Next Generation Engineering Consultancy Services

Remediation Strategy for Base Building, Pencroft Way, Manchester Science Park, Manchester M15 6SE.

Project No: 369R3

Client

bruntwood

Next Generation Engineering Consultancy Services

DOCUMENT VERIFICATION

Report Reference: **NX369R3** **Issue:** Final **Date:** 12th May 2020

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Revision History

Revision	Date	Description	Reviewed by	Approved by
Issue	August 9th 2019	Final		
R1	5th September 2019	Additional of revised red line plan and planning comments		
R2	11th December 2019	Additional gas monitoring		
R3	12th May 2020	UU Risk Assessment & Cover System Depth Changes		

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EXECUTIVE SUMMARY

NX Consulting Limited has been commissioned by Bruntwood Sci-Tech Ltd (The Client) to conduct a remediation strategy; at the proposed Base Building, Manchester Science Park, Lloyd St North, Manchester M15 6SE.

It is understood that the site is to be redeveloped with a new 5-storey commercial building with internal mezzanine floor, together with provision of coworking and open "maker" workshop space on the ground floor, and associated disabled car and cycle parking and public realm. No proposed development levels have been provided to NX Consulting as part of this assessment. The proposed site layout is presented in Appendix A.

The proposed remediation strategy is based upon a single philosophy which provides a detailed understanding of the chemical and physical properties of the ground, groundwater, surface water and ground gas, established by way of extensive desk study, intrusive ground investigations, laboratory testing and monitoring. In addition, an assessment of how the remediation is to be achieved shall be approved and upon completion a validation report shall be submitted to the Directorate of Planning of Manchester City Council.

The works will be conducted as part of the main contract and involve a 'best sustainable approach' to remediation of potential contamination; involving a minimal approach with respect to the removal and disposal of contaminated materials from site. Minimum volumes of material will be moved around the site, limiting site workers and neighbours to dust, noise and visual intrusion. Minimum material will be taken off site thus conserving landfill space locally and minimising lorry movements onto local roads from the site.

The NX Consulting Phase I Desk Study and Preliminary Phase II Assessment carried out in June 2019 established a site history comprising residential terraces between 1891 and c.1980. After 1980, the site appears to have been cleared and replaced by a singular structure denoted 'Hillel House' in the east of the site which is extended to its present-day arrangement c.1989. The surrounding area has historically comprised residential land with university buildings constructed in the area in recent times with a brewery in close vicinity.

Geological mapping indicates that the site is likely to be underlain by Glacial Clay over Chester Pebble Bed Formation bedrock, designated by the EA as Primary, aquifer. Made ground associated with former residential housing/infrastructure are likely to result in average 2m depths of Made Ground across the site.

The site is unlikely to be in an area which may be affected by historical coal mining.

NX Consulting carried out a ground investigation at the site comprising the drilling of 5no. windowless sample boreholes to depths of 5.45m bgl (WS4A), 5no. cable tool percussion boreholes to depths of up to 10.30m bgl (BH03) and 1no rotary cored borehole to a depth of 20.00m bgl. (RBH01).

Ground conditions appear consistent with those identified within the wider site. Made Ground was identified within all exploratory hole locations to maximum proven depths of 3.50m bgl. Where deposits were noted to predominantly comprise black macadam overlying dark grey brown/reddish brown gravelly sands and soft-firm dark brown slightly sandy gravelly clay with concrete, timber, metal and brick noted. Underlying the Made Ground, Glaciofluvial and Glacial Clay deposits comprising firm sandy gravelly clay and/or medium dense clayey gravelly sand / sandy gravel were encountered where Made Ground was able to be penetrated to maximum depths of 9.80m bgl. SPT 'N' values within the natural granular deposits indicate that they are loose to very dense with 'N' values ranging from 5 to 50, whilst SPT's carried out in the natural cohesive deposits recorded 'N' values ranging from 4 to 50 indicating that they are firm to stiff with locally soft bands present. Suspected bedrock was encountered within all deeper exploratory hole locations and proven to a depth of 20.00m bgl within RBH01 comprising a reddish-brown SANDSTONE of varying strength.

The post-development foundation system cannot be confirmed until a Design and Build Contractor is appointed to construct the development project. Based on information provided to date, a bored piled solution is likely to be the most suitable solution for the proposed

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building. If adopted, a piling matt will be required in line with BRE470 Working Platforms for Tracked plant.

A specialist piling contractor has been approached for advice on their own specialist propriety systems. A piling risk assessment has been carried out to establish the most suitable choice of pile to ensure that it does not create migration pathways for potential soil and groundwater contamination into the underlying aquifer.

Numerous Made Ground and cobble/boulder obstructions were encountered within the upper 2.0m within many exploratory hole locations. It is likely that extensive relict features comprising residential housing footings, cellar floors and former roads are present within the subsurface and require screening and crushing prior to replacement and compaction onsite. These features will require 'grubbing out' and treatment (screening/crushing/segregation and reused (where appropriate) on site to prevent formation of the piled foundations and services formation.

Where possible all soils should be retained on site to reduce disposal costs. Unsuitable materials, that cannot be reused on site, will require removal from site to suitably licensed waste management facility. A degree of surface treatment should be anticipated within all areas comprising excavation, crushing, screening and/or removal from site.

The environmental chemistry results together with the findings of the intrusive investigation are consistent with the site's historical uses. The nature, consistency and quality of the made-ground soils encountered across the site suggests demolition arisings were historically employed as a fill material.

Across the majority of the site, contaminants will be isolated beneath buildings and areas of hardstanding. In areas of soft landscaping, to protect end users from isolated concentrations of lead contamination and possible asbestos fibres, a soil cover system (consisting of a minimum 450mm thick layer) is recommended over deposits of made ground. Where gross asbestos contamination has been identified within shallow sub-surface deposits, impacted soils will require delineation, excavation and disposal or suitable management to mitigate against potential harm to human health receptors.

Imported subsoil/topsoil materials will require chemical validation to demonstrate that they are suitable for a commercial end use and taken to depths sufficient to provide a sufficient cover system for all proposed materials used which are capable to support root growth.

For purposes of off-site disposal Waste Acceptance Criteria (WAC) testing is recommended on all made ground soils prior to discharge to a suitably licensed facility.

Construction workers should take appropriate health and safety measures when dealing with potential asbestos containing soils. General guidance on the protection of workers who may be exposed to asbestos containing materials is provided in the Health and Safety Executive (HSE) document "Asbestos: The Licensed Contractors Guide". Alternatively, further testing of made ground materials could be conducted to provide a higher degree of confidence and negate the need for measures recommended in the above document.

It is envisaged that new drainage and utility supplies will be at relatively shallow depth within the top 1200mm; the made-ground deposits. A United Utility potable water supply risk assessment has shown that either further testing along the line of the pipework should be carried out or the specialist barrier pipe be adopted.

No landfill or other significant source of potentially hazardous ground gas has been identified within 250m. Additionally, the underlying made ground is not likely to comprise materials with the potential to develop significant volumes of ground gas and therefore, the risks to identified receptors are deemed to be sufficiently low to negate the need for ground gas protection measures, within the proposed development. No specific ground gas protection measures (CS1) will be required within the proposed development in line with CIRIA 665 document guidelines. No radon protection measures are necessary in the construction of new dwellings or extensions.

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1st Line Defence Ltd has assessed that there is a Low Risk from items of German aerial delivered UXO and Allied UXO across the majority of the site, with a small area of Medium Risk within the north-west of the site.

Once the development has been completed; validation and approval from the Environment Agency and Manchester City Council will be required by the contractors appointed Engineers via a validation report encompassing all the findings of the remediation works on this site.

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1.0 INTRODUCTION

1.1 Instruction

NX Consulting Limited has been commissioned by Bruntwood Sci-Tech Ltd (The Client) to conduct a remediation Strategy of land within Manchester Science Parks; referred as the Base Building, Manchester Science Park, Lloyd St North, Manchester M15 6SE.

It is understood that the site is to be redeveloped with a new 5-storey commercial building with internal mezzanine floor, together with provision of coworking and open "maker" workshop space on the ground floor, and associated disabled car and cycle parking and public realm. The planning application for Base new building is to be submitted summer 2019 and this report will form part of the information submitted. The proposed site layout is presented in Appendix A.

Where referred to herein, 'the specification' shall mean the Remediation Specification'. The Contractor shall mean the Principal Contractor and their appointed sub-Contractors, personal representatives, successors and permitted assignees. The Engineer means the Contractor's appointed engineers who will be responsible for the implementation of the verification works and provision of a final verification report to discharge all outlying conditions relating to contamination and waste disposal.

