Phase II Geoenvironmental Site Assessment
Rye Bank Fields

Reference:13-355-R2-2
Date: March 2020

PHASE II GEOENVIRONMENTAL SITE ASSESSMENT

Rye Bank Fields
Ryebank Road,
Manchester,
Chorlton
M21 9LU

Prepared for:

Manchester Metropolitan University

Manchester Metropolitan University

Report Ref: 13-533-R2-2
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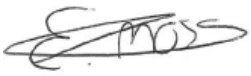
SIGNATURE			
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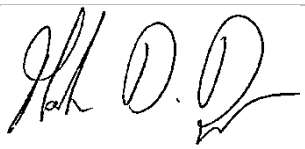
SIGNATURE			
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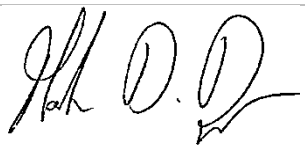
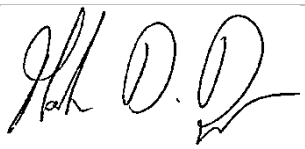
SIGNATURE			

EXECUTIVE SUMMARY

Site Address	Land north of Ryebank Road / Longford Road, Chorlton, Manchester, M21 9LU	
Grid Reference	E 381090, N 394580	
Site Area	4.60 Ha	
Current Site Use	The subject site is an irregular shaped parcel of land located to the north of Ryebank Road / Longford Road in Chorlton referred to as Ryebank Fields. The site is vacant and predominantly used by walkers. The site is surfaced by overgrown grasses and semi mature and mature trees, which are notably dense around the perimeter of the site. The Nico ditch is known to intersect the centre of the site which is a linear earthwork stretching across Manchester (9.7 km) and is of archaeological importance. There are no structures present on site, however an area of hardstanding is present to the south east of the site. A bund surfaced by grass is located adjacent to the area of hard standing in the south east of the site. A number of pedestrian paths intersect the site. The site is predominantly flat in topography but gradually falls from south to north.	
Proposed Development	E3P understands that Manchester Metropolitan University (MMU) are considering the proposed divestment of their asset at Ryebank Fields, Chorlton which is deemed to be surplus to requirement. As part of the divestment a Development Framework was approved by Manchester City Council in June 2019 that promotes a high-quality residential development across the site with associated gardens, estate roads and infrastructure. The Development Framework contains the proposed development layout for the site.	
Environmental Setting	**Drift Geology**	Glaciofluvial Sheet Deposits (North West)- SAND and GRAVEL Glacial Till (Majority of site) - SAND, GRAVEL and CLAY)
	Bedrock Geology	Wilmslow SANDSTONE Formation - SANDSTONE
	Hydrogeology	The site is predominantly underlain by a Secondary Undifferentiated aquifer with Secondary A aquifer in the north west of the site within the drift geology, overlying a Principal aquifer (bedrock geology). There are three groundwater abstraction points situated within 1 km of the site which are operated by Trafford Metal Finishers Manchester Ltd utilised as process water. The three abstraction licenses relate to these boreholes.
	Hydrology	The Nico Ditch (referred to as a drain) is intersecting the centre of the site however it is noted to be dry. A drain is located 156 m west of the site. Moreover, United Utilities have indicated that the route of the Thirlmere Aqueduct runs across the northern boundary of the site. Longford Brook (culverted) is located circa 210 m west of the site. Longford Brook historically flowed through the site, however has since been diverted.

	Flood Risk	The site is situated in a Flood Risk Zone 1; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (< 0.1%).
Natural Landform and Geomorphology	The site is predominantly underlain by till (Diamicton), historically glaciogenic in origin, with geomorphologies associated with glacial and inter-glacial periods during the Quaternary. The underlying bedrock mainly comprises SANDSTONE (Wilmslow Sandstone Formation). These sedimentary rocks are fluvial, lacustrine and marine in origin The site has previously undergone extensive quarrying during its use as a clay pit for an adjacent brick works. Following its excavation, the site had been infilled with waste materials in order to create a level platform.	
Site History	Historical mapping suggests that the site was undeveloped agricultural land with Longford Brook traversing the site west to east. In the late 1800's a pond was present in the centre of the site with a small structure in the south-western corner. In the early 1900's residential properties were present in the south-east of the site; furthermore, a brick works is present along the eastern boundary of the site. Mapping from 1930–1938 identifies a clay pit and two ponds in the north of the site, with embankments present across the entire site likely to be indicative of areas of excavation. Mapping from 1950 show all previous features to no longer be present, with a drain traversing the site west to east. An unspecified building was present in the west of the site from mapping dated 1971–1981 and was demolished at some point between 2003 and 2005.	
Previous Reports	E3P has been provided with a Geo-Environmental Appraisal prepared by WSP Parsons Brinckerhoff for Manchester Metropolitan University (Report Ref: 70014100, dated 18the September 2015, noted Highly Confidential) along with an Environmental Input (Report Ref: 70014100, dated October 2015, noted Confidential). The pertinent points from these reports are summarised in Section 2.4 of the E3P Phase I Geoenvironmental Site Assessment (Report Ref: 13-533-R1-2, dated March 2020).	
Utility Locations	A full GPR survey has not been completed however a review of online service records has identified an intermediate pressure gas main to dissect the site north to south, with a low pressure gas main present in the south-west of the site. BT and electricity service infrastructure are present in the south-western corner of the site. United Utilities have noted the presence of a surface water sewer in the south of the site with an overflow sewer within the north of the site. Adjacent to the northern boundary are 3 trunk mains one of which is named the Thirlmere Aqueduct, an LDTM Treated Water Trunk Main.	
Landfill Sites and Ground Gases	There are no current or historical landfill sites within 250 m of the subject site. However, mapping circa 1908 and 1989 indicates that the site has been subject to historical infilling (pits, quarries, pond, marsh, river, streams). In particular historical mapping shows significant topographical changes, steep slopes, infilled clay pits and ponds within the site boundary. There are also ten locations of potentially infilled land within 250 m of the site from historical mapping dating 1848 to 1955 with an unknown input type including two on-site from 1989 mapping.	
Radon	Unaffected – no special precautions required.	
Coal Mining/Land Stability	The site is not located in a coal mining affected area.	

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.

SITE INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising 30 mechanically excavated trial pits, 12 window sample probeholes, two cable percussion boreholes, ten Dynamic Cone Penetrometers and the installation of environmental monitoring installations.
Ground Conditions	**MADE GROUND** Made Ground deposits were encountered within all exploratory hole locations to a maximum depth of 12.70 mbgl in CP101. The full depth of Made Ground was only proven within two exploratory hole locations CP101 and CP102. The majority of exploratory hole locations were surfaced by a reworked topsoil to depths of between 0.10 m and 0.30 m bgl comprising a brown slightly clayey slightly sandy gravel with occasional cobbles and frequent rootlets, with gravel of sandstone, mudstone, concrete and brick with cobbles of concrete and brick. TP129, TP130 and WS112 located in the area of hardstanding in the south of the site, were all overlain by asphalt to depths of between 0.10 m and 0.20 m bgl. Underlying the reworked topsoil and asphalt, the deeper underlying Made Ground was largely granular, comprising a sandy ashy gravel which was encountered to depths of between 1.60 m and 12.70 m bgl. Made Ground consisted black sandy gravel (ashy) with occasional cobbles where gravel was of asphalt, ash, concrete, brick, plastic, and on occasion metal and glass. Cobbles comprised concrete and brick. Isolated areas of reworked clay were identified in TP102, WS102, WS103, WS108 and WS112, encountered at depths of between 0.20–2.50 mbgl. to a maximum depth of 3.45 m bgl and comprises a firm to stiff brown gravelly clay, with gravel of brick and concrete. White ash in the form of a grey blue clayey sand was encountered in pockets throughout the granular Made Ground in TP111, TP113, TP115, TP120, TP129, to depths of between 1.20 m bgl and 2.20 m bgl. The White ash was also encountered as bands in TP103 between 2.10m and 2.40 m bgl, WS105 between 3.60 m and 4.00 m bgl and WS111 between 2.00 m and 2.80 m bgl.
	DRIFT Drift deposits were only encountered within CP101 at 12.70 m and 14.95 m bgl and within CP102 at 10.20 m and 14.95 m bgl comprising a very stiff high strength sandy CLAY with bands of fine to medium SAND.

Ground Conditions ***Cont.***	**SOLID** The solid bedrock geology was not encountered within any exploratory hole locations and was not located within any BGS boreholes in close proximity to the site.
	GROUNDWATER Groundwater strikes were encountered as strikes and seepages between 1.20 m and 4.30 m bgl.

CONTAMINATED LAND ASSESSMENT

Human Health	The Tier 1 human health risk assessment identifies site wide concentrations of heavy metals, non-volatile PAHs, and non-volatile TPH compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. As such, it will be necessary to design and construct the proposed development in a manner that will ensure suitably validated cover systems to all areas of private garden, soft landscaping and public open space. Localised areas of volatile naphthalene, mercury and TPH impact has been identified within discreet locations (hotspots); these compounds pose a theoretical risk associated with volatilisation and subsequent ingress into the proposed dwellings (indoor air). Further testing should be completed to confirm the type of mercury present and whether it presents a vapour risk. Should the mercury present a vapour risk a hotspot removal should be undertaken. It is recommended that a Tier 2 vapour risk assessment is completed, as due to the homogenous nature of the fill materials it cannot be proven at this juncture if volatile compounds are present throughout the Made Ground or isolated within the locations identified thus far. Following the Tier 2 vapour risk assessment should these locations be deemed as hotspots, it will be necessary to delineate the extent of impact and ensure all material is excavated, analysed, treated for either reuse within an area of no sensitivity (post treatment) or, alternatively, removed from site. Asbestos was identified in four samples out of seventeen submitted for analysis. Asbestos in the form of chrysotile and amosite loose fibrous debris, loose fibres, bitumen and hard / cement type material. Asbestos was identified within WS102 at 3.20 m bgl, WS112 at 2.30 m bgl, WS110 at 0.50 m bgl and WS101 a 1.80 m bgl. Asbestos piping and sheeting were visually identified in TP116 and TP119 respectively; during the remediation and enabling works these should be removed from site by a licensed asbestos removal contractor. Impacted soils should be managed according to the E3P asbestos risk mitigation conceptual site model. There have been no VOCs identified above the LOD within the soil analysis. The SVOC 2-Methylnaphthalene was identified above the limit of detection in TP116 at 1.50 m bgl (0.5 mg/kg), TP127 (4.0 mg/kg) and WS102 (3.20 mg/kg) which was identified in the Made Ground deposits associated with the infilling of the clay pits. There are no suitable sources of topsoil or subsoil available on the site. Further site investigation will be required in the west of the site where access was restricted due to the presence of overgrown vegetation, a gas main and semi-improved neutral grassland.

Controlled Waters	Elevated concentrations of heavy metals, cyanide, PAH, TPH and VOCs have been identified within groundwater and leachate samples. Given that the site is predominantly underlain by CLAY this may afford some protection to the underlying Principal aquifer in the bedrock. Off-site surface water features are not considered at risk as cohesive CLAY drift deposits will limit the lateral migration of determinants. Given the sensitivity of the underlying Principal aquifer and proximity of surface water receptors E3P recommend that additional groundwater and leachate analysis will be required to delineate any previously identified contamination and to complete m-BAT bioavailability analysis of heavy metals along with a detailed P20 DQRA for groundwater. During the remediation and enabling works, hotspots will need to be delineated and validated through chemical analysis; additionally further leachate analysis will be required when engineering the Made Ground to ensure that no unacceptable materials are placed that could pose a risk to controlled waters. In addition, if any tanks or visually impacted waters with olfactory evidence are identified further risk assessment will be required.
Ground Gas	Preliminary ground gas monitoring suggests that the northern sector of the site can be predominantly classified as Green/CS1, and in these areas it is considered that gas protection measures will not be required. However, the south of the site has been assessed as being Amber 2 / CS3 and Red/CS4. The gas source is deemed to be associated with the underlying Made Ground deposits. As WS102 and WS103 have been assessed as being Red/ CS4 this would suggest this area is not suitable for residential development. It is suggested that additional monitoring wells are placed in the south of the site to fully delineate the zone of gas risk along with a phase of continuous ground gas monitoring. Full ground gas protection measures to be confirmed following completion of monitoring regime. A provision for the installation of ground gas protection measures adhering to Amber 2 / CS3 with VOC vapour membranes should be put in place.
Potable Water Infrastructure	This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation however it is likely PE Barrier Pipe will be required.

GEOTECHNICAL ASSESSMENT

Underground Obstructions	Concrete and brick obstructions have been encountered within the Made Ground. During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.
Allowable Bearing Pressure (ABP)	Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY. The CLAY has been noted to have an ABP in the region of 150 – 375 kN/m^2.
Foundation Options	Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY.

Foundation Options Continued…	The site is entirely underlain by deep Made Ground to depths of up to 12.70 m bgl. The underlying Made Ground predominantly comprises a sand or gravel containing ash, which has been assessed as very loose to dense. A programme of remediation and enabling works will be required to remove the extensive buried obstructions and cut/fill the site to provide suitable development platform levels. Due to the presence of deep Made Ground throughout the site it is considered that the most suitable foundation solution would be to utilise a driven pile into the natural underlying stiff to very stiff CLAY or a implement a raft foundation solution. Due to the age of the backfill material the near surface stratum may have been subject to long term total self-weight settlement with pore water dissipation at varying degrees, it is therefore considered that significant future consolidation of this material would be unlikely in the unaltered state. Within the deeper Made Ground the overburden pressures of >60 KPa have acted as surcharge pressures for the past 30+ years and as such long-term total and differential settlement is considered to have ceased. Consideration must also be given to potential changes in the groundwater regime within deep filled quarry. Viable ground engineering solutions include wholesale lift and process with subsequent replacement of all materials incorporating mechanical stabilisation features (Triaxial Geo-Grid with high tensile strength) which would form a stiffened soil platform on which a raft foundation could be constructed. The stiffened soil platform would be designed to ensure that materials are compacted to an end product specification that would ensure materials are compacted and that the density of the re-engineered material exceeds 95% of the optimum compaction potential simulated in a laboratory environment using a 2.5 kg remoulded sample. The viability of a VSC solution is inhibited due to the depth of Made Ground encountered on site exceeding 8.00 m along with the proximity of an intermediate pressure gas main bisecting the site and the Thirlmere Aqueduct along the northern boundary of the site. The proctor compaction tests completed on the underlying Made Ground deposits have indicated that the majority of materials analysed are wet of the optimum. It should be noted that if cohesive materials are 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. Foundation depths should take account of the presence of existing and proposed trees with foundations deepened locally, to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirements of NHBC standards. It is recommended that at working drawing stage a foundation schedule is prepared for the development taking account of the physical change of Made Ground clay soils and the current / proposed locations of trees. Consideration must also be given to the fact that the site has been classified as moderate to high risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. The site will therefore require clearance prior to the installation of any foundation solution.

Building Floor Slabs	Ground-bearing floor slabs are unlikely to be viable given the anticipated depths or reworked Made Ground > 600 mm and shallow cohesive soils.
Heave Precautions	Given that the underlying clay is of low volume change potential, heave precautions will not be required to 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 200 mm void) and pile ground beams are required within the modelled influencing distance of trees.
Soakaway Drainage	In-situ variable (falling) head permeability tests were undertaken within the monitoring well installations located in two probeholes (CP101 and CP102). Both of the installations were noted to be dry prior to the test being undertaken, therefore the tests were undertaken in the unsaturated zone. Infiltration tests in both CP101 and CP102 were completed in the underlying Made Ground where a soil infiltration rate of 1.32E-05 m/s and 1.56E-05 m/s have been calculated respectively. The site is underlain by Made Ground impacted by low-level inorganic and hydrocarbon compounds. It is therefore considered that soakaway drainage will not be suitable for the proposed development.
Sulphate Assessment	Following a process of remediation and enabling works, concrete classification will be DS-1 AC-1s.
CBR Design %	Made Ground can be re-engineered to ensure a CBR >5%. Granular soils can be re-engineered to ensure 3-5% within the sub-grade during favourable climatic conditions. Cohesive soils will provide a CBR in the order of 2-4% during drier climatic periods. However, if water is allowed to shed onto the formation, the CBR will reduce to <2% which will require specialist engineering of the subgrade.
Cut/Fill	Development levels unknown at this time, however some cut fill may be required.
Civil Engineering Excavations	The E3P Intrusive Ground Investigation has not identified the presence of weathered/competent bedrock at a shallow depth or running sands. Shallow groundwater has been encountered. Minor water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure.
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*.

RECOMMENDATIONS

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

- Further controlled waters risk assessment using the mBAT tool for heavy metals following the completion of supplementary groundwater sampling;
- Further site investigation will be required in the west of the site where access was restricted due to the presence of overgrown vegetation, a gas main and semi-improved neutral grassland;
- Continuous ground gas monitoring in the vicinity of WS102 and WS103 in the south of the site;
- Plot-specific foundation schedule (upon receipt of the final development levels and proposed development layout);
- Materials management plan;
- Geotechnical earthworks strategy (infrastructure);
- Remediation and enabling works strategy; and
- Full three-dimensional earthworks cut/fill model.

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1. INTRODUCTION

1.1. BACKGROUND

E3P Ltd has been commissioned by Manchester Metropolitan University to undertake a Phase II Geoenvironmental Site Assessment at land north of Ryebank Road in Chorlton.

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 proposed low-rise residential development.

The scope of work includes the following elements:

- Detailed review of historic information;
- Detailed desk study;
- Design of suitable intrusive ground investigation;
- Window sample probeholes with, and construction of, environmental monitoring installations;
- Deep cable percussive boreholes with monitoring installations;
- Mechanically excavated trial pits;
- Dynamic Cone Penetrometer Testing;
- In-situ geotechnical testing;
- Chemical and geotechnical laboratory analysis;
- Groundwater monitoring and sampling;
- Ground gas monitoring;
- Contamination risk assessment and conceptual site model;
- Geotechnical assessment and interpretation; and
- Factual and interpretive reporting.

1.2. PROPOSED DEVELOPMENT

E3P understands that Manchester Metropolitan University (MMU) are considering the proposed divestment of their asset at Ryebank Fields, Chorlton which is deemed to be surplus to requirement. As part of the divestment a Development Framework was approved by Manchester City Council in June 2019 that promotes a high-quality residential development across the site with associated gardens, estate roads and infrastructure. The Development Framework contains the proposed development layout for the site.

1.3. OBJECTIVES

The objectives of the geoenvironmental assessment are as follows:

- Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified.
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- Provide recommendations regarding future works required.

1.4. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.5. 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 contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.

2. GROUND INVESTIGATION

2.1. PHASE I DESK STUDY SUMMARY

E3P have completed a Phase I Geoenvironemental Site Assessment (Report Ref: 13-533-R1-2, dated March 2020), the pertinent points of which are summarised below:

Current and Historic Features

Historical mapping suggests that the site was undeveloped agricultural land with Longford Brook traversing the site west to east. In the late 1800's a pond was present in the centre of the site with a small structure in the south-western corner. In the early 1900's residential properties were present in the south-east of the site; furthermore, a brick works is present along the eastern boundary of the site. Mapping from 1930-1938 identifies a Clay Pit and two ponds in the north of the site, with embankments present across the entire site likely to be indicative of areas of excavation. Mapping from 1950 show all previous features to no longer be present, with a drain traversing the site west to east. An unspecified building was present in the west of the site from mapping dated 1971-1981 and was demolished at some point between 2003 and 2005.

Geology and Ground Conditions

The drift geology comprises Glaciofluvial Sheet Deposits (North West) consisting SAND and GRAVEL and Glacial till comprising CLAY, SAND and GRAVELS across the majority of the site. The bedrock is comprises Wilmslow SANDSTONE Formation.

Site Sensitivity

The site has been determined to be located within a high sensitivity setting.

There are residential houses immediately north, south and east of the site and St. Johns R.C. Primary School is located immediately east of the site.

There are three groundwater abstraction points situated within 1 km of the site which are operated by Trafford Metal Finishers Manchester Ltd utilised as process water. The three abstraction licenses relate to these boreholes. The site is also underlain by a Principal aquifer.

The Nico ditch intersects the centre of the site and is deemed to be of great historic and archaeological importance. The ditch will therefore require assessment by an archaeologist and protected during any future development on-site.

Human Health

Based on the information available to review, it is considered that there will be a moderate risk to human health. However, as the site has been subject to infilling and significant historical development, the site is thought to be underlain by significant depths of Made Ground. Made Ground may be potentially impacted with TPHs, heavy metals, PAHs and asbestos. Should these determinants be present it is likely that they can be mitigated through the placement of a suitably designed clean cover system to all gardens and landscaped areas. Should any volatile determinants be identified these are likely to require removal during remediation and enabling works in order to determine their retention on site and to not pose a risk to future end users.

Controlled Waters

The site is underlain by a Principal aquifer and the Nico Ditch (referred to as a drain) is intersecting the centre of the site however it is noted to be dry. A drain is located 156 m west of the site. Longford book (culverted) is located circa 210 m west of the site. There are also three groundwater abstraction points situated within 1 km of the site which may create a potential linkage. Made Ground across the site resulting from historic development and infilling may be a potential source of metals, hydrocarbon compounds, chlorinated solvents and PAHs.

The site is anticipated to be underlain by low permeability cohesive drift deposits which will afford protection to the underlying aquifer. The closest surface water feature is not considered to be within influencing distance of the site.

A detailed controlled water risk assessment will be required in order to confirm the absence of risk to controlled waters. It is likely that the Environment Agency will be consulted as part of any future planning application for a residential development.

Ground Gas

Significant depths of Made Ground, associated with former infilling and historical development of the site, are anticipated to be underlying the subject site which may be a potential source of ground gas such as methane and carbon dioxide. Hazardous ground gases may pose a low-level risk to construction workers and residential end users. Carbon dioxide and methane can migrate to indoor air spaces through service ducts and collect in deep excavations and have associated asphyxiation and explosive risks, respectively.

If a gas risk is identified, then mitigation may be required through the design and installation of appropriate gas protection measures as specified within BS8485 (2015)+A1(2019) Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

Geotechnical Risk

Extensive depths of Made Ground is anticipated beneath the site associated with the infilling of former clay pits and more recently, the demolition of former buildings. If volatile determinants are identified within the Made Ground they will require removal from site. Likely elevated levels of heavy metals and PAHs can be mitigated with the installation of a clean cover system within gardens and landscaped areas.

Made Ground present beneath the site is likely to be loosely compacted and possibly prone to collapse. Footings will require deepening in accordance with NHBC guidance 2016 Chapter 4.2 if the development incorporates any existing and proposed trees within any cohesive drift deposits;

The underlying superficial geology will likely comprise a cohesive soil matrix and, as such, is not likely to offer the required degree of permeability to make soak-away drainage viable in this instance;

The site has been determined to be at moderate risk of having compressible soils and this will require further investigation during a ground investigation.

Civil and Structural

The site is generally topographically level with a slight slope from south to north. To construct a low-rise residential development, limited earthworks will be required to create a level developable platform

Given the previously developed nature of the south of the site and that the site has been subject to extensive infilling, it is likely there will be Made Ground fill deposits and underground obstructions. All relic foundations and underground obstructions will require grubbing out in their entirety, prior to the construction of the proposed development.

A full utility survey has not been completed however a review of online service has identified an intermediate pressure gas main to dissect the site north to south, with a low pressure gas main present in the south-west of the site.

BT and electricity service infrastructure is present in the south-western corner of the site.

United Utilities have noted the presence of a surface water sewer in the south of the site with an overflow sewer within the north of the site. Adjacent to the northern boundary is the Thirlmere Aqueduct, an LDTM Treated Water Trunk Main.

2.2. 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 Table 2.1. 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 between 3rd and 5th December 2019. The works are summarised in Table 2.1.

TABLE 2.1 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 and depth of Made Ground in the vicinity of former ponds in the north of the site.	TP108	Mechanically Excavated Trial Pit	2.20	–
	TP120		2.20	–
	TP121		2.20	–
	WS108	Window Sample Probehole	4.45	0.50–3.00
General ground conditions including the presence / nature of obstructions and depth of Made Ground in the vicinity of former pond in the south of the site.	TP107	Mechanically Excavated Trial Pit	2.40	–
	TP117		1.60	–
	TP127		2.00	–
	WS103	Window Sample Probehole	5.45	0.50–2.00
	WS104		5.45	0.50–2.50
General ground conditions including the presence / nature of obstructions and depth of Made Ground in the vicinity of former houses in the south of the site.	TP104	Mechanically Excavated Trial Pit	2.10	–
	TP128		3.20	–
General ground conditions including the presence / nature of obstructions and depth of Made Ground in the vicinity of hardstanding in the south of the site.	TP129	Mechanically Excavated Trial Pit	1.90	–
	TP130		2.20	–
	WS112	Window Sample Probehole	3.45	0.50–2.00

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 and depth of Made Ground in the vicinity of former clay pit in the north of the site.	TP109	Mechanically Excavated Trial Pit	2.20	–
	TP110		2.20	–
	TP111		1.80	–
	TP112		1.90	–
	TP113		2.00	–
	TP114		2.30	–
	TP115		2.20	–
	TP118		1.90	-
	TP119		1.80	–
	TP122		3.00	–
	TP123		2.20	–
	TP124		2.20	–
	WS105	Window Sample Probehole	4.45	0.50–2.00
	WS106		3.00	0.50-2.00
	WS107		4.45	0.50–3.00
	WS109		4.45	0.50–2.50
	WS110		3.00	0.50–2.00
	WS111		4.00	0.50-3.00
General ground conditions including the presence / nature of obstructions and depth of Made Ground in the vicinity of former clay pit in the south of the site.	TP101	Mechanically Excavated Trial Pit	2.40	–
	TP102		2.30	–
	TP105		2.20	–
	TP106		1.70	–
	TP116		2.40	–
	TP126		2.30	–
	WS102	Window Sample Probehole	5.45	0.50–4.00
General ground conditions including the presence / nature of obstructions and depth of Made Ground in the vicinity of Longford Brook	TP118	Mechanically Excavated Trial Pit	1.90	–

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH	MONITORING WELLS RESPONSE ZONE (m bgl)
General ground conditions including the presence / nature of obstructions and depth of Made Ground in the vicinity of Unspecified Building in the south of the site.	TP103	Mechanically Excavated Trial Pit	2.40	–
General ground conditions including the presence / nature of obstructions and depth of Made Ground	WS101	Window Sample Probehole	5.45	0.50–3.00
	TP125	Mechanically Excavated Trial Pit	2.10	–
Investigation of deep ground conditions to identify suitable founding strata.	CP101	Cable Percussion Borehole	14.90	10.50–12.50
	CP102	Cable Percussion Borehole	14.45	8.00–10.00

Access was restricted in the west of the site due to the presence of overgrown vegetation, a gas main and semi-improved neutral grassland.

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 probeholes were advanced to undertaken in-situ detailed geotechnical testing, obtain environmental samples and install groundwater and ground gas monitoring wells.

Cable Percussion boreholes were advanced to facilitate the investigation of deeper soil horizons (in excess of 5.00 m bgl) with extensive in-situ geotechnical testing to determine the relative densities of granular soils and undrained strengths of clays.

Dynamic Cone Penetrometer tests will be completed where possible to assess the in-situ CBR value of the underlying strata to a depth of 1.00 m bgl.

The sampling locations are illustrated in Drawing 13-533-004 (Appendix III). The ground conditions encountered are indicated on the logs, which are provided in Appendix V.

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

2.3. 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 V and presented in Table 3.6 and discussed in Section 5.

2.4. IN-SITU CALIFORNIA BEARING RATIO (CBR)

In-situ CBR tests were undertaken at selected locations using a TRL probe. Tests were undertaken at depths of between 0.3 m and 1 m below ground level in order to intersect the likely pavement sub-formation level. The results are presented in Table 3.10 and test certificates are included within Appendix VIII.

2.5. PERMEABILITY TESTS

Two falling head permeability tests were undertaken within environmental monitoring wells (CP101 and CP102) in order to assess the likely permeability of the underlying strata to determine the potential suitability for soakaway drainage within the proposed development. The results are presented in Table 3.8 and the test certificates are included within Appendix IX.

2.6. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis comprising:

- Metals.
- pH, total sulphate, water-soluble sulphate (2:1 extract).
- Sulphide.
- Cyanide.
- Phenols.
- Total and speciated polycyclic aromatic hydrocarbons (PAHs).
- Semi Volatile Organic Compounds (SVOC).
- Volatile Organic Compounds (VOC).
- Asbestos identification and quantification.
- Speciated and banded total petroleum hydrocarbon (TPH).

I2 Analytical undertook the analytical work and the testing results are included in Appendix VI and discussed in Section 4.

Selected samples were submitted to PSL Laboratory where the following geotechnical tests were undertaken:

- Atterberg limits determinations;
- Moisture Content;
- Dry density/moisture content relationship (2.5kg); and
- Particle Size Distribution Test

Laboratory analysis sheets are included in Appendix X and are summarised in Section 9.

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 3.1.

TABLE 3.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (mbgl)		
	MADE GROUND TOPSOIL	MADE GROUND	CLAY
TP101	0.00–0.30	0.30–2.40	-
TP102	0.00–0.20	0.20–2.30	-
TP103	0.00–0.30	0.30–2.40	-
TP104	0.00–0.20	0.20–2.10	-
TP105	0.00–0.30	0.30–2.20	-
TP106	0.00–0.20	0.20–1.70	-
TP107	0.00–0.30	0.30–2.40	-
TP108	0.00–0.20	0.20–2.20	-
TP109	0.00–0.30	0.30–2.20	-
TP110	0.00–0.30	0.30–2.20	-
TP111	0.00–0.30	0.30–1.80	-
TP112	0.00–0.10	0.10–1.90	-
TP113	0.00–0.20	0.20–2.00	-
TP114	0.00–0.30	0.30–2.30	-
TP115	0.00–0.30	0.30–2.20	-
TP116	0.00–0.20	0.20–2.40	-
TP117	0.00–0.20	0.20–1.60	-
TP118	0.00–0.30	0.30–1.90	-
TP119	0.00–0.30	0.30–1.80	-
TP120	0.00–0.30	0.30–2.20	-
TP121	0.00–0.30	0.30–2.20	-
TP122	0.00–0.20	0.20–3.00	-
TP123	0.00–0.20	0.20–2.20	-
TP124	0.00–0.20	0.20–2.20	-
TP125	0.00–0.30	0.30–2.10	-
TP126	0.00–0.30	0.30–2.30	-
TP127	0.00–0.20	0.20–2.00	-
TP128	0.00–0.30	0.30–3.20	-
TP129	-	0.00–1.90	-
TP130	-	0.00–2.20	-
WS101	0.00–0.30	0.30–5.45	-
WS102	0.00–0.20	0.20–5.45	-
WS103	0.00–0.20	0.20–5.45	-
WS104	0.00–0.10	0.10–5.45	-
WS105	0.00–0.20	0.20–4.00	-
WS106	0.00–0.10	0.10–3.00	-
WS107	0.00–0.30	0.30–4.45	-
WS108	0.00–0.20	0.20–4.45	-
WS109	0.00–0.20	0.20–4.45	-
WS110	0.00–0.20	0.20–3.00	-
WS111	0.00–0.20	0.20–4.00	-

HOLE	DEPTH TO STRATUM (mbgl)		
	MADE GROUND TOPSOIL	MADE GROUND	CLAY
WS112	-	0.00–3.45	-
CP101	0.00–0.20	0.20–12.70	12.70–14.90
CP102	0.00–0.20	0.20–10.20	10.20–14.16

3.2. MADE GROUND

Made Ground deposits were encountered within all exploratory hole locations to a maximum depth of 12.70 m bgl in CP101. The full depth of Made Ground was only proven within two exploratory hole locations CP101 and CP102.

The majority of exploratory hole locations were surfaced by a reworked topsoil to depths of between 0.10 m and 0.30 m bgl comprising a brown slightly clayey slightly sandy gravel with occasional cobbles and frequent rootlets, with gravel of sandstone, mudstone, concrete and brick with cobbles of concrete and brick.

TP129, TP130 and WS112 located in the area of hardstanding in the south of the site, were all overlain by asphalt to depths of between 0.10 m and 0.20 mbgl.

Underlying the reworked topsoil and asphalt, the deeper underlying Made Ground was largely granular, comprising a sandy ashy gravel which was encountered to depths of between 1.60 m and 12.70 mbgl. Made Ground consisted black sandy gravel (ashy) with occasional cobbles where gravel was of asphalt, ash, concrete, brick, plastic, and on occasion metal and glass. Cobbles comprised concrete and brick.

Isolated areas of reworked clay were identified in TP102, WS102, WS103, WS108 and WS112, encountered at depths of between 0.20-2.50 m bgl. to a maximum depth of 3.45 m bgl. and comprised a firm to stiff brown gravelly clay, with gravel of brick and concrete.

White ash in the form of a grey blue clayey sand was encountered in pockets throughout the granular Made Ground in TP111, TP113, TP115, TP120, TP129, to depths of between 1.20 m bgl and 2.20 m bgl. The White ash was also encountered as bands in TP103 between 2.10m and 2.40 m bgl, WS105 between 3.60 m and 4.00 m bgl and WS111 between 2.00 m and 2.80 m bgl.

3.3. DRIFT DEPOSITS

Drift deposits were only encountered within CP101 at 12.70 m and 14.95 m bgl and within CP102 at 10.20 m and 14.95 m bgl comprising a very stiff high strength sandy CLAY with bands of fine to medium SAND.

3.4. SOLID GEOLOGY

The solid bedrock geology was not encountered within any exploratory hole locations and was not located within any BGS boreholes in close proximity to the site.

3.5. GROUNDWATER

Groundwater strikes were encountered as strikes and seepages. The depth of the strikes are shown on the exploratory hole records in Appendix V and are summarised in Table 3.2.

TABLE 3.2 SUMMARY GROUNDWATER STRIKES

LOCATION	DEPTH TO STRIKE (m)	NOTES
TP101	1.90	Strike – rapid ingress
TP102	2.10	Strike – rapid ingress
TP103	2.10	Strike – rapid ingress
TP104	2.10	Strike – rapid ingress
TP105	2.20	Strike – rapid ingress
TP106	1.60	Strike – rapid ingress
TP107	2.30	Strike – rapid ingress
TP108	2.20	Strike – rapid ingress
TP109	2.00	Strike – rapid ingress
TP110	2.10	Strike – rapid ingress
TP113	1.80	Strike – rapid ingress
TP114	2.20	Strike – rapid ingress
TP115	2.10	Strike – rapid ingress
TP116	2.00	Strike – rapid ingress
TP117	1.40	Strike – rapid ingress
TP120	2.10	Strike – rapid ingress
TP122	2.90	Strike – rapid ingress
TP123	2.00	Strike – rapid ingress
TP124	2.10	Strike – rapid ingress
TP125	2.10	Strike – rapid ingress
TP126	2.20	Strike – rapid ingress
TP127	1.70	Strike – rapid ingress
TP129	1.90	Strike – rapid ingress
TP130	2.00	Strike – rapid ingress
WS101	4.30	Strike – slow ingress
WS102	4.00	Strike – slow ingress
WS103	1.20	Strike – slow ingress
WS104	1.20	Strike – slow ingress
WS107	3.00	Strike – slow ingress
WS111	1.20	Strike – slow ingress
CP101	2.00	Strike – rapid ingress
CP102	2.30	Strike – rapid ingress

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free phase hydrocarbon product, however no hydrocarbon product was present.

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 3.3.

TABLE 3.3 SUMMARY VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

LOCATION	DEPTH (m)	STRATUM	NOTES
TP101	0.30–2.40	Made Ground	Slight hydrocarbon odour
TP116	1.50–2.40	Made Ground	Strong hydrocarbon odour
TP119	1.80	Made Ground	Asbestos sheeting
TP120	2.10	Made Ground	Strong hydrocarbon odour
TP125	0.30–2.10	Made Ground	Slight hydrocarbon odour
TP127	1.80	Made Ground	Hydrocarbon odour
WS101	1.20–3.20	Made Ground	Strong hydrocarbon odour
WS102	3.10–4.00	Made Ground	Strong hydrocarbon odour
WS104	3.10-4.00	Made Ground	Strong hydrocarbon odour

3.7. SIDE STABILITY AND EASE OF EXCAVATION

The majority of excavations were prematurely terminated due to collapse or rapid groundwater ingress flooding the excavation.

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.

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

The presence of brick and concrete cobbles within the Made Ground deposits meant that in certain places, excavation was slow throughout the Made Ground. The natural strata was not exposed within any excavations.

3.8. SOIL CONSISTENCY

Undrained shear strength values were measured using standard penetration tests. Results of the tests are presented in Table 3.4, which indicate the natural clay soils to vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.

TABLE 3.4 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/m^2)
WS101	1	MADE GROUND	12	12.10	Medium Dense	N/A	N/A	N/A
WS101	2	MADE GROUND	5	4.57	Loose	N/A	N/A	N/A
WS101	3	MADE GROUND	2	1.74	Very Loose	N/A	N/A	N/A
WS101	4	MADE GROUND	18	15.21	Medium Dense	N/A	N/A	N/A
WS101	5	MADE GROUND	16	13.27	Medium Dense	N/A	N/A	N/A
WS102	1	MADE GROUND	4	4.03	Loose	N/A	N/A	N/A
WS102	2	MADE GROUND	1	0.91	Very Loose	N/A	N/A	N/A
WS102	3	MADE GROUND	12	10.44	Medium Dense	N/A	N/A	N/A
WS102	4	MADE GROUND	4	3.38	Very Loose	N/A	N/A	N/A
WS102	5	MADE GROUND	11	9.13	Loose	N/A	N/A	N/A
WS103	1	MADE GROUND	15	15.12	Medium Dense	N/A	N/A	N/A
WS103	2	MADE GROUND	2	1.83	Very Loose	N/A	N/A	N/A
WS103	3	MADE GROUND	11	9.57	Loose	N/A	N/A	N/A
WS103	4	MADE GROUND	12	10.14	Medium Dense	N/A	N/A	N/A
WS103	5	MADE GROUND	7	5.81	Loose	N/A	N/A	N/A
WS104	1	MADE GROUND	13	13.11	Medium Dense	N/A	N/A	N/A
WS104	2	MADE GROUND	4	3.65	Very Loose	N/A	N/A	N/A
WS104	3	MADE GROUND	21	18.26	Medium Dense	N/A	N/A	N/A
WS104	4	MADE GROUND	17	14.36	Medium Dense	N/A	N/A	N/A
WS104	5	MADE GROUND	20	16.59	Medium Dense	N/A	N/A	N/A

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/m^2)
WS105	1	MADE GROUND	26	26.21	Medium Dense	N/A	N/A	N/A
WS105	2	MADE GROUND	0	0.00	Very loose	N/A	N/A	N/A
WS105	3	MADE GROUND	22	19.13	Medium Dense	N/A	N/A	N/A
WS105	4	MADE GROUND	4	3.38	Very Loose	N/A	N/A	N/A
WS106	1	MADE GROUND	17	17.14	Medium Dense	N/A	N/A	N/A
WS106	2	MADE GROUND	4	3.65	Very Loose	N/A	N/A	N/A
WS106	3	MADE GROUND	50	43.48	Dense	N/A	N/A	N/A
WS107	1	MADE GROUND	20	20.16	Medium Dense	N/A	N/A	N/A
WS107	2	MADE GROUND	17	15.53	Medium Dense	N/A	N/A	N/A
WS107	3	MADE GROUND	12	10.44	Medium Dense	N/A	N/A	N/A
WS107	4	MADE GROUND	16	13.52	Medium Dense	N/A	N/A	N/A
WS108	1	MADE GROUND	23	23.19	Medium Dense	N/A	N/A	N/A
WS108	2	MADE GROUND	30	27.41	N/A	High strength	Very Stiff	137.03
WS108	3	MADE GROUND	0	0.00	Very Loose	N/A	N/A	N/A
WS109	1	MADE GROUND	16	16.13	Medium Dense	N/A	N/A	N/A
WS109	2	MADE GROUND	7	6.39	Loose	N/A	N/A	N/A
WS109	3	MADE GROUND	21	18.26	Medium Dense	N/A	N/A	N/A
WS109	4	MADE GROUND	13	10.98	Medium Dense	N/A	N/A	N/A
WS110	1	MADE GROUND	8	8.07	Loose	N/A	N/A	N/A
WS110	2	MADE GROUND	28	25.58	Medium Dense	N/A	N/A	N/A
WS110	3	MADE GROUND	50	43.48	Dense	N/A	N/A	N/A

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/m^2)
WS111	1	MADE GROUND	23	23.19	Medium Dense	N/A	N/A	N/A
WS111	2	MADE GROUND	27	24.67	Medium Dense	N/A	N/A	N/A
WS111	3	MADE GROUND	1	0.87	Very Loose	N/A	N/A	N/A
WS112	1	MADE GROUND	18	18.15	Medium Dense	N/A	N/A	N/A
WS112	2	MADE GROUND	12	10.96	N/A	Medium strength	Stiff	54.81
WS112	3	MADE GROUND	4	3.48	N/A	Very low strength	Soft	17.39
CP101	1	MADE GROUND	7	7.06	Loose	N/A	N/A	N/A
CP101	2	MADE GROUND	7	6.39	Loose	N/A	N/A	N/A
CP101	3	MADE GROUND	9	7.83	Loose	N/A	N/A	N/A
CP101	4	MADE GROUND	20	16.90	Medium Dense	N/A	N/A	N/A
CP101	5	MADE GROUND	8	6.64	Loose	N/A	N/A	N/A
CP101	6.5	MADE GROUND	37	30.21	Dense	N/A	N/A	N/A
CP101	8	MADE GROUND	15	12.14	Medium Dense	N/A	N/A	N/A
CP101	9.5	MADE GROUND	15	12.09	Medium Dense	N/A	N/A	N/A
CP101	11	MADE GROUND	36	27.84	Medium Dense	N/A	N/A	N/A
CP101	12.5	CLAY	20	14.61	N/A	Medium strength	Stiff	73.06
CP101	14	CLAY	50	34.64	N/A	Very high strength	Very Stiff	173.18
CP101	14.5	CLAY	50	34.05	N/A	Very high strength	Very Stiff	170.24
CP102	1	MADE GROUND	10	10.08	Medium Dense	N/A	N/A	N/A
CP102	2	MADE GROUND	14	12.79	Medium Dense	N/A	N/A	N/A
CP102	3	MADE GROUND	26	22.61	Medium Dense	N/A	N/A	N/A

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/m^2)
CP102	4	MADE GROUND	46	38.86	Dense	N/A	N/A	N/A
CP102	5	MADE GROUND	51	42.31	Dense	N/A	N/A	N/A
CP102	6.5	MADE GROUND	25	20.41	Medium Dense	N/A	N/A	N/A
CP102	8	MADE GROUND	23	18.62	Medium Dense	N/A	N/A	N/A
CP102	9.5	MADE GROUND	32	25.79	Medium Dense	N/A	N/A	N/A
CP102	12.5	CLAY	20	14.61	N/A	Medium strength	Stiff	73.06
CP102	14	CLAY	50	34.64	N/A	Very high strength	Very Stiff	173.18
CP102	14.5	CLAY	50	34.05	N/A	Very high strength	Very Stiff	170.24
CP102	11	CLAY	28	21.65	N/A	High strength	Very Stiff	108.27
CP102	12.5	CLAY	50	36.53	N/A	Very high strength	Very Stiff	182.65
CP102	14	CLAY	52	36.02	N/A	Very high strength	Very Stiff	180.11

3.9. SOIL INFILTRATION

In-situ variable (falling) head permeability tests were undertaken within the monitoring well installations located in two probeholes (CP101 and CP102). Both of the installations were noted to be dry prior to the test being undertaken, therefore the tests were undertaken in the unsaturated zone. Infiltration tests in both CP101 and CP102 were completed in the underlying Made Ground where a soil infiltration rate of 1.32E-05 m/s and 1.56E-05 m/s have been calculated respectively. The site is underlain by Made Ground impacted by low-level inorganic and hydrocarbon compounds. It is therefore considered that soakaway drainage will not be suitable for the proposed development.