1.2 Previous Surveys

Previous assessments conducted upon the site, which should be read in conjunction with this study; comprise the following:

- NX Consulting Limited - Phase I pre-acquisition Phase 1 Geo-environmental Desk Study Assessment of the larger Manchester Science Park Site in March 2012. Reference NX128/R1.
- NX Consulting Limited - Phase I and Preliminary Phase 2 Geo-environmental site investigation of land at the Base Building, Manchester Science Park, Lloyd St North, Manchester M15 6SE (Ref: NX369/R1) dated June 2019.

The Remediation Strategy Report should be read in conjunction with the reports listed above and drawings and specifications provided by the appointed structural engineers; DW Consulting Engineers LLP and Bridge Architects. Particularly where details of water supply pipeworks and cover system in landscaped areas are presented.

NX Consulting Limited are unaware as to whether Planning Consent has been granted for the site however it is anticipated that any consent would contain conditions relating to the assessment of land contamination, mitigation of any risks to human health associated with such and verification that these had been adequately implemented.

Notwithstanding the above comments, previous assessment has indicated the requirement for some mitigation to protect future site users and the wider environment), and it is deemed prudent to formalise the inspections and verification works required to prepare the site for redevelopment and future use.

In addition, re-use of site generated, or materials may require development of a Materials Management Plan (MMP) for the site, and production and regulatory approval of a Remediation Strategy is a prerequisite for registering such a scheme under the Definition of Waste: Development Industry Code of Practice.

This report details the Remedial Strategy in accordance with the framework described in the EA / DEFRA Contaminated Land Report 11: 'Model Procedures for the Management of Land Contamination' 2004.

It is anticipated that a programme of works to physically prepare the site for development will also be required and measures to address ground contamination are most efficiently implemented contemporaneously with site preparatory earthworks. Therefore, while not containing detailed specifications for works to improve ground stability, the following Remediation Strategy considers the likely requirements and their interaction with contamination remediation measures.

1.3 Objectives

The aims of the Remediation Strategy are as follows:

- To comply with the requirements of the Local Planning Authority (Manchester City Council) and their Environmental Health Department/Pollution Control Unit to ensure that future end users of the site are not put at risk from any chemical contamination arising from its former uses.
- To ensure that construction workers are not put at an unacceptable short-term risk in reclaiming/remediating and redeveloping the site.
- To satisfy the requirements of the Environment Agency in ensuring that the proposed construction/reclamation/remediation works provide a degree of protection necessary to controlled waters.
- To provide a cost effective but robust reclamation/remediation scheme by utilising treating and re-using on site materials wherever possible and to minimise on and off-site movements but satisfy waste management licensing regulations. Reporting on volumes of material excavated from site and, where applicable, the methods and locations used in off-site disposal.

A Method Statement will be required from the appointed Contractor to undertake the remediation and preparatory works. The Method Statement should detail how the objectives outlined in the Strategy are to be achieved.

1.4 Report Layout

Section 2 of this report provides a background information with respect of the site such as site setting and description.

Section 3 details the intrusive investigations carried out to date with a summary of the environmental setting, ground conditions and chemical analyses. Section 4 details the risk assessment and target concentrations at the site.

Section 4 presents Tier 1 Guideline values to be used as assessment criteria for the site.

Section 5 presents the remedial strategy for the site and section 6 discusses the requirements for subsequent development and a piling risk assessment for the site.

1.5 Limitations

The accuracy of the data supplied by third parties should be considered in the context of any known site conditions for which NX Consulting Limited cannot be held liable.

The comments given in this report and the opinions expressed assume that the ground conditions (geology, hydrogeology, contamination) do not vary beyond the range revealed by this assessment. There may be, however, conditions within the site,

which have not been identified from the information reviewed and consequently have not been considered in this report: confirmation of such uncertainties should be the focus of any future intrusive investigations.

The comments made in this report are based on the data available at the time of its completion. Any unusual or conflicting evidence discovered during any future site works must be presented to NX Consulting as soon as possible so that any implications may be considered.

This report is provided for the benefit only of the party to whom it is addressed. NX Consulting does not extend responsibility to any third party for the whole or any part of the contents. NX Consulting owes no duty of care in relation to this report to any third party. The investigation and reportage have been undertaken with all reasonable skill, care and due diligence. NX Consulting disclaims any responsibility to the client or others in respect of any matter(s) outside this agreed scope of the above works.

In addition to the above it should be noted that when investigating or developing land, sub-surface conditions might vary both spatially and over time. Whilst this investigation and subsequent interpretation has been undertaken to reasonably characterise current sub-surface conditions at the site within the scope of works and agreed budget, the absence of certain ground, contamination or groundwater conditions at the individual locations is not a guarantee that these conditions do not exist elsewhere on the site. Additional information, changes in legislation or revised practices may necessitate re-interpretation of part or all of this report.

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2.0 BACKGROUND

2.1 Site Location & Setting

This report is intended to support an application relating to the redevelopment of the Manchester Science Park areas. The Base Building development is located to the west of the site adjacent to Greenheys building, with associated access roads, car parking and landscaped areas.

The larger Manchester Science Park site is generally rectangular in shape, generally flat and located off Lloyd Street North, Manchester, M15 6SE (NGR: 384440E; 396280N).). A Site Location Plan, site photographs and a site layout drawing is presented as Figure 01 in Appendix A.

The desk study information collected in the phase 1 desk study, provided sufficient information to characterise the potential for ground contamination the site with a reasonable level of confidence; a number of potential sources were identified involving demolition of former residential housing/infilling of associated basements; relic roads and infrastructure which had the potential to introduce a range of contaminants to the site, as well as heterogeneous ground conditions and associated stability for foundations.

2.3 The Proposed Development

It is understood that the site is to be redeveloped with a new multi-storey commercial office structure with associated access roads, car parking and landscaped areas. No proposed development levels have been provided to NX Consulting as part of this assessment. No proposed development levels have been provided to NX Consulting as part of this assessment. The proposed site layout is presented in Appendix A.

3.0 PREVIOUS INVESTIGATIONS

3.1 Introduction

Previous investigations of the site have comprised both desk study and intrusive investigations as listed in Section 1 of this text. A summary of findings relevant to the proposed remediation of the site is given in the following sections.

The NX Consulting desk study carried out in June 2019 established a site history principally comprising residential terraces between 1891 and c.1980. After 1980, the site appears to have been cleared and replaced by a singular structure denoted 'Hillel House' in the east of the site which is extended to its present-day arrangement c.1989.

A full historical land use appraisal is presented in the NX Consulting Reports (Report No. NX369/R1 dated June 2019).

A summary of the environmental setting of the site was produced in the above referenced NX Consulting Reports and for ease of reference has been summarised overleaf.

The investigations were, in part, constrained by live services, roads, access and vegetation. The total number of entries is roughly equivalent to average 15 to 30m spacing across the available parts of the site however overall site coverage was less than this with gaps of up to 50m. Many entries fully penetrated the made ground on the site, although some obstructions could not be penetrated. On this basis it is concluded that ground conditions at the site have been adequately characterised, and although there is always the possibility that localised sources could have been missed this issue would not necessarily have been resolved through additional entries or a second stage of investigation.

The number of soils and the soils analytical suite applied is considered appropriate for the site. The soil sampling and analysis was targeted to the areas where pollutant sources are more likely to be present, or key parts of migration pathways.

Issue	Data Reviewed	Summary
Geology & Mining	GroundSure report BGS Mapping	**Drift** – Low permeability Glacial Till (Boulder Clay) **Solid** – Chester Pebble beds Formation. **Faults** – No inferred major faults exist within close proximity of the site. **Coal Mining** – The site is indicated to be within an area, which may be affected by coal mining activities. However, the risks to the site from shallow coal mining hazards are deemed to be low due to the significant cover of sandstone bedrock directly overlying coal measures strata beneath the site.
Landfills	GroundSure Mapping	There are no Environment Agency defined licensed, registered or historic landfills sites within 250m of the site.
Hydrology	GroundSure Report	Records indicate that the presence of the culverted Corn Brook within 10m of the site. There are no Environment Agency defined Primary Rivers within 250m of the site.
Hydrogeology	GroundSure Report	Guidance from the Environment Agency indicates that the underlying bedrock strata are designated as a Principal Aquifer. The superficial drift strata beneath the site are classified designated as a non-aquifer (unproductive). The site lies within a Source Protection Zone Zone 3 (Outer Catchment) associated with an abstraction borehole situation 250m to the southwest within Royal Brewery. Given the underlying Principal Aquifer, the site sensitivity is regarded as low to moderate with regard to groundwater receptors as no surface water receptors are present within 250m of the site.
Flood Risk	GroundSure Report	GroundSure mapping data indicates that the site is located within Flood Risk Zones 2 and 3, the east of the site is stated to be located within a Zone 1 floodplain. The west of the site is stated to be at high risk from surface water flooding from rivers.
Radon	GroundSure Report	Both the Radon Atlas for England and Wales and the Envirocheck report confirm that the site is in an area where less than 1% of homes are affected by radon (above the action level). Consequently, no radon protection measures are necessary in the construction of new dwellings or extensions.
Unexploded Ordnance	1st Line Defence Ltd	1st Line Defence Ltd has assessed that there is a Low Risk from items of German aerial delivered UXO and Allied UXO across the majority of the site, with a small area of Medium Risk within the north-western section.