3.10. PARTICLE SIZE DISTRIBUTION

Particle Size Distribution Tests have been undertaken on selected samples of granular materials to obtain information on the soil fractions. The results are included in Table 3.8. The full results can be found in Appendix X.

TABLE 3.6 SUMMARY OF PARTICLE SIZE DISTRIBUTION

LOCATION	DEPTH (m)	SOIL FRACTION (%)			
		COBBLES	GRAVEL	SAND	SILT/CLAY
CP101	3.00–3.45	0	39	26	35
CP101	8.00–8.45	0	91	8	1
CP102	1.00–1.45	33	47	18	2
CP102	3.00–3.45	30	49	18	3
CP102	5.00–5.45	0	90	10	0
TP120	2.10	0	55	39	6
TP129	1.30	0	49	46	5

3.11. SOIL DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Dry density / moisture content relationship analysis has been conducted on soils utilising proctor compaction tests utilising a 2.5 kg rammer. The results of the tests have been summarised in Table 3.7. The full results can be found in Appendix X.

TABLE 3.7 SUMMARY DRY DENSITY AND MOISTURE CONTENT

LOCATION	LABORATORY DESCRIPTION	DEPTH (m)	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MAX DRY DENSITY (mg/m³)
CP101	Made Ground: Dark grey very gravelly very sandy clay.	3.00–3.45	31	17	1.67
CP101	Made Ground: Dark brown slightly sandy gravel.	8.00–8.45	16	18	1.62
CP102	Made Ground: Dark brown sandy slightly clayey gravel with many cobbles.	1.00–1.45	14	18	1.62
CP102	Made Ground: Dark brown sandy slightly clayey gravel with many cobbles.	3.00–3.45	19	21	1.54

LOCATION	LABORATORY DESCRIPTION	DEPTH (m)	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MAX DRY DENSITY (mg/m³)
TP120	Made Ground: Dark brown very sandy clayey gravel.	2.10	20	18	1.55
TP129	Made Ground: Brown clayey sand and gravel.	1.30	28	15	1.59

The proctor compaction tests have indicated that the majority of materials analysed are wet of the optimum.

It should be noted that if clay materials are 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.

3.12. 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. These tests enable determination of an average plasticity index (PI) for each “type” of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth.

E3P typically only consider a soil to be shrinkable if the proportion finer than 63 µm is > 35%.

PI results are compared against guidance given in the NHBC standards, Chapter 4.2 (revised January 2014), which advocates the use of modified plasticity index (I′p), defined as:

$$I'p = Ip \times (\% < 425\ \mu m/100)$$

In other words, if PI is 30%, but the soil contains 80% < 425 µm, then I′p = 30 × 80/100 = 24%.

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425 µm sieve is routinely reported by testing labs.

E3P apply engineering judgement where PI results are spread over a range of classifications. Consideration is given to the average values for each particular soil type (differentiate between residual soil and alluvium), the number of results in each class and the actual values.

The Atterberg limits determinations, summarised in Table 3.8, show the clay to be of predominantly low plasticity.

TABLE 3.8 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
CP101	14.45-14.95	11	15	28	13	78	10.14	LOW
CP102	12.50-12.95	10	14	26	12	77	9.24	LOW
CP102	14.00-14.45	16	19	36	17	84	14.28	LOW

The results of the Atterberg limits testing confirmed that the soils would be deemed to be Low Volume Change Potential in accordance with the classification system utilised by the LABC/NHBC industry guidance.

3.13. CALIFORNIA BEARING RATIO

The California bearing ratio (CBR) for the soils were measured using an in-situ TRL probe. The results are summarised in Table 3.9.

The result sheets are included in Appendix VIII and the locations are shown on Drawing 13-533-004. CBR results have been averaged from the blow counts across the strata tested and any abnormally high blow counts ignored as these are likely to be from larger granular material and so represent anomalies.

TABLE 3.9 SUMMARY OF DCP RESULTS

LOCATION	DEPTH (m)	STRATA	IN-SITU OR LAB TEST	CBR (%)
DCP101	0.21–0.32	MADE GROUND: Gravel	In-Situ	6.77
DCP102	0.36–0.44	MADE GROUND: Gravel	In-Situ	82.60
DCP103	0.18–0.27	MADE GROUND: Topsoil	In-Situ	85.28
DCP104	0.19–0.22	MADE GROUND: Topsoil / Gravel	In-Situ	173.70
DCP105	0.33–0.42	MADE GROUND: Gravel	In-Situ	53.69
DCP106	0.42–0.78	MADE GROUND: Gravel	In-Situ	12.73
DCP107	0.18–0.34	MADE GROUND: Topsoil / Gravel	In-Situ	47.62
DCP108	0.30–0.50	MADE GROUND: Gravel	In-Situ	33.53
DCP109	0.11–0.27	MADE GROUND: Topsoil / Gravel	In-Situ	25.76
DCP110	0.29–0.33	MADE GROUND: Topsoil / Gravel	In-Situ	35.40

It should be noted that the reported CBR results were obtained from soils in a highly undisturbed state. However, the topsoil and surface cover is removed during periods of wetter climatic condition, the formation will soften, reducing the CBR.

All locations were terminated due to the presence of obstructions within the underlying Made Ground. Obstructions within the Made Ground have caused the high CBR values calculated.

3.14. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in Appendix VI (summarised in Table 3.10), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

Elevated sulphate concentrations meeting Class DS-2, AC-1s were noted within the Made Ground deposits in WS102 at 3.20 m bgl.

TABLE 3.10 SUMMARY OF pH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP105	0.10	0.046	9.0	DS-1/AC-1s
TP115	1.60	0.15	12.3	DS-1/AC-1s

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP116	1.50	0.11	11.2	DS-1/AC-1s
TP120	2.10	0.13	10.30	DS-1/AC-1s
WS102	3.20	0.97	9.0	DS-2/AC-1s
WS105	3.80	0.055	12.4	DS-1/AC-1s

3.15. GROUND GAS

A ground gas assessment has been completed in accordance with guidance provided within CIRIA 665 – *Assessing risk posed by hazardous ground gases to buildings*.

3.16. INVESTIGATION RATIONALE

The ICSM has identified that the underlying Made Ground, infilled ponds, infilled clay pits, infilled field boundaries may represent a potential source of ground gas generation. Based on the identification of these sources, E3P has determined that the site represents a low ground gas source generation potential.

Within the context of the proposed residential end use and ground gas generation potential, the gas assessment requires that 9 visits are required over 6months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

The spacing requirements for monitoring wells are detailed within CIRIA 665 Table 4.2, which indicates that for low gas hazard sites (Made Ground with limited degradable material, organic clay of limited thickness) and a high sensitivity development, nominal well spacing should be between 25 m and 50 m.

TABLE 3.11 GROUND GAS MONITORING LOCATION RATIONALE

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Made Ground	0.50–3.00
WS102	Made Ground	0.50–4.00
WS103	Made Ground	0.50–2.00
WS104	Made Ground	0.50–2.50
WS105	Made Ground	0.50–2.00
WS106	Made Ground	0.50–2.00
WS107	Made Ground	0.50–3.00
WS108	Made Ground	0.50–3.00
WS109	Made Ground	0.50–2.50
WS110	Made Ground	0.50–2.00
WS111	Made Ground	0.50–3.00
WS112	Made Ground	0.50–2.00
CP101	Made Ground	10.50–12.50
CP102	Made Ground	8.00–10.00

3.17. MONITORING METHODOLOGY

Concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) were measured using an infra-red gas analyser (GFM435) calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 60 seconds at each location, 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 3.12.

TABLE 3.12 SUMMARY OF GROUND GAS MONITORING RESULTS

WELL	DATE	CH_4 INITIAL (%V/V)	CH_4 STEADY (%V/V)	CH_4 GSV (l/hr)	CO_2 INITIAL (%V/V)	CO_2 STEADY (%V/V)	CO_2 GSV (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	14/01/20	15.50	15.50	-0.2542	3.40	3.40	-0.0558	0.20	999	Falling	-1.64	0.50–3.00	2.85	1.80
	05/02/20	10.50	10.50	-0.1932	3.70	3.70	-0.0681	0.20	1034	Falling	-1.84		2.80	1.98
WS102	14/01/20	26.00	26.00	0.0676	1.10	1.10	0.0029	2.20	999	Falling	0.26	0.50–4.00	3.12	0.50
	05/02/20	Flooded												
WS103	14/01/20	63.80	63.80	1.0208	0.10	0.10	0.0016	5.80	999	Falling	1.60	0.50–2.00	1.90	1.15
	05/02/20	73.80	73.80	3.1808	0.20	0.20	0.0086	3.70	1034	Falling	4.31		1.94	1.27
WS104	14/01/20	Flooded										0.50–2.50	N/A	
	05/02/20													
WS105	14/01/20	0.10	0.10	0.0005	0.70	0.70	0.0036	18.40	999	Falling	0.52	0.50–2.00	2.10	2.00
	05/02/20	0.10	0.10	0.0003	0.70	0.70	0.0018	19.40	1034	Falling	0.26		2.12	2.00
WS106	14/01/20	0.10	0.10	-0.0003	1.00	1.00	-0.0026	18.30	999	Falling	-0.26	0.50–2.00	0.83	Dry
	05/02/20	0.10	0.10	0.0003	0.90	0.90	0.0023	18.30	1034	Falling	0.26		1.80	Dry
WS107	14/01/20	0.10	0.10	0.0001	3.80	3.80	0.0038	13.40	999	Falling	0.10	0.50–3.00	2.90	1.92
	05/02/20	0.10	0.10	0.002	1.70	1.70	0.0337	16.40	1034	Falling	1.98		2.90	2.00
WS108	14/01/20	0.10	0.10	0.0005	4.50	4.50	0.0234	12.20	999	Falling	0.52	0.50–3.00	2.29	1.97
	05/02/20	0.10	0.10	0.0009	3.20	3.20	0.0282	15.30	1034	Falling	0.88		2.30	2.05
WS109	14/01/20	0.10	0.10	0.0008	0.90	0.90	0.0071	18.90	999	Falling	0.79	0.50–2.50	2.35	2.10
	05/02/20	0.10	0.10	0.0009	0.90	0.90	0.0077	18.70	1034	Falling	0.85		2.33	2.20
WS110	14/01/20	0.10	0.10	0.0008	2.30	2.30	0.0182	18.30	999	Falling	0.79	0.50–2.00	2.60	2.00
	05/02/20	0.10	0.10	0.0003	2.20	2.20	0.0057	17.80	1034	Falling	0.26		2.60	2.13

WELL	DATE	CH_4 INITIAL (%V/V)	CH_4 STEADY (%V/V)	CH_4 GSV (l/hr)	CO_2 INITIAL (%V/V)	CO_2 STEADY (%V/V)	CO_2 GSV (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS111	14/01/20	0.10	0.10	0.0005	0.10	0.10	0.0005	20.40	999	Falling	0.52	0.50–3.00	1.92	1.92
	05/02/20	0.10	0.10	0.0003	0.40	0.40	0.0010	19.80	1034	Falling	0.26		1.97	1.95
WS112	14/01/20	0.10	0.10	0.0003	0.20	0.20	0.0005	19.50	999	Falling	0.26	0.50–2.00	1.79	Dry
	05/02/20	0.10	0.10	0.0003	0.70	0.70	0.0018	19.00	1034	Falling	0.26		1.80	Dry
CP101	14/01/20	0.10	0.10	-0.0043	0.10	0.10	-0.0043	19.30	999	Falling	-4.27	10.50–12.50	12.93	1.62
	05/02/20	0.10	0.10	0.0001	0.10	0.10	0.0001	19.70	1034	Falling	0.10		12.95	1.70
CP102	14/01/20	0.10	0.10	0.0005	0.40	0.40	0.0021	18.50	999	Falling	0.52	8.00–10.00	9.97	2.04
	05/02/20	0.10	0.10	0.0015	0.60	0.60	0.0092	18.90	1034	Falling	1.54		10.20	2.10

4. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 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).

The results of this comparison have been summarised within Table 4.1.

TABLE 4.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A RESIDENTIAL END USE

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	37	17	34	N/A	1	No Further Action
Cadmium	mg/kg	17	17	3.3	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.1	17	<4.0	N/A	1	No Further Action
Lead	mg/kg	200	17	820 230 460 1100 220 1000 680 230	TP105 0.10 m TP127 1.80 m TP128 0.80 m WS102 3.20 m TP101 0.10 m TP119 0.10 m TP120 2.10 m TP125 2.10 m	1	**Further Action**
Mercury	mg/kg	1.2	17	2.8 1.4	TP116 1.50 m TP119 0.10 m	3	**Further Action**
Nickel	mg/kg	180	17	80	N/A	1	No Further Action
Selenium	mg/kg	250	17	3.8	N/A	1	No Further Action
Copper	mg/kg	2400	17	2600	TP128 0.80 m	1	**Further Action**
Zinc	mg/kg	3700	17	2500	N/A	1	No Further Action
Cyanide – Total	mg/kg	791	17	120	N/A	1	No Further Action
Phenols – Total	mg/kg	210	7	47	N/A	1	No Further Action
Asbestos	Fibres	NFD	17	1.183% 0.036% 0.014% <0.001%	WS101 1.80 m WS102 3.20 m WS112 2.30 m WS110 0.50 m	4	**Further Action**
Naphthalene	mg/kg	2.3	17	5.1	TP127 1.80 m	3	**Further Action**
Acenaphthylene	mg/kg	170	17	11	N/A	2	No Further Action
Acenaphthene	mg/kg	210	17	5.7	N/A	1	No Further Action
Fluorene	mg/kg	170	17	17	N/A	1	No Further Action
Phenanthrene	mg/kg	95	17	150	TP119 0.10	2	No Further Action
Anthracene	mg/kg	2400	17	46	N/A	2	No Further Action
Fluoranthene	mg/kg	280	17	150	N/A	2	No Further Action
Pyrene	mg/kg	620	17	130	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	17	10 44 19 12 9.6 6.8	TP128 0.80 m TP119 0.10 m TP116 1.50 m TP127 1.80 m WS102 3.20 m TP120 0.10 m	2	**Further Action**

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Chrysene	mg/kg	15	17	37 16	TP119 0.10 m TP116 1.50 m	2	Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	17	3.0 2.8 11 3.0 50 3.3 14 10 8.5 6.6	TP103 1.30 m TP105 0.10 m, TP128 0.80 m TP101 0.10 m TP119 0.10 m TP125 0.10 m TP116 1.50 m TP127 1.80 m WS102 3.20 m TP120 2.10 m	2	Further Action
Benzo(k)Fluoranthene	mg/kg	77	17	15	N/A	2	No Further Action
Benzo(a)Pyrene**	mg/kg	2.2	17	2.7 2.7 8.9 2.5 45 2.8 13 9.7 7.6 5.6	TP103 1.30 m TP105 0.10 m TP128 0.80 m TP101 0.10 m TP119 0.10 m TP125 0.10 m TP116 1.50 m TP127 1.80 m WS102 3.20 m TP120 2.10 m	2	Further Action
Indeno(123-cd)Pyrene	mg/kg	27	17	30	TP119 0.10 m	2	Further Action
Dibenzo(a,h) Anthracene	mg/kg	0.24	17	0.42 0.39 1.1 0.44 7.2 0.42 2.1 1.1 1.4 1.0	TP103 1.30 m TP105 0.10 m TP128 0.80 m TP101 0.10 m TP119 0.10 m TP125 0.10 m TP116 1.50 m TP127 1.80 m WS102 3.20 m TP120 2.10 m	2	Further Action
Benzo(ghi)Perylene	mg/kg	320	17	25	N/A	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	14	<1.0	N/A	3	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	14	<0.1	N/A	3	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	14	<0.1	N/A	3	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	13	40	N/A	3	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	13	220	TP119 0.10 m	3	Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	13	1700	TP119 0.10 m	1	Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	13	1300	TP119 0.10 m	1	Further Action
TPH C5-C7 (aromatic)	mg/kg	70	3	<0.001	N/A	1	No Further Action
TPH C7-C8 (aromatic)	mg/kg	130	3	<0.001	N/A	3	No Further Action

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
TPH C8-C10 (aromatic)	mg/kg	34	3	<0.001	N/A	3	No Further Action
TPH C10-C12 (aromatic)	mg/kg	74	3	7.9	N/A	3	No Further Action
TPH C12-C16 (aromatic)	mg/kg	140	3	200	TP116 1.50 m	3	Further Action
TPH C16-C21 (aromatic)	mg/kg	260	3	1100	TP116 1.50 m	1	Further Action
TPH C21-C35 (aromatic)	mg/kg	1100	3	910	N/A	1	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	3	<0.001	N/A	3	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	3	<0.001	N/A	3	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	3	<0.001	N/A	3	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	3	13	N/A	3	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	3	20	N/A	3	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	3	76	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	3	450	N/A	1	No Further Action

Notes
Main exposure pathways: 1 = soil ingestion, 2 = dermal contact and ingestion, 3 = vapour inhalation (indoor), 4 = dust inhalation.
Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

Referring to Table 4.1, the results of this direct comparison indicates that the data exceeds the screening criteria for a residential end use for the following contaminants:

- Lead;
- Mercury;
- Copper;
- Asbestos;
- Naphthalene;
- Phenanthrene;
- Benzo(a)Anthracene;
- Chrysene;
- Benzo(b)Fluoranthene;
- Benzo(a)Pyrene;
- Indeno(123-cd)Pyrene;
- Dibenzo(a,h)Anthracene;
- TPH C12-C16 (aromatic);
- TPH C16-C21 (aromatic);

- TPH C21-C35 (aromatic).

Asbestos was identified in four samples out of seventeen submitted for analysis. Asbestos in the form of Chrysotile and Amosite loose fibrous debris, loose fibres, bitumen and hard / cement type material. Asbestos was identified within WS102 at 3.20 m bgl, WS112 at 2.30 m bgl, WS110 at 0.50 m bgl and WS101 a 1.80 m bgl. Asbestos piping and sheeting were visually identified in TP116 and TP119 respectively.

There have been no VOCs identified above the laboratory LOD of 1.0 µg/kg. The SVOC 2-Methylnaphthalene was identified above the limit of detection in TP116 at 1.50 m bgl (0.5 mg/kg), TP127 (4.0 mg/kg) and WS102 (3.20 mg/kg) which was identified in the Made Ground deposits associated with the infilling of the clay pits.

The laboratory analysis confirms the assessment within the initial conceptual site model that the main constituents of concern were likely to be asbestos, PAHs, hydrocarbon compounds and heavy metals.

In relation to these exceedances, the following can be determined:

- The main exposure pathways based on the Tier I exceedances are:
  - Soil ingestion;
  - Vapour inhalation (indoor);
  - Dust inhalation
  - Dermal contact and ingestion;
  - Consumption of homegrown vegetables; and
- Exceedances have been identified between 0.10 m and 3.20 m bgl within the Made Ground deposits associated with the infilling of former clay pits.

HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

Laboratory analysis of the soils across the site has indicated the presence of elevated metals, non-volatile PAHs, and non-volatile TPH compounds within the Made Ground. Naphthalene, mercury and volatile TPH compounds were also identified in several locations.

The majority of the identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion, soil ingestion and consumption of homegrown produce. These exceedances can be mitigated by the installed of a suitably designed cover system with a hard no dig layer within all proposed garden areas to be confirmed by Manchester City Council.

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

With regards to the elevated SVOCs, mercury, naphthalene and volatile TPHs, these present a potential volatilisation to indoor air risk. Exceedances in mercury were identified in TP116 at 1.50 m bgl and TP119 at 0.10 m bgl. Elevated naphthalene was identified in TP127 at 1.80 m bgl. Exceedances in TPH C12-16 were identified in TP119 at 0.10 m bgl and TP116 at 1.50 m bgl.

Further testing should be completed to confirm the type of mercury present and whether it presents a vapour risk. Should it be volatile a hotspot removal should be undertaken.

It is recommended that a Tier 2 vapour risk assessment is completed, as due to the homogenous nature of the fill materials it cannot be proven at this juncture if volatile compounds are present throughout the Made Ground or isolated within the locations identified thus far. Following the Tier 2 vapour risk assessment should these locations be deemed as hotspots, it will be necessary to delineate the extent of impact and ensure all material is excavated, analysed, treated for either reuse within an area of no sensitivity (post treatment) or, alternatively, removed from site.

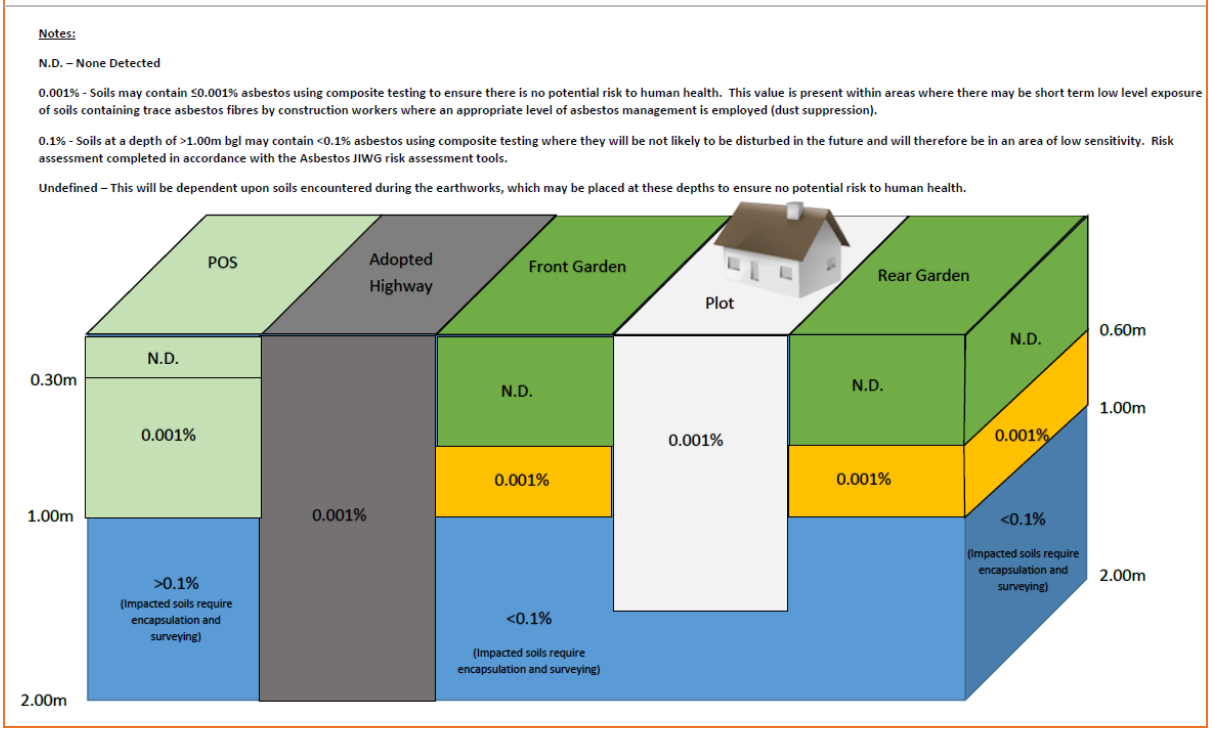
Asbestos has been identified in four locations across the site. Asbestos quantification has been completed which has identified concentrations to be <0.001% by hand picking weight in WS110 at 0.50 mbgl. However, concentrations above <0.001% by hand picking weight have been identified in WS101 at 1.80 mbgl at 1.183%, WS102 at 3.20 mbgl at 0.036% and WS112 at 2.30 mbgl at 0.014%.

It should be assumed that asbestos fibres are present throughout the Made Ground on site, and therefore materials should be managed according to the E3P Asbestos Risk Mitigation Conceptual Site Model shown in Figure 4.1.

Where asbestos has been identified at concentrations >0.001% by hand picking weight in WS101, WS102 and WS112, a phase of hotspot removal should be undertaken with the appropriate health and safety procedures in place, where the materials can then be placed in an area in which they will no longer pose a risk to future end users.

Visual pieces of asbestos have been identified within the site investigation. These should be handpicked, suitably bagged and removed off-site by a licensed waste contractor to a suitable site.

Figure 4.1 Asbestos Risk Mitigation Conceptual Site Model



Where a potentially unacceptable degree of risk is identified, the impacted soils should either be remediated or alternatively the prosed dwellings should be designed with appropriate mitigation measures to remove the potential pollution linkage.

There are no suitable sources of topsoil or subsoil available on the site.

4.2. CONTROLLED WATERS RISK ASSESSMENT

The site sensitivity with respect to controlled waters is summarised within Table 4.2.

TABLE 4.2 CONTROLLED WATERS SENSITIVITY PROFILE

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located in a Groundwater Source Protection Zone or Drinking Water Safeguard Zone	**Low**
Distance to the Closest Groundwater Abstraction Point	There are three groundwater abstraction points located 593 m north of the site which are all operated by Trafford Metal Finishers Manchester Ltd and utilised for process water.	**Moderate**
Aquifer Classification in Superficial Drift Deposits	Secondary A and Secondary Undifferentiated aquifers underlie the subject site. The underlying superficial deposits comprise low-permeability clay deposits. However, these have only been encountered at depths of between 10.20 m - 12.70 mbgl, which may reduce the potential for mobile phase contaminants to migrate towards the bedrock aquifer.	**Moderate**
Aquifer Classification in Bedrock	Principal Aquifer	**High**
Viability for Anthropogenic Soil in Direct Contact with Aquifer (Drift or Bedrock)	Extensive depths of Made Ground with heavy metal, PAH and hydrocarbon impact has been identified to be present throughout the Made Ground.	**High**
Is the Site Located Within 50 m of a Surface Watercourse?	The Nico Ditch intersects the centre of the site (albeit dry) and a culverted inland river is located 156 m north west of the site. Moreover, United Utilities have indicated that the route of the Thirlmere Aqueduct runs adjacent to the northern boundary of the site. Longford book (culverted) is located circa 210 m west of the site.	**High**
SUMMARY The ICSM developed within the context of the site setting has identified viable pollutant linkages, associated with the downward migration of potentially mobile phase-soluble contaminants towards the underlying Principal aquifer and lateral migration towards the on-site drain ditch and Thirlmere Aqueduct.		

To further refine the ICSM, E3P has undertaken an initial qualitative assessment of the soil data analysis to assess the potential for a source of separate-phase or dissolved-phase contamination originating from either a defined on-site source or from impacted soils. This assessment is summarised in Table 4.3.

TABLE 4.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

BTEX > 1 mg/kg	There were no exceedances in BTEX or VOC. Additionally, the soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of VOC impact
Total VOC > 1 mg/kg	
Total SVOC > 1 mg/kg	2-Methylnaphthalene was identified above the limit of detection in TP116 at 1.50 m bgl (0.5 mg/kg), TP127 (4.0 mg/kg) and WS102 (3.20 mg/kg).
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD
C10-C12 > 10 mg/kg	TP103 at 1.30 m bgl, WS102 at 3.20 m bgl and TP120 at 2.10 m bgl all have exceedances of C10-C12 above 10 mg/kg with a maximum concentration of 40 mg/kg in TP103 at 1.30 m bgl.
C12-C16 > 50 mg/kg	Exceedances of C12-C16 have been identified in TP116 at 1.50 m bgl and TP119 at 0.10 m bgl with a maximum concentration of 220 mg/kg.
Phenols > 2 mg/kg	All concentrations are below 2 mg/kg, with the exception of WS105 at 3.80 m which has a concentration of 47 mg/kg.
Naphthalene > 2 mg/kg	The most soluble SVOC (naphthalene) has been not identified at concentrations greater than 2 mg/kg, except for within TP127 at 1.80 mbgl) which has a concentration of 5.1 mg/kg.
Total PAH > 10 mg/kg	Concentrations of low solubility PAH compounds greater than 10mg/kg have been detected throughout the site.
PCB > 1 mg/kg	An electrical substation has been identified adjacent to the south-western boundary of the site, no analysis has been possible to date.
Heavy metals > 500 mg/kg	Heavy metals have been identified throughout the site at concentrations above 500 mg/kg, with a maximum concentration of copper identified in TP128 at 0.80 m bgl.

In due consideration of the ICSM, E3P has undertaken a Tier I controlled waters risk assessment. The Tier I assessment has included a comparison of leachate analysis and groundwater samples to environmental surface water quality (EQS) for the protection of surface water quality and drinking water standards (DWS) for the protection of the underlying aquifer.

These are presented in Table 4.4.

TABLE 4.4 COMPARISON OF GROUNDWATER ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]	N		MC	LOC. OF EX	ASSESS-MENT
		AA	MAC		L	GW			
Arsenic	µg/l	50	–	10	4	4	15.4 12.8 14.0 12.0	WS110 (GW-DWS) CP101(GW-DWS) CP102(GW-DWS) TP103 2.10 m (L-DWS)	**Further Assessment**
Cadmium	µg/l	0.08-0.25	0.45-1.5	5	4	4	<0.08	–	No Further Assessment
Chromium (VI)	µg/l	3.4	–	–	4	4	20	TP106 1.50 m (L-EQS AA)	**Further Assessment**
Chromium (III)	µg/l	4.7	–	50	4	4	5.7	CP101 (GW-EQS AA)	**Further Assessment**
Copper (hardness)	µg/l	1	–	2000	4	4	14 110 9 13 4.3 9.1 7.5 5.0	TP103 2.10m (L-EQS AA) TP106 1.50 m (L-EQS AA) WS106 0.80m (L-EQS AA) WS111 2.70m (L-EQS AA) WS101 (GW-EQS AA) WS110 (GW-EQS AA) CP101 (GW-EQS AA) CP102 (GW-EQS AA)	**Further Assessment**
Total Cyanide	µg/l	1	–	50	4	4	5.2 31 160 81 7.4 1.5 5.2	WS101 (GW – EQS AA) WS110 (GW – EQS AA) CP101 (GW – EQS AA / DWS) CP102 (GW – EQS AA / DWS) TP103 2.10 m (L-EQS AA) WS106 0.80 m (L-EQS AA) WS111 2.70 m (L-EQS AA)	**Further Assessment**

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]	N		MC	LOC. OF EX	ASSESS-MENT
		AA	MAC		L	GW			
Lead	µg/l	1.2	14	10	4	4	16 4.4 9.5 1.5 9.8 26	WS101 (GW – EQS / DWS) CP101 (GW – EQS AA) CP102 (GW – EQS AA) TP103 2.10 m (L-EQS AA) TP106 1.50 m (L-EQS AA) WS106 0.80 m (L-EQS / DWS)	**Further Assessment**
Mercury	µg/l	–	0.07	1.0	4	4	0.18 0.17	CP101 (GW – EQS MAC) CP102 (GW – EQS MAC)	**Further Assessment**
Nickel	µg/l	4	34	20	4	4	4.7 22 6.4 15 11 7.1	WS101 (GW-EQS AA) WS110 (GW-EQS AA/ DWS) CP101 (GW-EQS AA) CP102 (GW-EQS AA) TP103 2.10 m (L-EQS AA) TP106 1.50 m (L-EQS AA)	**Further Assessment**
Selenium	µg/l	–	–	10	4	4	5.3	–	No Further Assessment
Zinc (hardness)	µg/l	10.9	–	–	4	4	73 13 14 48 62 34	TP106 1.50m (L-EQS AA) WS106 0.80m (L-EQS AA) WS101 (GW – EQS AA) WS110 (GW – EQS AA) CP101 (GW – EQS AA) CP102	**Further Assessment**

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]	N		MC	LOC. OF EX	ASSESS-MENT
		AA	MAC		L	GW			
								(GW – EQS AA)	
pH		6–9			4	4	11.1 10.7 12.6 12.6	CP101 (GW – EQS/DWS) CP102 (GW – EQS/DWS) TP103 2.10m (L – EQS/DWS) WS111 2.70m (L – EQS/DWS)	Further Assessment
PAH									
Naphthalene	µg/l	2	130	10*	4	4	16 3.4	CP101 (GW-EQS AA / DWS) CP102 (GW-EQS AA)	Further Assessment
Anthracene	µg/l	0.1	0.1		4	4	0.25	WS101 (GW – EQS AA/MAC)	Further Assessment
Benzo[b]fluoranthene	µg/l	1.7–4	0.017		4	4	<0.01	–	No Further Assessment
Benzo[k]fluoranthene	µg/l	1.7–4	0.017		4	4	<0.01	–	No Further Assessment
Benzo(a)pyrene	µg/l	1.7–4	0.27		4	4	<0.01	–	No Further Assessment
Indeno(123-cd)pyrene	µg/l	0.00017*	5*		4	4	<0.01	-	No Further Assessment
Benzo(ghi)pyrene	µg/l	0.00017*	5*		4	4	<0.01	-	No Further Assessment
Fluoranthene	µg/l	0.0063	0.12		4	4	<0.01	–	No Further Assessment
Benzo(ghi)perylene	µg/l	1.7–4	8.2–3		4	4	<0.01	–	No Further Assessment
TPH-Aromatic									
TPH C5-C6 (benzene)	µg/l	10	50	1	4	4	11-11.3 7	CP101 (Inc. Benzene – GW – EQS AA/DWS) CP102 (Inc. Benzene – GW DWS)	Further Assessment

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]	N		MC	LOC. OF EX	ASSESS-MENT
		AA	MAC		L	GW			
TPH C6-C8 (toluene)	µg/l	74	–	700	4	4	4.6	–	No Further Assessment
TPH C8-C10 (ethyl Benzene)	µg/l	20	–	300	4	4	12	–	No Further Assessment
TPH C10-C12 (xylene)	µg/l	30	–	500	4	4	63 48	CP101 (GW – EQS AA) CP102 (GW – EQS AA)	**Further Assessment**
TPH C12-C16	µg/l	2	130	90[5]	4	4	220 63	CP101 (GW – EQS AA/MAC, DWS) CP102 (GW – EQS AA)	**Further Assessment**
TPH C16-C35	µg/l	50#	50#	90[5]	4	4	79	CP101 (GW – EQS AA/MAC)	**Further Assessment**
TPH Aliphatic[5]									
TPH C5-C6	µg/l	–	–	15000	4	4	<1.0	–	No Further Assessment
TPH C6-C8	µg/l	–	–	15000	4	4	<1.0	–	No Further Assessment
TPH C8-C10	µg/l	–	–	300	4	4	<1.0	–	No Further Assessment
TPH C10-C12	µg/l	–	–	300	4	4	<10	–	No Further Assessment
TPH C12-C16	µg/l	–	–	300	4	4	<10	–	No Further Assessment
TPH C16 – C21	µg/l	–	–	300**	4	4	<10	–	No Further Assessment
TPH C21-C35	µg/l	–	–	300**	4	4	<10	–	No Further Assessment
VOC									
Tetrachloroethylene	µg/l	0.4	–	10	–	4	<1.0	–	No Further Assessment
Trichloroethylene	µg/l	10	–	10	–	4	<0.1	-	No Further Assessment
Trichlorobenzene	µg/l	0.4	–	–	–	4	<1.0	–	No Further Assessment
Trichloromethane	µg/l	2.5	–	–	–	4	9.1	CP101 (GW – EQS AA)	**Further Assessment**

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]	N		MC	LOC. OF EX	ASSESS-MENT
		AA	MAC		L	GW			
Dichloromethane	µg/l	20	–	200	–	-	-	-	No Further Assessment
Carbon Tetrachloride	µg/l	12	–	3	–	4	<1.0	–	No Further Assessment
Vinyl Chloride	µg/l	–	–	0.3	–	4	<1.0	–	No Further Assessment

Notes
Solubility < 0.01 µg/l.
AA – Annual average.
MAC – Maximum admissible concentration.
* Sum of The specified compounds are benzo[b]fluoranthene (CAS 205-99-2), benzo[k]fluoranthene (CAS 207-08-9), benzo[g,h,i]perylene (CAS 191-24-2) and indeno[1,2,3-c,d]pyrene (CAS 193-39-5).

1. *The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations* (2015).
2. *Directive establishing a framework for Community action in the field of water policy* (Water Framework Directive).
3. *Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) – List II substances.*
4. *Council Directive on the quality of water intended for human consumption (Drinking Water Directive).*
5. *WHO Guidelines for Drinking Water Quality*. Third edition (2004).

CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that the data exceeds the DWS / EQS screening values for the following inorganic compounds:

- Total cyanide;
- Arsenic;
- Chromium (VI);
- Chromium (III);
- Copper;
- Lead;
- Mercury;
- Nickel;
- Zinc;
- Naphthalene;
- Aromatic TPH C5-C6 (benzene);
- Aromatic TPH C10-C12;

- Aromatic TPH C12-C16;
- Aromatic TPH C16-C35; and,
- Trichloromethane.

HEAVY METALS

Groundwater samples from WS110, CP101 and CP102 along with a leachate sample from TP103 at 2.10 m bgl have recorded elevated concentrations of arsenic when compared against the DWS.

Elevated concentrations of chromium (VI) has been identified within a leachate sample from TP106 at 1.50 m bgl against EQS Annual Average (AA) values. A Maximum Admissible Concentration (MAC) and DWS value is not available for this determinant.

The EQS AA Chromium (III) screening value has been exceeded by a groundwater sample from CP101.

All leachate and groundwater samples have exceeded the EQS AA screening value for copper. concentrations have not exceeded the DWS screening criteria.

All groundwater samples, and all bar one leachate sample have exceeded the EQS AA screening value for total cyanide.

Lead exceeding EQS AA, EQS MAC and DWS screening values have been identified in groundwater samples from WS101 and a leachate sample from WS106 at 0.80 m bgl. Furthermore, groundwater samples from CP101 and CP102, along with leachate samples from TP103 at 2.10 m bgl and TP106 at 1.50 m bgl have exceeded the EQS AA screening value.