3.2 Fieldworks

The intrusive investigation was carried by Taylor Drilling Services and monitored by an engineer from NX Consulting between 16th and 19th May 2019. A plan showing all the exploratory hole locations are presented in Appendix A.

Underground services were surveyed, and hand dug trial pits formed to a depth of 1.20metres below ground level (mbgl) prior to the intrusive investigation; in line with NX Consulting health and safety methodology.

During the site investigation a total of 6no. Cable Tool Percussion Boreholes were formed to maximum depths of 10.30mbgl (BH03).

The exploratory hole retrieved continuous soil samples; these were then logged by an onsite engineer and representative samples were taken for geotechnical and chemical analysis.

During the site investigation a total of 6no. window sample boreholes were formed to maximum depths of 5.45mbgl (WS04).

The exploratory hole retrieved continuous soil samples; these were then logged by an onsite engineer and representative samples were taken for geotechnical and chemical analysis.

During the site investigation 1no. Rotary Open borehole was formed to a maximum depth of 20.00mbgl (RBH01).

The exploratory hole retrieved continuous rock samples; these were then logged by an onsite engineer and representative samples were taken for geotechnical and chemical analysis.

Environmental sample collection was carried out in accordance with BS EN ISO 22475-1:2006. All soil and groundwater samples were collected using either clean stainless-steel utensils or clean disposable gloves and placed directly into clean containers provided by the laboratory. Samples obtained during the investigation were subjected to a range of geochemical testing at appropriate UKAS accredited laboratories.

Testing was carried out in accordance with the procedures outlined in BS EN ISO14688-1:2002, 14688-2:2004, and 14689-1:2003.

Soil samples were tested for speciated PAH, asbestos screen, arsenic, boron (water soluble), cadmium, copper, chromium, lead, mercury, nickel, selenium, silver, zinc, total cyanide, free cyanide, phenols, pH, asbestos, total sulphur, sulphide, total sulphur, total organic carbon and nitrate analysis.

3.3 Ground Conditions

General

The following ground conditions summary has been utilised from information provided within the NX Consulting report. To obtain a more comprehensive picture of the ground conditions within the wider site, reference should be made to the NX Consulting Reports (ref: NX128/R1 and NX369/R1).

Topsoil was not recorded within any exploratory hole locations.

Made Ground has been identified within all exploratory hole locations to maximum proven depths of up to 3.50m bgl. where deposits were able to be fully penetrated. Deposits were noted to predominantly comprise black macadam overlying dark grey brown/reddish brown gravelly sands and soft-firm dark brown slightly sandy gravelly clay with concrete, timber, metal and brick noted.

Glaciofluvial drift and Glacial Clay deposits comprising firm sandy gravelly clay and/or medium dense clayey gravelly sand / sandy gravel were encountered where Made Ground was able to be penetrated to maximum depths of 9.80m bgl. SPT 'N' values within the natural granular deposits indicate that they are loose to very dense with 'N' values ranging from 5 to 50. SPT's was carried out in the natural cohesive deposits recorded 'N' values ranging from 4 to 50 indicating that they are firm to stiff with locally soft bands present.

Bedrock deposits were noted to comprise a reddish-brown SANDSTONE of varying strength at depths ranging from 7.90m to 9.40m bgl. Suspected bedrock was encountered within in all deeper exploratory hole locations and proven to a depth of 20.00m bgl within RBH01.

3.4 Groundwater

The following groundwater observations were monitored within boreholes during drilling at the following depths. Saturated sand and gravel depths are also provided:

Table 3.4.1 Groundwater Observations

Borehole	Groundwater Observations
BH02D	Groundwater at 7.20m bgl.
BH03	Groundwater at 8.60m bgl.
BH04	Damp strata between 7.90m bgl and 8.90m bgl.

3.5 Contamination Observations

A faint hydrocarbon/organic odour was noted within BH04 between depths of 0.70-1.20m bgl.

No other visual or olfactory evidence of hydrocarbon and/or solvent contamination was identified during drilling works

3.6 Underground Service Plans

Underground services, comprising BT Lines, gas mains, combined and foul sewers, CCTV, and possible fibre optic cables may all impact the site and the design team and Client should familiarise themselves with their presence. Surface drainage is also present elsewhere. The site and surrounding area are located within a technological and academic setting with very expensive underground service plant present within near vicinity to the proposed buildings and car parking areas.

3.7 Below ground obstructions

Numerous Made Ground and cobble/boulder obstructions were encountered within the upper 2.0m within many exploratory hole locations. Made Ground obstructions were noted to comprises concrete and tarmac features thought to represent historic road and cellar features.

It is likely that extensive relict features comprising residential housing footings, cellar floors and former roads are present within the subsurface and require screening and crushing prior to replacement and compaction onsite.

Unsuitable materials will require removal from site to suitably licensed waste management facility.

3.8 Contamination

The chemistry analysis results were compared against the Tier 1 criteria for a *commercial* end use to reflect the development proposals.

For risk assessment purposes a soil organic matter value of 2.5% was assumed for both the Made Ground and natural strata. The pH of the soils was generally slightly alkaline (mean value of 8.3).

Made Ground & Natural Soils

Tier 1 thresholds were not exceeded within the majority of samples analysed within the made-ground or natural soils with respect to the end use of the site. The only exceptions recorded were localized shallow Made Ground deposits beneath tarmacadam to the southwest and southeast of the existing structure. As shown below.

BH No	Strata Type	Determinant	Recorded Value	C4SL (commercial end use) mg/kg
RBH01 (0.90m)	MG – Loose slightly gravelly clayey sand	Lead	2200 mg/kg	1100 - 6000
BH03 (0.60m)	MG – Medium slightly clayey, gravelly sand	Asbestos	0.534%	No fibres detected

Appendix H 'Provisional C4Sls for Lead' stops short of providing "final C4SLs" for lead since they consider that final C4SLs should be set by "relevant authorities" (e.g., Defra).
The environmental chemistry results together with the findings of the

intrusive investigation are considered consistent with the site's historical uses. The nature, consistency and quality of the made-ground soils encountered across the site suggests that ash, clinker clay and demolition rubble fill were historically employed as a fill material.

A faint hydrocarbon/organic odour was noted within BH04 between depths of 0.70-1.20m bgl although chemical analysis of the soils proved inorganic and organic contaminants to be largely absent beneath the site. The only exception to this was one elevated concentrations of lead and another of asbestos.

Asbestos was encountered in demolition arising in a single sample only, however, is considered likely to be present in other localised areas of the site and as such

recommend good construction management with appropriate PPE adopted by construction staff and dust control will adequately reduce risks from potential asbestos contamination following demolition of the existing buildings.

The provision of hardstanding and the building footprint across the site and a proposed 450mm 'clean' soil cover in any areas of proposed landscaping will isolate the locally elevated inorganic and locally unrecorded contaminants from future site users. The hardstanding and proposed cover layer in landscaped areas will effectively isolate unacceptable contamination (lead and potentially as yet unidentified asbestos concentrations) by providing a minimum clean soil cover system over deposits of made ground. Imported and site won materials used for capping in landscaped areas will require chemical validation to demonstrate that they are suitable for a commercial end use. The upper 450mm should contain a minimum 150mm of 'clean' topsoil' and also be capable to support root growth.

The underlying solid strata is classified as a Principal Aquifer and the nearest surface water feature is located subjacent to the site. When compared to UK Drinking Water Standards, slightly elevated concentrations of benzo(a)pyrene are not considered likely to pose an unacceptable risk to controlled waters. A low risk to receptors is foreseen upon completion of the proposed development.

Water Supply

It is envisaged that new drainage and utility supplies will be at relatively shallow depth within the top 1200mm of the made-ground deposits. It is considered unlikely that specialist supply pipe is required at the site. A United Utility potable water supply risk assessment is required to establish the nature of water supply pipework for the proposed development

It is recommended that statutory services are consulted at an early stage, with respect to the ground conditions within which they will lay services, in order to enable them to assess at an early state any protection measures required.

3.9 Asbestos

11no. sample of Made Ground from the NX Consulting investigation were tested for the presence of asbestos fragments. One sample from BH03 at 0.60m contained fibres of Chrysotile asbestos cement. Quantitative sampling was carried out and although the amosite was recorded the subsequent concentration was recorded was 0.534% of the sample volume.

It is recommended that impacted soils are delineated, excavated and disposed of or managed accordingly to minimize potential risks to future site users

3.10 Ground Gas

No landfill or other significant source of potentially hazardous ground gas has been identified within 250m. Additionally, the underlying made ground is not likely to comprise materials with the potential to develop significant volumes of ground gas and therefore, the risks to identified receptors are deemed to be sufficiently low to negate the need for ground gas protection measures, within the proposed development.

During the NX Consulting investigation, gas monitoring installations were incorporated in 3 exploratory boreholes (WS2, WS3, WS4A & WS5).

To date 6no rounds of monitoring has been undertaken during 11th March 2019 & 11th December 2019. Barometric pressure was recorded between 999mb and 1015mb.

Table 3.10.1 *Summary of Soil Gas Monitoring Results*

Borehole Reference	No of Visits required over a 3month period in line with Ciria 665	CO2 Range (%v/v)	Flow (l/hr)	Max GSV (l/hr)	CH4 Range (%v/v)	Max GSV (l/hr)
WS2	6	0.1-0.8	<0.10	<0.05	0.0	<0.05
WS3	6	0.1-0.8	<0.10	<0.05	0.0	<0.05
WS4a	6	1.5-2.6	<0.10	<0.05	0.0	<0.05
WS5	6	0.1	<0.10	<0.05	0.0	<0.05

In line with CIRIA 665 Guidance on Methane and Carbon Dioxide, the site is to be developed for commercial end use and the ground gas investigation has identified a maximum carbon dioxide concentration of 2.6% with no flows recorded to date. The maximum recorded concentration for methane was 0.00%. In addition, hydrogen sulphide concentrations of 0.0 ppm were recorded.

As such no special protection measures are required for the proposed building.

Minor olfactory evidence of hydrocarbon contamination was encountered during the investigation though has been proven to be unsubstantiated.

No radon protection measures were deemed necessary for the proposed development.

3.11 Development Constraints

The potential risks which may exist on the site should be readily managed through implementation of an inspection regime to reduce uncertainty in the site conceptual model, good materials management and some basic mitigation measures to break the potential exposure pathways identified.

A significant amount of work will also be required to physically prepare the site for development and achieve the required stable development platform needed for the proposed buildings, car parking, access roads and supporting infrastructure. As this involves significant levels of site disturbance and importation of materials and soils for cover systems, the potential for introduction of new sources or creation of new pathways must be addressed.

The majority of the site is underlain by made ground comprising broken concrete, brick, cobble sets, tarmacadam road, sand, gravel and clay typically varying from loose to dense in relative density or soft to firm in consistency, extending to between 1.5m and 3.5m depth. Numerous obstructions and/or oversized materials are present as surface deposits and within the made ground. Where construction of roads and other infrastructure or where level surfaces are required for parking areas, some ground improvement is likely to be required to achieve long-term stability.

Shallow footings or deeper traditional foundation options are unlikely to be viable and the buildings will have to be supported by piles, and/or the ground strength improved other techniques prior to construction.

The following is a summary of the development constraints/conditions identified during the NX Consulting report, regarding to the proposed redevelopment of the site:

- Compliance with the requirements of the regulators i.e. Manchester City Council, the Environment Agency, service providers (e.g drainage, water, gas and electricity, fibre optics).
- The presence of existing foundations/slabs from previous site demolition and below ground obstructions (demolition filled cellars etc).
- The presence of a significant thickness of Made Ground across the site.
- Relic site services not identified to date.

4.0 RISK ASSESSMENT AND TARGET CONCENTRATIONS

Quantitative risk assessments have not been established to date to derive site specific clean up criteria for hydrocarbon contamination. This is because the results recorded to date for soils have been recorded generally below Environment Agency Soil Guideline Values (SGVs), Generic Assessment criteria and C4SIs. NX Consulting propose continued use of SGVs and GACs for a commercial end use throughout the remediation works. If deemed necessary as a result of the finding of the any unexpectedly elevated concentrations of hydrocarbon contamination, site-specific clean up criteria will be reassessed via human health QRA.

With regards to site specific clean up criteria for hydrocarbon contaminated Made Ground where encountered, remediation proposals include provision of a capping system and basic gas protection measures, thus breaking the source-pathway-receptor linkage. The NX Consulting conceptual model should be continually re-assessed, throughout the construction works. As such, Tier 1 commercial values have been utilised at this time.

The following table provides Tier 1 values for a range of potential contaminants for the site; for a commercial end use.

	Residential with Homegrown Produce.		Residential without Homegrown Produce.		Commercial Industrial with Landscaping	
Active Pathways	• Direct Ingestion • Dermal Contact • Consumption of Vegetables and Attached Soil • Inhalation of Indoor Vapour and Dust • Inhalation of Outdoor Vapours and Dust		• Direct Ingestion • Dermal Contact • Inhalation of Indoor Vapour and Dust • Inhalation of Outdoor Vapours and Dust		• Direct Ingestion • Dermal Contact • Inhalation of Indoor Vapour and Dust • Inhalation of Outdoor Vapours and Dust	
Critical Receptors	Female Child 0-6yrs Old		Female Child 0-6yrs Old		Female Adult Worker >17 years old.	
Determinand/Units	mg/kg	Source	mg/kg	Source	mg/kg	Source
Arsenic	37	LQM / CIEH S4ULs	40	LQM / CIEH S4ULs	640	LQM / CIEH S4ULs
Cadmium	11	LQM / CIEH S4ULs	85	LQM / CIEH S4ULs	190	LQM / CIEH S4ULs
Mercury (inorganic)	40	LQM / CIEH S4ULs	56	LQM / CIEH S4ULs	1,100	LQM / CIEH S4ULs
Nickel	180	LQM / CIEH S4ULs	180	LQM / CIEH S4ULs	980	LQM / CIEH S4ULs
Selenium	250	LQM / CIEH S4ULs	430	LQM / CIEH S4ULs	1,200	LQM / CIEH S4ULs
Chromium III	910	LQM / CIEH S4ULs	910	LQM / CIEH S4ULs	8,600	LQM / CIEH S4ULs
Chromium VI	6	LQM / CIEH S4ULs	6	LQM / CIEH S4ULs	33	LQM / CIEH S4ULs
Lead	450	C4SLs	450	C4SLs	750	C4SLs
Copper	2,400	LQM / CIEH S4ULs	7,100	LQM / CIEH S4ULs	68,000	LQM / CIEH S4ULs
Zinc	3,700	LQM / CIEH S4ULs	40,000	LQM / CIEH S4ULs	730,000	LQM / CIEH S4ULs
Boron	290	LQM / CIEH S4ULs	1100	LQM / CIEH S4ULs	240,000	LQM / CIEH S4ULs

Consulting Tier 1 Values Version 1 - CLEA 2009 (Software Version 1.06)

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Standard Land Use Scenario	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Source
Determinand/SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	
Naphthalene	*2.3*	*5.6*	*13*	*2.3*	*5.6*	*13*	*190*	*460*	*1100*	LQM / CIEH S4ULs
Acenaphthylene	170	420	920	2900	4600	6000	83000	97000	10000	LQM / CIEH S4ULs
Acenaphthene	210	510	1100	3000	4700	6000	84000	97000	10000	LQM / CIEH S4ULs
Fluorene	170	400	860	2800	3800	4500	63000	68000	71000	LQM / CIEH S4ULs
Phenanthrene	95	220	440	1300	1500	1500	22000	22000	23000	LQM / CIEH S4ULs
Anthracene	2400	5400	1100	31000	35000	37000	520000	540000	540000	LQM / CIEH S4ULs
Fluoranthene	280	560	890	1500	1600	1600	23000	23000	23000	LQM / CIEH S4ULs
Pyrene	620	1200	2000	3700	3800	3800	54000	54000	54000	LQM / CIEH S4ULs
Benzo(a)anthracene	7.2	11	13	11	14	15	170	170	180	LQM / CIEH S4ULs
Chrysene	15	22	27	30	31	32	350	350	350	LQM / CIEH S4ULs
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	44	44	LQM / CIEH S4ULs
Benzo(k)fluoranthene	77	93	100	110	110	110	1200	1200	1200	LQM / CIEH S4ULs
Benzo(a)pyrene	*2.2*	*2.7*	*3*	*3.2*	*3.2*	*3.2*	*35*	*35*	*35*	LQM / CIEH S4ULs
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	LQM / CIEH S4ULs
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	3.5	3.6	3.6	LQM / CIEH S4ULs
Benzo(ghi)perylene	320	340	350	360	360	360	3900	4000	4000	LQM / CIEH S4ULs
Benzene	*0.087*	*0.17*	*0.37*	*0.38*	*0.7*	*1.4*	*27*	*47*	*90*	LQM / CIEH S4ULs
Toluene	*130*	*290*	*660*	*880*	*1900*	*3900*	*55,600*	*11000*	*18000*	LQM / CIEH S4ULs
Ethylbenzene	*47*	*110*	*260*	*83*	*190*	*440*	*5,700*	*13000*	*27000*	LQM / CIEH S4ULs
Xylenes	*56*	*130*	*310*	*79*	*180*	*430*	*5,900*	*14000*	*30000*	LQM / CIEH S4ULs
Aliphatic C5-C6	*42*	*78*	*160*	*42*	*78*	*160*	*3200*	*5900*	*12000*	LQM / CIEH S4ULs