Mercury has been identified to be elevated against EQS MAC for groundwater samples in CP101 and CP102.

Nickel has been noted to be elevated against predominately EQS AA values in groundwater (WS101, WS110, CP101 and CP102) and leachate samples (TP103 2.10 m and TP106 1.50 m). Whilst groundwater samples from WS110 also exceeded the Nickel DWS screening value.

Zinc has been identified to be elevated against EQS AA values for leachate samples in TP106 1.50 m and WS106 0.80 m, and groundwater samples in WS101, WS110, CP102 and CP102.

The elevated concentrations of inorganic heavy metal impact are deemed to be associated with the historic Made Ground fill materials from the infilling of former clay pits on site.

It is recommended that further groundwater sampling is completed in order to retrieve DOC, Manganese and Calcium concentrations to enable the completion of a bioavailability assessment using the m-BAT tool to determine the amount of metal that is bioavailable for Copper, Zinc, Nickel, Manganese and Lead.

Elevated concentrations of arsenic, chromium (VI), nickel, total cyanide and zinc against the Tier I values have not been identified within the soil analysis on site, and therefore not considered to be a significant source on site.

pH has been noted to be elevated in groundwater samples from CP101 and CP102, and leachate samples TP103 at 2.10 m and WS111 at 2.70 m.

PAH, TPH AND VOC

Elevated concentrations of naphthalene have been identified within groundwater from CP101 against EQS AA and DWS screening values, and groundwater from CP102 against EQS AA values.

Anthracene has been noted to be elevated against EQS AA and MAC screening values in groundwater from WS101.

Groundwater from CP101 has been identified to contain elevated concentrations of aromatic TPH C5– C6 (benzene) against EQS AA and DWS values. Meanwhile groundwater in CP102 has been noted to exceed DWS values.

Aromatic TPH C10–C12 is elevated against EQS AA screening values for groundwater from CP101 and CP102.

Groundwater in CP101 has been noted to contain elevated levels of aromatic TPH C12–C16 against EQS AA and MAC along with DWS screening criteria. Whilst elevated concentrations have also been identified against EQS AA screening values in CP102. Groundwater from CP101 has been identified to contain elevated concentrations of aromatic TPH C16-C35 against EQS AA and MAC screening values. Furthermore, groundwater from CP101 has also identified elevated concentrations of Trichloromethane against EQS AA values, however there is no DWS screening criteria for this determinant.

All exceedances were noted within leachate and groundwater analysis within the Made Ground deposits. Elevated concentrations of VOCs have not been noted within the soil analysis and therefore is not considered a significant source for these determinants.

The source of the elevated TPH within groundwater are considered to be the Made Ground on site as elevated concentrations have been detected within the soils analysis. As part of the remediation and enabling works a phase of hotspot removal should be undertaken in these localities. However, it is thought that this will not remove the source completely. Furthermore, the elevated TPH concentrations within the groundwater have been identified in samples taken from deep groundwater monitoring wells as the base of the Made Ground overlying low permeability CLAY drift deposits. It is considered that this groundwater is perched and is unlikely to affect the underlying Principal aquifer.

It is anticipated that the site is acting as a basin as clay has been extracted from the area previously, and the groundwater at the base of the fill has leached from the Made Ground. Groundwater is likely to move in an easterly or southerly direction towards the River Mersey or Longford Brook. However, there is not considered to be significant lateral movement, as north, south and west of the site has not previously undergone clay extraction, and therefore the clay in situ will act as an impermeable layer. The former clay pits associated with neighbouring brick works advanced eastwards of the site, and therefore should there be any impact off-site it will not wholly be associated with the subject site. The underlying CLAY drift deposits will afford protection to the underlying Principal aquifer within the bedrock geology.

It is likely the proposed development will be constructed using a driven piled foundation, where the piles are likely to be set within the underlying stiff to very stiff CLAY drift deposits, where they will not create a preferential pathway to the Principal aquifer. In order to prevent any risk from vapours to the proposed dwellings, they should be constructed with a vapour membrane. It is recommended that a vapour risk assessment is completed to determine the risk to the proposed development.

Given the determinants identified within sampling completed to date and the underlying Principal aquifer, a detailed P20 DQRA for groundwater along with further sampling should be undertaken.

Based on the above, there is considered to be a moderate level of risk to the controlled water receptors. Furthermore, due to the presence of heavy metals and organic hydrocarbon compounds in the perched groundwater careful consideration as to the risks to site operatives and the possible requirement to pre-treat the water will be required.

4.3. GROUND GAS

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). However, it is recommended that the full ground gas assessment and recommended protection measures 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.

CIRIA C665 and NHBC Report No 10627-R01 provide assessments for carbon dioxide and methane based upon gas screening values (GSVs) utilising flow rates and concentrations. The site-based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{concentration\ (by\ vol)}{100} \times flowrate\ (1\ /\ hr)$$

The GSVs within CIRIA C665 are based upon all buildings other than standard residential houses. The NHBC GSVs are based upon standard residential houses with precast concrete floors (block and beam). The CIRIA 665 report author (Steve Wilson) since provided further clarification regarding which guidance should be adopted for residential houses that have suspended cast in-situ concrete floor slab: for the avoidance of doubt, it was confirmed that the GSVs within the CIRIA 665 guidance should be adopted. The thresholds for GSVs based upon NHBC and CIRIA guidance are provided within Table 4.5.

TABLE 4.5 RESIDENTIAL THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH CIRIA C665 AND NHBS REPORT NO 10627-R01 – RESIDENTIAL END USE

CIRIA – NO SUBFLOOR VOID		NHBC – SUBFLOOR VOID		
CLASSIFICATION	**GSV (METHANE AND CARBON DIOXIDE)**	**CLASSIFICATION**	**GSV (METHANE)**	**GSV (CARBON DIOXIDE)**
CS1	< 0.07	Green	< 0.13	< 0.76
CS2	< 0.70	Amber 1	< 0.63	< 1.60
CS3	< 3.5	Amber 2	< 1.60	< 3.10
CS4	< 15	Red	> 1.60	> 3.10
CS5	< 70	N/A	N/A	N/A
CS6	> 70	N/A	N/A	N/A

4.3.1. SOURCES OF GROUND GAS

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

- Made Ground deposits related to the former infilling of the site associated with historical clay pits, ponds and field boundaries.

4.3.2. GROUNDWATER

WS102, WS104, CP101 and CP102 have been noted to be flooded on both occasions of monitoring completed thus far and therefore cannot be included within the ground gas risk assessment.

Within the remaining monitoring wells groundwater levels have been shown to decrease over the monitoring completed thus far. WS106 and WS112 have been noted to be dry on both monitoring visits completed to date.

4.3.3. GAS FLOW

During the monitoring completed to date a positive gas flow has been recorded in WS102, WS103, WS105, WS106, WS107, WS108, WS109, WS110, WS111, WS112, CP101 and CP102.

Negative flows are indicative of back pressure from wind being greater than the active flow from the wells. Negative flows were recorded in WS101, WS106 and CP101.

4.3.4. GAS CONCENTRATIONS

Methane has been recorded within all monitoring wells at concentrations varying between 0.10 % v/v (Limit of Detection (LOD)) and 73.80 % v/v (WS103). Elevated concentrations of methane have been recorded in WS101 (15.50 % v/v), WS102 (26.00 % v/v) and WS103 (63.80 % v/v). No elevated concentrations were recorded within any of the remaining monitoring wells.

Carbon dioxide concentrations were recorded within all the monitoring wells at concentrations ranging from 0.10 % v/v (LOD) to a maximum concentration of 4.50 % v/v (WS108). The maximum carbon dioxide levels were also associated with low oxygen concentrations and appear to be associated with Made Ground.

4.3.5. GAS ASSESSMENT

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV). The GSVs for the monitoring positions are summarised in Table 4.6.

TABLE 4.6 GAS RISK PROFILE AND LOCATION

LOCATION	MAX CO_2 (% v/v)	GSV (l/hr)	MAX CH_4 (% v/v)	GSV (l/hr)	CLASSIFICATION
WS101	3.70	-0.0681	15.50	-0.2542	Amber 2 / CS3
WS102	1.10	0.0029	26.00	0.0676	Red / CS4
WS103	0.20	0.0086	73.80	3.1808	Red / CS4
WS105	0.70	0.0036	0.10	0.0005	Green/ CS1
WS106	1.00	-0.0026	0.10	-0.0003	Green/ CS1
WS107	3.80	0.0337	0.10	0.002	Green/ CS1
WS108	4.50	0.0282	0.10	0.0009	Green/ CS1
WS109	0.90	0.0077	0.10	0.0009	Green/ CS1
WS110	2.30	0.0182	0.10	0.0008	Green/ CS1
WS111	0.40	0.0010	0.10	0.0005	Green/ CS1
WS112	0.70	0.0018	0.10	0.0003	Green/ CS1
CP101	0.10	-0.0043	0.10	-0.0043	Green/ CS1
CP102	0.60	0.0092	0.10	0.0015	Green/ CS1

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Preliminary ground gas monitoring suggests that the site can be predominantly classified as Green/CS1, and in these areas it is considered that gas protection measures will not be required. However, elevated concentrations of methane have been identified in the south of the site in the vicinity of WS101, WS102, WS103 and have been assessed as being Amber 2 / CS3 and Red/CS4. The gas source is deemed to be associated with the underlying Made Ground deposits where organic and putrescible materials may be present.

Within WS102 hydrocarbon odours were identified during the site investigation and therefore may be attributable to the elevated concentrations of methane.

As WS102 and WS103 have been assessed as being Red / CS4 this would suggest this area is not suitable for residential development. It is suggested that additional monitoring wells are placed in the south of the site to fully delineate the zone of gas risk.

In due consideration of the recorded methane concentrations, a supplementary quantitative risk assessment is required, to ensure a robust assessment of the actual gas concentrations, potential emission rate and flux, it is recommended that real time monitoring apparatus (Gas Clams) are installed within selected positions to determine the actual methane concentration and emission rate to accurately assess the potential risk, characterise the site and inform the design of mitigation measures.

VOCs have been identified within groundwater samples, and the use of driven piles may create a preferential pathway to the properties constructed. At this time provision should be allowed for the construction of properties with a VOC vapour membrane pending a Tier 2 vapour risk assessment

The site should be developed in the south of the site with ground gas mitigation measures in accordance with Amber 2 / CS3 with a VOC vapour membrane as detailed below.

4.4. RESIDENTIAL BUILDING GAS RISK MITIGATION

British Standard BS8485 (2015)+A1(2019) provides two types of residential property that require assessment. These building types are:

- **Type A Building –** Private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms are present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.

- **Type B Building –** Private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small- to medium-sized rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Based on the ground gas risk assessment and the proposed Type A Building, it is envisaged that a point score of 4.5 will be required for affected properties, as summarised in Table 4.7.

TABLE 4.7 BS 8485 (2015)+A1(2019) POINTS REQUIRED FOR TYPE A AND TYPE B BUILDINGS

Characteristic Situation	NHBC Traffic Light System	Minimum gas protection score (points)	
		HIGH SENSITIVITY	
		TYPE A BUILDING	TYPE B BUILDING
1	Green	0	0
2	Amber 1	3.5	3.5
3	Amber 2	4.5	4
4	Red	6.5	5.5
5	N/A	N/A	6.5
6	N/A	N/A	N/A

Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, for example, high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system such as in institutional and/or fully serviced contractual situations.

The requisite 4.5 points must be achieved by installation of a suitable combination of measures detailed in Table 4.8.

TABLE 4.8 SUMMARY OF GROUND GAS MITIGATION MEASURES – BS8485 (2015)+A1(2019)

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	SCORE[A]
Floor and Substructure Design	
Precast Suspended Segmental Subfloor (Beam and Block)	0
Cast In-Situ Ground-Bearing Floor Slab (With Only Nominal Mesh Reinforcement)	0.5
Cast In-Situ Monolithic Reinforced Ground-Bearing Raft or Reinforced Cast In-Situ Suspended Floor Slab With Minimal Penetrations	1 or 1.5[B]
Basement Floor and Walls Conforming to BS 8102:2009, Grade 2 Waterproofing[C]	2
Basement Floor and Walls Conforming to BS 8102:2009, Grade 3 Waterproofing[C]	2.5

A) The scores are conditional on breaches of floor slabs, etc. being effectively sealed.
B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see **A.2.2.2**).
C) The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see **C.3,** Note 4).

PROTECTION ELEMENT SYSTEM		SCORE	COMMENTS
Gas protection scores for ventilation protection measures			
(a) Pressure Relief Pathway – Usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building.		0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is 0.
(b) Passive Subfloor Dispersal Layer – Media used to provide the dispersal layer are: • Clear void; • Polystyrene void former blanket; • Geocomposite void former blanket; • No-fines gravel layer with gas drains; and • No-fines gravel layer.	Very good performance	2.5	The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B of BS 8485 (2015). Passive ventilation should be designed to meet at least "good performance".
	Good performance	1.5	

(c) Active Dispersal Layer – Usually comprising fans with active abstraction (suction) from a subfloor dilution layer with roof-level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers.	1.5 to 2.5	This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance".
(d) Active Positive Pressurisation – Provided by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket.	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".

PROTECTION ELEMENT SYSTEM	SCORE	COMMENTS
(e) Ventilated Car Park – Floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park.	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to Buildings Regulations 2000, Approved Document F [9].
Gas Protection Score for the Gas-Resistant Membrane		
Gas-resistant membrane meeting all of the following criteria: • Sufficiently impervious to the gases with a methane gas transmission rate < 40.0 ml/day/m^2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); • Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; • Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); • Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre-reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools); • Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and • Verified in accordance with CIRIA C735.	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.4 mm thickness (equivalent to 370 g/m^2 for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite, then the score is 0.
This table should be read in conjunction with the notes presented in BS 8485 (2015)+A1 (2019)		

4.5. 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 4.9 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	<1.0
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	61 mg/kg TP103 1.30 m 24.3 mg/kg TP128 0.80 m
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	657 mg/kg TP128 0.80 m
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	NA
Ethers*	0.5	NA
Nitrobenzene*	0.5	NA
Ketones*	0.5	NA
Aldehydes*	0.5	NA
Amines	Fail	NA
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	Elevated SVOC 2-Methylnaphthalene within TP127 at 1.80 m (4.00 mg/kg) have been identified. Elevated concentrations above the PE threshold for EC10-EC16- Aliphatic and Aromatic Hydrocarbons and EC16-EC40 Aliphatic and Aromatic Hydrocarbons have been identified.	
Is free product present in soil and groundwater?	Elevated concentrations of hydrocarbons have been identified within soil and groundwater.	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	Heavy end hydrocarbon impact and low solubility PAH has been identified within Made Ground at depths above or below the proposed pipeline depth. Rapid groundwater strikes have also been identified between 1.20 m and 4.30 m bgl	
Will soils impacted with above determinands likely be utilised elsewhere on site?	To be determined, site likely to undergo some form of site wide turnover to create a developable platform.	

Will soils be imported to site as part of any future earth works	Currently unknown, however it is likely soils will be required to be imported to site.

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

It is considered that barrier pipe will be required unless soils containing elevated concentrations of SVOCs and TPHs are removed during remediation and enabling works.

4.6. CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 4.10 has been prepared for the site.

TABLE 4.10 CONCEPTUAL MODEL

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL1 PL2	Dermal contact Dermal contact and Soil Ingestion	Future site users. Offsite receptors.	Heavy metals and non-volatile PAHs (in Made Ground).	Likely	Moderate	**LOW**
Discussion: Heavy metals and non-volatile PAHs have been identified throughout Made Ground deposits between depths of 0.10 m and 12.70 m bgl associated with the former infilling of clay pits on site. **Recommendation:** The chronic risk to human health associated with the elevated concentrations of inorganic heavy Metals and non-volatile PAHs 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 to future site users. Construction works completed with PPE and provision of welfare.						

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL3	ACM in Made Ground	Inhalation of dust.	Future site users. Buildings. Off-site land users.	Likely	High	**LOW**

Assessment:
Asbestos has been identified in four locations. Quantification identified concentrations to be <0.001% in WS110 at 0.50 m bgl. However, concentrations have been identified within WS101 1.80 m bgl at 1.18%, WS102 3.20 m bgl at 0.036% and WS112 2.30 m bgl at 0.014%. Visual pieces of asbestos were also identified during the intrusive site investigation.

Recommendation:
Further investigation is required to identify and remove any potential visual signs of ACM across the site. Care must be taken in the demolition of the buildings as asbestos roofing and cladding is likely present. Impacted soils and visual signs of ACMs will need to be managed according to the Asbestos Risk Mitigation Conceptual Site Model shown in Figure 4.1 including the installation of a suitably cover system to garden and landscaped areas which will prevent exposure to future site users. Construction works completed with PPE and provision of welfare in accordance with JIWG guidelines.

Where asbestos has been identified >0.001% in WS101, WS102 and WS112, the impacted Made Ground will require hotspot removal and placement in an area of low sensitivity where it will not pose a risk to future end users. Visual signs of asbestos will require removal from site by a licensed waste handler, with subsequent validation sampling to determine if asbestos remains at the locations.

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL4	Inhalation of vapours. Migration through permeable strata and preferential pathways.	Future site users. Offsite receptors.	Volatile Contaminants such as naphthalene, mercury, VOCs and volatile-TPHs (Made Ground)	Likely	High	**To Be Determined**

Assessment:
Elevated concentrations of naphthalene, mercury and volatile TPHs have been identified within isolated concentrations across the site. The SVOC 2-Methylnaphthalene was identified above the limit of detection in TP116 at 1.50 m bgl (0.5 mg/kg), TP127 (4.0 mg/kg) and WS102 (3.20 mg/kg). Elevated concentrations of VOCs have also been identified within groundwater samples.

Recommendation:

Localised areas of volatile naphthalene, mercury and TPH impact has been identified within discreet locations (hotspots); these compounds pose a theoretical risk associated with volatilisation and subsequent ingress into the proposed dwellings (indoor air). Further testing should be completed to confirm the type of mercury present and whether it presents a vapour risk. Should it be volatile a hotspot removal should be undertaken.

It is recommended that a Tier 2 vapour risk assessment is completed, as due to the homogenous nature of the fill materials it cannot be proven at this juncture if volatile compounds are present throughout the Made Ground or isolated within the locations identified thus far. Following the Tier 2 vapour risk assessment should these locations be deemed as hotspots, it will be necessary to delineate the extent of impact and ensure all material is excavated, analysed, treated for either reuse within an area of no sensitivity (post treatment) or, alternatively, removed from site.

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL5	Methane, carbon dioxide (infilled features on and within 250 m of the site)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users.	Low likelihood	High (South)	**To be determined**

Assessment:
Preliminary ground gas monitoring suggests that the northern sector of the site can be predominantly classified as Green/CS1, and in these areas it is considered that gas protection measures will not be required. However, the south of the site has been assessed as being Amber 2 / CS3 and Red/CS4. The gas source is deemed to be associated with the underlying Made Ground deposits. As WS102 and WS103 have been assessed as being Red/ CS4 this would suggest this area is not suitable for residential development. It is suggested that additional monitoring wells are placed in the south of the site to fully delineate the zone of gas risk along with a phase of continuous ground gas monitoring.

Recommendation:
An assessment of the likely source of hazardous ground gasses will be completed once further monitoring has been completed.

In due consideration of the recorded methane concentrations, a supplementary quantitative risk assessment is required, to ensure a robust assessment of the actual gas concentrations, potential emission rate and flux; it is recommended that real time monitoring apparatus is installed within selected positions to determine the actual methane concentration and emission rate.

Full ground gas protection measures to be confirmed following completion of monitoring regime. A provision for the installation of ground gas protection measures adhering to Amber 2 / CS3 with VOC vapour membranes should be put in place.

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL6	Mobile contaminants such as metals, PAHs, hydrocarbons, volatile compounds (Made Ground, infilled ponds and clay pits)	Surface runoff. Migration through permeable strata and preferential pathways. Perched waters migration.	Groundwater (Principal aquifer). Surface water (Longford Brook). Three abstraction Points Thirlmere Aqueduct	Likely	Moderate	**LOW**

Assessment:
Elevated concentrations of heavy metals, cyanide, PAH, TPH and VOCs within groundwater and leachate samples. Given that the site is predominantly underlain by CLAY this may afford some protection to the underlying Principal Aquifer in the bedrock. Off-site surface water features are not considered at risk as cohesive CLAY drift deposits will limit the lateral migration of determinants.

Recommendation:
Given the sensitivity of the underlying principal aquifer and proximity of surface water receptors E3P recommend that additional groundwater and leachate analysis will be required to delineate any previously identified contamination and to complete m-BAT bioavailability analysis of heavy metals along with a detailed P20 DQRA for groundwater.

During the remediation and enabling works, hotspots will need to be delineated and validated through chemical analysis; additionally further leachate analysis will be required when engineering the Made Ground to ensure that no unacceptable materials are placed that could pose a risk to controlled waters. In addition, if any tanks or visually impacted waters with olfactory evidence are identified further risk assessment will be required.

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL7	Sulphate (potential ash within MADE GROUND)	Sulphate attack on concrete.	Building structure.	Likely	Low	**LOW**
Assessment: Chemical analyses for pH and soluble sulphate content contained in Appendix V (summarised in Table 3.11), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005). Elevated sulphate concentrations meeting Class DS-2, AC-1 were noted within the Made Ground deposits in WS102 at 3.20 m bgl. **Recommendation:** Remediation of soils required.						
PL8	Organic contaminants such as hydrocarbons, solvents (MADE GROUND, scrap yards, mills and works)	Ingestion of tainted water supply.	Future site users. Water pipes.	Likely	Moderate	**LOW**
Assessment: Likely probability as significant contamination anticipated at pipeline depth across the west of the site (0.75-1.35m). **Recommendation:** It is considered that barrier pipe will be required to be confirmed following the completion of a UKWIR risk assessment.						

POLLUTANT LINKAGE	CONTAMINANT (SOURCE)	PATHWAY	RECEPTOR	PROBABILITY	CURRENT RISK	RESIDUAL RISK AFTER MITIGATION
PL9	Phytotoxic contaminants (Made Ground)	Direct Contact (plant uptake).	Flora.	Likely	Moderate	**LOW**
Assessment: Likely probability as contamination considered possible, which may be taken up by flora in soft landscaping/gardens. **Recommendation:** The contaminated material will likely be removed or the installation of a suitably designed cover system within gardens and areas of soft standing and landscaped areas.						

Main exposure pathways:
PL1 = dermal contact, PL2 = dermal contact and ingestion, PL3 = dust inhalation, PL4 = vapour inhalation (indoor), PL5 = Inhalation, PL6 = Vertical/lateral migration; PL7 = Corrosion of concrete; PL8=Tainting of water supply; PL9 = Uptake by plants

5. GEOTECHNICAL ASSESSMENT

5.1. PROPOSED DEVELOPMENT

E3P understands that Manchester Metropolitan University (MMU) are considering the proposed divestment of their asset at Ryebank Fields, Chorlton which is deemed to be surplus to requirement. As part of the divestment a Development Framework was approved by Manchester City Council in June 2019 that promotes a high-quality residential development across the site with associated gardens, estate roads and infrastructure. The Development Framework contains the proposed development layout for the site.

5.2. SUMMARY OF GROUND CONDITIONS

- Made Ground

  Made Ground deposits were encountered within all exploratory hole locations to a maximum depth of 12.70 mbgl in CP101. The full depth of Made Ground was only proven within two exploratory hole locations CP101 and CP102.

  The majority of exploratory hole locations were surfaced by a reworked topsoil to depths of between 0.10 m and 0.30 mbgl comprising a brown slightly clayey slightly sandy gravel with occasional cobbles and frequent rootlets, with gravel of sandstone, mudstone, concrete and brick with cobbles of concrete and brick.

  TP129, TP130 and WS112 located in the area of hardstanding in the south of the site, were all overlain by asphalt to depths of between 0.10 m and 0.20 mbgl.

  Underlying the reworked topsoil and asphalt, the deeper underlying Made Ground was largely granular, comprising a sandy ashy gravel which was encountered to depths of between 1.60 m and 12.70 mbgl. Made Ground consisted black sandy gravel (ashy) with occasional cobbles where gravel was of asphalt, ash, concrete, brick, plastic, and on occasion metal and glass. Cobbles comprised concrete and brick.

  Isolated areas of reworked clay were identified in TP102, WS102, WS103, WS108 and WS112, encountered at depths of between 0.20-2.50 mbgl. to a maximum depth of 3.45 mbgl. and comprised a firm to stiff brown gravelly clay, with gravel of brick and concrete.

  White ash in the form of a grey blue clayey sand was encountered in pockets throughout the granular Made Ground in TP111, TP113, TP115, TP120, TP129, to depths of between 1.20 m bgl and 2.20 m bgl. The White ash was also encountered as bands in TP103 between 2.10m and 2.40 m bgl, WS105 between 3.60 m and 4.00 m bgl and WS111 between 2.00 m and 2.80 m bgl.

- Drift

  Drift deposits were only encountered within CP101 at 12.70 m and 14.95 mbgl and within CP102 at 10.20 m and 14.95 mbgl comprising a very stiff high strength sandy CLAY with bands of fine to medium SAND.

- Solid

  The solid bedrock geology was not encountered within any exploratory hole locations and was not located within any BGS boreholes in close proximity to the site.

- Groundwater

  Groundwater strikes were encountered as strikes and seepages between 1.20 m and 4.30 m bgl.

5.3. SITE PREPARATION

The site should 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.
- Removal of all concrete and asphalt hardstanding.
- 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.

5.4. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has undertaken an assessment of the net safe allowable bearing pressure (ABP) 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 5.1.

TABLE 5.1 SUMMARY OF ABPS IN MADE GROUND

COHESIVE SOILS			
Description	**Depth (range m bgl)**	**Undrained Shear Strength (Cu) (kN/m^2)**	**Allowable Bearing Pressure (kN/m^2)**
Stiff medium strength gravelly CLAY	12.50	73.06	150.21
Very stiff high to very high strength gravelly CLAY	11.00 – 14.50	108.27 – 182.65	222.60-375.53

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY.

The site is entirely underlain by deep Made Ground to depths of up to 12.70 m bgl. The underlying Made Ground predominantly comprises a sand or gravel containing ash, which has been assessed as very loose to dense.

A programme of remediation and enabling works will be required to remove the extensive buried obstructions and cut/fill the site to provide suitable development platform levels.

Due to the presence of deep Made Ground throughout the site it is thought that the most suitable foundation solution would be to utilise a driven pile into the natural underlying stiff to very stiff CLAY or a implement a raft foundation solution.

Due to the age of the backfill material the near surface stratum may have been subject to long term total self-weight settlement with pore water dissipation at varying degrees, it is therefore considered that significant future consolidation of this material would be unlikely in the unaltered state. Within the deeper Made Ground the overburden pressures of >60KPa have acted as surcharge pressures for the past 30+ years and as such long-term total and differential settlement is considered to have ceased.

Consideration must also be given to potential changes in the groundwater regime within deep filled quarry.

Viable ground engineering solutions include wholesale lift and process with subsequent replacement of all materials incorporating mechanical stabilisation features (Triaxial Geo-Grid with high tensile strength) which would form a stiffened soil platform on which a raft foundation could be constructed. The stiffened soil platform would be designed to ensure that materials are compacted to an end product specification that would ensure materials are compacted and that the density of the re-engineered material exceeds 95% of the optimum compaction potential simulated in a laboratory environment using a 2.5 kg remoulded sample.

The viability of a VSC solution is inhibited due to the depth of Made Ground encountered on site exceeding 8.00 m along with the proximity of an intermediate pressure gas main dissecting the site and the Thirlmere Aqueduct along the northern boundary of the site.

The proctor compaction tests completed on the underlying Made Ground deposits have indicated that the majority of materials analysed are wet of the optimum. It should be noted that if cohesive materials are 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.

Foundation depths should take account of the presence of existing and proposed trees with foundations deepened locally, to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirements of NHBC standards.

It is recommended that at working drawing stage a foundation schedule is prepared for the development taking account of the physical change of Made Ground clay soils and the current / proposed locations of trees.

Consideration must also be given to the fact that the site has been classified as moderate to high risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. The site will therefore require clearance prior to the installation of any foundation solution.

5.5. 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.

5.6. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils at depth and these are not considered to be susceptible to volumetric instability due to fluctuations in moisture content within influencing distance of trees.

Should CLAY deposits be encountered are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectured zones of influence an assessment of the plasticity will be required.

As the clay that has been encountered on site is deemed to be low plasticity, heave precautions are not required to the internal face of the external load-bearing walls (outside or within tree influence).

If a ground beam is to be constructed within the zone of tree influence, heave precautions are required to the underside of this and edge beams.

If the ground floor slab is to be constructed with a beam and block floor, a minimum subfloor void of 200 mm is required within any structures located in the zone of conjectured tree influence.

If the ground floor slab is constructed with a cast in-situ suspended floor slab, then heave precautions that can tolerate 50 mm of clay swelling are required within any part of the floor slab to be located within the zone of influence of a tree.

A summary of heave precautions is presented in Table 5.5.

TABLE 5.5 SUMMARY OF HEAVE PRECAUTIONS

		Minimum void dimension for foundations, ground beams and suspended in-situ concrete ground floors		Minimum void dimensions under precast concrete and suspended timber floors
Plasticity Index of Soil	**Required Foundation Depth (m)**	**Thickness of Void Former Against Side of Foundation or Ground Beam (mm)**	**Thickness of Void Former on Underside of Edge Beam and Floor Slab (mm)**	**Void Dimension (mm)**
High Plasticity (> 40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	35	150	300
	1.5–2.0	25	75	
Moderate Plasticity (20–40)	> 2.5	Engineer Design		Engineer Design
	2.0–2.5	25	100	250
	1.5–2.0	25	50	
Low Plasticity (< 20)	2.0–2.5	N/A	50	200
	> 2.0	No Special Precautions		

5.7. 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.

It is considered that the material can be re-engineered using method compaction to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions.

5.8. DRAINAGE

In-situ variable (falling) head permeability tests were undertaken within the monitoring well installations located in two probeholes (CP101 and CP102). Both of the installations were noted to be dry prior to the test being undertaken, therefore the tests were undertaken in the unsaturated zone. Infiltration tests in both CP101 and CP102 were completed in the underlying Made Ground where a soil infiltration rate of 1.32E-05 m/s and 1.56E-05 m/s have been calculated respectively. The site is underlain by Made Ground impacted by low-level inorganic and hydrocarbon compounds. It is therefore considered that soakaway drainage will not be suitable for the proposed development.

5.9. CONCRETE DURABILITY

Based upon the results of the chemical analyses it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE *Special Digest 1* (2005).

Elevated sulphate concentrations meeting Class DS-2, AC-1s were noted within the Made Ground deposits in WS102 at 3.20 mbgl. However, upon completion of site enabling works it will, in all likelihood, be DS1 AC1s.

5.10. EXCAVATIONS

The majority of excavations were prematurely terminated due to collapse or rapid groundwater strikes flooding the excavation.

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.

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

The presence of brick and concrete cobbles within the Made Ground deposits meant that in certain places, excavation was slow.

During a phase of cut fill enabling works to create a developable platform, all below ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of proposed plots.

TABLE 5.6 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 excavations will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	No	Shallow bedrock has not been identified.

5.11. FURTHER WORKS

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

- Further controlled waters risk assessment using the mBAT tool for heavy metals following the completion of supplementary groundwater sampling;
- Further site investigation will be required in the west of the site where access was restricted due to the presence of overgrown vegetation, a gas main and semi-improved neutral grassland;
- Continuous ground gas monitoring in the vicinity of WS102 and WS103 in the south of the site;
- Plot-specific foundation schedule (upon receipt of the final development levels and proposed development layout);
- Materials management plan;
- Geotechnical earthworks strategy (infrastructure);
- Remediation and enabling works strategy; and
- Full three-dimensional earthworks cut/fill model.

5.12. CONSTRUCTION ACTIVITY AND INSPECTION

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

- Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formations and sub-formations to foundations and pavement construction.
- 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 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, to include the use of personnel protective equipment (PPE).

6. CONCLUSIONS AND RECOMMENDATIONS

CONTAMINATED LAND ASSESSMENT

Human Health	The Tier 1 human health risk assessment identified site wide concentrations of heavy metals, non-volatile PAHs, and non-volatile TPH compounds that would present unacceptable degrees of theoretical risk to the identified receptors associated with direct exposure pathways. As such, it will be necessary to design and construct the proposed development in a manner that will ensure suitably validated cover systems to all areas of private garden, soft landscaping and public open space. Localised areas of volatile naphthalene, mercury and TPH impact has been identified within discreet locations (hotspots); these compounds pose a theoretical risk associated with volatilisation and subsequent ingress into the proposed dwellings (indoor air). Further testing should be completed to confirm the type of mercury present and whether it presents a vapour risk. Should it be volatile a hotspot removal should be undertaken. It is recommended that a Tier 2 vapour risk assessment is completed, as due to the homogenous nature of the fill materials it cannot be proven at this juncture if volatile compounds are present throughout the Made Ground or isolated within the locations identified thus far. Following the Tier 2 vapour risk assessment should these locations be deemed as hotspots, it will be necessary to delineate the extent of impact and ensure all material is excavated, analysed, treated for either reuse within an area of no sensitivity (post treatment) or, alternatively, removed from site. Asbestos was identified in four samples out of seventeen submitted for analysis. Asbestos in the form of chrysotile and amosite loose fibrous debris, loose fibres, bitumen and hard / cement type material. Asbestos was identified within WS102 at 3.20 m bgl, WS112 at 2.30 m bgl, WS110 at 0.50 m bgl and WS101 a 1.80 m bgl. Asbestos piping and sheeting were visually identified in TP116 and TP119 respectively; during the remediation and enabling works these should be removed from site by a licensed asbestos removal contractor. Impacted soils should be managed according to the E3P asbestos risk mitigation conceptual site model. There have been no VOCs identified above the LOD within the soil analysis. The SVOC 2-Methylnaphthalene was identified above the limit of detection in TP116 at 1.50 m bgl (0.5 mg/kg), TP127 (4.0 mg/kg) and WS102 (3.20 mg/kg) which was identified in the Made Ground deposits associated with the infilling of the clay pits. There are no suitable sources of topsoil or subsoil available on the site. Further site investigation will be required in the west of the site where access was restricted due to the presence of overgrown vegetation, a gas main and semi-improved neutral grassland.
Controlled Waters	Elevated concentrations of heavy metals, cyanide, PAH, TPH and VOCs within groundwater and leachate samples. Given that the site is predominantly underlain by CLAY this may afford some protection to the underlying Principal aquifer in the bedrock. Off-site surface water features are not considered at risk as cohesive CLAY drift deposits will limit the lateral migration of determinants.

Controlled Waters *Cont.*	Given the sensitivity of the underlying Principal aquifer and proximity of surface water receptors E3P recommend that additional groundwater and leachate analysis will be required to delineate any previously identified contamination and to complete m-BAT bioavailability analysis of heavy metals along with a detailed P20 DQRA for groundwater. During the remediation and enabling works, hotspots will need to be delineated and validated through chemical analysis; additionally further leachate analysis will be required when engineering the Made Ground to ensure that no unacceptable materials are placed that could pose a risk to controlled waters. In addition, if any tanks or visually impacted waters with olfactory evidence are identified further risk assessment will be required.
Ground Gas	Preliminary ground gas monitoring suggests that the northern sector of the site can be predominantly classified as Green/CS1, and in these areas it is considered that gas protection measures will not be required. However, the south of the site has been assessed as being Amber 2 / CS3 and Red/CS4. The gas source is deemed to be associated with the underlying Made Ground deposits. As WS102 and WS103 have been assessed as being Red/ CS4 this would suggest this area is not suitable for residential development. It is suggested that additional monitoring wells are placed in the south of the site to fully delineate the zone of gas risk along with a phase of continuous ground gas monitoring. Full ground gas protection measures to be confirmed following completion of monitoring regime. A provision for the installation of ground gas protection measures adhering to Amber 2 / CS3 with VOC vapour membranes should be put in place.
Potable Water	This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation however it is likely PE Barrier Pipe will be required.

GEOTECHNICAL ASSESSMENT

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying stiff to very stiff CLAY.

The site is entirely underlain by deep Made Ground to depths of up to 12.70 m bgl. The underlying Made Ground predominantly comprises a sand or gravel containing ash, which has been assessed as very loose to dense.

A programme of remediation and enabling works will be required to remove the extensive buried obstructions and cut/fill the site to provide suitable development platform levels.

Due to the presence of deep Made Ground throughout the site it is thought that the most suitable foundation solution would be to utilise a driven pile into the natural underlying stiff to very stiff CLAY or a implement a raft foundation solution.

Due to the age of the backfill material the near surface stratum may have been subject to long term total self-weight settlement with pore water dissipation at varying degrees, it is therefore considered that significant future consolidation of this material would be unlikely in the unaltered state. Within the deeper Made Ground the overburden pressures of >60KPa have acted as surcharge pressures for the past 30+ years and as such long-term total and differential settlement is considered to have ceased.

Consideration must also be given to potential changes in the groundwater regime within deep filled quarry.

Viable ground engineering solutions include wholesale lift and process with subsequent replacement of all materials incorporating mechanical stabilisation features (Triaxial Geo-Grid with high tensile strength) which would form a stiffened soil platform on which a raft foundation could be constructed. The stiffened soil platform would be designed to ensure that materials are compacted to an end product specification that would ensure materials are compacted and that the density of the re-engineered material exceeds 95% of the optimum compaction potential simulated in a laboratory environment using a 2.5 kg remoulded sample.

The viability of a VSC solution is inhibited due to the depth of Made Ground encountered on site exceeding 8.00 m along with the proximity of an intermediate pressure gas main dissecting the site and the Thirlmere Aqueduct along the northern boundary of the site.

The proctor compaction tests completed on the underlying Made Ground deposits have indicated that the majority of materials analysed are wet of the optimum. It should be noted that if cohesive materials are 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.

Foundation depths should take account of the presence of existing and proposed trees with foundations deepened locally, to mitigate the potential for volumetric instability attributed to fluctuations in moisture content, in accordance with the requirements of NHBC standards.

It is recommended that at working drawing stage a foundation schedule is prepared for the development taking account of the physical change of Made Ground clay soils and the current / proposed locations of trees.

Consideration must also be given to the fact that the site has been classified as moderate to high risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. The site will therefore require clearance prior to the installation of any foundation solution.

END OF REPORT

APPENDIX I
LIMITATION

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. 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 do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.