Standard Land Use Scenario	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Source
Aliphatic C6-C8	*100*	*230*	*530*	*100*	*230*	*530*	*7800*	*17000*	*40000*	LQM / CIEH S4ULs
Aliphatic C8-C10	*27*	*65*	*150*	*27*	*65*	*150*	*2000*	*4800*	*11000*	LQM / CIEH S4ULs
Aliphatic C10-C12	*130*	*330*	*760*	*130*	*330*	*770*	*9700*	*23000*	*47000*	LQM / CIEH S4ULs
Aliphatic C12-C16	*1100*	*2400*	*4300*	*1100*	*2400*	*4400*	*59000*	*82000*	*90000*	LQM / CIEH S4ULs
Aliphatic C16-C35	*65000*	*92000*	*110000*	*65000*	*92000*	*110000*	*1600000*	*1700000*	*1800000*	LQM / CIEH S4ULs
Aliphatic C35-44	*65000*	*92000*	*110000*	*65000*	*92000*	*110000*	*1600000*	*1700000*	*1800000*	LQM / CIEH S4ULs
Aromatic C5-C7	*70*	*140*	*300*	*370*	*690*	*1400*	*26000*	*46000*	*860000*	LQM / CIEH S4ULs
Aromatic C7-C8	*130*	*290*	*660*	*860*	*1800*	*3900*	*56000*	*110000*	*180000*	LQM / CIEH S4ULs
Aromatic C8-C10	*34*	*83*	*190*	*47*	*110*	*270*	*3500*	*8100*	*17000*	LQM / CIEH S4ULs
Aromatic C10-C12	*74*	*180*	*380*	*250*	*590*	*1200*	*16000*	*28000*	*34000*	LQM / CIEH S4ULs
Aromatic C12-C16	*140*	*330*	*660*	*1800*	*2300*	*2500*	*36000*	*37000*	*38000*	LQM / CIEH S4ULs
Aromatic C16-C21	*260*	*540*	*930*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Aromatic C21-C35	*1100*	*1500*	*1700*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Aromatic C35-C44	*1100*	*1500*	*1700*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Aromatic+aromatic EC>44-70	*1600*	*1800*	*1900*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Phenol	280	550	1100	750	1300	2300	760	1500	3200	LQM / CIEH S4ULs
Cyanide	527			527			1400			*CLEA 2009*

Standard Land Use Scenario	Residential with Homegrown Produce	Residential without Homegrown Produce	Commercial	Source
PCBs	1.7	1.8	1.8	*CLEA 2009*

5.0 REMEDIATION STRATEGY

5.1 Aims

This report contains a summary of the findings of the previous investigations and the risk assessment carried out, and then uses the risk pathways identified to define clear remediation objectives which must be met to allow the site to be developed without significant risk to human health or the wider environment. The various options for achieving these objectives are explored and a preferred strategy is arrived at and presented.

This detailed Remediation Strategy is intended to confirm the preliminary recommendations made are appropriate, refine these into a final implementation plan and provide additional detail regarding the verification programme for the works.

If any unexpected contamination is encountered, then it will be necessary to characterise the source and submit the results of the supplementary investigations and assessments, and confirmation whether these require any amendments to the proposed scheme (as set out in this report).

This strategy does not provide estimates of volumes of material requiring excavation, haulage, treatment, storage, placement or disposal. The factual information provided in the site investigations may provide assistance in determining costs for the remediation programme, however estimating quantities to allow costing of works is outside the scope of this assessment.

As such the aims of this remediation strategy are the following:

- Resolve any potential and identified contamination issues in order to protect environmental receptors and render the site suitable for the proposed development.
- Satisfy the Environmental Agency and the Local Planning Authority with regards to soil and groundwater contamination.
- Provide a stable development platform (to agreed levels and gradients) for subsequent construction of the proposed development and associated infrastructure.

5.2 Overview

Potential risks to human health associated with the identified contamination by metals and low level asbestos contamination have been identified; in the case of asbestos the contaminant is a non-threshold substance (one for which there is no minimum exposure threshold) without any recognised soil guideline value or other risk-based assessment criteria so there is a general requirement to minimise exposure to as low as is reasonably practicable. Other low-mobility contaminants may also be present although not at concentrations likely to pose significant risks to human health under the development scenario under consideration.

Proposed scope of works summary:

- Excavation and segregation of surface tarmac.
- Breakout and removal of slabs, hardstanding, roads and below ground structures (where necessary) and replacement with appropriate soil materials in line with DOT Series 600 Department of Highway Works.
- Crushing of all suitable artificial hard material and obstructing relic infrastructure (i.e. concrete/tarmac, brick, concrete etc).
- Provision of a piling mat in line with BRE470 Working Platforms for Tracked plant (where necessary).
- Placement of clean soil cover in landscaped areas.

- Protection and re-routing of site services (if necessary).
- Part-time supervision of the works by a suitably qualified engineer to include detailed records, testing requirements, etc.
- Validation of the remediated site in the form of a detailed Completion Statement confirming that the works set out in this document and agreed were completed and that the site is suitable for its intended use.

5.3 Site Setup, Organisation and Safety

Site works should be supervised when only deemed suitable by the contractor, by a suitably qualified Engineer, who will report to a Project Manager. Supervision may be part time for certain activities but must be full time if any grossly contaminated soil/fill is identified during construction works.

Site cabins and welfare provisions should be provided in accordance with the HSE Guidelines by the appointed Contractor.

All personnel shall undergo a site-specific health and safety induction prior to commencement of work on site.

The Engineer should be informed prior to any proposed entry to a confined space or deep excavation. Entry must be restricted to a suitably qualified and equipped person and supervised at all times.

Works will be carried out with the proper regard to the following standards:

- Health and safety at work act 1974
- Management of Health and safety at work Regulations 1999
- Construction (Health, Safety and Welfare) Regulations 1994
- Construction (Head Protection) Regulations 1998
- Provision and Use of Work equipment Regulation 1998
- Lifting Operations and Lifting Equipment Regulations 1994
- Construction (design and management) Regulations 1994
- Health and Safety Executive "Protection of Workers and the general public during the redevelopment of Contaminated Land", HS(G)66, HMSO 1991
- The Control of Substances Hazardous to Health Regulations 1994
- Any successive legislation to the above

During any remediation works, all personnel on site will comply with guidance provided in the Health and Safety Executive (HSE) document "Protection of Workers and the general public during the redevelopment of Contaminated Land". In summary, the following should be provided by the appointed contractor if contamination is found during the construction works:

- Protective clothing, footwear, glasses and gloves. (Personnel should be instructed in why and how they are to be used).
- Disposable coveralls should be provided where appropriate.
- Handwashing, eye-washing and boot-washing facilities.
- Smoking shall be limited to designated areas.

If at any time during the works personnel begin to feel unwell, they are to inform the Site Manager/Engineer, who will determine appropriate action.

All visitors to the site must enter and register at the main site contractor's office.

5.4 Contractor's Responsibilities

Prior to the commencement of any works the Contractor, in agreement with their appointed Engineer, shall:

- Satisfy requirements of the Client's contract documentation.
- Establish the boundaries of the site and the working areas
- Liaise with Local Authority regarding working hours, noise/dust/odour control, and protected trees.
- Liaise with the Local Water Company prior to any proposed discharge to local sewers.
- Complete a full services search and liaise with all relevant utility companies regarding work in close proximity to existing services.
- Prepare a detailed method statement outlining how the objectives in the Remediation Strategy are to be achieved to be agreed with both the client and consultant.
- Prepare any necessary COSSH statement and Health and Safety Plan in accordance with current CDM regulations.
- Provide and erect secure Herras-type fence to protect site and any remedial activities and discourage entrance by the general public.
- Provide the engineer with consignment notes and Waste management tip tickets and records

The Contractor shall satisfy the HSE with regards to all matters concerning health, safety and the welfare of personnel on site.