10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

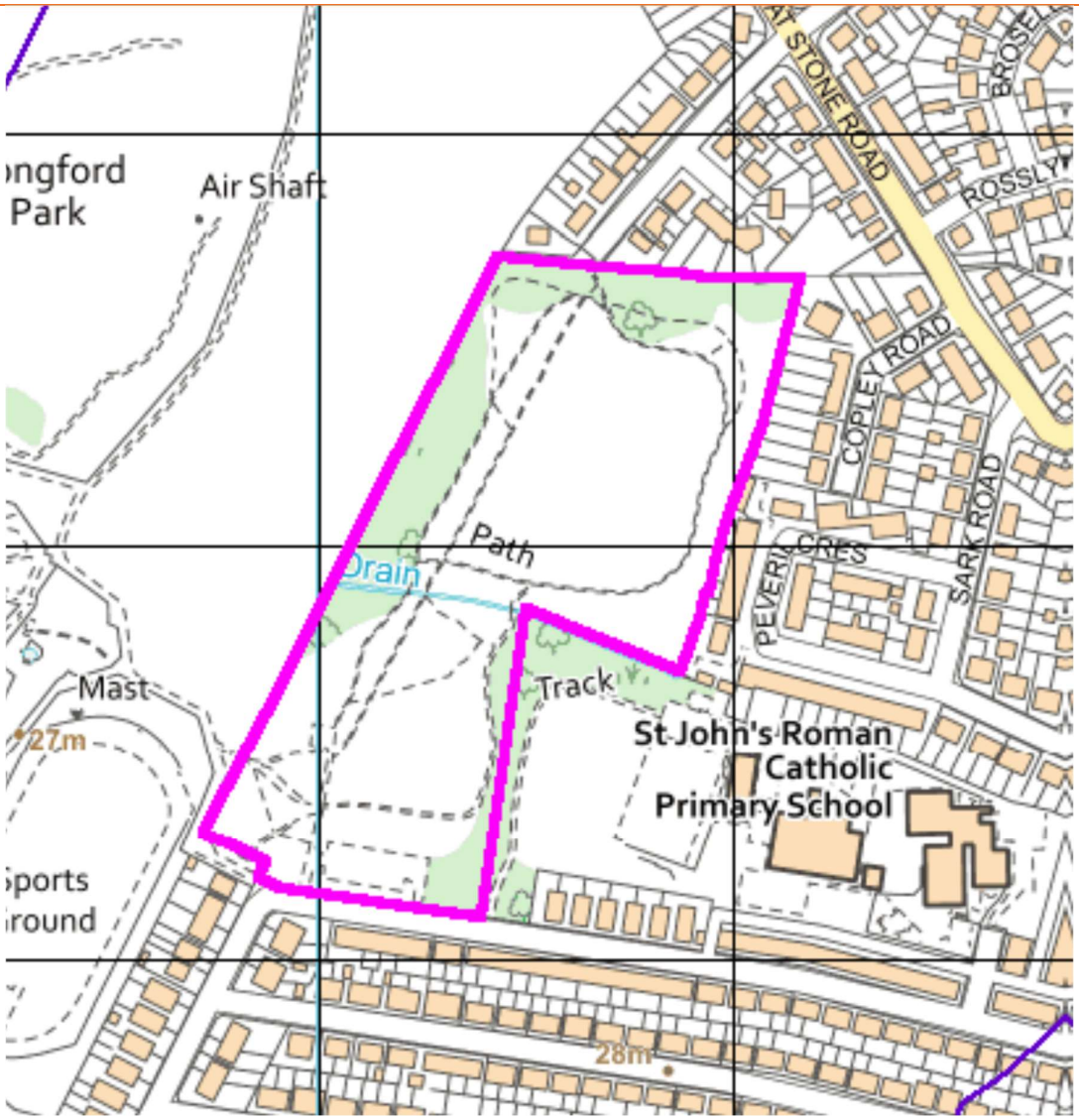
TERMS

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
DRAWINGS

DRAWING 13-533-001 – SITE LOCATION PLAN



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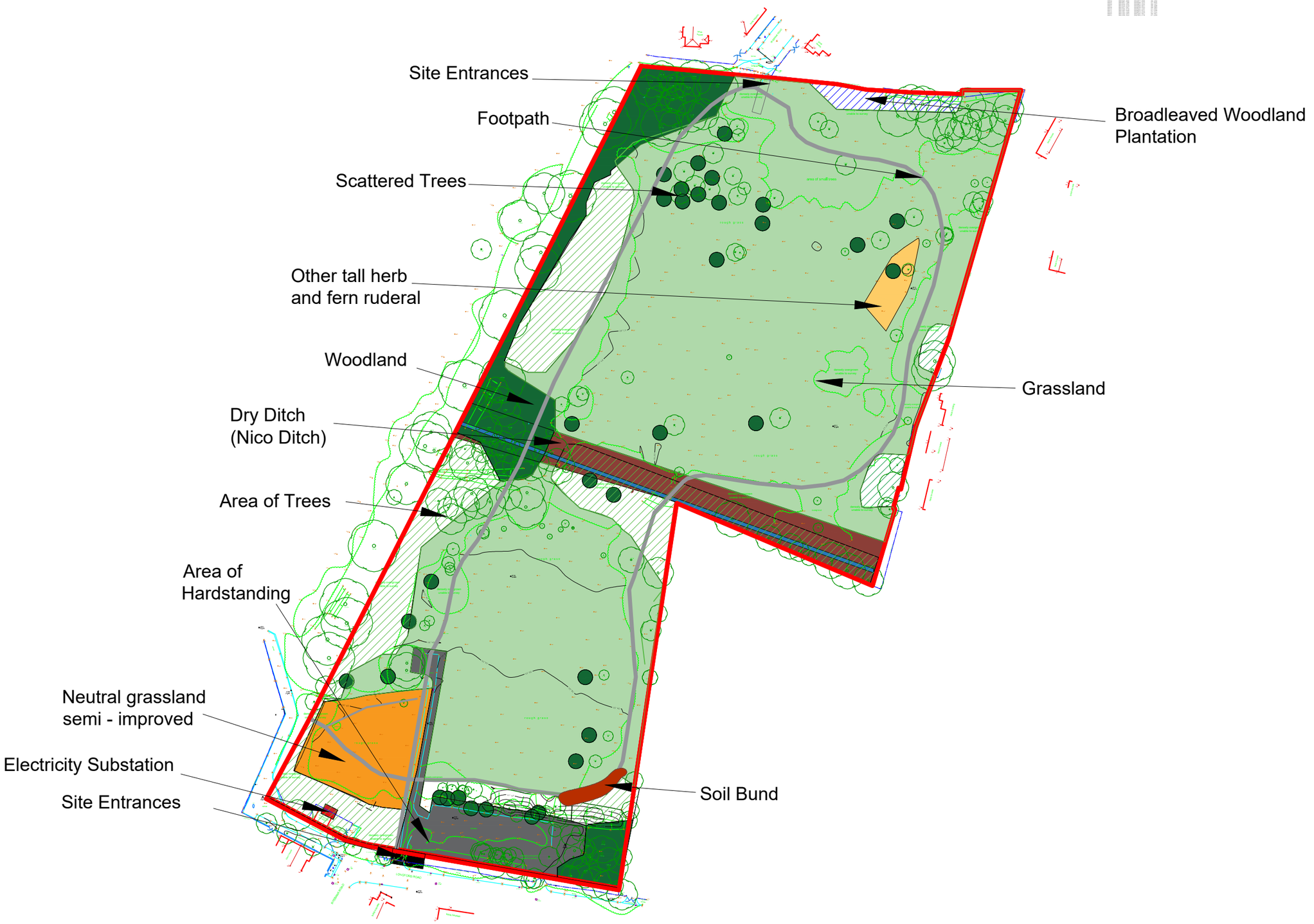

Site Features

- Hardstanding
- Broadleaved woodland semi-natural
- Dry Ditch
- Footpath
- Sub Station
- Neutral Grassland semi-improved
- Scrub - Dense/Continuous
- Scattered Trees
- Broadleaved Woodland Plantation
- Footpath
- Dry Ditch (Nico)
- Other tall herb and fern ruderal
- Soil Bund
- Grassland
- Site Entrances

Notes:

Phase	Revision	Date	Issue	Drawn	Checked
P1	R1	02.03.2020	REVISION	LM	BH
P1	-	05.11.2019	DRAFT	LM	BH

Client: Manchester Metropolitan University

Job No: 13-533

Date: 02.03.2020

Drawing No: 002

Scale: NTS

Job Title: Rye Bank Road, Chorlton

Drawing Title: Site Features Plan

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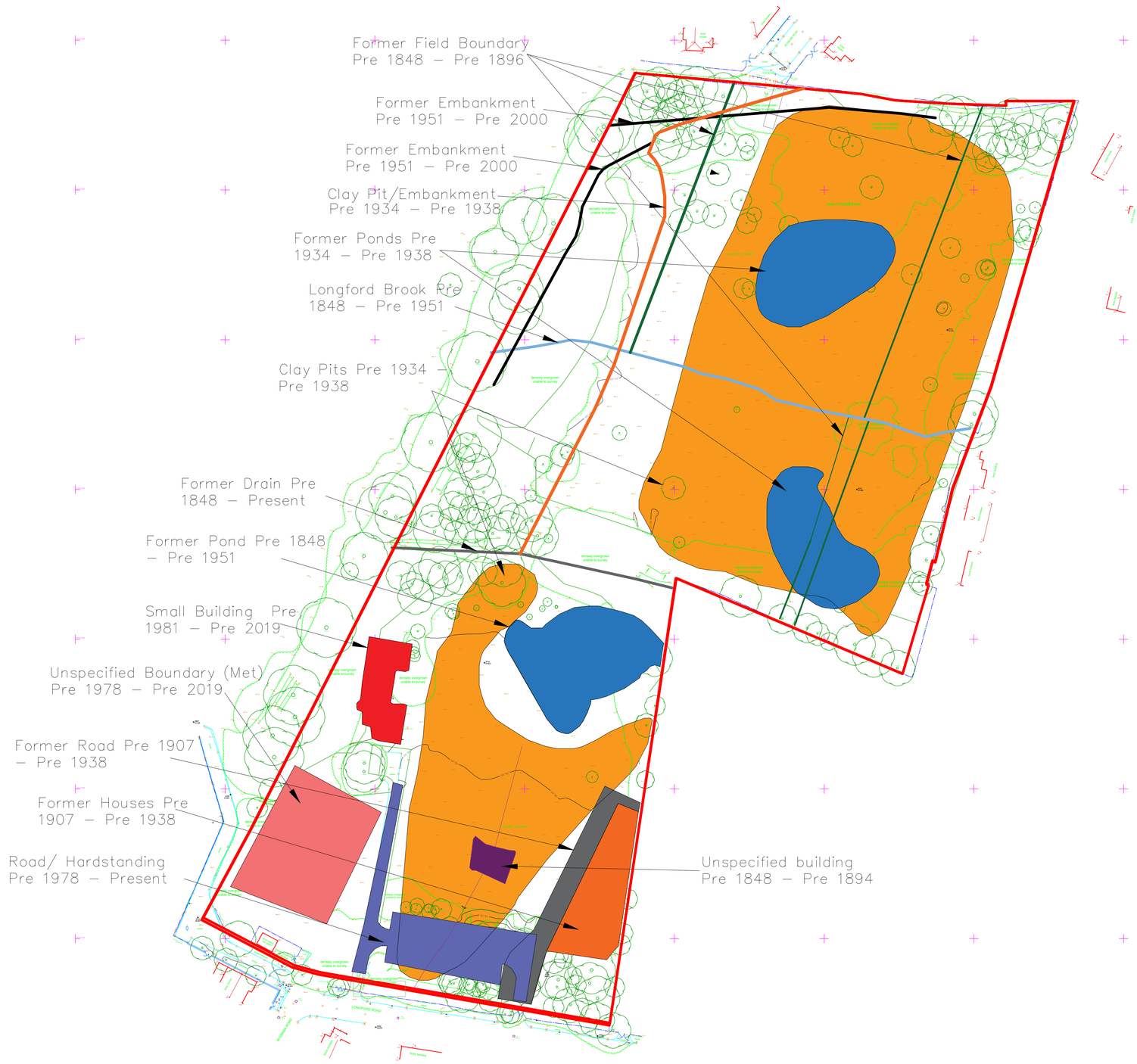

Historical Features

- Small Building Pre 1981 - Pre 2019
- Former Pond Pre 1848 - Pre 1951 / Pre 1934 - Pre 1938
- Former Houses Pre 1907 - Pre 1938
- Former Road Pre 1907 - Pre 1938
- Unspecified Building Pre - 1848 - Pre 1894
- Unspecified Boundary (Met) Pre 1978 - Pre 2019
- Former Clay Pits Pre 1934 - Pre 1938
- Road/Hardstanding Pre 1978 - Present
- Longford Brook Pre 1848 - Pre 1951
- Former Field Boundary Pre 1848 - Pre 1896
- Former Drain Pre 1848 - Present
- Former Embankment Pre 1951 - Pre 2000
- Former Clay pit/embankment Pre 1934 - Pre 1938

Notes:

Phase	Revision	Date	Issue	Drawn	Checked
P3	R2	02.03.2020	REVISION	LM	RH
P2	R1	28.02.2020	REVISION	LM	RH
P1	-	14.01.2020	DRAFT	LM	EM

Client: Manchester Metropolitan University

Job No: 13-533

Date: 02.03.2020

Drawing No: 003

Scale: NTS

Job Title: Rye Bank Road, Chorlton

Drawing Title: Historical Features Plan

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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location
- Approximate Dynamic Cone Penetrometer Test Location
- Approximate Window Sample Probehole Location with Install

Notes:

Client:
Manchester Metropolitan University

Job No: 13-533

Date: 27.02.2020

Drawing No: 004

Scale: NTS

Phase	Revision	Date	Issue	Drawn	Checked
P1	-	27.02.2020	DRAFT	LM	RH

Job Title:
Rye Bank Road, Chorlton

Drawing Title:
Exploratory Hole Location Plan

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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Window Sample Probehole Location with Install
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location
- Approximate Dynamic Cone Penetrometer Test Location

Historical Features

- Small Building Pre 1981 - Pre 2019
- Former Pond Pre 1848 - Pre 1951 / Pre 1934 - Pre 1938
- Former Houses Pre 1907 - Pre 1938
- Former Road Pre 1907 - Pre 1938
- Unspecified Building Pre - 1848 - Pre 1894
- Unspecified Boundary (Met) Pre 1978 - Pre 2019
- Former Clay Pits Pre 1934 - Pre 1938
- Road/Hardstanding Pre 1978 - Present
- Longford Brook Pre 1848 - Pre 1951
- Former Field Boundary Pre 1848 - Pre 1896
- Former Drain Pre 1848 - Present
- Former Embankment Pre 1951 - Pre 2000
- Former Clay pit/embankment Pre 1934 - Pre 1938

Notes:

Client: Manchester Metropolitan University

Job No: 13-533

Date: 27.02.2020

Drawing No: 005

Scale: NTS

P1	-	27.02.2020	DRAFT	LM	EM
Phase	Revision	Date	Issue	Drawn	Checked

Job Title: Rye Bank Road, Chorlton

Drawing Title: Exploratory Hole Location Plan with Historical Features

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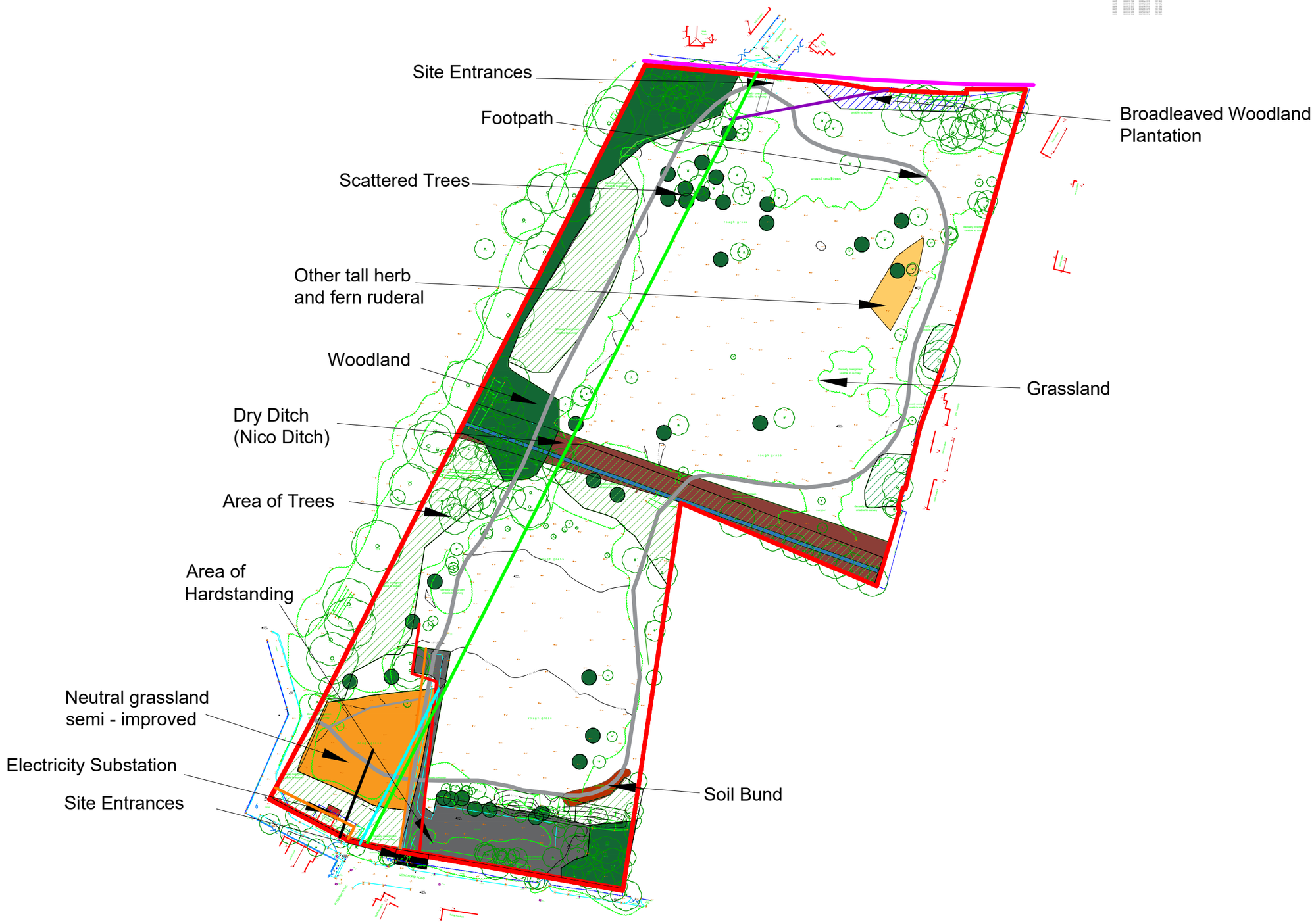

Development Constraints Plan

- Hardstanding
- Broadleaved woodland semi-natural
- Dry Ditch
- Footpath
- Sub Station
- Dry Ditch (Nico)
- Scrub - Dense/Continuous
- Other tall herb and fern ruderal
- Broadleaved Woodland Plantation
- Area of Trees
- Gas Infrastructure
- Gas Infrastructure
- Electric Infrastructure
- United Utilities Infrastructure
- United Utilities Infrastructure
- BT Infrastructure
- Thirlmere Aqueduct

Notes:

Phase	Revision	Date	Issue	Drawn	Checked
P1	R1	28.02.2020	REVISION	LM	BH
P1	-	10.02.2020	DRAFT	LM	BH

Client:
Manchester Metropolitan University

Job No: 13-533

Date: 28.02.2020

Drawing No: 006

Scale: NTS

Job Title:
Rye Bank Road, Chorlton

Drawing Title:
Development Constraints Plan

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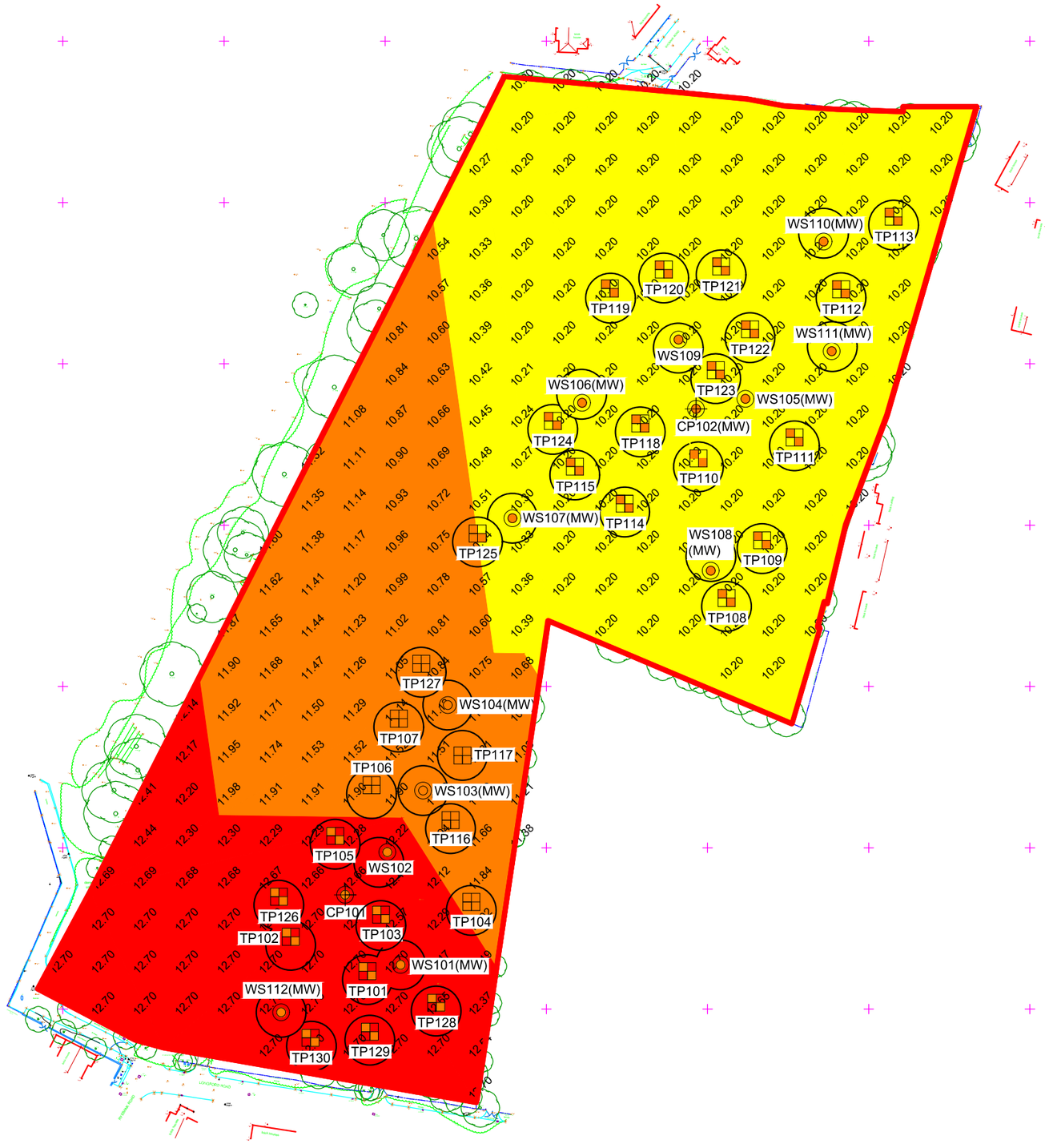

Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Window Sample Probehole Location with Install
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location

Made Ground Depth (m)

- Depth of Made Ground 0.00 - 1.49m
- Depth of Made Ground 1.50 - 2.99m
- Depth of Made Ground 3.00 - 4.49m
- Depth of Made Ground 4.50 - 5.99m
- Depth of Made Ground 6.00 - 7.49m
- Depth of Made Ground 7.50 - 8.99m
- Depth of Made Ground 9.00 - 10.49m
- Depth of Made Ground 10.50 - 11.99m
- Depth of Made Ground >12.00m

Full extent of Made Ground not identified.

Notes:

Phase	Revision	Date	Issue	Drawn	Checked
P2	R2	28.02.2020	REVISION	LM	RH
P1	-	10.02.2020	DRAFT	LM	EM

Client: Manchester Metropolitan University

Job No: 13-533

Date: 28.02.2020

Drawing No: 007

Scale: NTS

Job Title: Rye Bank Road, Chorlton

Drawing Title: Depth to Made Ground Plan

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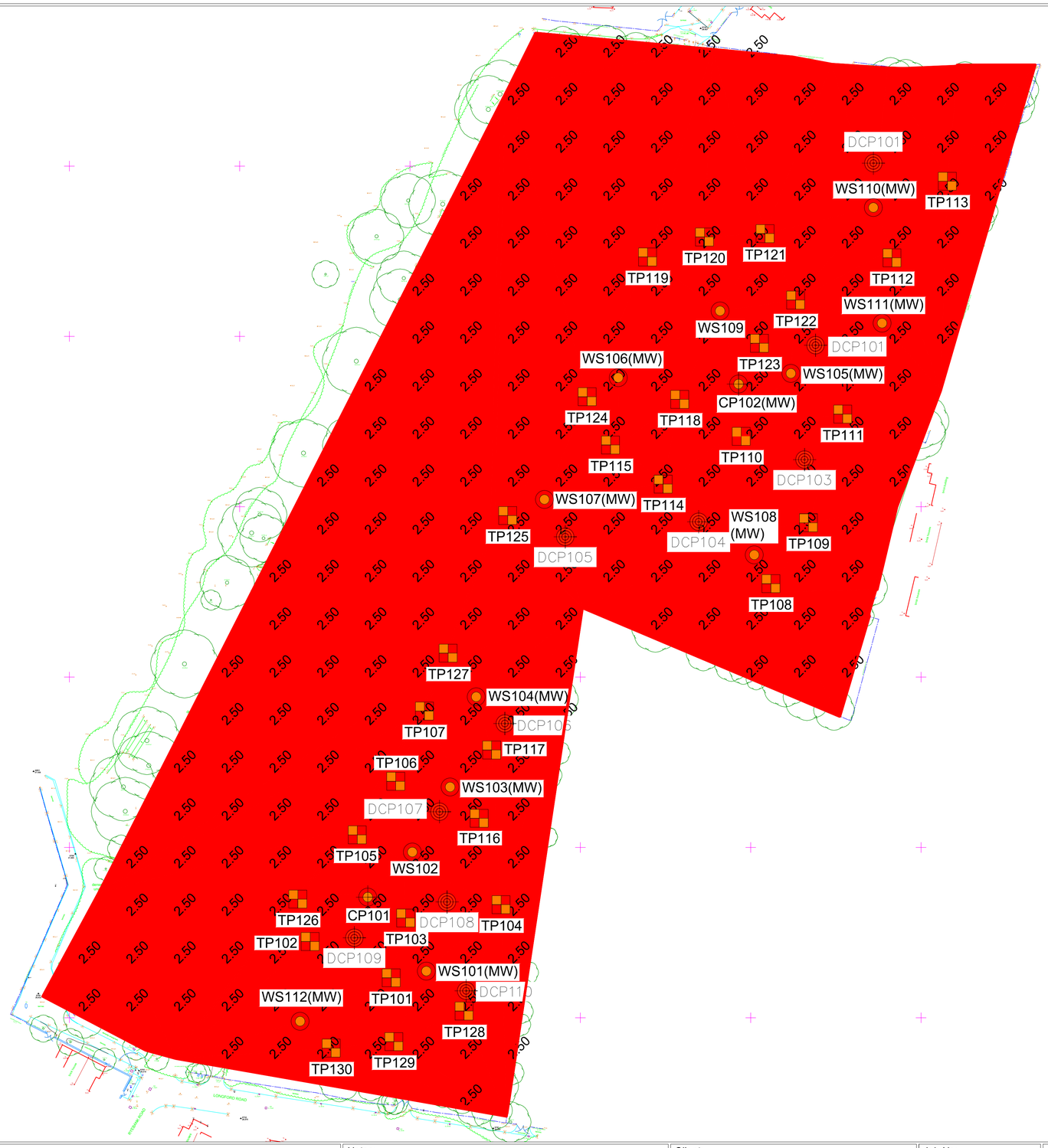

Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Window Sample Probehole Location with Install
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location

Shallow Spread Footings

- Depth to Founding Strata 0.00 - 1.24m
- Depth to Founding Strata 1.25 - 1.49m

Mass Trench Fill Footings

- Depth to Founding Strata 1.50 - 1.74m
- Depth to Founding Strata 1.75 - 1.99m
- Depth to Founding Strata 2.00 - 2.24m

Engineered Footings

- Depth to Founding Strata 2.25 - 2.49m
- Depth to Founding Strata >2.50m

Notes:

Client:
Manchester Metropolitan University

Job No: 13-533

Date: 27.02.2020

Drawing No: 008

Scale: NTS

Phase	Revision	Date	Issue	Drawn	Checked
P2	R1	27.02.2020	REVISION	LM	EM
P1	-	07.01.2019	DRAFT	LM	EM

Job Title:
Rye Bank Road, Chorlton

Drawing Title:
Depth to Founding Strata

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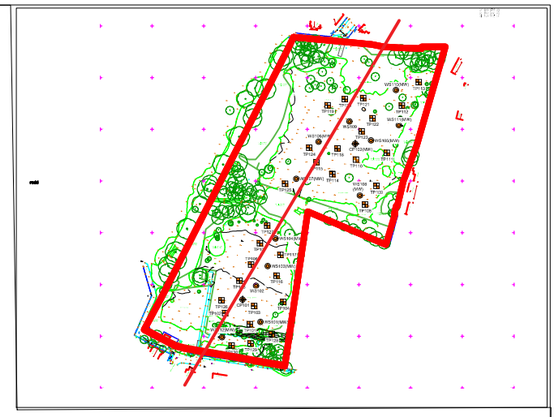
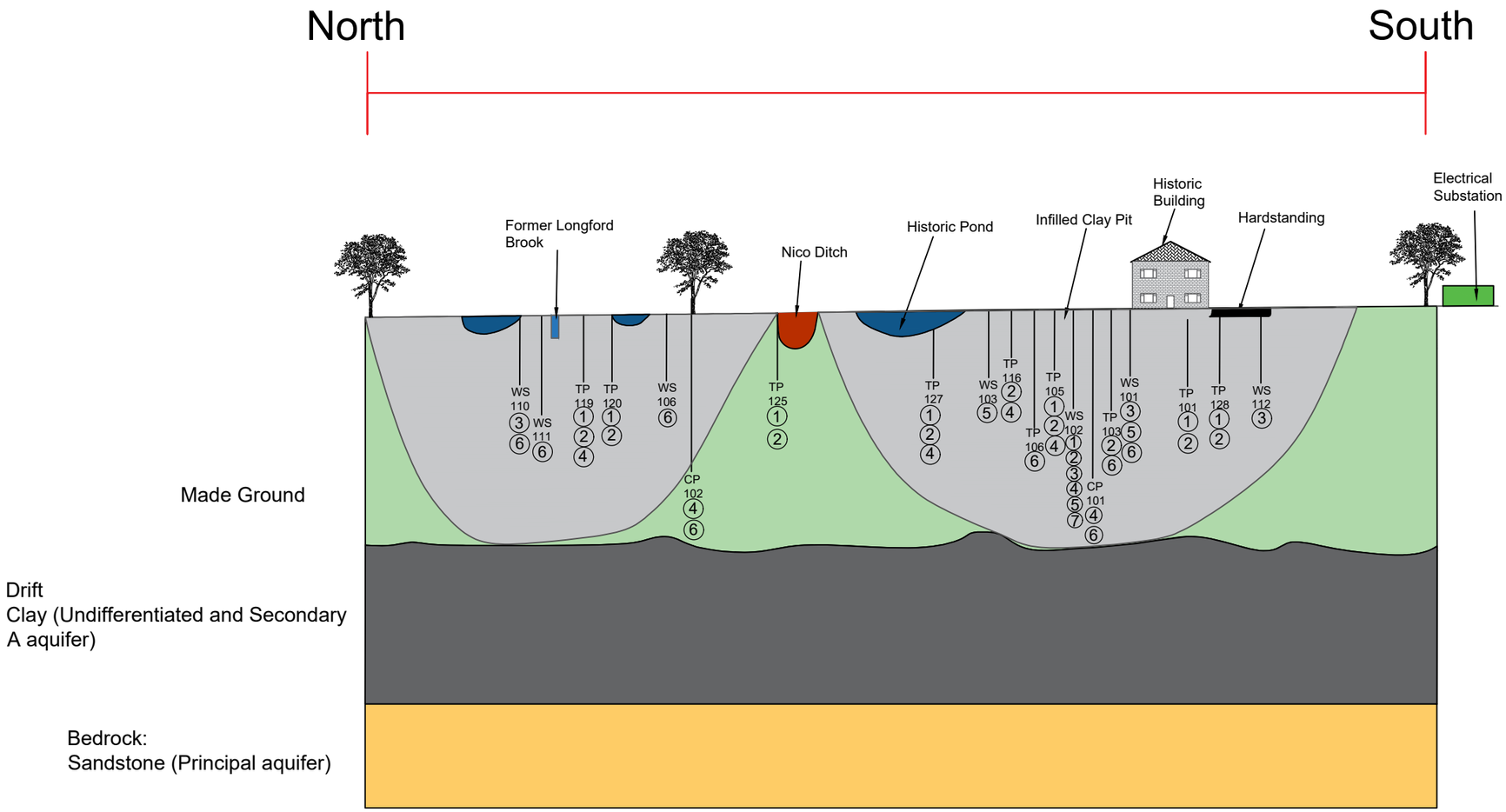
ID	SOURCE	POTENTIAL PATHWAY	RECEPTOR
PL1	Soil Ingestion	Future site users. Offsite receptors.	Heavy metals (in Made Ground).
PL2	Dermal Contact & Ingestion	Future site users. Off-site receptors.	None Volatile PAH/TPHs compounds (in Made Ground).
PL3	ACM in MADE GROUND	Inhalation of dust.	Future site users. Buildings. Off-site land users.
PL4	Inhalation of vapours. Migration through permeable strata and preferential pathways.	Future site users. Offsite receptors.	Volatile Contaminants such as naphthalene, mercury and volatile-TPHs (Made Ground)
PL5	Methane, carbon dioxide (Infilled features on and within 250 m of the site)	Inhalation of gas. Migration through permeable strata and preferential pathways. Explosion in confined spaces.	Future site users. Buildings. Off-site land users
PL6	Mobile contaminants such as metals, PAHs, hydrocarbons, volatile compounds (MADE GROUND, infilled pond and clay pit)	Surface runoff. Migration through permeable strata and preferential pathways. Perched waters migration.	Groundwater (Principal aquifer). Surface water (Longford Brook).
PL7	Sulphate (potential ash within MADE GROUND)	Sulphate attack on concrete.	Building structure
PL8	Organic contaminants such as hydrocarbons, solvents (MADE GROUND, scrap yards, mills and works)	Ingestion of tainted water supply.	Future site users. Water pipes.





CSM Features

- Clay (Drift)
- Clay Pits
- Hardstanding
- Former Longford Brook
- Former Ponds
- Nico Ditch
- Electrical Substation
- Made Ground
- Sandstone (Bedrock)

Notes:

Phase	Revision	Date	Issue	Drawn	Checked
P2	R1	02.03.2020	Revision	LM	RH
P1	-	11.02.2020	Draft	LM	EM

Client: Manchester Metropolitan University

Job No: 13-533

Date: 02.03.2020

Drawing No: 009

Scale: NTS

Job Title: Rye Bank Road, Chorlton

Drawing Title: Conceptual Site Model

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Location Symbols

- Approximate Window Sample Probehole Location with Install
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location

Contamination Exceedances (Groundwater/Leachate)

- Heavy Metals
- VOCs
- TPH
- PAHs
- PHs

Notes:

P1	-	28.02.2020	DRAFT	LM	RH
Phase	Revision	Date	Issue	Drawn	Checked

Client: Manchester Metropolitan University

Job No: 13-533

Date: 28.02.2020

Drawing No: 010

Scale: NTS

Job Title: Rye Bank Road, Chorlton

Drawing Title: Contamination Distribution Plan - Groundwater/Leachate

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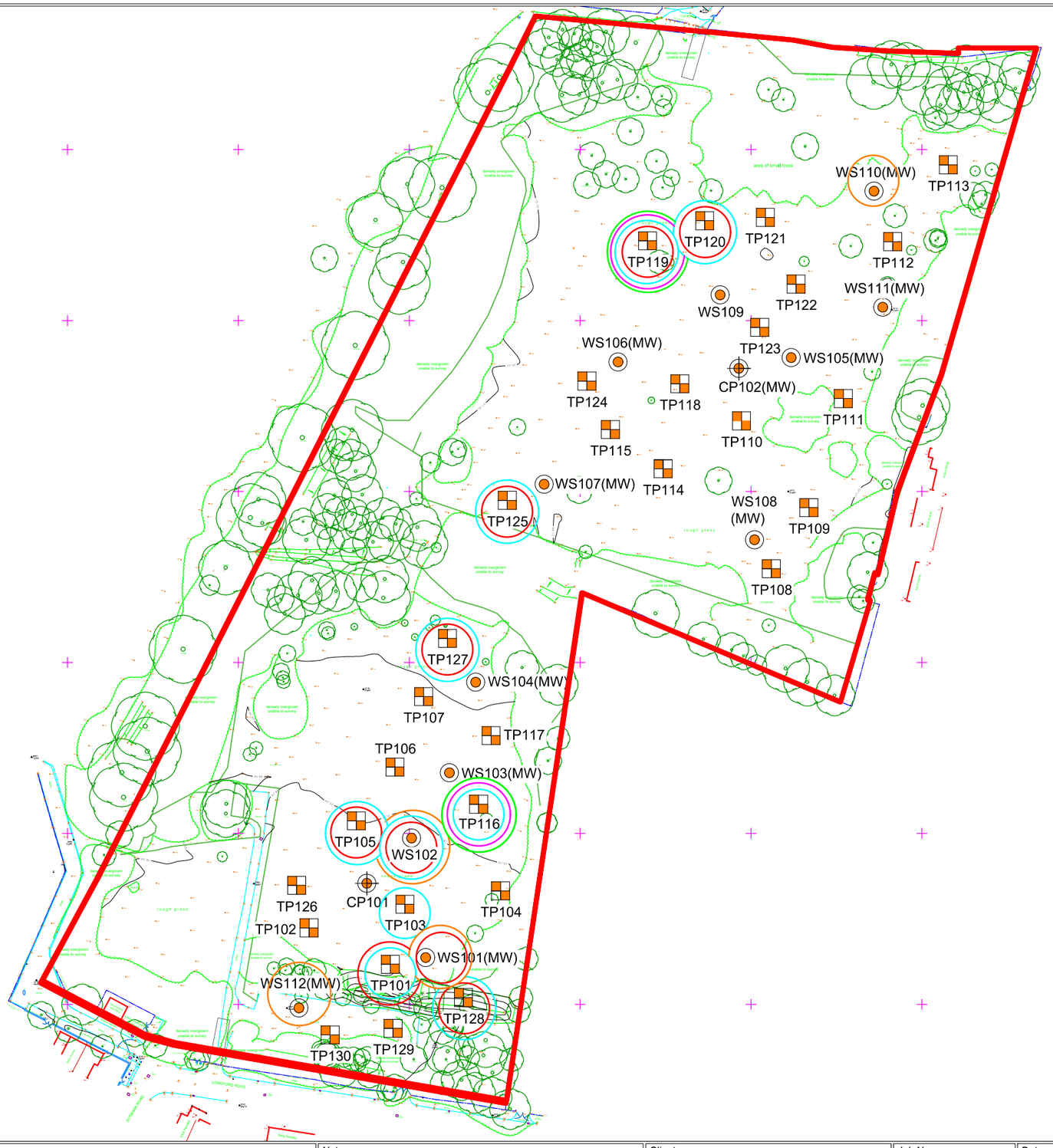

Location Symbols

- Approximate Window Sample Probehole Location with Install
- Approximate Trial Pit Location
- Approximate Cable Percussive Borehole Location

Contamination Exceedances (Soils)

- Heavy Metals
- PAH
- TPH
- Asbestos
- Mercury

Notes:

Phase	Revision	Date	Issue	Drawn	Checked
P2	R1	28.02.2020	REVISION	LM	RH
P1	-	10.02.2020	DRAFT	LM	EM

Client:
Manchester Metropolitan University

Job No: 13-533

Date: 28.02.2020

Drawing No: 011

Scale: NTS

Job Title:
Rye Bank Road, Chorlton

Drawing Title:
Contamination Distribution Plan - Soils

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APPENDIX IV
PHOTOGRAPHS

PLATE 1 TP101

PLATE 2 TP101 ARISINGS

PLATE 3 TP108

PLATE 4 TP108 ARISINGS

PLATE 5 TP110 ARISINGS

PLATE 6 TP116 ARISINGS

PLATE 7 TP119

PLATE 8 TP129

APPENDIX V
E3P EXPLORATORY HOLE LOGS

Trial Pit Log

			TrialPit No TP101 Sheet 1 of 1
Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 03/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 2.40	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

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 gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
	1.50	ES					MADE GROUND: Black sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of ash, asphalt, concrete, brick and plastic. Cobbles are sub-angular of concrete and brick. (Slight hydrocarbon odour).
▼ 1.90				2.40			End of Pit at 2.40m

1 2 3 4

Trial Pit Photographs

Trial Pit 101

Trial Pit 101 Spoil

Remarks: 1.Terminated at 2.40m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 1.90m bgl. 3.Excavation slow due to cobbles within Made Ground. 4. Hydrocarbon odour within Made Ground.

Stability: Stable

Trial Pit Log

TrialPit No: TP102
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: -	Date 03/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70	Scale 1:30
Client: Manchester Metropolitan University		Depth 2.30	Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20			MADE GROUND: Brown sandy gravel with frequent rootlets (Reworked Topsoil). Gravel Is fine to coarse, sub-angular to sub-rounded of concrete and brick.
							MADE GROUND: Brown sandy, clayey gravel (ashy) with occasional cobbles and rare boulders. Gravel is fine to coarse, sub-angular to sub-rounded of ash, sandstone, concrete and brick. Cobbles are sub-angular of concrete. Boulders are sub-angular of concrete.
				1.50			MADE GROUND: Brown fine to medium sand.
				1.60			MADE GROUND: Brown gravelly clay. Gravel is fine to coarse, sub-angular to sub-rounded of asphalt and concrete. (Reworked clay)
▼ 2.10	2.10	ES					
				2.30			End of Pit at 2.30m

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Trial Pit Photographs

Trial Pit 102

Trial Pit 102 Spoil

Remarks: 1.Terminated at 2.30m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.10m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP103
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 03/12/2019
Location: Chorlton		Dimensions (m): 2.30 x 0.60 Depth 2.40	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy gravel with frequent cobbles and rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick.
							MADE GROUND: Brown slightly sandy clayey gravel with frequent cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded of sandstone, mudstone, concrete, metal, plastic and timber. Cobbles are sub-angular of brick and concrete. Boulders are sub-angular of concrete.
	1.30	ES		1.20			MADE GROUND: Black gravelly medium to coarse sand (ash) with frequent cobbles. Gravel is fine to coarse sub-angular to sub-rounded of concrete, glass, timber, ash and brick. Cobbles are sub-angular of concrete, glass, timber and brick.
	1.50	B					
▼ 2.10	2.10	ES		2.10			MADE GROUND: Soft blue grey clayey medium sand (ash).
	2.20	ES		2.40			End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 103

Trial Pit 103 Spoil

Remarks: 1.Terminated at 2.40m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.10m bgl.

Stability: Unstable in northern elevation of trial pit at 1.00m bgl.

Trial Pit Log

TrialPit No: TP104
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 03/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 2.10	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
	0.80	ES					MADE GROUND: Brown sandy, clayey gravel (ashy) with occasional cobbles and rare boulders. Gravel is fine to coarse, sub-angular to sub-rounded of ash, sandstone, plastic, wood, concrete and brick. Cobbles are sub-angular of concrete. Boulders are sub-angular of concrete.
▼ 2.10				2.10			End of Pit at 2.10m

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Trial Pit Photographs

Trial Pit 104

Trial Pit 104 Spoil

Remarks: 1.Terminated at 2.10m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.10m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP105
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 03/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

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 gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
							MADE GROUND: Black gravel (ashy) with frequent cobbles and occasional boulders. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete, ash and brick. Cobbles are sub-angular of concrete and brick. Boulders are sub-angular of concrete.
▼ 2.20				2.20			End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 105

Trial Pit 105 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.20m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP106
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 03/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 1.70	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
				0.30			MADE GROUND: Brown gravel. Gravel is coarse, sub-angular of concrete and limestone.
▼ 1.60	1.50	ES					MADE GROUND: Black gravel (ashy) with frequent cobbles and occasional boulders. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, timber, ash, concrete and brick. Cobbles are sub-angular of concrete and brick. Boulders are sub-angular of concrete.
				1.70			End of Pit at 1.70m

1 2 3 4

Trial Pit Photographs

Trial Pit 106

Trial Pit 106 Spoil

Remarks: 1.Terminated at 1.70m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 1.60m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP107
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.00 × 0.60 Depth 2.40	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
	1.80	ES					MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, ash and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete.
▼ 2.30				2.40			End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 107

Trial Pit 107 Spoil

Remarks: 1.Terminated at 2.40m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.30m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP108
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.00 x 0.60 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00 1.00	B ES		0.20			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
							MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, ash, copper, asphalt and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete.
▼ 2.20				2.20			End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 108

Trial Pit 108 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.20m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP109
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.30			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
▼ 2.00							MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, ash, rebar, asphalt, rare glass and brick. Cobbles are sub-angular of sandstone, brick and concrete.
				2.20			End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 109

Trial Pit 109 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater ingress. 2.Rapid groundwater strike at 2.00m bgl. 3.Excavation slow due to compact Made Ground.

Stability: Stable

Trial Pit Log

TrialPit No: TP110
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
2.10 ▼							MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, ash and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete.
				2.20			End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 110

Trial Pit 110 Spoil

Remarks: 1.Terminated due to continued collapse at 0.80m bgl. 2.Rapid Groundwater strike at 2.10m bgl

Stability: Unstable

Trial Pit Log

TrialPit No: TP111
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 1.80	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
	1.20	ES					MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, ash and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete. (Soft blue, grey clayey medium sand (White ash) in east at 1.20m bgl.)
				1.80			End of Pit at 1.80m

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Trial Pit Photographs

Trial Pit 111

Trial Pit 111 Spoil

Remarks: 1.Terminated due to continued collapse at 1.80m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP112
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 1.90	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.10			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
				0.20			MADE GROUND: Brown gravel. Gravel is fine to coarse, sub-angular to sub-rounded of concrete.
	1.50	ES					MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, ash, rebar and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete.
				1.90			End of Pit at 1.90m

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Trial Pit Photographs

Trial Pit 112

Trial Pit 112 Spoil

Remarks: 1.Terminated due to continued collapse at 1.90m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP113
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 2.00	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
	1.50	ES					MADE GROUND: Black red sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of asphalt, brick, ash, rebar and concrete. Cobbles are sub-angular to sub-rounded of brick and concrete. Boulders are sub-angular of concrete and brick. Boulders are angular to sub-rounded of brick and concrete. (Soft grey blue clayey medium sand with ash in southern elevation between 1.10m and 1.50m bgl)
▼ 1.80				2.00			End of Pit at 2.00m

1 2 3 4

Trial Pit Photographs

Trial Pit 113

Trial Pit 113 Spoil

Remarks: 1.Terminated at 2.00m bgl due to collapse. 2.Rapid groundwater strike at 1.80m bgl. 3.Excavation slow due to cobbles within Made Ground. 4. Large concrete and brick obstructions within strata at 0.40m and 0.30m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP114
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 2.30	Scale 1:24
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
				0.50			MADE GROUND: Brown gravel. Gravel is fine to coarse, sub-angular to sub-rounded of concrete.
▼ 2.20							MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, ash and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete.
				2.30			End of Pit at 2.30m

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Remarks: 1.Complete. 2.Rapid groundwater strike at 2.20m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP115
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): Depth 2.20 — 2.20 × 0.70	Scale 1:24
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
▼ 2.10							MADE GROUND: Black sandy gravel (ashy) with frequent cobbles and plastic sheeting. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, brick and concrete. Cobbles are sub-angular of brick and concrete. (Pockets of soft blue grey clayey medium sand (ash) at 1.60m bgl).
				2.20			End of Pit at 2.20m

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Remarks: 1.Complete. 2.Rapid groundwater strike at 2.10m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP116
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 04/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.40	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
	1.70	ES					MADE GROUND: Black clayey sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, brick, ash, tin and potential asbestos pipe. Cobbles are sub-angular of brick. (Hydrocarbon odour between 1.50m to 2.40m bgl).
▼ 2.00				2.40			End of Pit at 2.40m

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Trial Pit Photographs

Trial Pit 116

Trial Pit 116 Spoil

Remarks: 1. Terminated due to potential asbestos pipe. 2.Rapid groundwater strike at 2.00m bgl. 3. Strong hydrocarbon odour at 1.50m bgl to 2.40m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP117
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 1.60	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown sandy gravel with frequent cobbles. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, brick and sandstone. Cobbles are sub-angular of concrete, brick and sandstone.
▼ 1.40							MADE GROUND: Black gravelly medium to coarse sand (ashy) with frequent cobbles and boulders. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt, ash and brick. Cobbles are sub-angular of sandstone, brick and concrete. Boulders are sub-angular of concrete.
				1.60			End of Pit at 1.60m

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Trial Pit Photographs

Trial Pit 117

Trial Pit 117 Spoil

Remarks: 1.Terminated due to rapid groundwater ingress. 2.Rapid groundwater strike at 1.40m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP118
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 1.90	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown slightly sandy gravel (ash) with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
							MADE GROUND: Brown sandy gravel (ashy). Gravel is fine to coarse, of sandstone, mudstone, tin, ash, metal and concrete. Cobbles are sub-angular of sub-rounded of brick and concrete. Boulders are sub-angular of concrete.
				1.90			End of Pit at 1.90m

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Trial Pit Photographs

Trial Pit 118

Trial Pit 118 Spoil

Remarks: 1.Terminated at 1.90m bgl due to continued collapse.

Stability: Unstable

Trial Pit Log

TrialPit No: TP119
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 1.80	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

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 gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
							MADE GROUND: Brown sandy gravel (ashy). Gravel is fine to coarse, of sandstone, mudstone, tin, ash, metal, rebar, potential asbestos sheeting and concrete. Cobbles are sub-angular of sub-rounded of brick and concrete. Boulders are sub-angular of concrete. (Obstructions of concrete at 0.50m long).
	1.80	ES		1.80			End of Pit at 1.80m

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Trial Pit Photographs

Trial Pit 119

Trial Pit 119 Spoil

Remarks: 1.Terminated at 1.80m bgl due to asbestos sheeting.

Stability: Stable

Trial Pit Log

TrialPit No: TP120
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	B		0.30			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
2.10	2.10	ES		2.20			MADE GROUND: Brown sandy gravel (ashy). Gravel is fine to coarse, of sandstone, mudstone, tin, ash, metal, and concrete. Cobbles are sub-angular of sub-rounded of brick and concrete. Boulders are sub-angular of concrete. (Pockets of blue grey clayey medium sand (White ash)) (Strong hydrocarbon odour at 2.10m bgl).
							End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 120

Trial Pit 120 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater strike. 2.Rapid groundwater strike at 2.10m bgl. 3.Strong hydrocarbon odour at 2.10m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP121
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): Depth 2.20 (2.20 × 0.70)	Scale 1:24
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
							MADE GROUND: Black sandy gravel (ashy) with frequent cobbles and boulders and pockets of blue Le Blanc Process Waste. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick and concrete. Boulders are sub-angular of concrete. (Brick Fill)
				2.20			End of Pit at 2.20m

Remarks: 1.Terminated at 2.20m bgl due to continued collapse.

Stability: Unstable

Trial Pit Log

TrialPit No: TP122
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 3.00	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
	1.00	ES					MADE GROUND: Black gravelly coarse sand (ash) with frequent cobbles and occasional boulders. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick. Boulders are sub-angular of concrete. (Concrete obstructions 0.50m in length).
▼ 2.90				3.00			End of Pit at 3.00m

1 2 3 4

Trial Pit Photographs

Trial Pit 122

Trial Pit 122 Spoil

Remarks: 1. Complete. 2. Water strike encountered at 2.90m bgl (Slow ingress).

Stability: Unstable

Trial Pit Log

TrialPit No: TP123
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
▼ 2.00							MADE GROUND: Black gravelly coarse sand (ash) with frequent cobbles and occasional boulders. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick. Boulders are sub-angular of concrete. (Concrete obstructions 0.50m in length).
				2.20			End of Pit at 2.20m

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4

Trial Pit Photographs

Trial Pit 123

Trial Pit 123 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater strike. 2. Groundwater strike encountered at 2.00m bgl (Slow ingress).

Stability: Unstable

Trial Pit Log

TrialPit No: TP124
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.80	ES		0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
	1.50	B					MADE GROUND: Black gravelly coarse sand (ash) with frequent cobbles and occasional boulders. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick. Boulders are sub-angular of concrete. (Concrete obstructions 0.50m in length).
▼ 2.10				2.20			End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 124

Trial Pit 124 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater ingress and continued collapse. 2.Rapid groundwater strike at 2.10m bgl.

Stability: Unstable

Trial Pit Log

TrialPit No: TP125
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 2.10	Scale 1:24
Client: Manchester Metropolitan University			Logged E.Moss

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 gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
▼ 2.10				2.10			MADE GROUND: Black sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of ash, glass, pottery, ceramic, rebar, metal, asphalt, concrete, brick and plastic. Cobbles are sub-angular of concrete and brick. (Slight hydrocarbon odour).
							End of Pit at 2.10m

1 2 3 4 5

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater ingress and continued collapse. 2.Rapid groundwater strike at 2.10m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP126
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.30	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
	1.00	ES					MADE GROUND: Brown sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick and concrete.
▼ 2.20				2.30			End of Pit at 2.30m

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Trial Pit Photographs

Trial Pit 126

Trial Pit 126 Spoil

Remarks: 1.Terminated at 2.20m bgl due to rapid groundwater ingress and continued collapse. 2.Rapid groundwater strike at 2.20m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP127
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 2.00	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
▼ 1.70							MADE GROUND: Brown sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular to sub-rounded of concrete. (Hydrocarbon odour encountered at 1.80m bgl).
				2.00			End of Pit at 2.00m

1 2 3 4

Trial Pit Photographs

Trial Pit 127

Trial Pit 127 Spoil

Remarks: 1.Complete. 2.Rapid groundwater strike at 1.70m bgl. 3.Strong hydrocarbon odour at 1.80m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP128
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70 Depth 3.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.80	ES		0.30			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular of concrete and brick.
							MADE GROUND: Brown sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick and concrete.
				3.20			End of Pit at 3.20m

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Trial Pit Photographs

Trial Pit 128

Trial Pit 128 Spoil

Remarks: Complete.

Stability: Stable

Trial Pit Log

TrialPit No: TP129
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 × 0.70, Depth 1.90	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Asphalt.
							MADE GROUND: Light brown sandy gravel with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone and brick. Cobbles are sub-angular of brick.
	1.30 1.30	B ES		1.20			MADE GROUND: Black sandy gravel (ashy) pockets of blue grey clayey medium sand (ash). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, ash, mudstone, asphalt and brick. Cobbles are sub-angular of brick.
▼ 1.90				1.90			End of Pit at 1.90m

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Trial Pit Photographs

Trial Pit 129

Trial Pit 129 Spoil

Remarks: 1. Terminated due to rapid groundwater ingress at 1.90m bgl.

Stability: Stable

Trial Pit Log

TrialPit No: TP130
Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords: - Level:	Date 05/12/2019
Location: Chorlton		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: Manchester Metropolitan University			Logged E.Moss

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Asphalt.
							MADE GROUND: Light brown sandy gravel with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone and brick. Cobbles are sub-angular of brick.
				1.30			MADE GROUND: Black sandy gravel (ashy) with pockets of soft grey blue clayey medium sand (ash). Gravel is fine to coarse, sub-angular to sub-rounded of concrete, ash, mudstone, asphalt and brick. Cobbles are sub-angular of brick.
▼ 2.00							
				2.20			End of Pit at 2.20m

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Trial Pit Photographs

Trial Pit 130

Trial Pit 130 Spoil

Remarks: 1.Terminate due to rapid groundwater strike at 2.0 m bgl.

Stability: Stable

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 03/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			MADE GROUND: Brown slightly gravelly clayey fine to medium sand with occasional rootlets (Reworked Topsoil) .Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete.
		1.00	SPT	N=12 (2,5/5,3,2,2)				MADE GROUND: Red brown sandy gravel with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of brick, concrete and sandstone. Cobbles are sub-angular of brick.
		1.20	ES		1.20			
		1.80	ES					MADE GROUND: Medium dense brown sandy gravel. Gravel is fine to coarse, sub-angular to sub-rounded of concrete, asphalt and brick. (Hydrocarbon odour encountered between 1.50m to 5.00m bgl). (Circa 2.00m bgl becomes loose) (No return between 2.00m and 3.00m bgl, assume continuation of above).
		2.00	SPT	N=5 (2,1/1,1,1,2)				
		3.00	SPT	N=2 (0,0/0,0,0,2)				
					3.20			MADE GROUND: Very loose dark brown slightly clayey gravel. Gravel is fine to coarse, sub-angular to sub-rounded of asphalt, concrete and brick. (Becoming medium dense at circa 4.00m bgl) (Hydrocarbon odour).
	4.30	4.00	SPT	N=18 (2,3/5,5,4,4)				
		4.80	ES					
		5.00	SPT	N=16 (3,3/4,4,4,4)				
					5.45			End of Borehole at 5.45m

Remarks

1.Complete. 2.No return at 2.00m to 3.00m bgl. 3.Fell in to 3.00m bgl 3.Slow groundwater strike at 4.30m bgl 4.Strong hydrocarbon odour between 1.50m and 5.00m bgl. 5.Monitoring well installed.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 03/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown slightly gravelly clayey fine to medium sand with occasional rootlets (Reworked Topsoil) .Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete.
		1.00	SPT	N=4 (5,6/4,0,0,0)	1.00			MADE GROUND: Firm brown gravelly clay. Gravel is fine to coarse, sub-angular to sub-rounded of brick and concrete.
		2.00	SPT	N=1 (1,0/0,0,0,1)				MADE GROUND: Loose black gravelly coarse sand (ash). Gravel is fine to coarse, sub-angular of mudstone, ash, concrete and brick. (Strong hydrocarbon odour encountered between 3.10m and 4.00m bgl). (Circa 2.00m bgl becomes very loose) (Circa 3.00m bgl becomes medium dense) (Circa 4.00m bgl becomes very loose) (Circa 5.00m bgl becomes loose).
		3.00	SPT	N=12 (3,3/4,3,3,2)				
		3.20	ES					
	▼ 4.00	4.00	SPT	N=4 (2,2/2,1,0,1)				
		4.20	ES					
		5.00	SPT	N=11 (3,3/2,3,3,3)				
					5.45			End of Borehole at 5.45m

Remarks

1.Complete. 2. Collapse in to 3.00m bgl 3.Slow groundwater strike at 4.00m bgl 3.Strong hydrocarbon odour between 3.10m and 4.00m bgl 4.Monitoring well installed.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 03/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown slightly gravelly clayey fine to medium sand with occasional rootlets (Reworked Topsoil) .Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete.
								MADE GROUND: Firm brown gravelly clay. Gravel is fine to coarse, sub-angular to sub-rounded of brick and concrete.
	1.20	1.00	SPT	N=15 (7,6/6,6,2,1)	1.00			MADE GROUND: Loose black gravelly coarse sand (ash). Gravel is fine to coarse, sub-angular of mudstone, ash, concrete and brick. (Circa 2.00m bgl becomes very loose) (Circa 3.00m bgl becomes loose) (Circa 4.00m bgl becomes medium dense) (Circa 5.00m bgl becomes loose).
		1.80	ES					
		2.00	SPT	N=2 (1,0/0,0,2,0)				
		3.00	SPT	N=11 (2,2/2,2,3,4)				
		4.00	SPT	N=12 (5,6/4,2,3,3)				
		5.00	SPT	N=7 (3,3/3,2,1,1)				
					5.45			End of Borehole at 5.45m

1 2 3 4 5 6 7 8 9 10

Remarks

1.Complete. 2. Collapse in to 2.00m bgl 3.Slow groundwater strike at 1.20m bgl 4.Monitoring well installed.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 03/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Brown slightly gravelly clayey fine to medium sand with occasional rootlets (Reworked Topsoil) .Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete.
	1.20	1.00	SPT	N=13 (5,6/3,3,3,4)				MADE GROUND: Medium dense light brown slightly gravelly fine sand. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone and concrete.
		1.20	ES		1.30			
		2.00	SPT	N=4 (2,3/2,2,0,0)				MADE GROUND: Medium dense black gravelly coarse sand (ash). Gravel is fine to coarse, sub-angular of mudstone, ash, concrete and brick. (Strong hydrocarbon odour encountered between 3.10m and 4.00m bgl). (Circa 2.00m bgl becomes very loose) (Circa 3.00m bgl becomes medium dense).
		3.00	SPT	N=21 (3,3/4,7,6,4)				
		4.00	SPT	N=17 (3,4/4,4,5,4)				
		5.00	SPT	N=20 (3,3/4,5,4,7)				
					5.45			End of Borehole at 5.45m

Remarks

1.Complete. 2. Collapse in to 2.50m bgl 3.Slow groundwater strike at 1.20m bgl 4.Monitoring well installed.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 03/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown slightly gravelly clayey fine to medium sand with occasional rootlets (Reworked Topsoil) .Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete.
		1.00	SPT	N=26 (6,8/9,6,7,4)				MADE GROUND: Medium dense black sandy gravel (ashy) with occasional cobbles and pockets of soft blue grey clayey medium sand (ash). Gravel is fine to coarse, sub-angular of brick, ash and concrete. (Circa 2.00m bgl becomes very loose) (Circa 3.00m bgl becomes medium dense).
		2.00	SPT	N=0 (2,0/0,0,0,0)				
		3.00	SPT	N=22 (3,5/8,7,3,4)				
		3.80	ES		3.60			MADE GROUND: Blue grey clayey medium sand (Ash). (slight sulphur odour) (circa 4.00m bgl becomes very loose).
		4.00	SPT	N=4 (3,2/3,0,0,1)				
					4.45			End of Borehole at 4.45m

1 2 3 4 5 6 7 8 9 10

Remarks

1.Terminated at 4.00m bgl due to continued collapse back to 2.00m bgl. 2.Monitoring well installed.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 03/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Brown slightly gravelly clayey fine to medium sand with occasional rootlets (Reworked Topsoil) .Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete.
		0.80	ES					MADE GROUND: Medium dense red sandy gravel with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete. Cobbles are sub-angular of brick. (No return between 1.00m and 2.00m bgl, assume continuation of above strata). (Circa 2.00m bgl becomes very loose) (Circa 3.00m bgl becomes dense).
		1.00	SPT	N=17 (7,6/4,4,5,5,4)				
		2.00	SPT	N=4 (3,0/0,0,2,2)				
		3.00	SPT	50 (10,12/50 for 30mm)	3.00			End of Borehole at 3.00m

Remarks

1.Terminated due to refusal on cobble within Made Ground at 3.00m bgl. 2.No return from 1.00m to 2.00m bgl. 3.Monitoring well installed.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			MADE GROUND: Brown slightly clayey sandy gravel. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick.
					0.80			MADE GROUND: Brown sandy gravel (ashy) with frequent cobbles. Gravel is sub-angular of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick.
		1.00	SPT	N=20 (5,7/6,6,5,3)				MADE GROUND: Medium dense brown gravelly fine to medium sand. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete and brick.
		2.00	SPT	N=17 (3,4/4,5,4,4)	2.00			MADE GROUND: Medium dense brown sandy gravel with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of concrete. Cobbles are sub-angular of concrete.
	3.00	3.00	SPT	N=12 (3,3/2,3,3,4)				
		4.00	SPT	N=16 (4,6/5,5,3,3)				
					4.45			End of Borehole at 4.45m

1 2 3 4 5 6 7 8 9 10

Remarks

1.Terminated at 4.45m bgl due to continued collapse at 3.00m bgl. 2.Only 20% of core recovered at 3.00 to 4.00m bgl. 3.Monitoring well installed. 4.Slow groundwater strike at 3.00m bgl.

Borehole Log

Borehole No. **WS108**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown slightly clayey sandy gravel. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick.
		1.00	SPT	N=23 (7,6/6,7,5,5)				MADE GROUND: Black sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick.
					1.30			MADE GROUND: Very stiff high strength brown slightly gravelly clay with occasional cobbles. (Reworked Clay). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete and brick. Cobbles are sub-angular of brick.
		2.00	SPT	N=30 (4,5/5,8,9,8)				
					2.30			MADE GROUND: Black sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick.
					2.50			
		2.80	ES					MADE GROUND: Very soft very low strength brown slightly gravelly clay with occasional cobbles. (Reworked Clay). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete and brick. Cobbles are sub-angular of brick.
		3.00	SPT	N=0 (2,1/0,0,0,0)	3.00			No return- assume strata as: MADE GROUND: Very loose black sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick.
					4.45			End of Borehole at 4.45m

Remarks

1.Terminated at 4.45m bgl due to continued collapse. 2.No return from 3.10 to 4.00m bgl. 3.Monitoring well installed.

Borehole Log

Borehole No. **WS109**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MAE GROUND: Brown slightly clayey sandy gravel. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick.
		1.00	SPT	N=16 (3,4/4,3,5,4)				MADE GROUND: Medium dense red brown gravelly fine to medium sand. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, ash, concrete and brick. (Circa 2.00m bgl becomes loose) (Circa 3.00m bgl becomes medium dense).
		2.00	SPT	N=8 (2,1/1,2,3,2)				
		3.00	SPT	N=21 (7,7/6,5,4,6)				
		4.00	SPT	N=13 (3,4/4,3,3,3)				
					4.45			End of Borehole at 4.45m

1 2 3 4 5 6 7 8 9 10

Remarks

1.Terminated at 4.00m bgl due to continued collapse to 3.00m bgl. 2.Monitoring well installed.

Borehole Log

Borehole No. **WS110**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES		0.20			MADE GROUND: Brown slightly clayey sandy gravel. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick.
		1.00	SPT	N=8 (3,2/2,2,2,2)				MADE GROUND: Loose black sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, mudstone, concrete and brick. Cobbles are sub-angular of brick. (Becoming medium dense at circa 2.00m) (Becoming dense at circa 3.00m bgl).
		2.00	SPT	N=28 (7,9/8,8,7,5)				
		3.00	SPT	50 (10,13/50 for 35mm)	3.00			End of Borehole at 3.00m

Remarks

1.Terminated at 3.00m bgl due to refusal on cobble within Made Ground. 2.Monitoring well installed.

Borehole Log

Borehole No. **WS111**

Sheet 1 of 1

Project Name:	Rye Bank Road	Project No. 13533	Co-ords:
Location:	Chorlton		Level:
Client:	Manchester Metropolitan University		Dates: 04/12/2019

Hole Type: WS

Scale: 1:50

Logged By: E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown slightly clayey sandy gravel. (Reworked Topsoil). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick.
	1.20	1.00	SPT	N=23 (4,5/5,6,5,7)	1.00			MADE GROUND: Medium dense black red sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, , ash, asphalt, brick and concrete. Cobbles are sub-angular of brick and concrete.
		2.00	SPT	N=27 (4,3/7,8,6,6)				MADE GROUND: Medium dense brown sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of limestone and sandstone.
					2.20			
					2.40			MADE GROUND: Medium dense black red sandy gravel (ashy) with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, , ash, asphalt, brick and concrete. Cobbles are sub-angular of brick and concrete.
		2.70	ES		2.80			MADE GROUND: Blue grey clayey medium sand (Ash).
		3.00	SPT	N=1 (2,3/1,0,0,0)				MADE GROUND: Very loose black red sandy gravel with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, brick and concrete. Cobbles are sub-angular of brick and concrete.
					4.00			End of Borehole at 4.00m

1 2 3 4 5 6 7 8 9 10

Remarks

1.Terminated at 4.00m bgl due to continued collapse back to 3.00m bgl. 2.Slow groundwater strike at 1.20m bgl 3.Monitoring well installed.

Borehole Log

Borehole No. **WS112**

Sheet 1 of 1

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type WS
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Asphalt.
					0.40			MADE GROUND: Brown sandy gravel with frequent cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete and asphalt. Cobbles are angular to sub-rounded of concrete.
					0.90			MADE GROUND: Black gravelly coarse sand (ashy). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, concrete, brick and asphalt.
		1.00	SPT	N=18 (4,4/5,5,4,4)	1.00			MADE GROUND: Brown gravelly clay. Gravel is fine to coarse, sub-angular to sub-rounded of concrete and brick.
		2.00	SPT	N=12 (4,5/4,3,2,3)	2.00			MADE GROUND: Medium dense black gravelly coarse sand (ashy). Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, concrete, brick and asphalt.
		2.30	ES					MADE GROUND: Stiff medium strength brown gravelly clay. Gravel is fine to coarse, sub-angular to sub-rounded of concrete and brick. (Circa 3.00m bgl becomes soft very low strength).
		3.00	SPT	N=4 (3,4/3,0,0,1)				
					3.45			End of Borehole at 3.45m

Remarks

1.Terminated at 3.45m bgl due to continued collapse. 2.Monitoring well installed.

Borehole Log

Borehole No. **CP101**

Sheet 1 of 2

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type CP
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular to concrete and brick. (Reworked Topsoil)
		1.00 1.00	B SPT	N=7 (4,4/3,2,1,1)				MADE GROUND: Loose brown sandy clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete, ash and brick. Cobbles are sub-angular of concrete.
	2.00	2.00	SPT	N=7 (1,2/2,1,2,2)	2.00			MADE GROUND: Loose brown, sandy, clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, metal, timber concrete and brick. Cobbles are sub-angular of concrete.
		3.00 3.00	B SPT	N=9 (4,5/3,2,2,2)	3.00			MADE GROUND: Loose brown, , sandy, clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, metal, timber concrete and brick. Cobbles are sub-angular of concrete.
		4.00	SPT	N=20 (1,3/4,4,5,7)				
		5.00 5.00	B SPT	N=8 (3,3/2,2,2,2)	5.00			MADE GROUND: Loose brown, sandy, clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, metal, timber concrete and brick. Cobbles are sub-angular of concrete.
		6.50	SPT	N=37 (3,5/6,9,10,12)	6.50			MADE GROUND: Medium dense brown, , sandy, clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, metal, ash, timber concrete and brick. Cobbles are sub-angular of concrete.
		8.00 8.00	B SPT	N=15 (2,2/3,3,4,5)				
		9.50	SPT	N=15 (2,2/3,3,4,5)				

1 2 3 4 5 6 7 8 9 10

Remarks

1.Complete. 2.Chiselled from 6.70 m to 7.10 m for 1 hour. 3.Chiselled from 7.30 m to 7.60 m for 45 minutes. 4.Chiselled from 10.20 m to 10.40m for half an hour. 5.Chiselled from 11.30 m to 11.70 m for 45 minutes. 6.Chiselled from 14.00 m to 14.50 m for 1 hour. 7.Monitoring well installed. 7.Rapid groundwater strike at 2.00m bgl.

Borehole Log

Borehole No. **CP101**

Sheet 2 of 2

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type CP
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		11.00 11.00	B SPT	N=36 (3,4/6,9,10,11)	11.00			MADE GROUND: Medium dense brown, , sandy, clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, metal, ash, timber concrete and brick. Cobbles are sub-angular of concrete.
		12.50	SPT	N=20 (2,2/3,3,5,9)				MADE GROUND: Dense brown, , sandy, clayey gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, metal, timber concrete and brick. Cobbles are sub-angular of concrete.
		14.00	SPT	50 (9,10/50 for 285mm)	12.70			Stiff medium strength brown sandy CLAY with bands of fine to medium SAND. (Becoming very stiff very high strength at circa 14.00m bgl).
		14.50	SPT	50 (7,12/50 for 255mm)				
					14.90			End of Borehole at 14.90m

11 12 13 14 15 16 17 18 19 20

Remarks

1.Complete. 2.Chiselled from 6.70 m to 7.10 m for 1 hour. 3.Chiselled from 7.30 m to 7.60 m for 45 minutes. 4.Chiselled from 10.20 m to 10.40m for half an hour. 5.Chiselled from 11.30 m to 11.70 m for 45 minutes. 6.Chiselled from 14.00 m to 14.50 m for 1 hour. 7.Monitoring well installed. 7.Rapid groundwater strike at 2.00m bgl.

Borehole Log

Borehole No. **CP102**

Sheet 1 of 2

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type CP
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	D		0.20			MADE GROUND: Brown slightly sandy gravel with occasional cobbles and frequent rootlets. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, mudstone, concrete and brick. Cobbles are sub-angular to concrete and brick. (Reworked Topsoil)
		1.00 1.00 1.00	B D SPT	N=10 (1,1/2,3,3,2)				MADE GROUND: Medium dense brown sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, concrete and brick. Cobbles are sub-angular of concrete.
	2.30	2.00	SPT	N=14 (2,3/4,4,3,3)				
		3.00 3.00 3.00	B D SPT	N=26 (3,4/6,6,7,7)				
		4.00	SPT	N=46 (2,4/7,9,15,15)	4.00			MADE GROUND: Dense brown sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete, ash and brick. Cobbles are sub-angular of concrete.
		5.00 5.00 5.00	B D SPT	51 (7,12/51 for 190mm)	5.00			MADE GROUND: Very dense brown sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete, ash and brick. Cobbles are sub-angular of concrete.
		6.50	SPT	N=25 (4,4/6,7,7,5)	6.50			MADE GROUND: Medium dense brown sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, concrete, ash and brick. Cobbles are sub-angular of concrete.
		8.00 8.00 8.00	B D SPT	N=23 (2,4/6,6,6,5)				
		9.50 9.50	D SPT	N=32 (7,9/11,9,8,4)	9.50			MADE GROUND: Medium dense brown sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone,

Remarks

1.Complete. 2.Chiselled from 4.30 m to 4.70 m for 45 minutes. 3.Chiselled from 5.00 m to 5.50 m fr 1 hour. 4.Chiselled from 5.80 m to 6.10 m for half an hour. 5.Chiselled from 9.70 m to 9.90 m for 30 minutes. 6.Chiselled from 13.80 m to 14.00 m for 1 hour. 7.Monitoring well installed. 8.Rapid groundwater strike at 2.30m bgl.

Borehole Log

Borehole No. **CP102**

Sheet 2 of 2

Project Name: Rye Bank Road	Project No. 13533	Co-ords:	Hole Type CP
Location: Chorlton		Level:	Scale 1:50
Client: Manchester Metropolitan University		Dates: 04/12/2019	Logged By E.Moss

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					10.20			MADE GROUND: Medium dense brown sandy gravel (ashy) with occasional cobbles. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, ash, concrete and brick. Cobbles are sub-angular of concrete.
		11.00 11.00	D SPT	N=28 (3,4/6,6,7,9)				Very stiff high strength brown sandy CLAY with bands of fine to medium SAND. (Becoming very stiff very high strength at circa 12.50m bgl).
		12.50	SPT	50 (6,10/50 for 285mm)				
		14.00	SPT	52 (7,10/52 for 226mm)	14.16			End of Borehole at 14.16m

11 12 13 14 15 16 17 18 19 20

Remarks

1.Complete. 2.Chiselled from 4.30 m to 4.70 m for 45 minutes. 3.Chiselled from 5.00 m to 5.50 m fr 1 hour. 4.Chiselled from 5.80 m to 6.10 m for half an hour. 5.Chiselled from 9.70 m to 9.90 m for 30 minutes. 6.Chiselled from 13.80 m to 14.00 m for 1 hour. 7.Monitoring well installed. 8.Rapid groundwater strike at 2.30m bgl.

APPENDIX VI
CHEMICAL TESTING RESULTS

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Analytical Report Number : 19-77078

Project / Site name:	Ryebank Chorlton	**Samples received on:**	11/12/2019
Your job number:	13533	**Samples instructed on:**	11/12/2019
Your order number:	34146	**Analysis completed by:**	19/12/2019
Report Issue Number:	1	**Report issued on:**	19/12/2019
Samples Analysed:	6 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389778	1389779	1389780	1389781	1389782
Sample Reference				TP101	TP113	TP119	TP120	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	2.10	0.10
Date Sampled				04/12/2019	05/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	39	23	14	17	30
Total mass of sample received	kg	0.001	NONE	0.33	0.31	0.34	0.36	0.38
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	-	-	10.3	-
Total Cyanide	mg/kg	1	MCERTS	< 1	2	120	2	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	-	1100	-
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	250	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	0.13	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	125	-
Sulphide	mg/kg	1	MCERTS	-	-	-	2.3	-
Total Sulphur	mg/kg	50	MCERTS	-	-	-	1300	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-	< 1.0	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.54	< 0.05	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	11	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.35	< 0.05	2.4	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.39	< 0.05	17	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	3.1	0.81	150	-	3.1
Anthracene	mg/kg	0.05	MCERTS	0.90	0.25	46	-	0.90
Fluoranthene	mg/kg	0.05	MCERTS	5.1	1.7	150	-	5.8
Pyrene	mg/kg	0.05	MCERTS	5.2	1.8	130	-	5.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.4	0.91	44	-	2.5
Chrysene	mg/kg	0.05	MCERTS	2.3	1.0	37	-	2.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.0	1.1	50	-	3.3
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.98	0.59	15	-	1.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.5	1.1	45	-	2.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3	0.51	30	-	1.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.44	0.20	7.2	-	0.42
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.5	0.58	25	-	1.7
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	30.0	10.6	763	-	31.3

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389778	1389779	1389780	1389781	1389782
Sample Reference				TP101	TP113	TP119	TP120	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	2.10	0.10
Date Sampled				04/12/2019	05/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	17	23	32	18
Barium (aqua regia extractable)	mg/kg	1	MCERTS	200	150	440	-	250
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.64	0.79	1.2	-	1.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	0.4	1.6	0.4	0.6
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	24	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	150	72	620	160	110
Lead (aqua regia extractable)	mg/kg	1	MCERTS	220	180	1000	680	230
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.5	0.7	1.4	1.0	0.9
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	17	27	33	23
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	16	21	32	-	28
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	320	130	1000	280	200
Petroleum Hydrocarbons								
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	5.6	3.7	6.3	12	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	13	16	220	40	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	44	51	1700	140	15
TPH (C21 - C35)	mg/kg	1	MCERTS	110	110	1300	230	27
TPH (C35 - C40)	mg/kg	10	MCERTS	19	20	40	18	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	200	200	3300	460	43

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389778	1389779	1389780	1389781	1389782
Sample Reference				TP101	TP113	TP119	TP120	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	2.10	0.10
Date Sampled				04/12/2019	05/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Chloroethane	µg/kg	1	NONE	-	-	-	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	< 1.0	-
Benzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Styrene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Tribromomethane	µg/kg	1	NONE	-	-	-	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	-

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389778	1389779	1389780	1389781	1389782
Sample Reference				TP101	TP113	TP119	TP120	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.10	2.10	0.10
Date Sampled				04/12/2019	05/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	-	-	< 0.1	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	< 0.2	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	< 0.05	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	< 0.2	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	0.61	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	< 0.1	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	< 0.1	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	0.7	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	0.72	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	0.94	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	0.5	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	< 0.3	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	1.5	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	11	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	2.0	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	0.4	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	< 0.2	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	< 0.3	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	14	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	14	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	< 0.3	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	6.8	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	5.5	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	6.6	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	2.5	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	5.6	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	2.8	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	1.0	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	3.6	-

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389783				
Sample Reference				WS110				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	11				
Total mass of sample received	kg	0.001	NONE	0.36				

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile				
Asbestos in Soil	Type	N/A	ISO 17025	Detected				
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001				
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001				

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-				
Total Cyanide	mg/kg	1	MCERTS	-				
Total Sulphate as SO_4	mg/kg	50	MCERTS	-				
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-				
Sulphide	mg/kg	1	MCERTS	-				
Total Sulphur	mg/kg	50	MCERTS	-				
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.6				

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-				

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	0.32				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	0.24				
Phenanthrene	mg/kg	0.05	MCERTS	1.3				
Anthracene	mg/kg	0.05	MCERTS	0.36				
Fluoranthene	mg/kg	0.05	MCERTS	1.7				
Pyrene	mg/kg	0.05	MCERTS	1.5				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.2				
Chrysene	mg/kg	0.05	MCERTS	0.82				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.77				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.50				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.66				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.33				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.40				

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	10.0				

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton
Your Order No: 34146

Lab Sample Number				1389783				
Sample Reference				WS110				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-				
Chromium (hexavalent)	mg/kg	4	MCERTS	-				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-				

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0				
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0				
TPH (C12 - C16)	mg/kg	4	MCERTS	8.2				
TPH (C16 - C21)	mg/kg	1	MCERTS	27				
TPH (C21 - C35)	mg/kg	1	MCERTS	44				
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10				
TPH Total C5 - C40	mg/kg	10	MCERTS	81				

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389783				
Sample Reference				WS110				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-				
Chloroethane	µg/kg	1	NONE	-				
Bromomethane	µg/kg	1	ISO 17025	-				
Vinyl Chloride	µg/kg	1	NONE	-				
Trichlorofluoromethane	µg/kg	1	NONE	-				
1,1-Dichloroethene	µg/kg	1	NONE	-				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-				
1,1-Dichloroethane	µg/kg	1	MCERTS	-				
2,2-Dichloropropane	µg/kg	1	MCERTS	-				
Trichloromethane	µg/kg	1	MCERTS	-				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-				
1,2-Dichloroethane	µg/kg	1	MCERTS	-				
1,1-Dichloropropene	µg/kg	1	MCERTS	-				
Trans-1,2-dichloroethene	µg/kg	1	NONE	-				
Benzene	µg/kg	1	MCERTS	-				
Tetrachloromethane	µg/kg	1	MCERTS	-				
1,2-Dichloropropane	µg/kg	1	MCERTS	-				
Trichloroethene	µg/kg	1	MCERTS	-				
Dibromomethane	µg/kg	1	MCERTS	-				
Bromodichloromethane	µg/kg	1	MCERTS	-				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-				
Toluene	µg/kg	1	MCERTS	-				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-				
1,3-Dichloropropane	µg/kg	1	ISO 17025	-				
Dibromochloromethane	µg/kg	1	ISO 17025	-				
Tetrachloroethene	µg/kg	1	NONE	-				
1,2-Dibromoethane	µg/kg	1	ISO 17025	-				
Chlorobenzene	µg/kg	1	MCERTS	-				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-				
Ethylbenzene	µg/kg	1	MCERTS	-				
p & m-Xylene	µg/kg	1	MCERTS	-				
Styrene	µg/kg	1	MCERTS	-				
Tribromomethane	µg/kg	1	NONE	-				
o-Xylene	µg/kg	1	MCERTS	-				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-				
Isopropylbenzene	µg/kg	1	MCERTS	-				
Bromobenzene	µg/kg	1	MCERTS	-				
n-Propylbenzene	µg/kg	1	ISO 17025	-				
2-Chlorotoluene	µg/kg	1	MCERTS	-				
4-Chlorotoluene	µg/kg	1	MCERTS	-				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-				
tert-Butylbenzene	µg/kg	1	MCERTS	-				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-				
sec-Butylbenzene	µg/kg	1	MCERTS	-				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-				
p-Isopropyltoluene	µg/kg	1	ISO 17025	-				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-				
Butylbenzene	µg/kg	1	MCERTS	-				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-				
Hexachlorobutadiene	µg/kg	1	MCERTS	-				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-				

Analytical Report Number: 19-77078

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1389783				
Sample Reference				WS110				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-				
Phenol	mg/kg	0.2	ISO 17025	-				
2-Chlorophenol	mg/kg	0.1	MCERTS	-				
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-				
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-				
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-				
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-				
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-				
2-Methylphenol	mg/kg	0.3	MCERTS	-				
Hexachloroethane	mg/kg	0.05	MCERTS	-				
Nitrobenzene	mg/kg	0.3	MCERTS	-				
4-Methylphenol	mg/kg	0.2	NONE	-				
Isophorone	mg/kg	0.2	MCERTS	-				
2-Nitrophenol	mg/kg	0.3	MCERTS	-				
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-				
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-				
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-				
Naphthalene	mg/kg	0.05	MCERTS	-				
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-				
4-Chloroaniline	mg/kg	0.1	NONE	-				
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-				
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-				
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-				
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-				
2-Methylnaphthalene	mg/kg	0.1	NONE	-				
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-				
Dimethylphthalate	mg/kg	0.1	MCERTS	-				
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-				
Acenaphthylene	mg/kg	0.05	MCERTS	-				
Acenaphthene	mg/kg	0.05	MCERTS	-				
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-				
Dibenzofuran	mg/kg	0.2	MCERTS	-				
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-				
Diethyl phthalate	mg/kg	0.2	MCERTS	-				
4-Nitroaniline	mg/kg	0.2	MCERTS	-				
Fluorene	mg/kg	0.05	MCERTS	-				
Azobenzene	mg/kg	0.3	MCERTS	-				
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-				
Hexachlorobenzene	mg/kg	0.3	MCERTS	-				
Phenanthrene	mg/kg	0.05	MCERTS	-				
Anthracene	mg/kg	0.05	MCERTS	-				
Carbazole	mg/kg	0.3	MCERTS	-				
Dibutyl phthalate	mg/kg	0.2	MCERTS	-				
Anthraquinone	mg/kg	0.3	MCERTS	-				
Fluoranthene	mg/kg	0.05	MCERTS	-				
Pyrene	mg/kg	0.05	MCERTS	-				
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-				
Chrysene	mg/kg	0.05	MCERTS	-				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-				

Analytical Report Number: 19-77078
Project / Site name: Ryebank Chorlton
Your Order No: 34146

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1389783	WS110	0.50	118	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

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

Analytical Report Number : 19-77078

Project / Site name: Ryebank Chorlton

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1389778	TP101	None Supplied	0.10	Brown loam and clay with vegetation.
1389779	TP113	None Supplied	0.10	Brown loam with vegetation.
1389780	TP119	None Supplied	0.10	Brown loam and sand with gravel.
1389781	TP120	None Supplied	2.10	Brown clay and sand with clinker.
1389782	TP125	None Supplied	0.10	Brown loam and clay with vegetation.
1389783	WS110	None Supplied	0.50	Brown sand with clinker.