The contractor shall insure that:

- Personnel, plant, materials and other equipment related to the contract are confined within the boundaries of the site.
- Any live services lying within the site boundary are clearly marked and protected or appropriated arrangements have been made to truncate them.
- Good practise relating to personal hygiene are adopted.
- Suitable precautions are taken to prevent the spread of soil and debris onto public roads.
- Suitable precautions are implemented to prevent offsite migration of any found pollutants via airborne dust and vapours.
- Refuelling of mobile plant is undertaken in a designated area. Above ground fuel storage tanks shall comply with the requirements of the Pollution Prevention Guideline PPG2. A spill kit shall be kept adjacent to any fuel storage area.

5.5 Engineering Supervision and Verification

The Engineer shall ensure that the requirements of the Remediation Strategy are complied with in a safe and orderly manner.

The responsibilities of the Engineer shall include but are not limited to the following:

- Retrieval of soil and water samples from within the made ground and the subsequent scheduling of appropriate laboratory analysis to enable validation of various aspects of the works, and to advise the project manager of progress and unforeseen occurrences.
- Liaise with statutory authorities as required by the contractor.
- Liaise with Client as required.

When onsite, the Engineer will maintain a record of the works to include the following:

- Daily record sheets and summary of the day's activities.
- Date and weather conditions
- Test results

All areas of reduced excavation should be recorded by the use of digital photography of the excavation with a suitable scale indicator (such as survey staff) prior to backfilling. All

photographs should include landmarks or other indicators proving their geographical location and indicate the entire area of backfilling, as well as detailed assessments of banks and boundaries.

On satisfactory completion of the works the Engineer will provide a verification report outlining and including the following:

- A summary of the desk study, site investigation report.
- A summary of the preparatory works undertaken and remediation strategy.
- Details of who carried out the respective remedial works.
- Details and justification of any changes from the original remediation strategy, including unforeseen ground conditions.
- Copies of any correspondence with Regulators relating to specific aspects of remedial works.
- Substantiating validation data included as follows:
    - Laboratory and in-situ test results (Geotechnical and Chemical)
    - Chemical test results relating to clean up criteria
    - Representative plans depicting treated areas and any amendments to strategy as a result of finding further contamination (if necessary).
    - Photographic records
    - Waste management tip tickets and records
- Recommendations with regards to the handling of contaminated soils.

The remedial recommendations will be produced in accordance with results obtained for the remediation strategy investigation and thus may differ significantly from the recommendations originally presented in the site investigation report.

5.6 Removal of Below Ground Obstructions

Numerous Made Ground and cobble/boulder obstructions were encountered within the upper 2.0m within many exploratory hole locations. Made Ground obstructions were noted to comprises concrete and tarmac features thought to represent historic road and cellar features.

Obstructions in the form of boulders, in-situ residential housing relic foundations and infrastructure, associated with the former site uses, should be anticipated. These materials will require 'grubbing out' and treatment (screening, crushing, segregation and reuse where appropriate) on site as part of the site preparation. Unsuitable materials will require removal from site to suitably licensed waste management facility.

Where relict structures are found to retain fluid contaminants, they shall be drained and removed from site. The engineer should be notified to ensure that the appropriate action is taken, and records made for final validation.

Deep excavations for the removal of structures etc will be unstable in the short term and side support may be necessary.

Suitable materials derived from the grubbing-up shall be stored in a location on site, to be agreed with the engineer, prior to crushing. Any unsuitable materials shall be removed to a suitable licensed landfill site as stipulated within the earthwork's specification.

5.7 Contamination

Although unlikely, areas of potential contamination, not identified in the site investigation, may be encountered during the remedial works. The contractor should stop works, notify the Engineer immediately providing reasonable notice for site attendance.

Any grossly contaminated soil/fill found during construction works shall be placed in temporary stockpiles on hardstanding or high density Visqueen and be suitability covered to minimize the

potential for dust/odour nuisance and prevent surface water runoff. Samples of arisings material will be taken to determine whether this material is suitable for re-use on site following crushing in line with the earthwork's specification.

Should any visual or olfactory evidence of contamination be identified during the removal of below ground obstructions and the turning over of made ground appropriate samples shall be taken by the Engineer for chemical analysis. The Engineer should check the nature of materials excavated for visual and olfactory evidence of contamination throughout the remedial works. Depending on the results, the excavated materials shall either be returned to the works beneath the proposed cover system or disposed of, off-site to a suitable licensed facility.

Excavations should not be left open for longer than necessary, should be safely battered back and should be securely cordoned-off using 2m high Herras-type fencing, with appropriate warning signs whenever excavations works are suspended.

5.8 Control of Water

During the removal of below ground obstructions and the excavation through of the made ground, perched water may be encountered.

Groundwater shall be control in accordance with CIRIA report 113 "Control of Ground Water to Temporary Works".

Arrangements should be made to prevent ponding in any excavation, the Contractor shall ensure that ground levels are of sufficient gradient to enable the collection of surface water run-off in sumps or grips.

Any potentially contaminated water shall not be allowed to migrate into other areas until the results of the analysis are available and, if required, a suitable means of water treatment has been agreed.

Pumping from over excavated sumps may be required to maintain satisfactory working conditions.

5.9 Exported to Landfill

Any soils to be exported from site should be allocated an appropriate waste code, following the steps within Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste 2015.

The results appended to this document indicate that the samples tested are likely to be classified as NON-HAZARDOUS WASTE. This should be confirmed by the appointed waste management contractor following submission of all available test results carried out at the site to date.

Any material exported from the site to landfill should be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations, 1991 and the Landfill (England and Wales) Regulations 2005.

A transfer note should then be completed, signed and retained by the parties involved. The transfer note should include the volume of waste, the nature of the material and a statement of its chemical composition, details of the source and destination sites, and details of the haulier.

In order to protect the general public from dust and vapour emissions, wagons that are used for the haulage of the contaminated material from the site must be sheeted. In addition, the Contractor must ensure that no fluids seep from the wagons.

All hazardous waste going for disposal at landfills must be classified according to the new European Waste Catalogue (EWC)

Contaminated soils are minor entries in the EWC. Waste contaminated soils may be classified as either hazardous or non-hazardous depending on the concentrations of "dangerous substance" in the waste soil. An assessment of the composition of the waste soil will therefore be undertaken to determine if it is hazardous waste.

The WAC set threshold concentrations for leachable components of the waste stream and landfill operators will have waste acceptance procedures in place to ensure that only compliant waste is landfilled. Most waste will need to be treated before it can be landfilled to reduce its quality and the hazard it presents. Leaching compliance testing will be required in accordance with BS EN 14899:2005.

5.10 Dust Control

The excavation of fill should not present a significant problem with regard to emission of dust during the excavations and transport. However, at all times during the excavation works, Best Practicable Means shall be employed to minimise dust and odour generation and their emission off site.

5.11 Controlled Waters

The superficial drift strata beneath the site are classified designated as a non-aquifer (unproductive). The site lies within a Source Protection Zone 3 (Outer Catchment) associated with an abstraction borehole situation 250m to the southwest within Royal Brewery. It is imperative that no pathways are created which results in impact of the underlying sandstone aquifer.

True groundwater levels are likely to be encountered at a significant depth and are unlikely to have an adverse impact on the site, although localised perched groundwater could be present within granular pockets within the Made Ground and Glacial till deposits.

The risk to Controlled Water receptors from leaching and groundwater migration is considered to be low.

5.12 Health and Safety during Remedial Construction

During construction works the workforce will need to adopt full HSE measures to ensure that the elevated concentrations of contaminants, established during construction works, requiring cover, treatment and/or removal are dealt with according to current guidelines and codes of practice. Suitably experienced and competent staff should be employed to carry out any on-site remediation.

Site personnel are not permitted to enter unstable excavations, nor excavations in which contamination is present, nor unsupported excavations deeper than 1.2m, in accordance with standard HSE protocols.

NX Consulting are not the Planning Supervisor for this scheme and therefore, a site pre-tender health and safety plan has yet to be made available and will not form part of this scope of works.

6.0 REQUIREMENTS FOR SUBSEQUENT SITE DEVELOPMENT

6.1 Foundation Requirements and Earthworks

The proposed ground floor plan and proposed site plan for the Base Building are presented within Appendix A. It is anticipated that site levels will not change significantly, other than removal and replacement (where appropriate) of landscaping areas surrounding the proposed structure.

The Made Ground and Glacial till deposits are considered unsuitable as an adequate founding stratum due to the possible risks of unacceptable total and differential settlements occurring and a bored pile solution is likely to be the adopted foundation solution. This should be confirmed by a suitably qualified piling contractor. A piling matt will be required in line with BRE470 Working Platforms for Tracked plant.