Analytical Report Number : 19-77078

Project / Site name: Ryebank Chorlton

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS

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Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

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

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

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TP101		S	19-77078	1389778	c	Total cyanide in soil	L080-PL	c

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

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Analytical Report Number : 19-76421

Replaces Analytical Report Number : 19-76421, issue no. 1

Project / Site name:	Ryebank Chorlton	**Samples received on:**	06/12/2019
Your job number:	13533	**Samples instructed on:**	09/12/2019
Your order number:	34146	**Analysis completed by:**	16/12/2019
Report Issue Number:	2	**Report issued on:**	13/01/2020
Samples Analysed:	4 leachate samples - 11 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386182	1386183	1386184	1386186	1386187
Sample Reference				TP103	TP105	TP111	TP115	TP116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.30	0.10	1.20	1.60	1.50
Date Sampled				04/12/2019	04/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	13	25	33	23	14
Total mass of sample received	kg	0.001	NONE	0.39	0.44	0.30	0.35	0.39
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	9.0	-	12.3	11.2
Total Cyanide	mg/kg	1	MCERTS	1	< 1	< 1	< 1	1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	650	-	3200	770
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	-	0.046	-	0.15	0.11
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	-	91	-	300	220
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	-	45.6	-	152	111
Sulphide	mg/kg	1	MCERTS	-	7.0	-	91	36
Total Sulphur	mg/kg	50	MCERTS	-	610	-	1600	1100
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.8	-	-	-	2.4
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	-	1.2	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.35	< 0.05	< 0.05	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	0.59	0.76	< 0.05	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	0.59	0.53	< 0.05	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	4.0	5.1	< 0.05	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	0.93	1.0	< 0.05	< 0.05	-
Fluoranthene	mg/kg	0.05	MCERTS	5.8	5.9	< 0.05	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	5.2	5.8	< 0.05	< 0.05	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.1	3.4	< 0.05	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	2.8	2.8	< 0.05	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.0	2.8	< 0.05	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.5	1.5	< 0.05	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.7	2.7	< 0.05	< 0.05	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3	1.2	< 0.05	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.42	0.39	< 0.05	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.5	1.5	< 0.05	< 0.05	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	33.7	35.4	< 0.80	< 0.80	-

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton
Your Order No: 34146

Lab Sample Number				1386182	1386183	1386184	1386186	1386187
Sample Reference				TP103	TP105	TP111	TP115	TP116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.30	0.10	1.20	1.60	1.50
Date Sampled				04/12/2019	04/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	21	< 1.0	< 1.0	20
Barium (aqua regia extractable)	mg/kg	1	MCERTS	290	-	12	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	-	0.67	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	0.8	< 0.2	< 0.2	1.8
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	36	-	26	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	99	120	10	14	160
Lead (aqua regia extractable)	mg/kg	1	MCERTS	180	820	7.4	4.8	180
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	0.6	< 0.3	< 0.3	2.8
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	23	3.9	4.6	40
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1.7
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	32	-	5.7	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	230	310	6.0	58	530
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	8.1
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	35
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	67
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	110
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	7.9
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	200
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	1100
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	910
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	2200
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	-
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	-
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	-
TPH (C10 - C12)	mg/kg	2	MCERTS	40	3.8	< 2.0	< 2.0	-
TPH (C12 - C16)	mg/kg	4	MCERTS	21	14	< 4.0	< 4.0	-
TPH (C16 - C21)	mg/kg	1	MCERTS	67	47	< 1.0	10	-
TPH (C21 - C35)	mg/kg	1	MCERTS	170	110	< 1.0	78	-
TPH (C35 - C40)	mg/kg	10	MCERTS	42	22	< 10	< 10	-
TPH Total C5 - C40	mg/kg	10	MCERTS	390	200	< 10	91	-

Analytical Report Number: 19-76421

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Your Order No: 34146

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Sample Reference				TP103	TP105	TP111	TP115	TP116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.30	0.10	1.20	1.60	1.50
Date Sampled				04/12/2019	04/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	-	-	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	< 1.0
Benzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Styrene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	-	-	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0

Analytical Report Number: 19-76421

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Your Order No: 34146

Lab Sample Number				1386182	1386183	1386184	1386186	1386187
Sample Reference				TP103	TP105	TP111	TP115	TP116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.30	0.10	1.20	1.60	1.50
Date Sampled				04/12/2019	04/12/2019	05/12/2019	05/12/2019	05/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	-	-	-	< 0.1
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	< 0.2
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	< 0.05
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	0.5
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	0.62
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	5.7
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	3.6
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	9.1
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	55
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	17
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	4.1
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	1.8
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	53
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	42
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	19
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	16
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	14
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	6.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	13
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	7.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	2.1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	7.9

* This sample was reported unsuitable for analysis due to high level of asbestos contamination and the laboratory was unable to remove all of the fibres.

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386189	1386190	1386191*	1386192	1386193
Sample Reference				TP127	TP128	WS101	WS102	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80	0.80	1.80	3.20	3.80
Date Sampled				05/12/2019	05/12/2019	04/12/2019	04/12/2019	04/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	13	13	23	22	36
Total mass of sample received	kg	0.001	NONE	0.39	0.38	0.30	0.41	0.31
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Chrysotile & Amosite	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	1.183	0.036	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	1.18	0.036	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-	-	U/S	9.0	12.4
Total Cyanide	mg/kg	1	MCERTS	1	6	2	1	3
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	U/S	4900	3500
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	-	-	U/S	0.97	0.055
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	-	-	U/S	1900	110
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	-	-	U/S	966	55.3
Sulphide	mg/kg	1	MCERTS	-	-	U/S	470	19
Total Sulphur	mg/kg	50	MCERTS	-	-	U/S	17000	1600
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.9	-	U/S	3.2	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	< 1.0	< 1.0	47
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	0.45	-	-	0.61
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.47	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	2.8	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	2.7	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	19	-	-	0.23
Anthracene	mg/kg	0.05	MCERTS	-	5.4	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	-	25	-	-	0.33
Pyrene	mg/kg	0.05	MCERTS	-	21	-	-	0.29
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	10	-	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	-	8.7	-	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	11	-	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	3.9	-	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	8.9	-	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	3.8	-	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	1.1	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	4.4	-	-	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	127	-	-	1.46

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386189	1386190	1386191*	1386192	1386193
Sample Reference				TP127	TP128	WS101	WS102	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80	0.80	1.80	3.20	3.80
Date Sampled				05/12/2019	05/12/2019	04/12/2019	04/12/2019	04/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	18	U/S	34	1.4
Barium (aqua regia extractable)	mg/kg	1	MCERTS	350	380	-	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	0.98	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	1.2	U/S	3.3	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	U/S	43	6.0
Copper (aqua regia extractable)	mg/kg	1	MCERTS	130	2600	U/S	400	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	230	460	U/S	1100	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.6	U/S	1.0	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	25	U/S	58	6.2
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.1	U/S	2.1	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	34	28	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	260	760	U/S	1600	23
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
o-xylene	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	< 1.0	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-	-	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	2.5	-	-	13	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	11	-	-	20	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	25	-	-	76	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	49	-	-	450	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	88	-	-	560	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-	-	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	5.5	-	-	6.2	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	41	-	-	34	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	110	-	-	180	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	250	-	-	510	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	410	-	-	730	-
TPH (C5 - C6)	mg/kg	1	NONE	-	< 1.0	< 1.0	-	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	-	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	-	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	-	2.3	U/S	-	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	-	22	U/S	-	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	-	150	U/S	-	7.9
TPH (C21 - C35)	mg/kg	1	MCERTS	-	460	U/S	-	85
TPH (C35 - C40)	mg/kg	10	MCERTS	-	47	U/S	-	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	-	680	< 10	-	95

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386189	1386190	1386191*	1386192	1386193
Sample Reference				TP127	TP128	WS101	WS102	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80	0.80	1.80	3.20	3.80
Date Sampled				05/12/2019	05/12/2019	04/12/2019	04/12/2019	04/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Chloroethane	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
Benzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Styrene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Butylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	-	< 1.0	< 1.0	-

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386189	1386190	1386191*	1386192	1386193
Sample Reference				TP127	TP128	WS101	WS102	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80	0.80	1.80	3.20	3.80
Date Sampled				05/12/2019	05/12/2019	04/12/2019	04/12/2019	04/12/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	-	U/S	< 0.1	-
Phenol	mg/kg	0.2	ISO 17025	< 0.2	-	U/S	< 0.2	-
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	-	U/S	< 0.05	-
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	U/S	< 0.2	-
Isophorone	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
Naphthalene	mg/kg	0.05	MCERTS	5.1	-	U/S	1.4	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	U/S	< 0.1	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	U/S	< 0.1	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
2-Methylnaphthalene	mg/kg	0.1	NONE	4.0	-	U/S	0.7	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	-	U/S	< 0.1	-
Acenaphthylene	mg/kg	0.05	MCERTS	2.4	-	U/S	0.61	-
Acenaphthene	mg/kg	0.05	MCERTS	4.6	-	U/S	3.0	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
Dibenzofuran	mg/kg	0.2	MCERTS	3.0	-	U/S	1.1	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	-	U/S	< 0.3	-
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
Fluorene	mg/kg	0.05	MCERTS	5.7	-	U/S	3.6	-
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	-	U/S	< 0.3	-
Phenanthrene	mg/kg	0.05	MCERTS	24	-	U/S	19	-
Anthracene	mg/kg	0.05	MCERTS	7.5	-	U/S	5.6	-
Carbazole	mg/kg	0.3	MCERTS	2.3	-	U/S	1.1	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	-	U/S	< 0.2	-
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	-	U/S	0.9	-
Fluoranthene	mg/kg	0.05	MCERTS	27	-	U/S	25	-
Pyrene	mg/kg	0.05	MCERTS	22	-	U/S	21	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	-	U/S	< 0.3	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	12	-	U/S	9.6	-
Chrysene	mg/kg	0.05	MCERTS	9.2	-	U/S	9.9	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	10	-	U/S	8.5	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	5.9	-	U/S	4.8	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	9.7	-	U/S	7.6	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	4.1	-	U/S	4.4	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.1	-	U/S	1.4	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	4.6	-	U/S	4.6	-

* This sample was reported unsuitable for analysis due to high level of asbestos contaminati

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386194				
Sample Reference				WS112				
Sample Number				None Supplied				
Depth (m)				2.30				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	14				
Total mass of sample received	kg	0.001	NONE	0.41				
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile				
Asbestos in Soil	Type	N/A	ISO 17025	Detected				
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.014				
Asbestos Quantification Total	%	0.001	ISO 17025	0.014				
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	-				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Total Sulphate as SO_4	mg/kg	50	MCERTS	-				
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	-				
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	-				
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	-				
Sulphide	mg/kg	1	MCERTS	-				
Total Sulphur	mg/kg	50	MCERTS	-				
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.1				
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.94				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	0.54				
Anthracene	mg/kg	0.05	MCERTS	0.11				
Fluoranthene	mg/kg	0.05	MCERTS	0.51				
Pyrene	mg/kg	0.05	MCERTS	0.54				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.29				
Chrysene	mg/kg	0.05	MCERTS	0.27				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.31				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.14				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.22				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	3.87				

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386194				
Sample Reference				WS112				
Sample Number				None Supplied				
Depth (m)				2.30				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	780				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	5.0				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	2.0				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	320				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	110				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	80				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	3.8				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	100				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	2500				
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-				
Toluene	µg/kg	1	MCERTS	-				
Ethylbenzene	µg/kg	1	MCERTS	-				
p & m-xylene	µg/kg	1	MCERTS	-				
o-xylene	µg/kg	1	MCERTS	-				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-				
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-				
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-				
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0				
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C10 - C12)	mg/kg	2	MCERTS	4.4				
TPH (C12 - C16)	mg/kg	4	MCERTS	9.6				
TPH (C16 - C21)	mg/kg	1	MCERTS	33				
TPH (C21 - C35)	mg/kg	1	MCERTS	85				
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10				
TPH Total C5 - C40	mg/kg	10	MCERTS	140				

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386194				
Sample Reference				WS112				
Sample Number				None Supplied				
Depth (m)				2.30				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-				
Chloroethane	µg/kg	1	NONE	-				
Bromomethane	µg/kg	1	ISO 17025	-				
Vinyl Chloride	µg/kg	1	NONE	-				
Trichlorofluoromethane	µg/kg	1	NONE	-				
1,1-Dichloroethene	µg/kg	1	NONE	-				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-				
1,1-Dichloroethane	µg/kg	1	MCERTS	-				
2,2-Dichloropropane	µg/kg	1	MCERTS	-				
Trichloromethane	µg/kg	1	MCERTS	-				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-				
1,2-Dichloroethane	µg/kg	1	MCERTS	-				
1,1-Dichloropropene	µg/kg	1	MCERTS	-				
Trans-1,2-dichloroethene	µg/kg	1	NONE	-				
Benzene	µg/kg	1	MCERTS	-				
Tetrachloromethane	µg/kg	1	MCERTS	-				
1,2-Dichloropropane	µg/kg	1	MCERTS	-				
Trichloroethene	µg/kg	1	MCERTS	-				
Dibromomethane	µg/kg	1	MCERTS	-				
Bromodichloromethane	µg/kg	1	MCERTS	-				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-				
Toluene	µg/kg	1	MCERTS	-				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-				
1,3-Dichloropropane	µg/kg	1	ISO 17025	-				
Dibromochloromethane	µg/kg	1	ISO 17025	-				
Tetrachloroethene	µg/kg	1	NONE	-				
1,2-Dibromoethane	µg/kg	1	ISO 17025	-				
Chlorobenzene	µg/kg	1	MCERTS	-				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-				
Ethylbenzene	µg/kg	1	MCERTS	-				
p & m-Xylene	µg/kg	1	MCERTS	-				
Styrene	µg/kg	1	MCERTS	-				
Tribromomethane	µg/kg	1	NONE	-				
o-Xylene	µg/kg	1	MCERTS	-				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-				
Isopropylbenzene	µg/kg	1	MCERTS	-				
Bromobenzene	µg/kg	1	MCERTS	-				
n-Propylbenzene	µg/kg	1	ISO 17025	-				
2-Chlorotoluene	µg/kg	1	MCERTS	-				
4-Chlorotoluene	µg/kg	1	MCERTS	-				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-				
tert-Butylbenzene	µg/kg	1	MCERTS	-				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-				
sec-Butylbenzene	µg/kg	1	MCERTS	-				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-				
p-Isopropyltoluene	µg/kg	1	ISO 17025	-				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-				
Butylbenzene	µg/kg	1	MCERTS	-				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-				
Hexachlorobutadiene	µg/kg	1	MCERTS	-				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-				

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386194				
Sample Reference				WS112				
Sample Number				None Supplied				
Depth (m)				2.30				
Date Sampled				05/12/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-				
Phenol	mg/kg	0.2	ISO 17025	-				
2-Chlorophenol	mg/kg	0.1	MCERTS	-				
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-				
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-				
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-				
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-				
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-				
2-Methylphenol	mg/kg	0.3	MCERTS	-				
Hexachloroethane	mg/kg	0.05	MCERTS	-				
Nitrobenzene	mg/kg	0.3	MCERTS	-				
4-Methylphenol	mg/kg	0.2	NONE	-				
Isophorone	mg/kg	0.2	MCERTS	-				
2-Nitrophenol	mg/kg	0.3	MCERTS	-				
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-				
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-				
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-				
Naphthalene	mg/kg	0.05	MCERTS	-				
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-				
4-Chloroaniline	mg/kg	0.1	NONE	-				
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-				
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-				
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-				
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-				
2-Methylnaphthalene	mg/kg	0.1	NONE	-				
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-				
Dimethylphthalate	mg/kg	0.1	MCERTS	-				
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-				
Acenaphthylene	mg/kg	0.05	MCERTS	-				
Acenaphthene	mg/kg	0.05	MCERTS	-				
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-				
Dibenzofuran	mg/kg	0.2	MCERTS	-				
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-				
Diethyl phthalate	mg/kg	0.2	MCERTS	-				
4-Nitroaniline	mg/kg	0.2	MCERTS	-				
Fluorene	mg/kg	0.05	MCERTS	-				
Azobenzene	mg/kg	0.3	MCERTS	-				
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-				
Hexachlorobenzene	mg/kg	0.3	MCERTS	-				
Phenanthrene	mg/kg	0.05	MCERTS	-				
Anthracene	mg/kg	0.05	MCERTS	-				
Carbazole	mg/kg	0.3	MCERTS	-				
Dibutyl phthalate	mg/kg	0.2	MCERTS	-				
Anthraquinone	mg/kg	0.3	MCERTS	-				
Fluoranthene	mg/kg	0.05	MCERTS	-				
Pyrene	mg/kg	0.05	MCERTS	-				
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-				
Chrysene	mg/kg	0.05	MCERTS	-				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-				

* This sample was reported unsuitable for analysis due to high level of asbestos contaminati

Analytical Report Number: 19-76421
Project / Site name: Ryebank Chorlton
Your Order No: 34146

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1386191	WS101	1.80	80	Loose Fibrous Debris	**Chrysotile & Amosite**	1.183	**1.18**
1386192	WS102	3.20	120	Bitumen	**Chrysotile**	0.036	**0.036**
1386194	WS112	2.30	133	Hard/ Cement Type Material	**Chrysotile**	0.014	**0.014**

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

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386195	1386196	1386197	1386198	
Sample Reference				TP103	TP106	WS106	WS111	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.10	1.50	0.80	2.70	
Date Sampled				04/12/2019	04/12/2019	04/12/2019	05/12/2019	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	12.6	8.2	8.3	12.6	
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	7.4	< 1.0	1.5	5.2	
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	22	4.6	2.0	8.9	
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	12	5.5	2.0	4.4	
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	20	< 5.0	< 5.0	
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.5	0.7	3.1	0.6	
Copper (dissolved)	µg/l	0.7	ISO 17025	14	110	9.0	13	
Lead (dissolved)	µg/l	1	ISO 17025	1.5	9.8	26	< 1.0	
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	
Nickel (dissolved)	µg/l	0.3	ISO 17025	11	7.1	2.0	5.3	
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	
Zinc (dissolved)	µg/l	0.4	ISO 17025	6.4	73	13	2.7	
Monoaromatics & Oxygenates								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	

Analytical Report Number: 19-76421

Project / Site name: Ryebank Chorlton

Your Order No: 34146

Lab Sample Number				1386195	1386196	1386197	1386198	
Sample Reference				TP103	TP106	WS106	WS111	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.10	1.50	0.80	2.70	
Date Sampled				04/12/2019	04/12/2019	04/12/2019	05/12/2019	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	

Analytical Report Number : 19-76421

Project / Site name: Ryebank Chorlton

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1386182	TP103	None Supplied	1.30	Brown loam and sand with gravel.
1386183	TP105	None Supplied	0.10	Brown clay and sand with vegetation.
1386184	TP111	None Supplied	1.20	Grey clay.
1386186	TP115	None Supplied	1.60	Grey clay.
1386187	TP116	None Supplied	1.50	Brown clay and sand with gravel.
1386189	TP127	None Supplied	1.80	Brown clay and sand with gravel.
1386190	TP128	None Supplied	0.80	Brown sand with gravel and clinker
1386191	WS101	None Supplied	1.80	Brown clay and sand.
1386192	WS102	None Supplied	3.20	Brown sand with clinker.
1386193	WS105	None Supplied	3.80	Grey clay.
1386194	WS112	None Supplied	2.30	Brown sand with clinker.

Analytical Report Number : 19-76421

Project / Site name: Ryebank Chorlton

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE

Analytical Report Number : 19-76421

Project / Site name: Ryebank Chorlton

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

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

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Analytical Report Number : 19-78337

Project / Site name:	Ryebank	**Samples received on:**	17/12/2019
Your job number:	13533	**Samples instructed on:**	18/12/2019
Your order number:	34269	**Analysis completed by:**	30/12/2019
Report Issue Number:	1	**Report issued on:**	30/12/2019
Samples Analysed:	4 water samples		

Signed: A. Czerwińska

Agnieszka Czerwińska

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

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

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

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

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

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

Analytical Report Number: 19-78337

Project / Site name: Ryebank

Your Order No: 34269

Lab Sample Number				1397016	1397017	1397018	1397019	
Sample Reference				WS101	WS110	CP101	CP102	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				16/12/2019	16/12/2019	16/12/2019	16/12/2019	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.2	7.8	11.1	10.7	
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	5.2	31	160	81	
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	5.1	34	190	310	
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	3.63	15.4	12.8	14.0	
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03	0.06	0.04	0.03	
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.7	0.9	5.7	1.3	
Copper (dissolved)	µg/l	0.5	ISO 17025	4.3	9.1	7.5	5.0	
Lead (dissolved)	µg/l	0.2	ISO 17025	0.4	16	4.4	9.5	
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	0.18	0.17	
Nickel (dissolved)	µg/l	0.5	ISO 17025	4.7	22	6.4	15	
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.4	3.1	5.3	3.8	
Zinc (dissolved)	µg/l	0.5	ISO 17025	14	48	62	34	
Monoaromatics & Oxygenates								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	11.3	7.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	4.6	4.4	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	1.8	1.6	
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	4.3	5.3	
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	3.3	3.1	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	360	150	
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	11	7.0	
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	4.6	4.4	
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	11	12	
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	63	48	
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	220	63	
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	79	41	
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	390	180	

Analytical Report Number: 19-78337

Project / Site name: Ryebank

Your Order No: 34269

Lab Sample Number				1397016	1397017	1397018	1397019	
Sample Reference				WS101	WS110	CP101	CP102	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				16/12/2019	16/12/2019	16/12/2019	16/12/2019	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	9.1	< 1.0	
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	11.3	7.0	
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	4.6	4.4	
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	1.8	1.6	
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	4.3	5.3	
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	3.3	3.1	
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	1.9	1.7	
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	

Analytical Report Number: 19-78337

Project / Site name: Ryebank

Your Order No: 34269

Lab Sample Number				1397016	1397017	1397018	1397019	
Sample Reference				WS101	WS110	CP101	CP102	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	
Date Sampled				16/12/2019	16/12/2019	16/12/2019	16/12/2019	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	4.5	9.7	10	
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	6.0	17	
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	17	39	
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	26	55	
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	2.0	38	76	
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	16	3.4	
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.50	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025	5.2	< 0.01	0.35	< 0.01	
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Dibenzofuran	µg/l	0.05	NONE	0.97	< 0.05	< 0.05	< 0.05	
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Fluorene	µg/l	0.01	ISO 17025	2.0	< 0.01	< 0.01	< 0.01	
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Phenanthrene	µg/l	0.01	ISO 17025	1.0	< 0.01	< 0.01	< 0.01	
Anthracene	µg/l	0.01	ISO 17025	0.25	< 0.01	< 0.01	< 0.01	
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	3.2	1.7	
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	6.9	20	5.8	
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	1.8	
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	

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

Analytical Report Number : 19-78337

Project / Site name: Ryebank

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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

APPENDIX VII
ORIGIN OF TIER I GENERIC 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)	

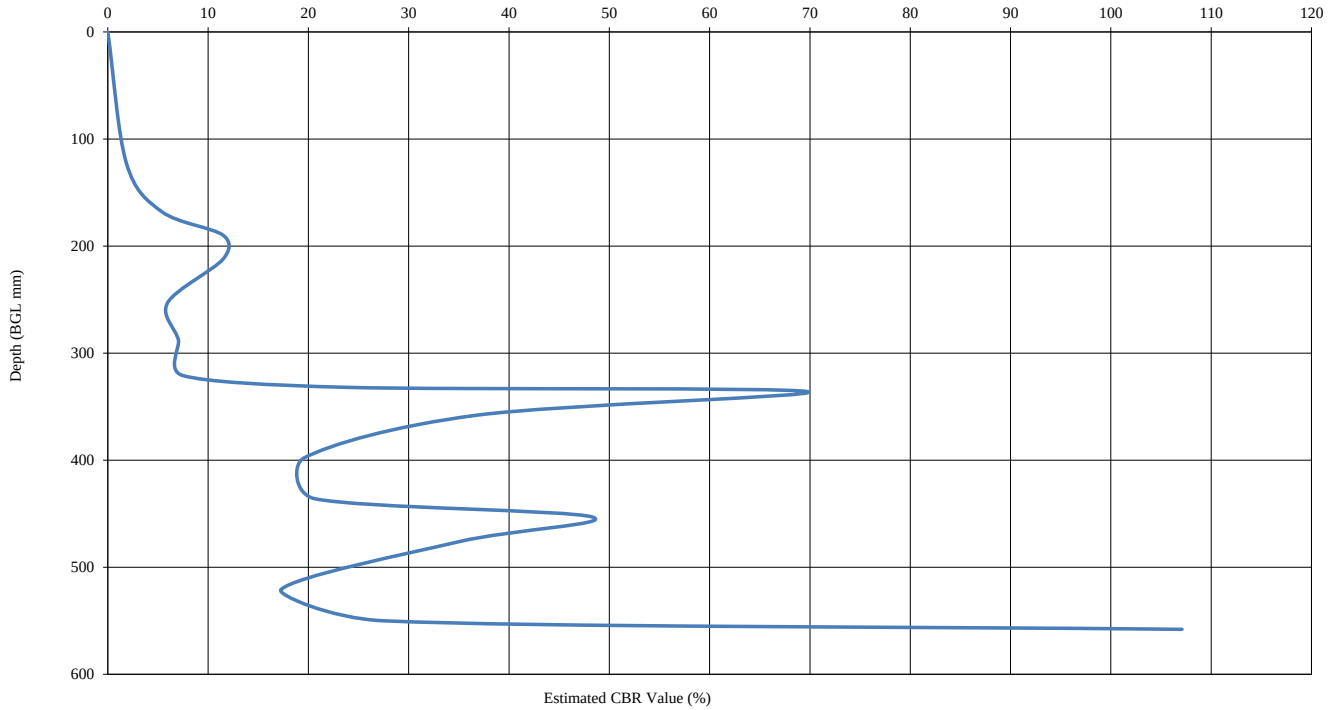
APPENDIX VIII
DYNAMIC CONE PENETROMETER TEST CERTIFICATES

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP101	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	558		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	212	4	4	53.00	4.54
212	321	7	3	36.33	6.77
321	558	33	26	9.12	29.21

Comments

Terminated due to obstruction

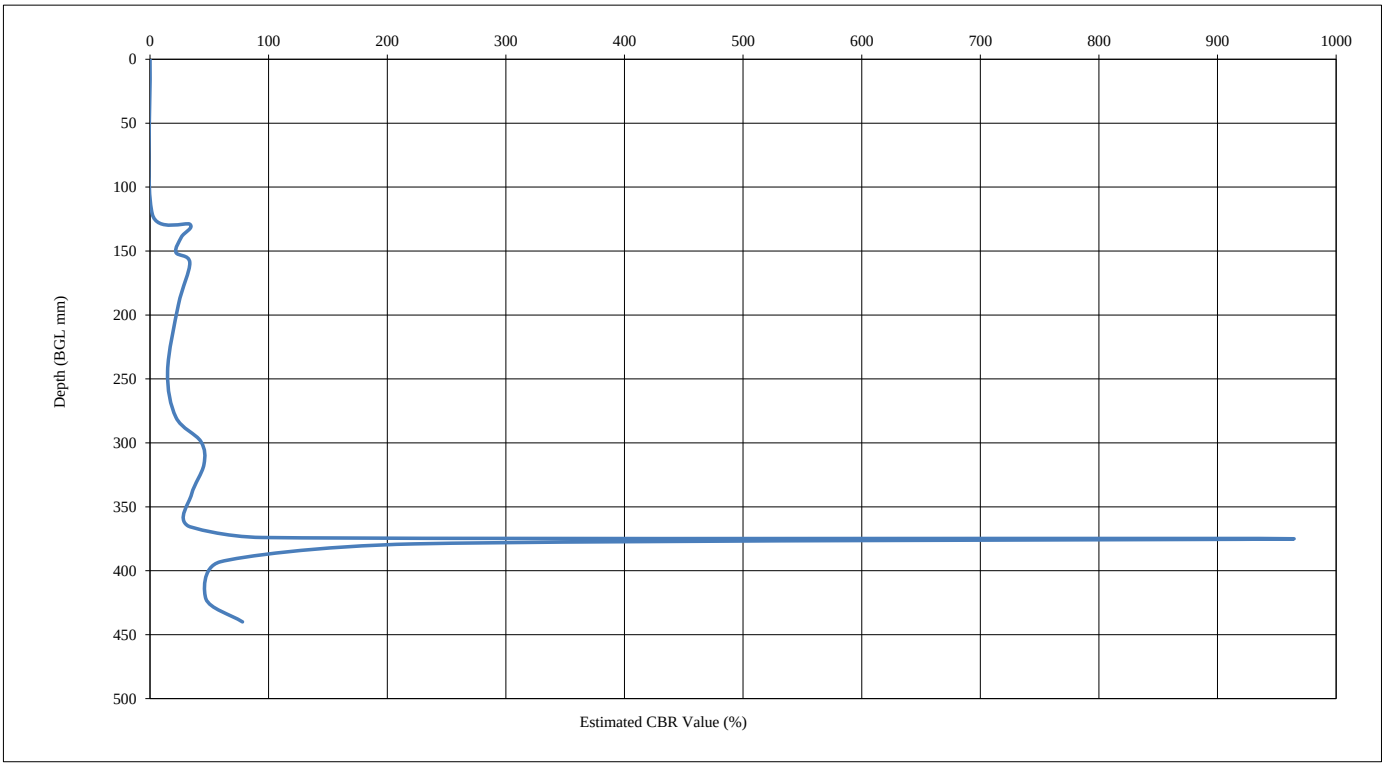
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP102	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	440		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	129	2	2	64.50	3.69
129	365	26	24	9.83	26.96
365	440	48	22	3.41	82.60

Comments

Terminated due to obstruction

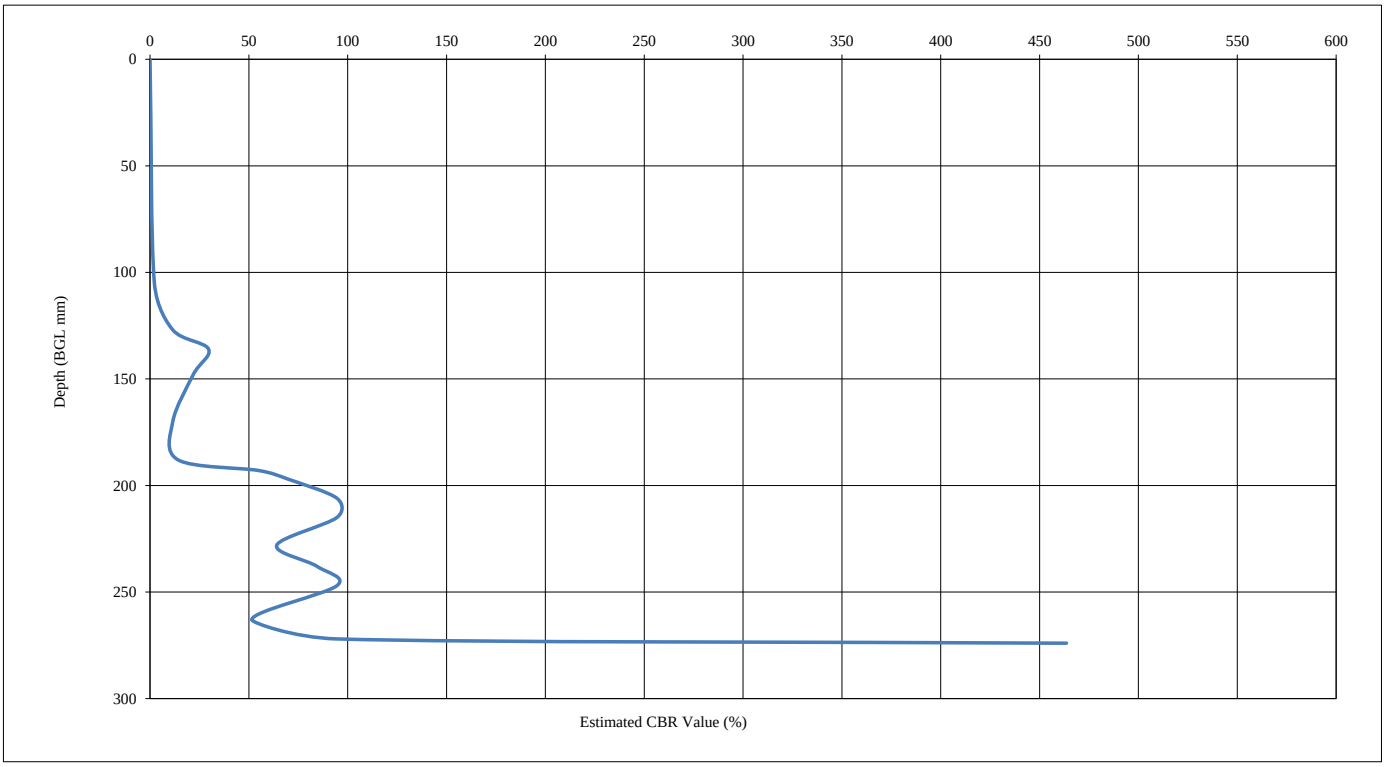
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP103	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	274		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	136	3	3	45.33	5.36
136	188	6	3	17.33	14.81
188	274	32	26	3.31	85.28

Comments

Terminated Due to Obstruction.

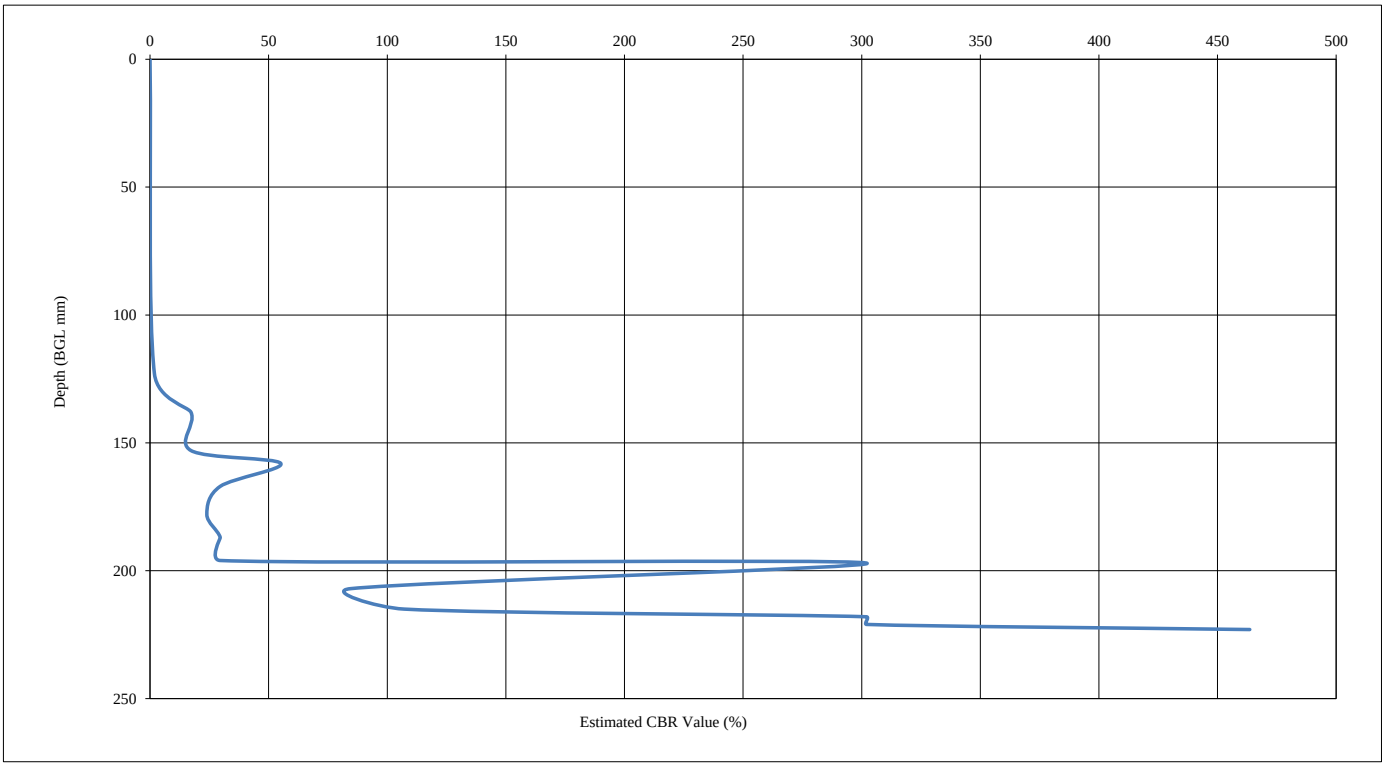
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP104	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	223		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	138	2	2	69.00	3.44
138	196	8	6	9.67	27.45
196	223	24	16	1.69	173.70

Comments

Terminated due to obstruction.