Unsuitable site materials will require 'grubbing out' and treatment (screening, crushing, segregation and reuse where appropriate) on site as part of the site preparation and to prevent obstruction of piled foundations. Soils and materials that cannot be reused on site, will require removal from site to suitably licensed waste management facility.

Site won and imported suitable earthworks materials will need to be classified and compacted in accordance with Table 6/1 of Department of Transport Specification for Highways Works. Any imported materials used for upfilling will require chemical validation to demonstrate that they are suitable for a commercial end use.

As a result of potential spalling and collapse within areas of deeper fill, temporary support may be necessary during service excavations and unrecorded underground services may be present beneath the site.

The earthworks designer should assess the requirement for pre-earthworks drainage that allows for temporary fill surfaces to be sealed and shaped to shed water and operational restrictions during periods of rainfall.

6.2 Management of Asbestos Impacted Soils

To protect end users from localised areas of identified asbestos contamination, it is recommended that impacted soils are delineated, excavated and either removed from site or managed in such a way as to mitigate against potential risks.

The resultant void should be backfilled with geotechnically and chemically suitable material.

Soils that are imported must be stockpiled separately to allow for validation. It is the responsibility of the Contractor and the Contractor's appointed engineers to validate the material as being suitable for use. It is crucial that the stockpiles are kept clean of any construction materials in order to prevent them being inadvertently identified as contaminated and rejected for use on site.

Samples should be submitted to the analytical laboratory for a 5-day turnaround of results. A shorter turnaround time can be achieved upon the request of the client with a surcharge fee for expedited results requests. The appointed Engineer should respond within 24 hours of receiving laboratory results from each stockpile; notifying the Contractor if the materials are suitable for their intended use. This procedure should be adopted for every stockpile brought to site for purposes of remediation and topsoil laying.

6.3 Placement of Soil Cover

To protect end users from isolated areas of lead and potential asbestos contamination, a 'clean' soil cover system (consisting of a minimum 450mm thick layer including 150mm of topsoil) is required over deposits of made ground, in all new landscaped areas.

Imported materials will require chemical and visual validation in accordance with NX Consulting's Protocol for Validation of Soil Cover Systems (presented in Appendix B) to demonstrate that they are suitable for a commercial end use and taken to depths sufficient to provide a sufficient cover system for all new landscaped areas and materials used which are capable to support root growth.

Soils that are imported must be stockpiled separately to allow for validation. It is the responsibility of the Contractor and the Contractor's appointed engineers to validate the material as being suitable for use. It is crucial that the stockpiles are kept clean of any construction materials in order to prevent them being inadvertently identified as contaminated and rejected for use on site.

Samples should be submitted to the analytical laboratory for a 5-day turnaround of results. A shorter turnaround time can be achieved upon the request of the client with a surcharge fee for expedited results requests. The appointed Engineer should respond within 24 hours of receiving laboratory results from each stockpile; notifying the Contractor if the materials are suitable for their intended use. This procedure should be adopted for every stockpile brought to site for purposes of remediation and topsoil laying.

Soils which are to be used in landscaped areas, from imported materials, will be required to have concentrations of determinands at or below the Tier 1 Values provided within Appendix A.

The Contractor must maintain adequate site records regarding imported soil including date of delivery, type of material location of stockpiles onsite, date of sampling by the Engineer, date of rejection or approval for use by the Engineer. Stockpiled materials must not be used until receipt of approvals by the Engineer.

Where any material fails the chemical criteria, it shall not be suitable for use in the capping layer. The Contractor shall make provision for the costs of sampling, testing and removal of unacceptable materials from excavations and shall make provisions for delays associated with material testing and classification prior to disposal.

6.4 Gas Protection Measures

No radon or gas protection measures are deemed necessary in the construction and therefore, validation of protection measures are deemed unnecessary.

6.5 Drainage and Services Installations

It is recommended that statutory services are consulted at an early stage, with respect to the ground conditions within which they will lay services, in order to enable them to assess at an early state any protection measures required. Barrier pipe is required in line with the UU Potable Water Risk Assessment provided within Appendix D.

Underground services, comprising BT Lines, gas mains, combined and foul sewers, CCTV and possible fibre optic cables may all impact the site and the design team and Client should familiarise themselves with their presence.

All drainage installation will encounter Made Ground. Any suitable Made Ground arisings from drainage trenches etc, if not returned to the original excavation must be placed beneath proposed hard end-use areas of the site, placed beneath a cover of suitable thickness in landscaped areas, or disposed off-site adhering to the guidelines outlined above.

6.6 Piling Risk Assessment

SELECTION OF PILING METHOD

Table 1.0 Selection of foundation solution

FOUNDATION METHOD	ADVANTAGES	DISADVANTAGES	SUITABLE FOR USE	JUSTIFICATION
Raft / Strip / Pad Foundations	Likely to limit migration of contaminated made ground through alluvial deposits to underlying aquifer	Anticipated levels of differential settlement in deep made ground within superstructure of building are deemed un-suitable. - In order to mitigate against such settlements, areas containing potentially contaminated made ground deposits will require removal and replacement in order to create suitable bearing strata. Financial implications associated with such methods as well as importation costs of clean replacement material.	**Possible**: However unacceptable levels of differential settlement associated with these methods would occur within the building's superstructure.	Based on findings of site investigation works, conventional Raft / Strip / Pad foundations have been deemed unacceptable in this instance due to the potential for un-acceptable differential settlements. Environmental and financial impacts of removing large volumes of material from site in order to improve bearing strata also make this method un-suitable for use.
Displacement Piling	Able to provide suitable foundation solution whilst minimising volumes of contaminated material off site - Nature of technique likely to minimise migration of perched ground water within made ground deposits to underlying aquifer	- Due to required founding depth, method may introduce small volumes of potentially contaminated made ground into the underlying aquifer on base and sides of pile.	**No**: Displacement piled solution unlikely to provide suitable support for proposed development.	Low risk exists of small-scale localised contamination of underlying aquifer associated with installation of pile.
Non-Displacement Piling	- Able to provide suitable foundation solution whilst minimising volumes of contaminated material off site	-Increased risk of migration from potentially contaminated perched groundwater sources due to nature of technique - Will create small volumes of potentially contaminated materials that may pose a risk to site construction personnel & require disposal from site to tip	**Yes**: Capable of supporting the structure. Risks to underlying aquifer coupled with potentially contaminated arisings make this technique typically less suitable. However, no significant concentrations of contamination recorded on site with the potential to impact the underlying aquifer.	Required to provide support for building load. Low risk of migration from contaminated perched groundwater within made ground deposits to underlying aquifer during construction.

Having established ground conditions on site and taking into account design requirements for the proposed development, an assessment of several foundation methods has been undertaken in order to establish the most suitable technique for use in this instance. The suitability of each foundation technique as well as the justification for selection of final method is provided in the following table. It should be remembered that the risks to Controlled Water receptors are deemed to be low following chemical sampling of the overlying soils.

PILING RISK ASSESSMENT

Based on the assessment discussed within Table 1.0 it is considered that a Non-Displacement Pile solution would be most suitable for use on site subject to achieving building loads from geotechnical parameters. The following potential adverse environmental impacts have been identified as posing a risk to the site from this foundation technique.

- Migration of potentially contaminative material into underling major aquifer
- Generation of spoil during formation requiring removal off site.

Assessment of Risk – Displacement Piling

Risk is normally defined by the consequences of the risk (i.e. severity) and the probability of the risk occurring. For each pollutant linkage both the probability and severity is assessed to determine whether there may be an unacceptable risk.

Risk is classified as follow:

- Low - no action required,
- Medium - some mitigation measures may be required
- High - mitigation measures definitely required.

The following table assess and summarise the potentially adverse environmental impacts associated with the selected foundation technique in terms of the Source – Pathway – Receptor model. The assessment takes into account the risks posed by the selected foundation technique as well as the information collected from previous site investigations and risk assessments completed for the site. (See Table 2.0)

Table 2.0 Piling Risk Assessment

RECEPTOR	PATHWAYS	SOURCE	LINKAGE	RISK AND JUSTIFICATION
Underlying major aquifer	Vertical migration created from formation of pile.	Soil & Groundwater contamination	Unlikely as no significant source of contamination recorded during leachate analysis. Limited groundwater recorded during site investigation works	**Low** - NX Consulting assessment identified contaminates to be of low concentration.
New Structures	Contact with made ground	Contaminated made ground deposits	Unlikely	**Low** – Ensure appropriate class of concrete is used as recommended.