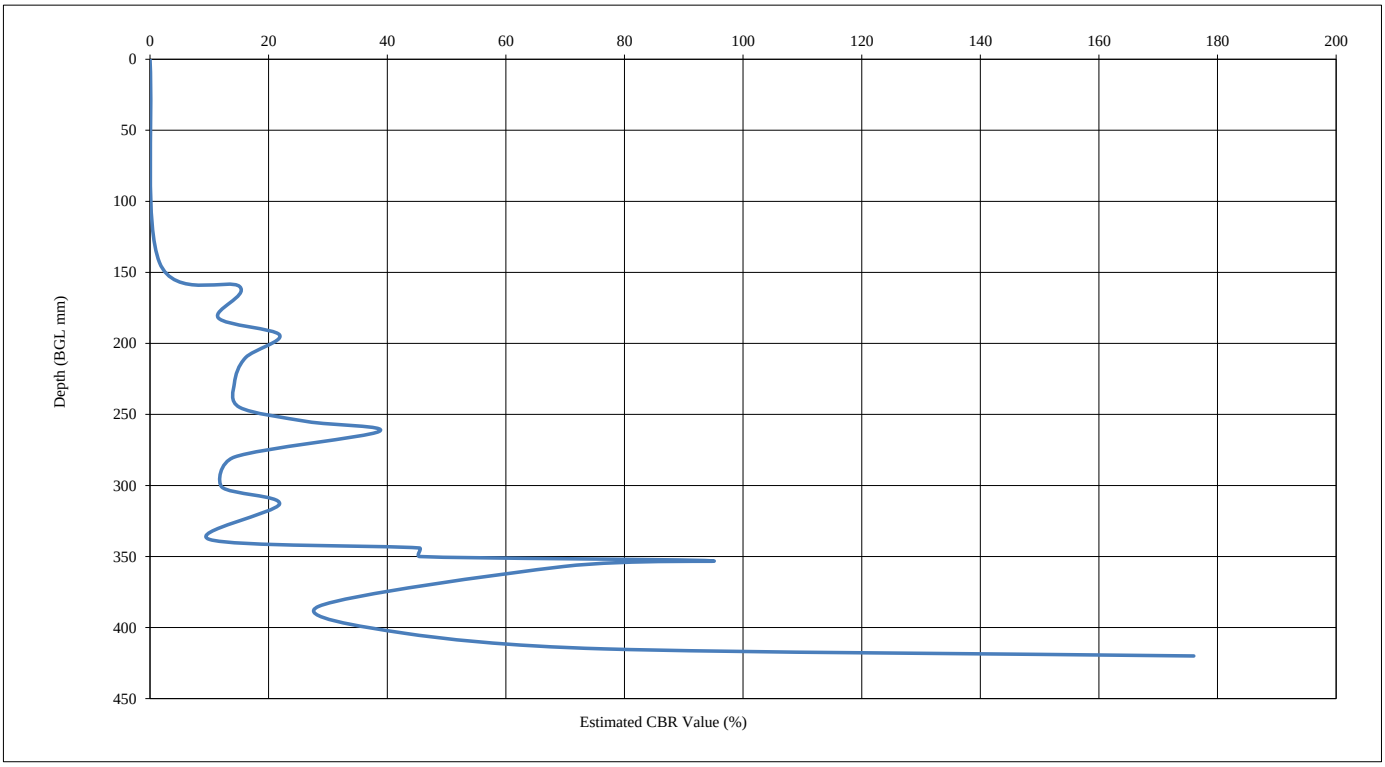
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP105	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	420		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	160	2	2	80.00	2.94
160	338	13	11	16.18	15.92
338	420	29	16	5.13	53.69

Comments

Terminated due to obstruction.

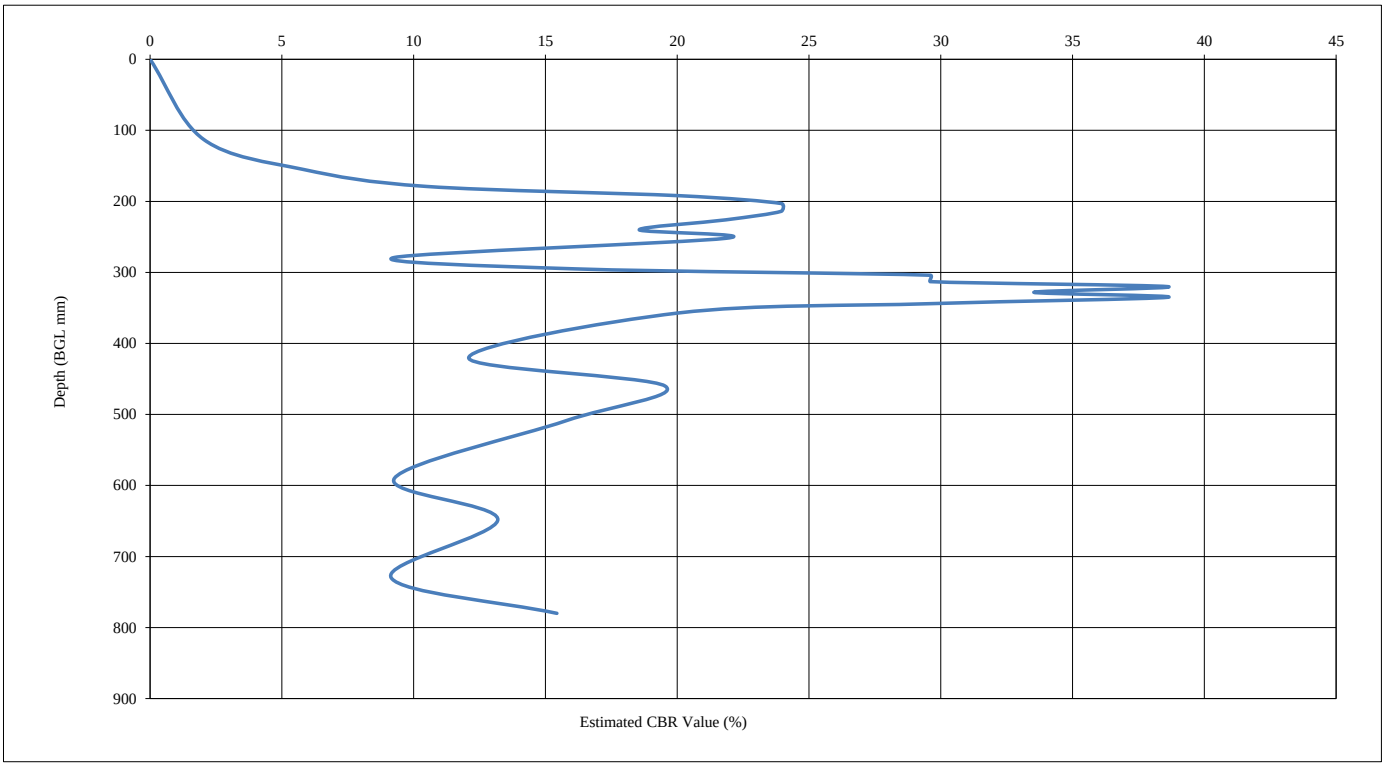
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP106	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	780		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	179	3	3	59.67	4.01
179	420	21	18	13.39	19.45
420	780	39	18	20.00	12.73

Comments

Terminated due to obstrruction.

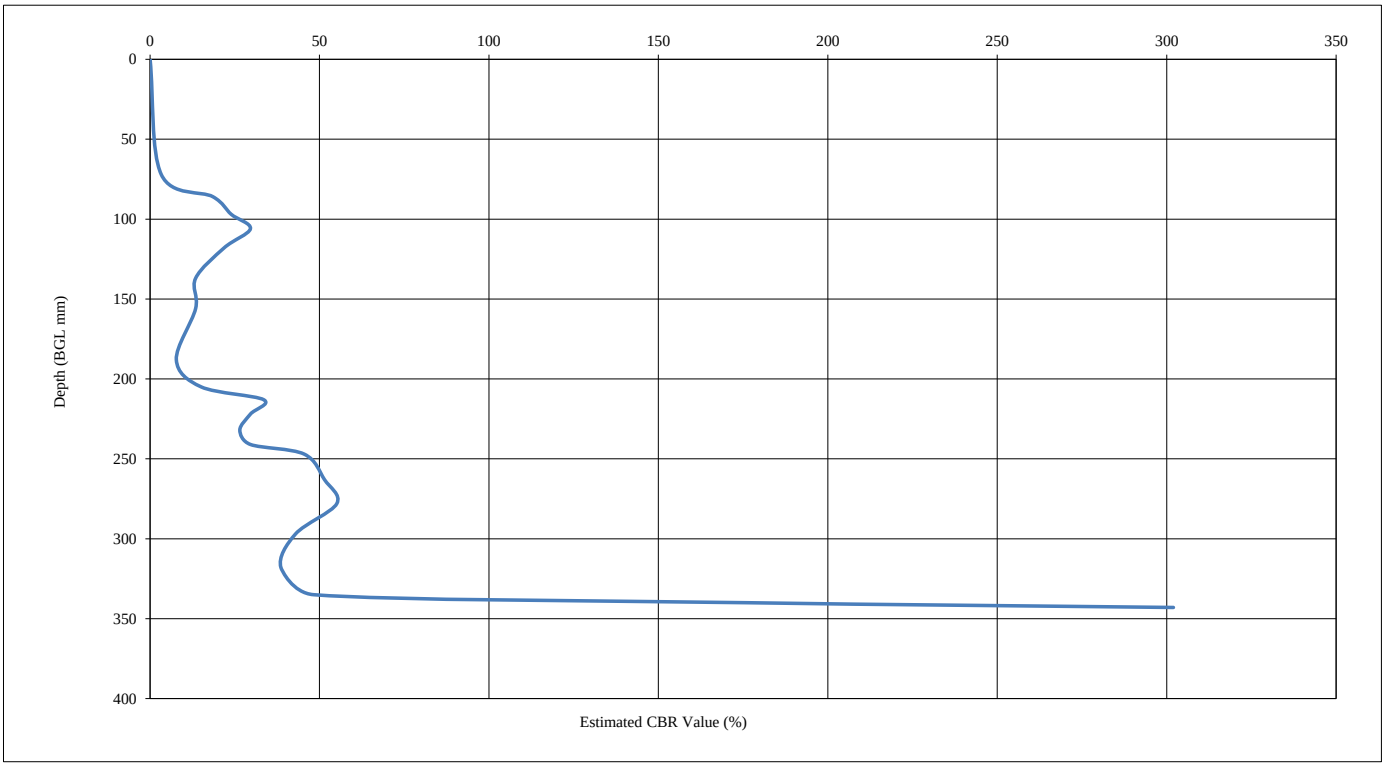
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP107	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	343		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	106	4	4	26.50	9.45
106	188	8	4	20.50	12.40
188	343	35	27	5.74	47.62

Comments

Terminated due to obstruction

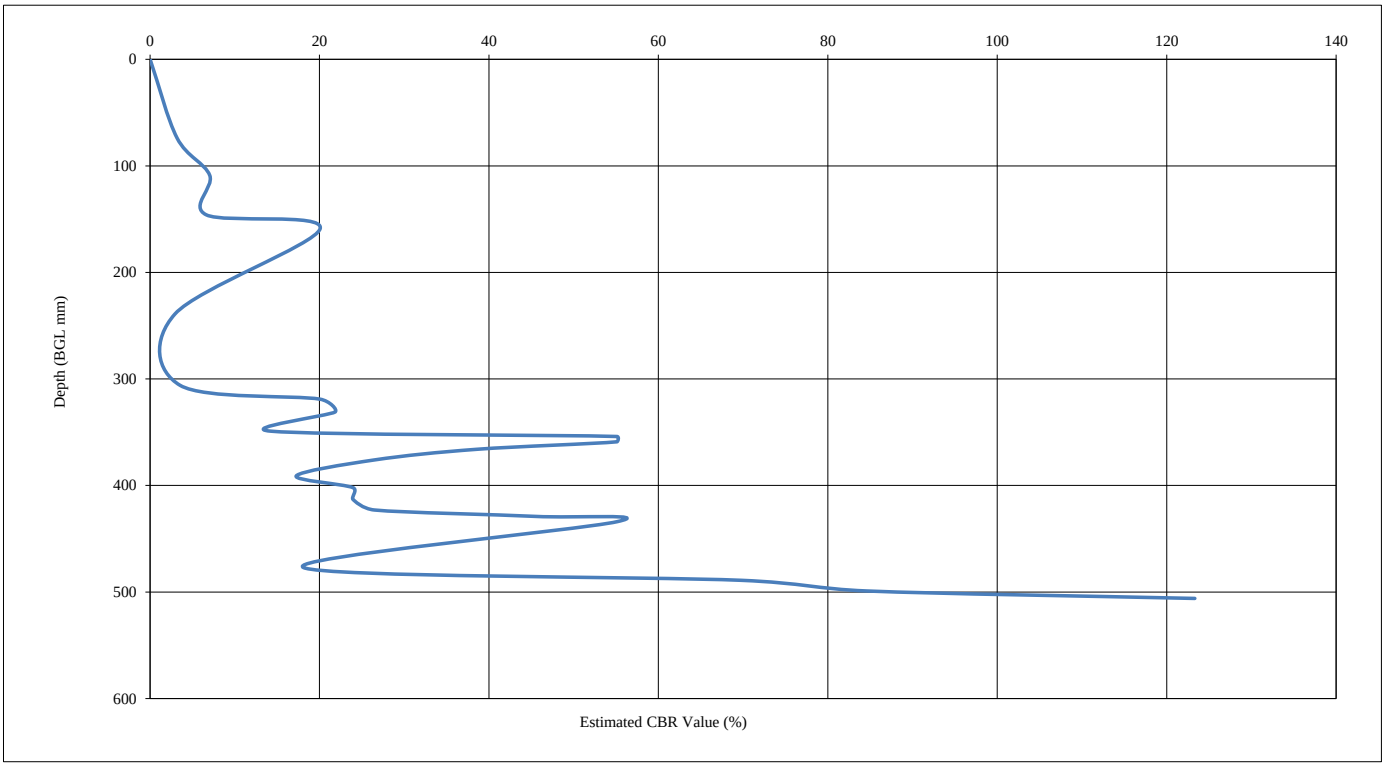
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP108	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	506		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	146	3	3	48.67	4.97
146	306	6	3	53.33	4.51
306	506	31	25	8.00	33.53

Comments

Terminated due to obstruction

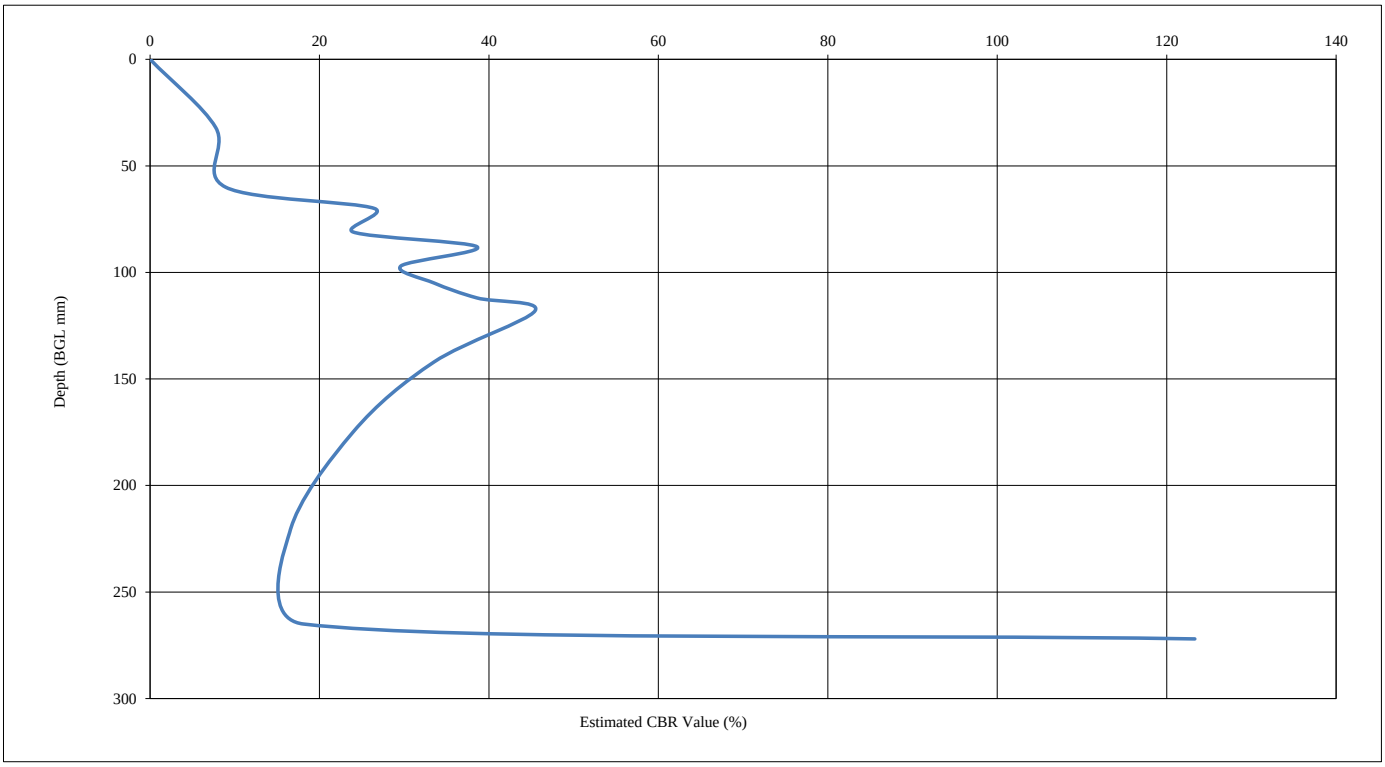
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP109	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	272		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	60	2	2	30.00	8.29
60	118	9	7	8.29	32.31
118	272	24	15	10.27	25.76

Comments

Terminated due to obstruction.

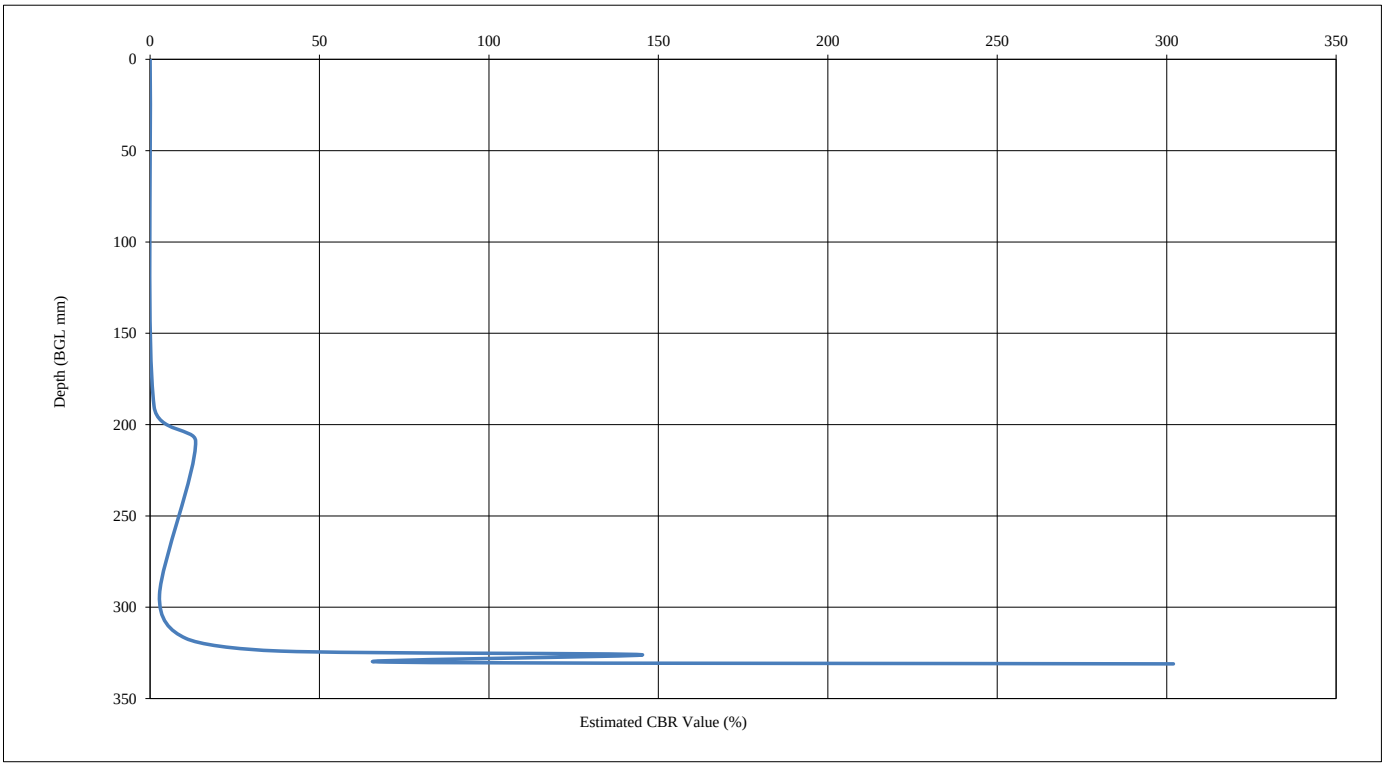
Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report PR/INT/277/04

Site Name	Ryebank	**Test Date:**	05.12.19
Site Ref	13533	**Test Location:**	Ryebank, Chorlton
Test No.:	DCP110	**Easting:**	0
Initial Depth (mm BGL):	0	**Northing:**	0
Final Depth (mm BGL):	331		

Estimated California Bearing Ratio Graph



Start Depth (mm) BGL	Finish Depth (mm) BGL	No. of Blows	Blows Per Layer	DCP mm/Blows	Ave Estimated Layer (CBR %)
0	209	2	2	104.50	2.22
209	293	3	1	84.00	2.79
293	331	8	5	7.60	35.40

Comments

Terminated due to obstruction

Site Engineer:	Checked By:	Date:	Approved By:	Date:
JN	BH	27/02/2020	MD	27/02/2020

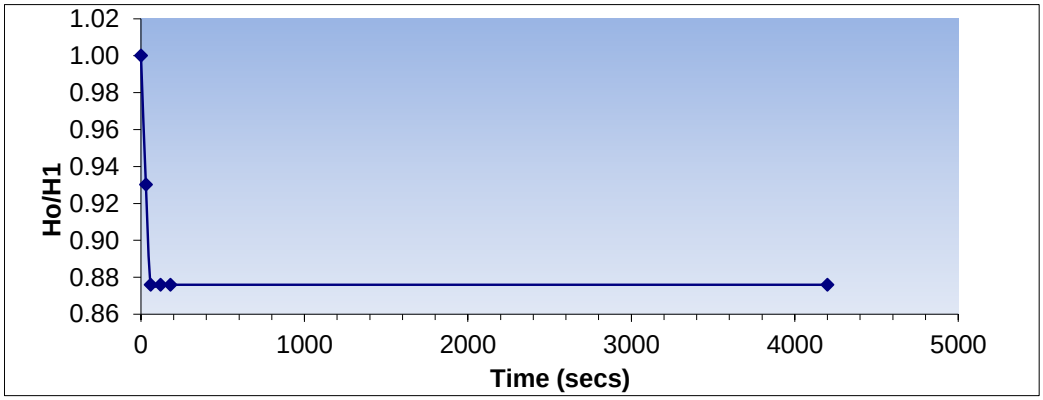
APPENDIX IX
FALLING HEAD PERMEABILITY TEST CERTIFICATES

Falling Head Test

Borehole: CP101 **Test No:** 1

Contract No:	13-533	Casing Diameter: (m)	0.05
Contract Title:	Ryebank Road	Height of Casing:	0
Date of Test:	02/01/2020	Depth of Borehole: (m)	12.90

Recorded Time			Total Time			H/Ho
Hours	Minutes	Seconds	(secs)	Depth (m)		
0	0	0	0	0	0	1.0000
0	0	30	30	0.9	30	0.9302
0	1	60	60	1.6	60	0.8760
0	2	120	120	1.6	120	0.8760
0	3	180	180	1.6	180	0.8760
0	70	4200	4200	1.6	4200	0.8760



General Approach

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

k = permeability of soil

F = Intake Factor (figures 6 &7, BS5930:1999)

H_1 = variable head measured at time t_1 after commencement of test

H_2 = variable head measured at time t_2 after commencement of test

A = Cross sectional area of borehole casing or standpipe as appropiate.

H_1 =	0.9302	t_1 =	30
H_2 =	0.876	t_2 =	180
		F=	2.86

A = 0.00196349 m^2

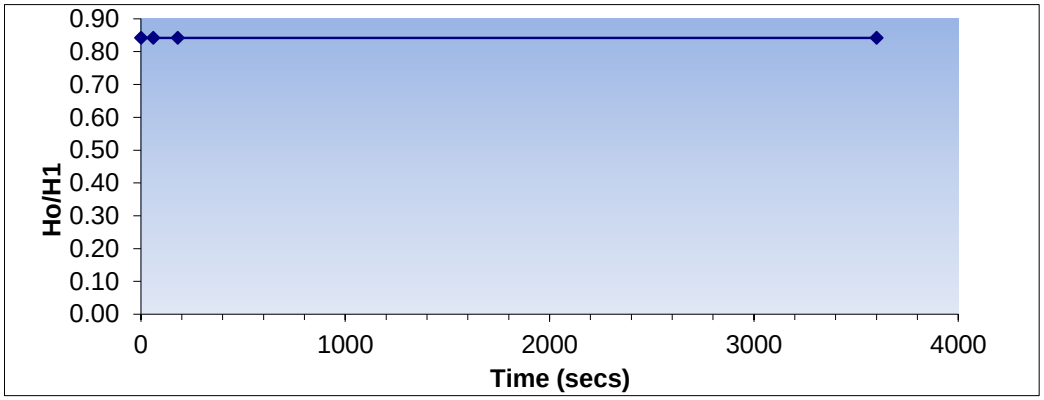
Coefficient of Permeability, k = **1.32E-05** m/s

Falling Head Test

Borehole: CP102 **Test No:** 1

Contract No:	13-533	Casing Diameter: (m)	0.05
Contract Title:	Ryebank Road	Height of Casing:	0
Date of Test:	02/01/2020	Depth of Borehole: (m)	12.90

Recorded Time			Total Time			H/Ho
Hours	Minutes	Seconds	(secs)	Depth (m)		
0	0		0	2.04	0	0.8419
0	1		60	2.04	60	0.8419
0	3		180	2.04	180	0.8419
0	60		3600	2.04	3600	0.8419



General Approach

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

k = permeability of soil

F = Intake Factor (figures 6 &7, BS5930:1999)

H_1 = variable head measured at time t_1 after commencement of test

H_2 = variable head measured at time t_2 after commencement of test

A = Cross sectional area of borehole casing or standpipe as appropiate.

H_1 =	0.8419	t_1 =	60
H_2 =	0.8419	t_2 =	180
		F=	2.86

A = 0.00196349 m^2

Coefficient of Permeability, k = **1.56E-05** m/s

APPENDIX X
GEOTECHNICAL TESTING

LABORATORY REPORT

4043

Contract Number: PSL19/7862

Report Date: 15 January 2020

Client's Reference: 13533

Client Name: E3P
Heliport Business Park
Liverpool Road
Eccles
Manchester
M30 7RU

For the attention of: Ella Moss

Contract Title: Ryebank

Date Received: 23/12/2019
Date Commenced: 23/12/2019
Date Completed: 15/1/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

S Royle (Laboratory Manager)
S Eyre (Senior Technician)
L Knight (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
CP101	3	BB	3.00	3.45	MADE GROUND dark grey very gravelly very sandy clay.
CP101	8	BB	8.00	8.45	MADE GROUND dark brown slightly sandy gravel.
CP102	1	BB	1.00	1.45	MADE GROUND dark brown sandy slightly clayey gravel with many cobbles.
CP102	3	BB	3.00	3.45	MADE GROUND dark brown sandy slightly clayey gravel with many cobbles.
CP102	5	BB	5.00	5.45	MADE GROUND brown sandy gravel.
TP120		BB	2.10		MADE GROUND dark brown very sandy clayey gravel.
TP129		BB	1.30		MADE GROUND brown clayey sand & gravel.
CP101		D	14.45	14.95	Dark brown gravelly very sandy CLAY.
CP102		D	12.50	12.95	Dark brown gravelly very sandy CLAY.
CP102		D	14.00	14.45	Dark brown gravelly very sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
CP101	3	BB	3.00	3.45	31							
CP101	8	BB	8.00	8.45	16							
CP102	1	BB	1.00	1.45	14							
CP102	3	BB	3.00	3.45	19							
TP120		BB	2.10		20							
TP129		BB	1.30		28							
CP101		D	14.45	14.95	11			28	15	13	78	Low plasticity CL.
CP102		D	12.50	12.95	10			26	14	12	77	Low plasticity CL.
CP102		D	14.00	14.45	16			36	19	17	84	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Ryebank

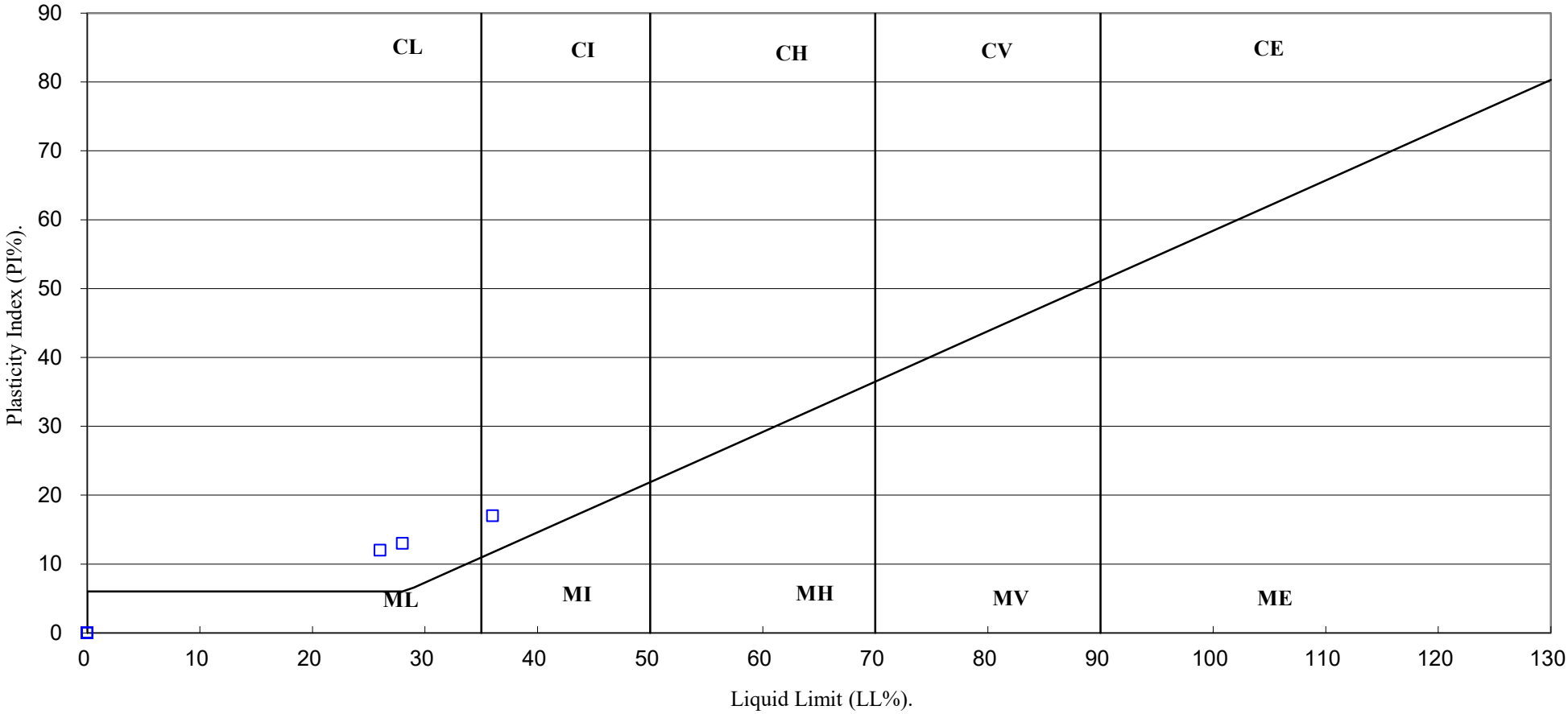
Contract No:

PSL19/7862

Client Ref:

13533

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



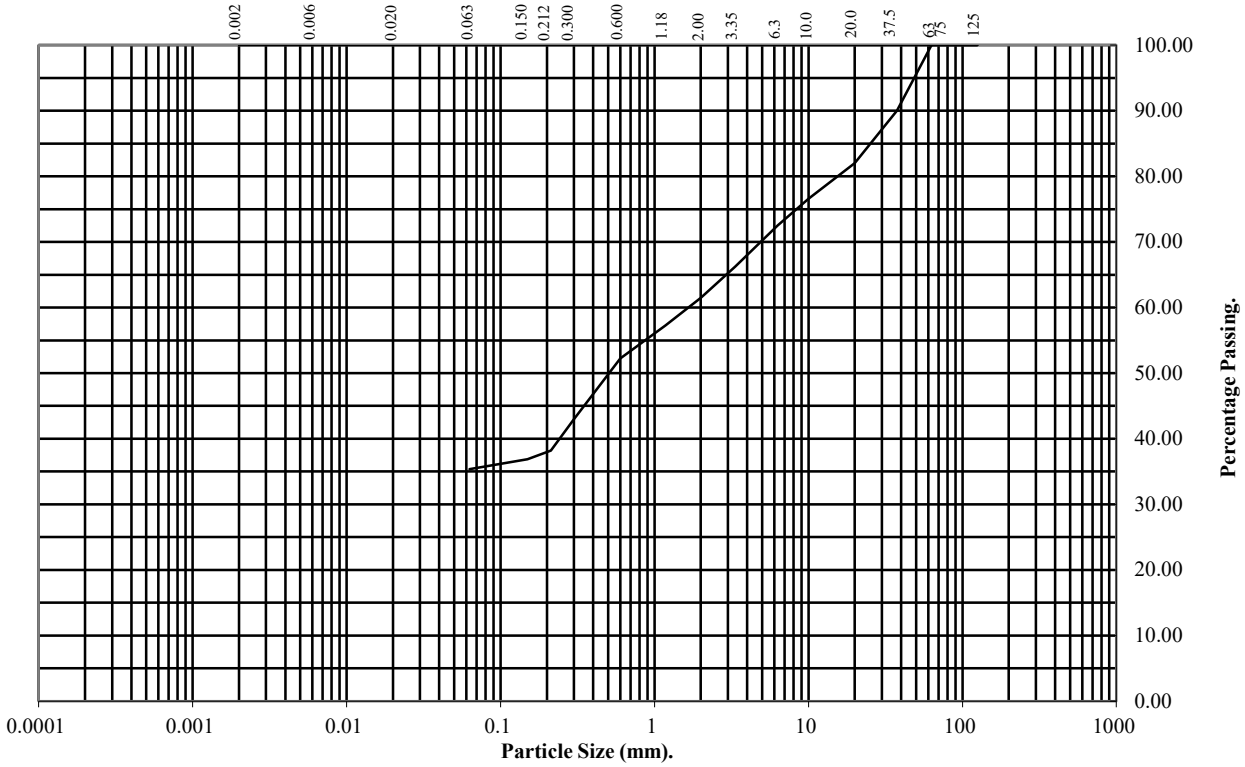
UKAS TESTING 4043	PSL Professional Soils Laboratory	Ryebank	Contract No: PSL19/7862 Client Ref: 13533

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP101**	**Top Depth (m):**	**3.00**
Sample Number:	**3**	**Base Depth(m):**	**3.45**
Sample Type:	**BB**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	90
20	82
10	77
6.3	72
3.35	66
2	61
1.18	57
0.6	52
0.3	43
0.212	38
0.15	37
0.063	35

Soil Fraction	Total Percentage
Cobbles	0
Gravel	39
Sand	26
Silt/Clay	35

Remarks:

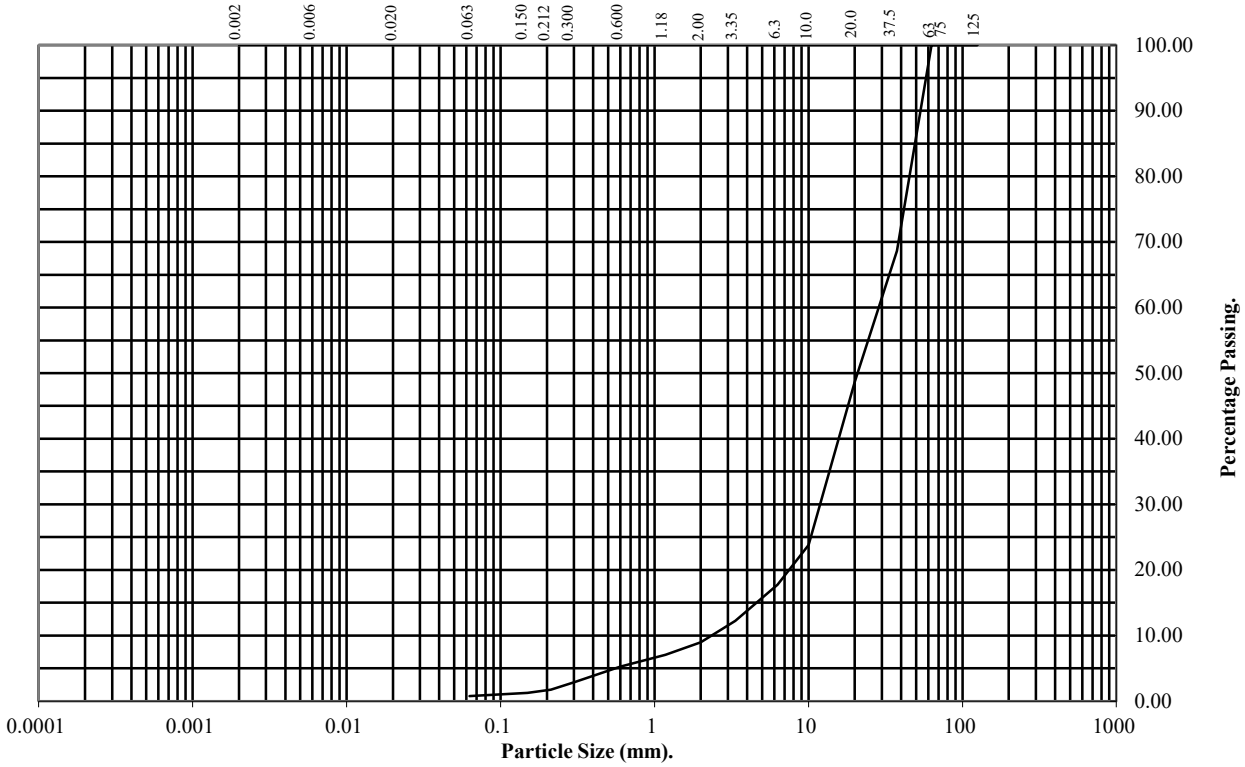
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP101**	**Top Depth (m):**	**8.00**
Sample Number:	**8**	**Base Depth(m):**	**8.45**
Sample Type:	**BB**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	69
20	49
10	24
6.3	18
3.35	12
2	9
1.18	7
0.6	5
0.3	3
0.212	2
0.15	1
0.063	1

Soil Fraction	Total Percentage
Cobbles	0
Gravel	91
Sand	8
Silt/Clay	1

Remarks:

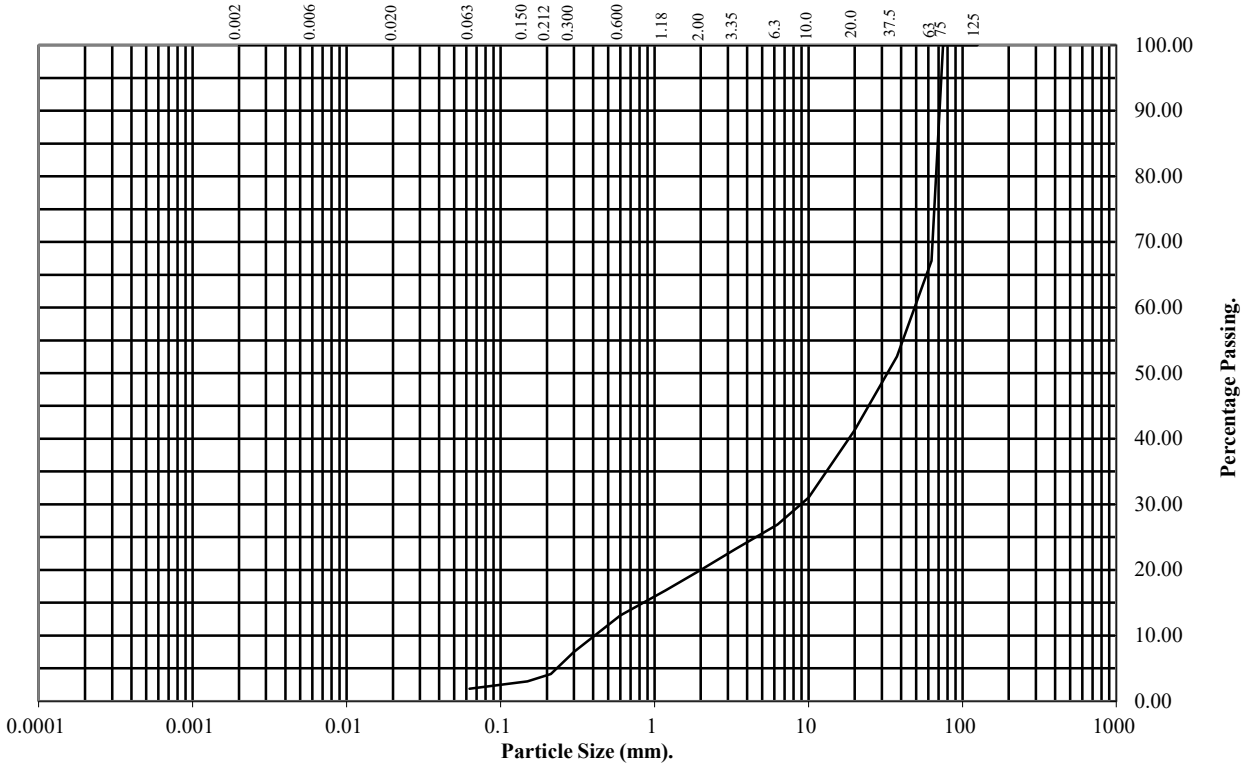
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP102**	**Top Depth (m):**	**1.00**
Sample Number:	**1**	**Base Depth(m):**	**1.45**
Sample Type:	**BB**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	67
37.5	53
20	41
10	31
6.3	27
3.35	23
2	20
1.18	17
0.6	13
0.3	8
0.212	4
0.15	3
0.063	2

Soil Fraction	Total Percentage
Cobbles	33
Gravel	47
Sand	18
Silt/Clay	2

Remarks:

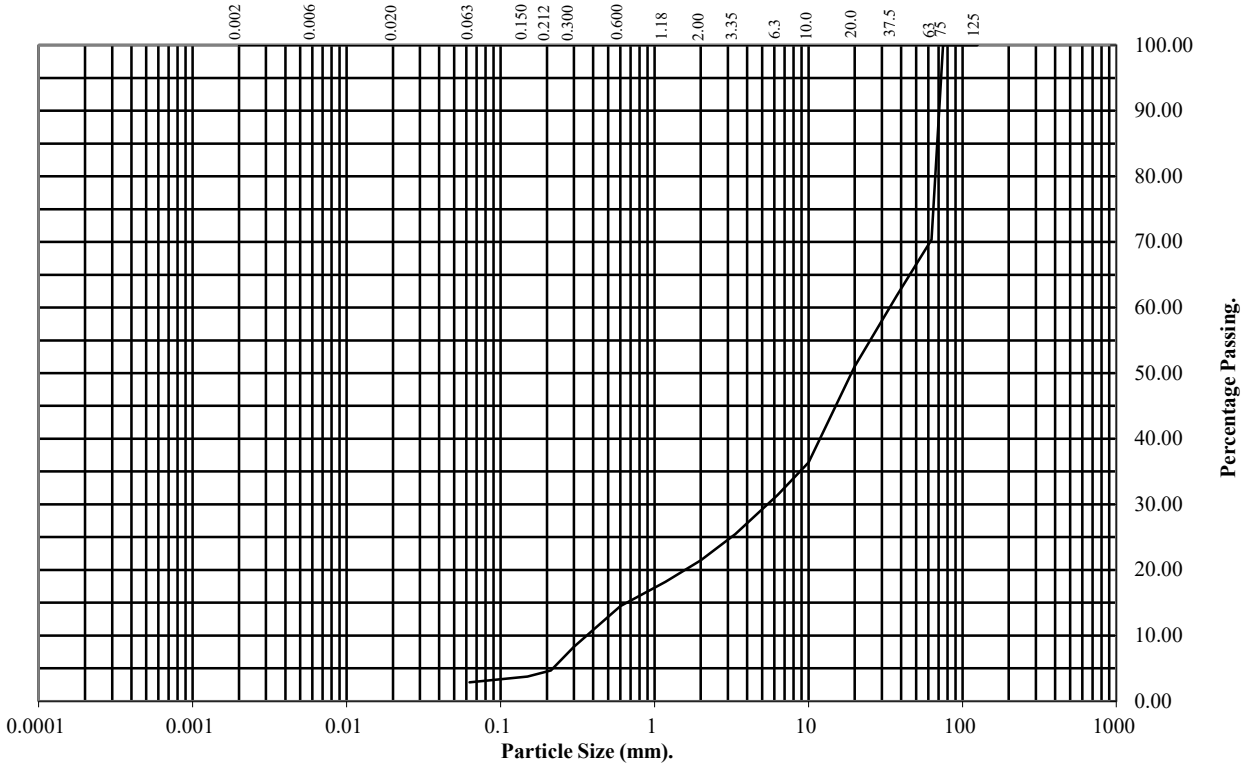
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP102**	**Top Depth (m):**	**3.00**
Sample Number:	**3**	**Base Depth(m):**	**3.45**
Sample Type:	**BB**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	70
37.5	62
20	51
10	36
6.3	31
3.35	25
2	21
1.18	18
0.6	14
0.3	8
0.212	5
0.15	4
0.063	3

Soil Fraction	Total Percentage
Cobbles	30
Gravel	49
Sand	18
Silt/Clay	3

Remarks:

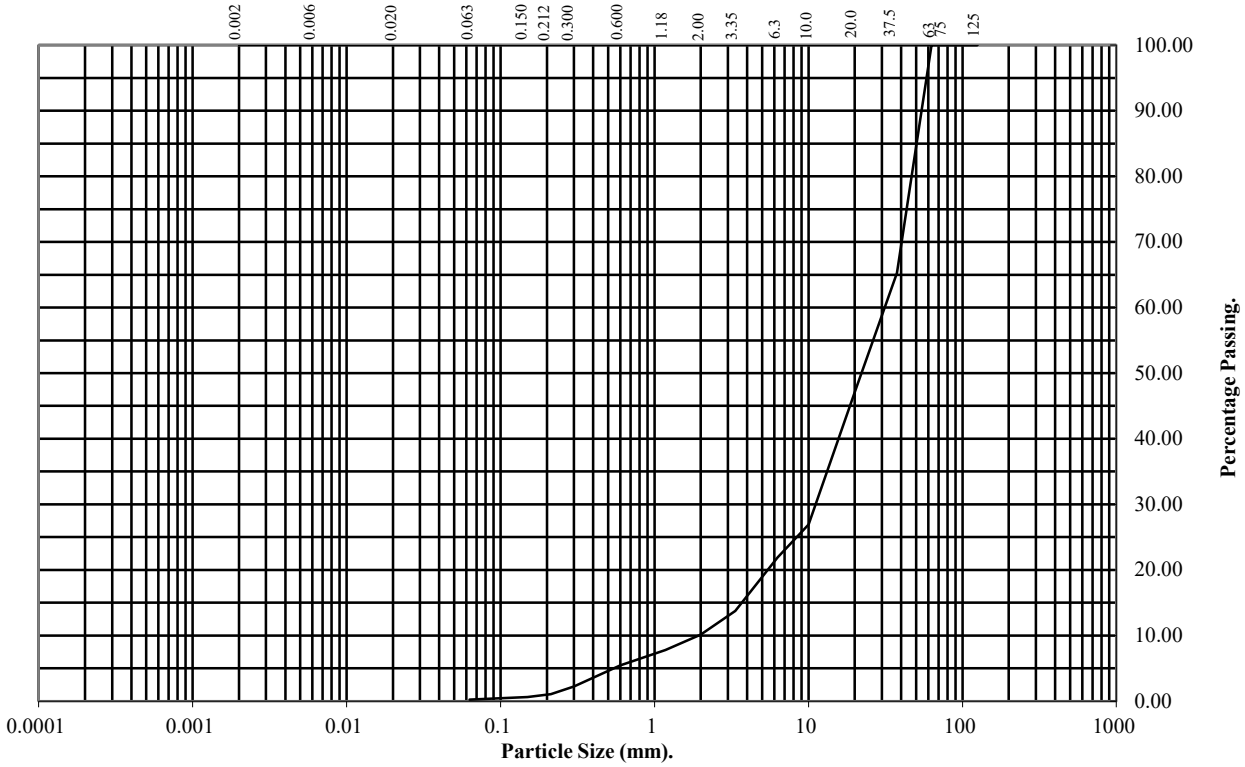
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:	**CP102**	**Top Depth (m):**	**5.00**
Sample Number:	**5**	**Base Depth(m):**	**5.45**
Sample Type:	**BB**		



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	65
20	47
10	27
6.3	22
3.35	14
2	10
1.18	8
0.6	5
0.3	2
0.212	1
0.15	1
0.063	0

Soil Fraction	Total Percentage
Cobbles	0
Gravel	90
Sand	10
Silt/Clay	0

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

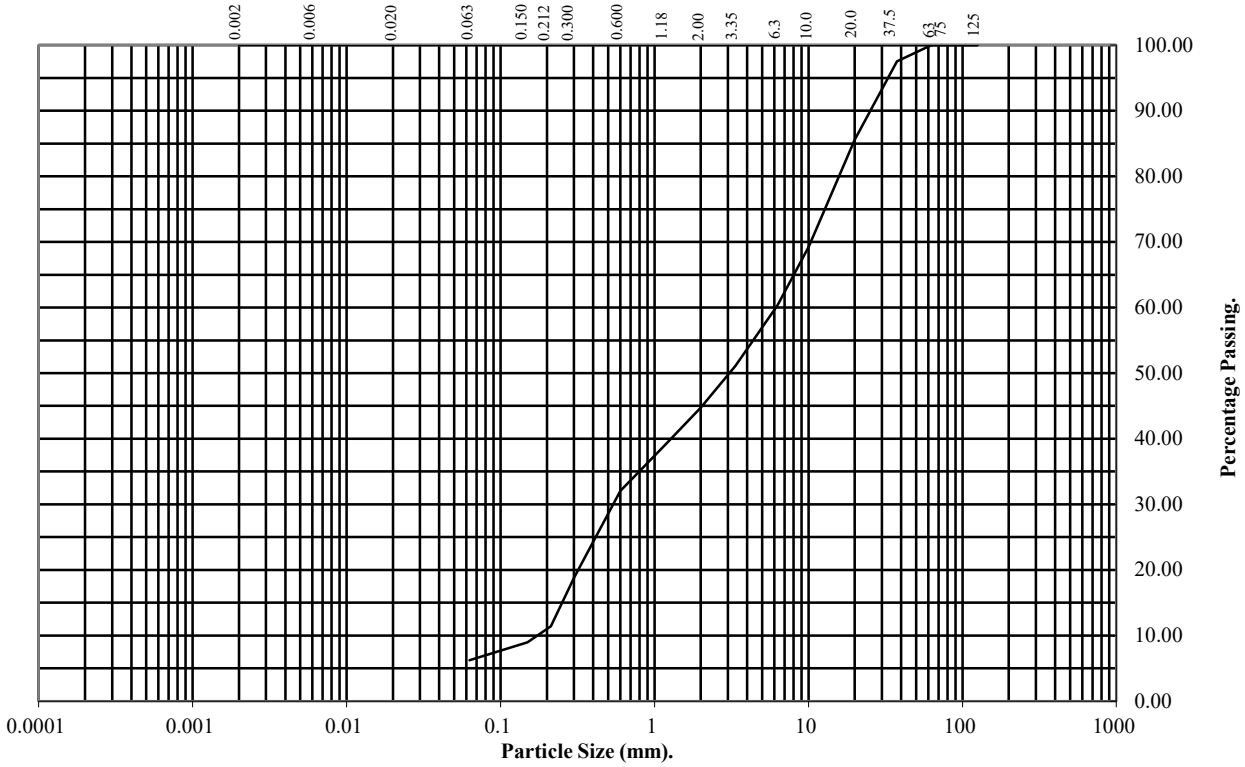
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP120 **Top Depth (m):** 2.10

Sample Number: **Base Depth(m):**

Sample Type: BB



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	98
20	86
10	69
6.3	60
3.35	51
2	45
1.18	39
0.6	32
0.3	19
0.212	11
0.15	9
0.063	6

Soil Fraction	Total Percentage
Cobbles	0
Gravel	55
Sand	39
Silt/Clay	6

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

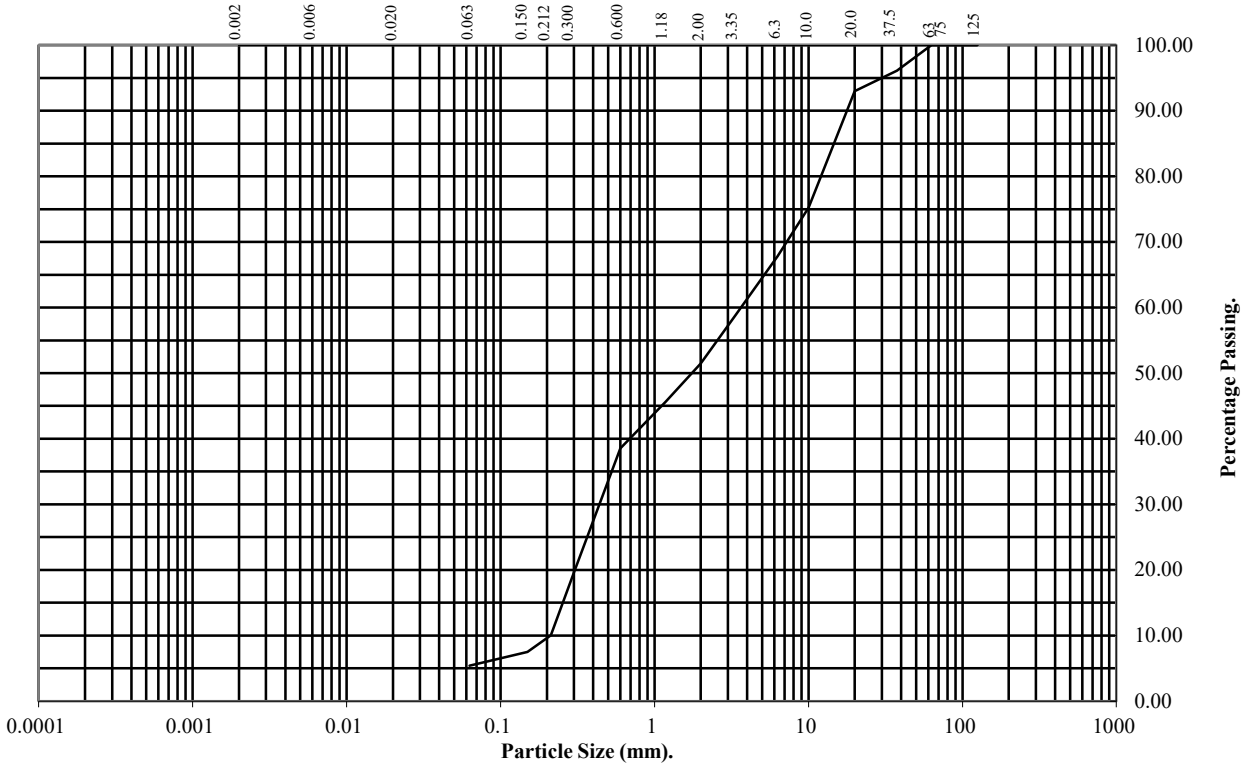
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP129 **Top Depth (m):** 1.30

Sample Number: **Base Depth(m):**

Sample Type: BB



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	96
20	93
10	75
6.3	68
3.35	59
2	51
1.18	46
0.6	39
0.3	20
0.212	10
0.15	8
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	49
Sand	46
Silt/Clay	5

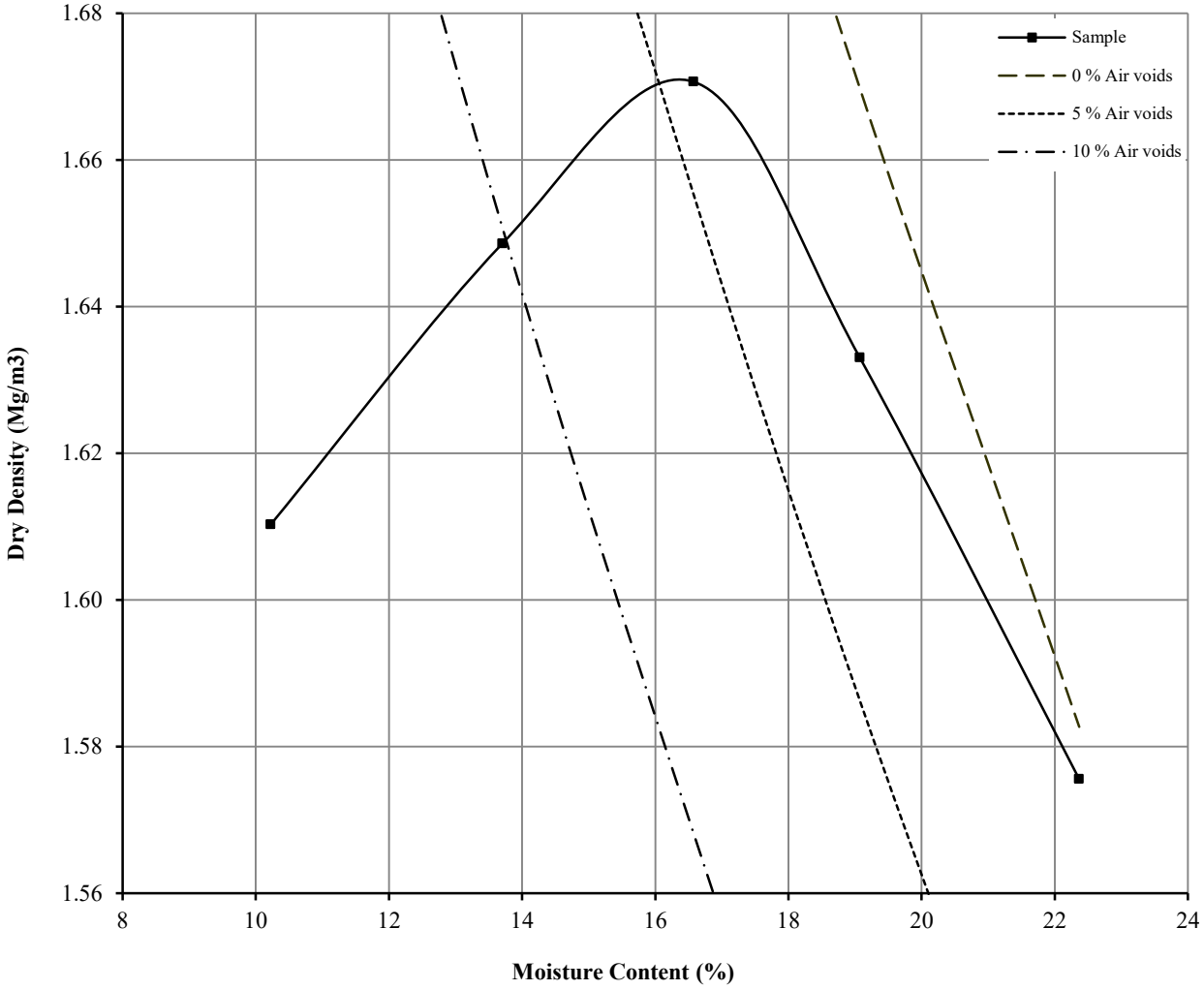
Remarks:

See Summary of Soil Descriptions

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**CP101**	**Top Depth (m) :**	**3.00**
Sample Number:	**3**	**Base Depth (m) :**	**3.45**
Sample Type:	**BB**		



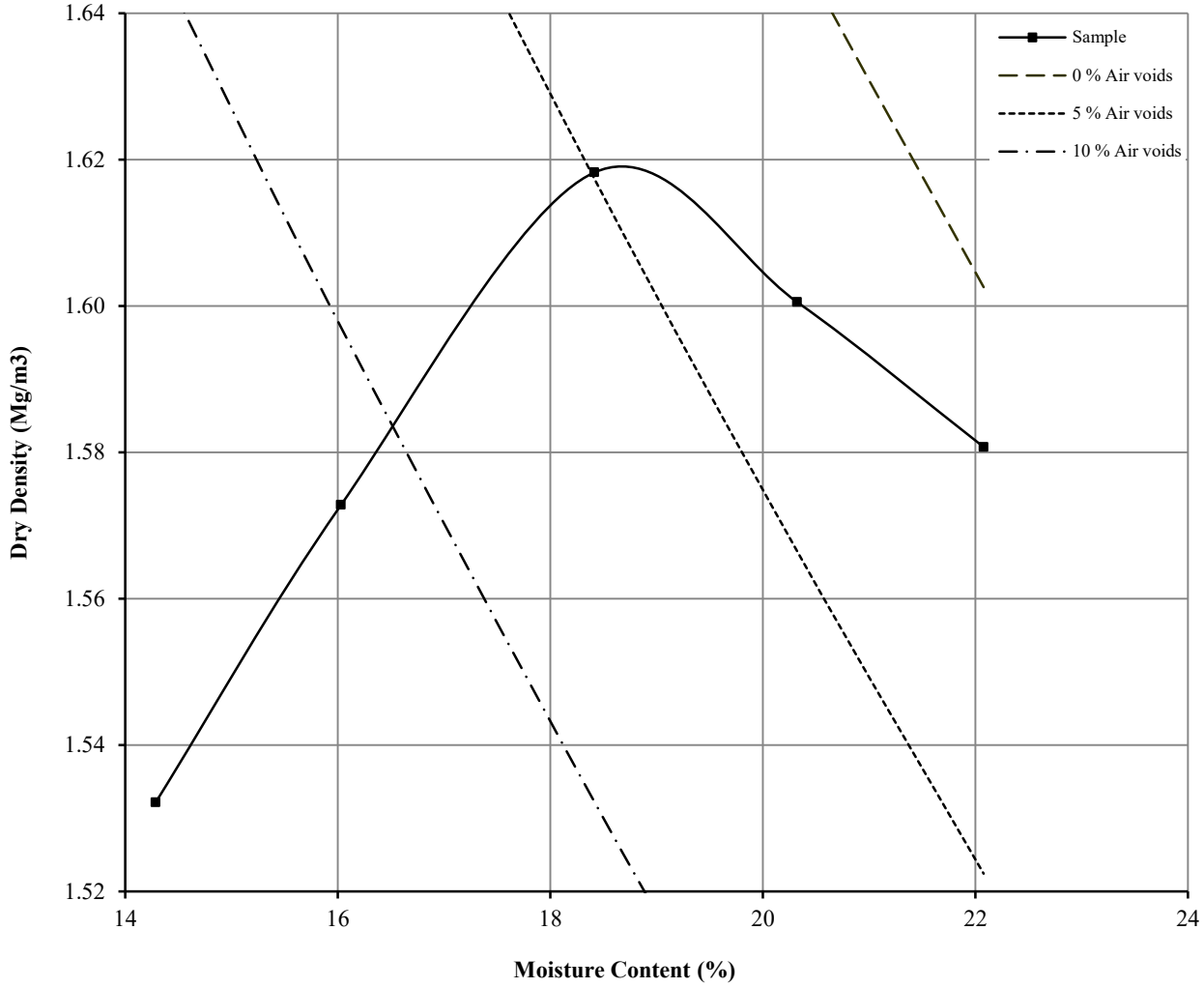
Initial Moisture Content:		31	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.45	Assumed	Material Retained on 37.5 mm Test Sieve (%):		10
Maximum Dry Density (Mg/m3):		1.67	Material Retained on 20.0 mm Test Sieve (%):		8
Optimum Moisture Content (%):		17			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Ryebank**	**Contract** **PSL19/7862** **Client Ref** **13533**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**CP101**	**Top Depth (m) :**	**8.00**
Sample Number:	**8**	**Base Depth (m) :**	**8.45**
Sample Type:	**BB**		



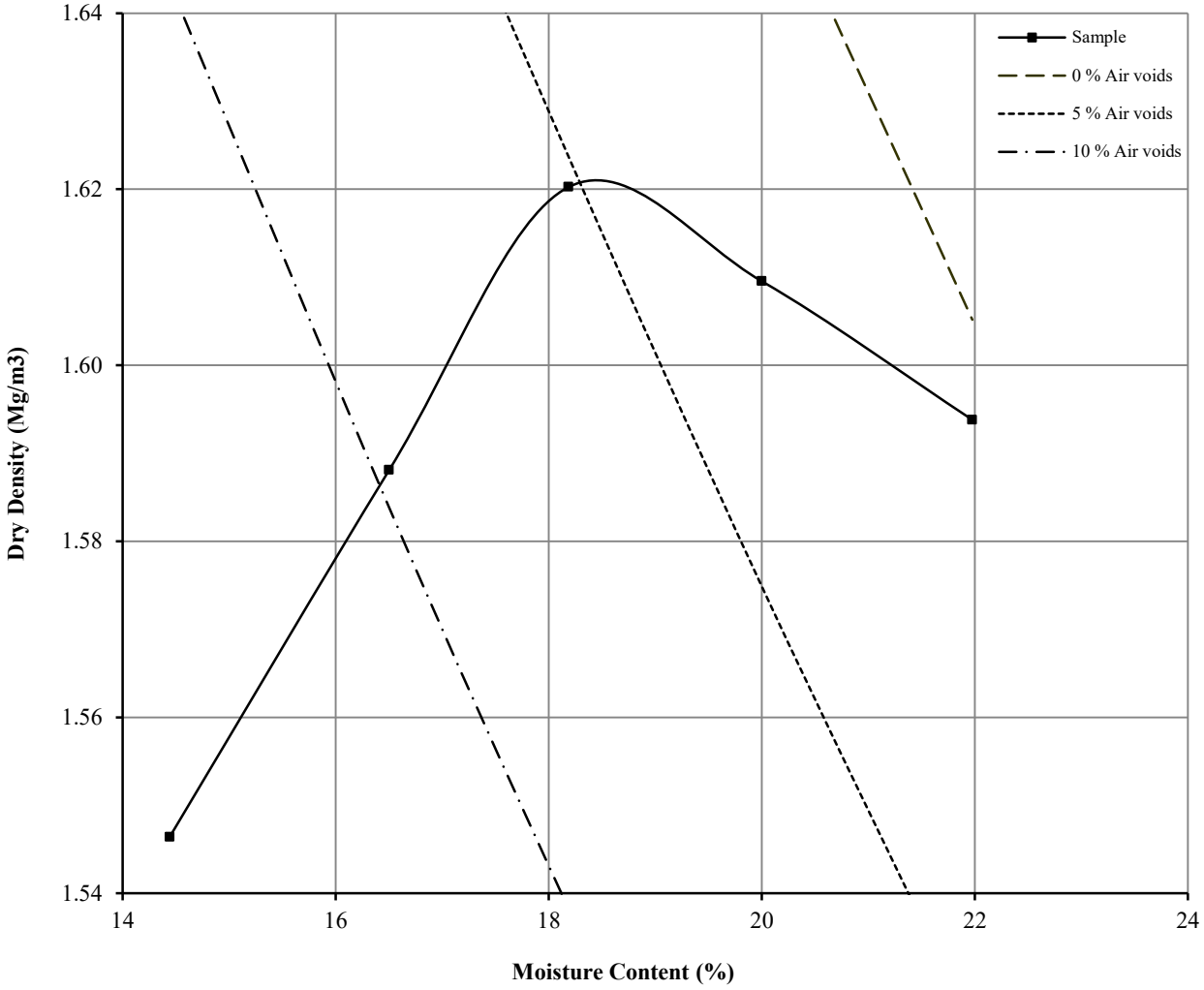
Initial Moisture Content:		16	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.48	Assumed	Material Retained on 37.5 mm Test Sieve (%):		31
Maximum Dry Density (Mg/m3):		1.62	Material Retained on 20.0 mm Test Sieve (%):		20
Optimum Moisture Content (%):		18			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Ryebank**	**Contract** **PSL19/7862** **Client Ref** **13533**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**CP102**	**Top Depth (m) :**	**1.00**
Sample Number:	**1**	**Base Depth (m) :**	**1.45**
Sample Type:	**BB**		

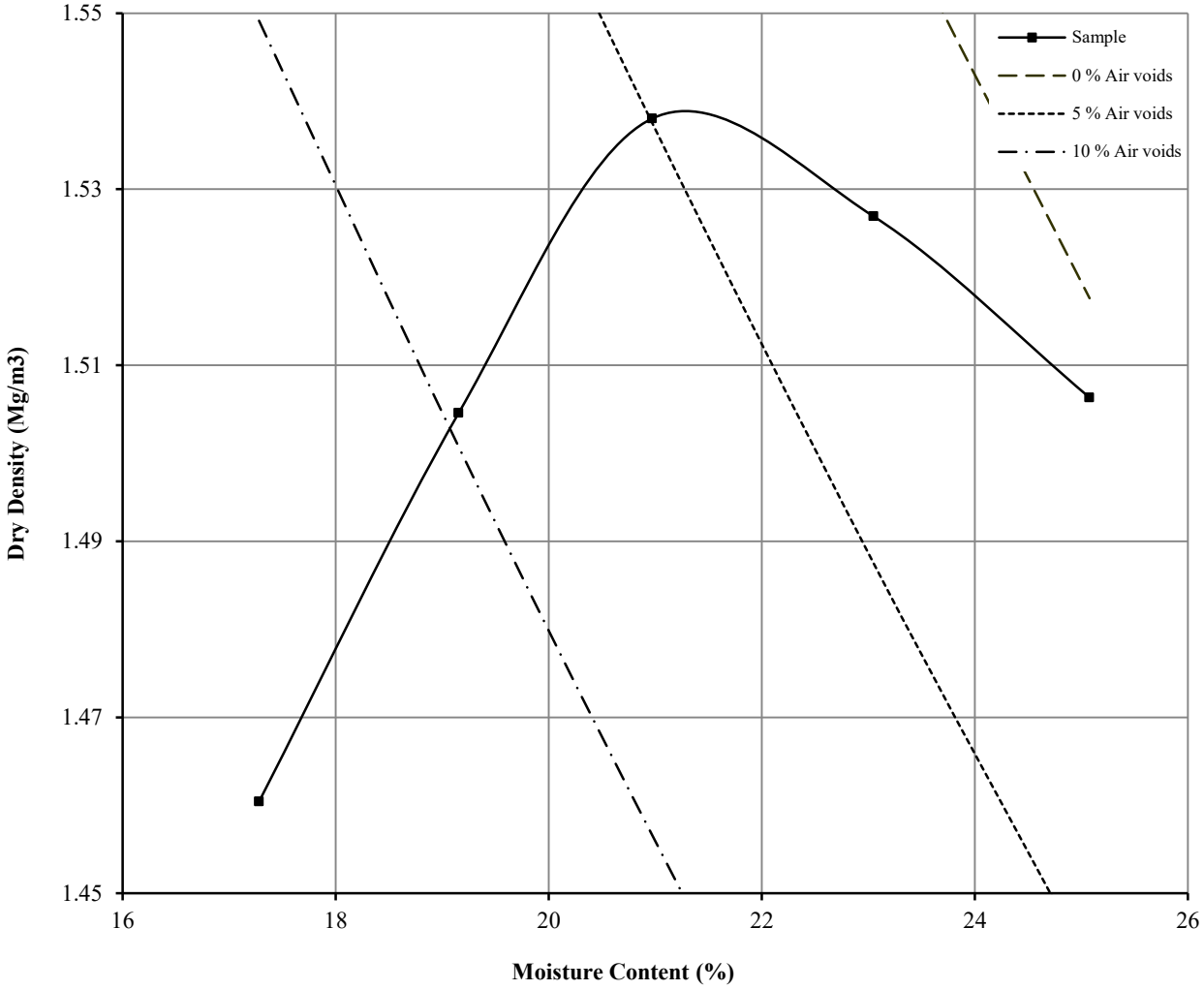


Initial Moisture Content:		14	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.48	Assumed	Material Retained on 37.5 mm Test Sieve (%):		47
Maximum Dry Density (Mg/m3):		1.62	Material Retained on 20.0 mm Test Sieve (%):		12
Optimum Moisture Content (%):		18			
Remarks See summary of soil descriptions.					

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number:	**CP102**	**Top Depth (m) :**	**3.00**
Sample Number:	**3**	**Base Depth (m) :**	**3.45**
Sample Type:	**BB**		



Initial Moisture Content:		19	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.45	Assumed	Material Retained on 37.5 mm Test Sieve (%):		38
Maximum Dry Density (Mg/m3):		1.54	Material Retained on 20.0 mm Test Sieve (%):		11
Optimum Moisture Content (%):		21			
Remarks See summary of soil descriptions.					

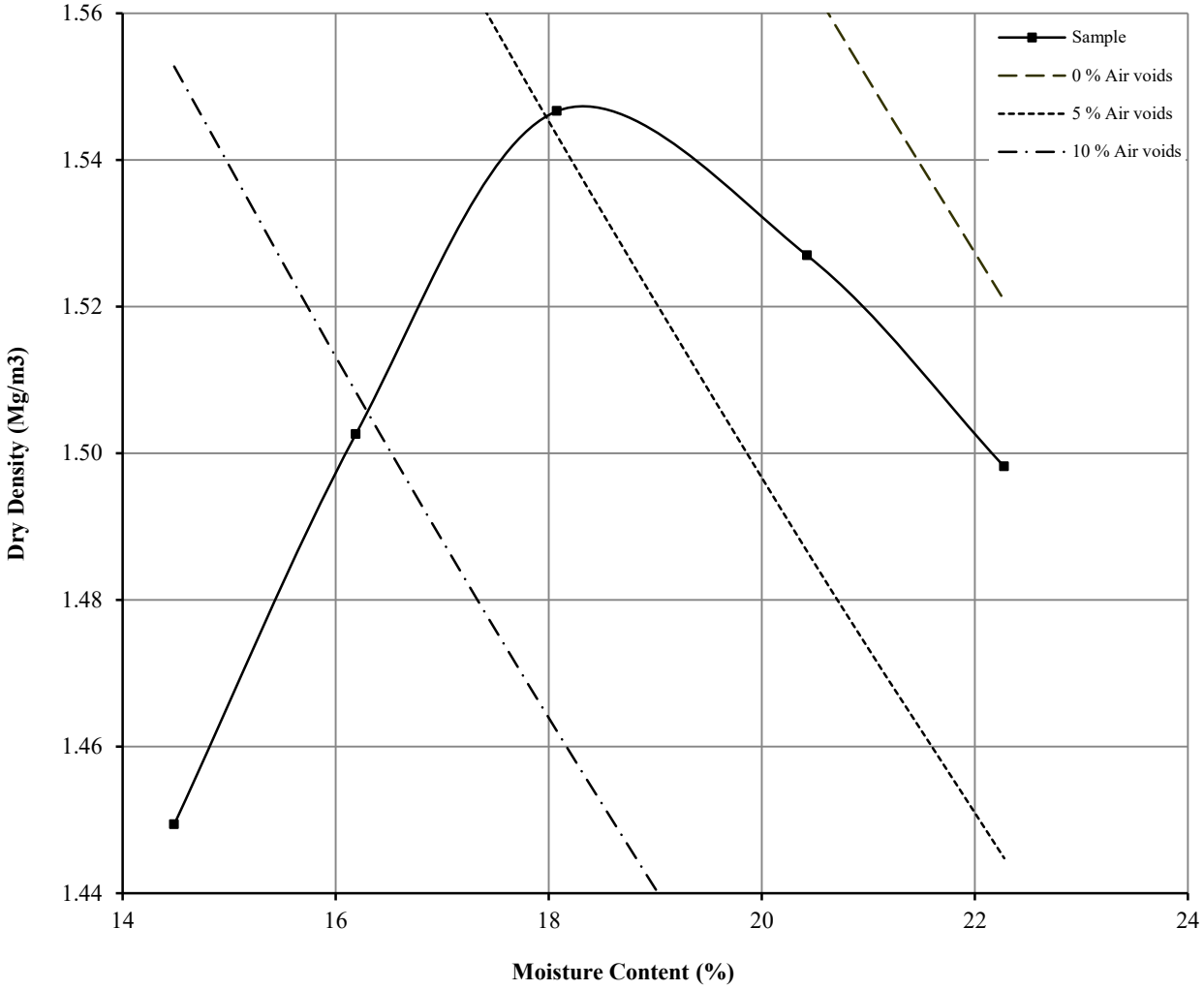
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP120 **Top Depth (m) :** 2.10

Sample Number: **Base Depth (m) :**

Sample Type: BB



Initial Moisture Content:		20	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.3	Assumed	Material Retained on 37.5 mm Test Sieve (%):		2
Maximum Dry Density (Mg/m3):		1.55	Material Retained on 20.0 mm Test Sieve (%):		12
Optimum Moisture Content (%):		18			
Remarks See summary of soil descriptions.					

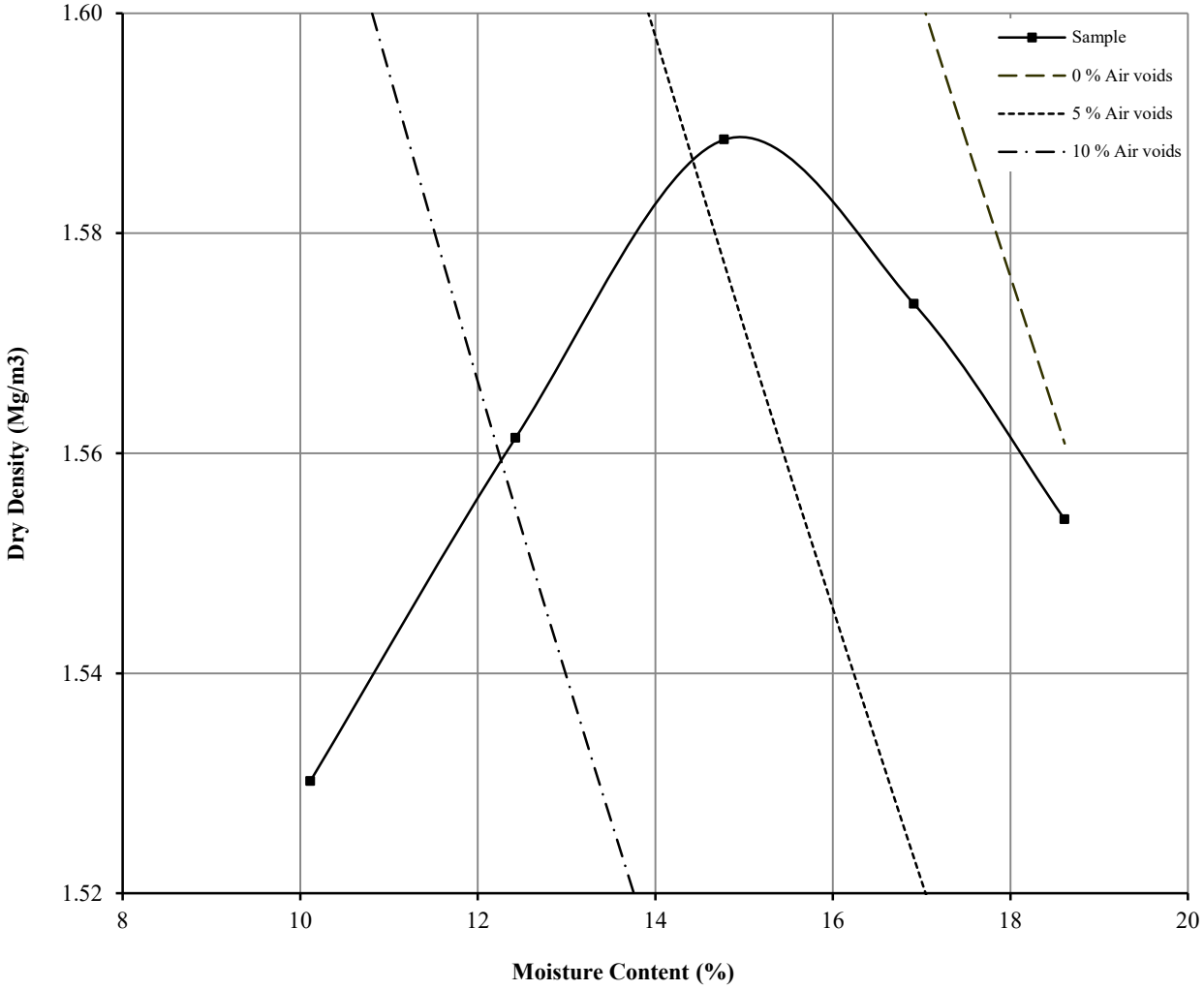
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP129 **Top Depth (m) :** 1.30

Sample Number: **Base Depth (m) :**

Sample Type: BB



Initial Moisture Content:		28	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.2	Assumed	Material Retained on 37.5 mm Test Sieve (%):		4
Maximum Dry Density (Mg/m3):		1.59	Material Retained on 20.0 mm Test Sieve (%):		3
Optimum Moisture Content (%):		15			
Remarks See summary of soil descriptions.					