APPENDICES

Appendix A – Drawings

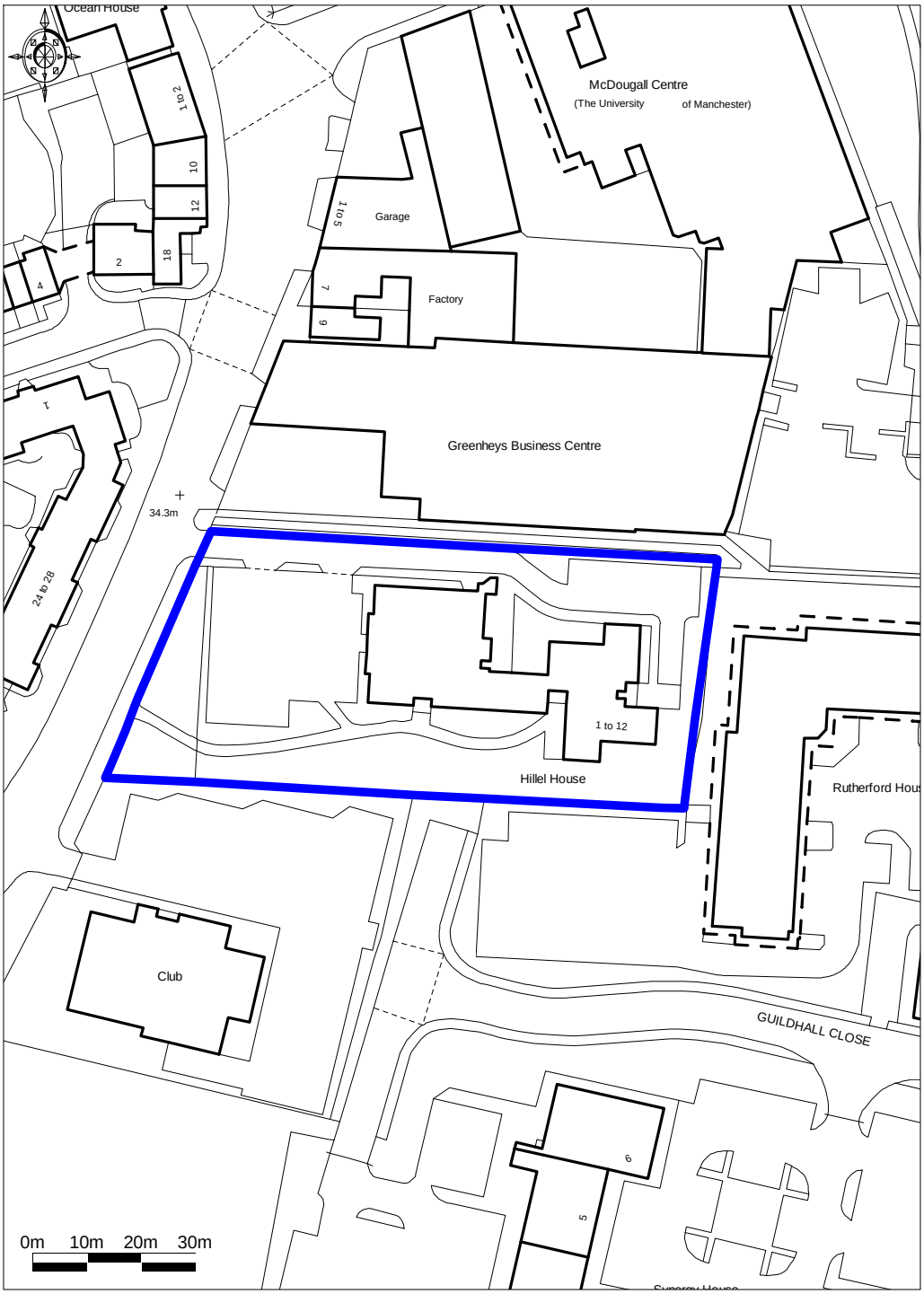
Appendix B – NX Phase 1 & Phase 2 Geoenvironmental Report & Updated Gas Monitoring

Appendix C – NX Consulting Protocol for Validation of Soil Cover Systems

Appendix D – UU Potable Water Risk Assessment

Appendix A – Drawings

Hillel House



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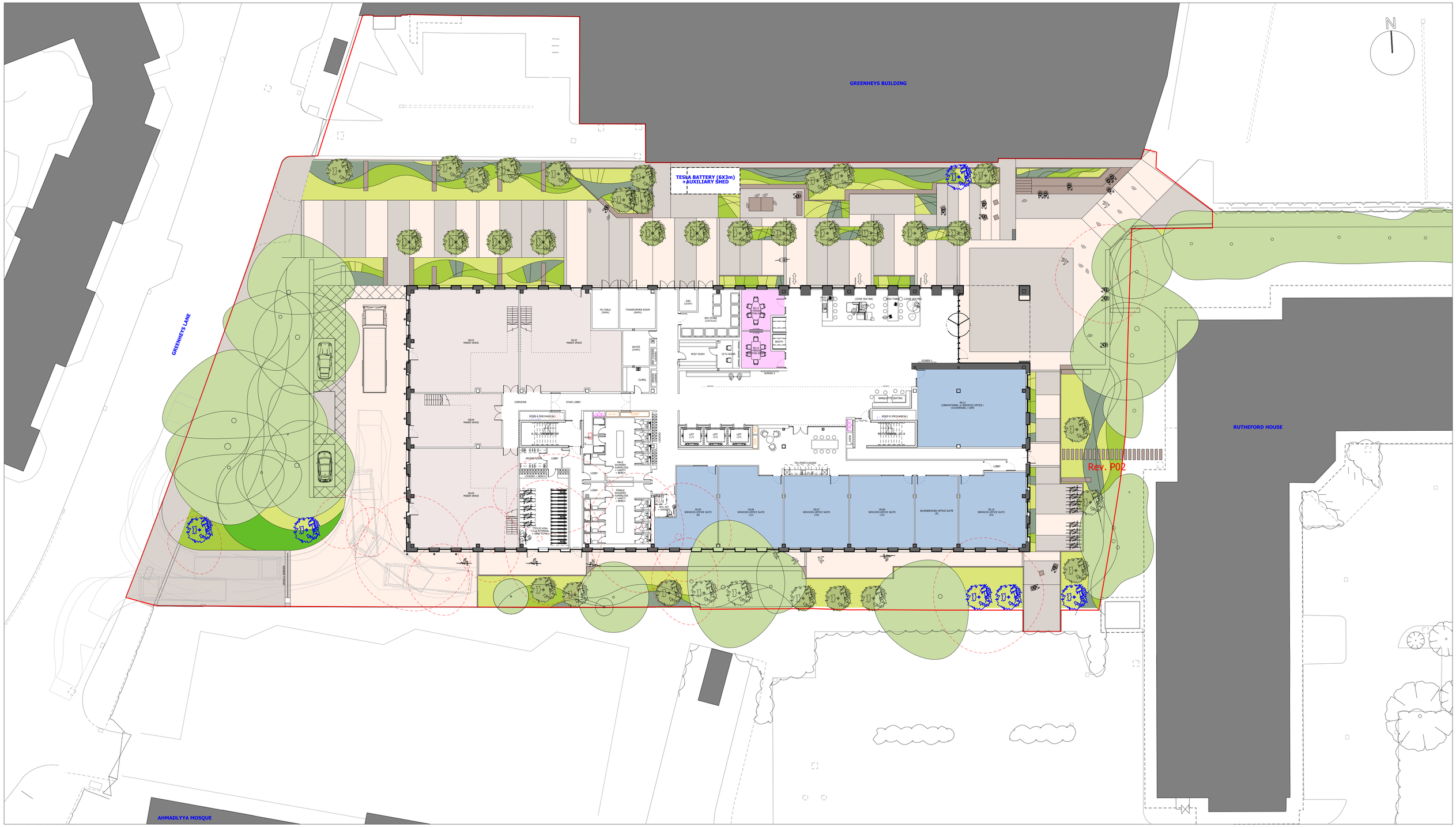

PROPOSED SITE PLAN (1:200)

Application Site Boundary

Ownership Boundary

bridge architects

address 14 Old Mill Street, Manchester, M4 6DZ **phone** 0161 879 2828 **web** www.bridgearchitects.com
directors Russell Bridge RIBA ARB Victoria Kirkpatrick ARB **company #** 07793934 **email** info@bridgearchitects.com

revision notes
rev P02 - 2019-08-15 - Application Site Boundary amended.

project	BASE, MSP	**drawing title**	Proposed Site Plan
client	Bruntwood SciTech	**drawing scale**	1:200 @ A1; 1:400 @ A3
job no.	0237	**drawing created**	August 2019
drawing no.	BA-BAR-01-XX-DR-A-05-0201	**drawing rev**	P02

PLANNING

bridge architects

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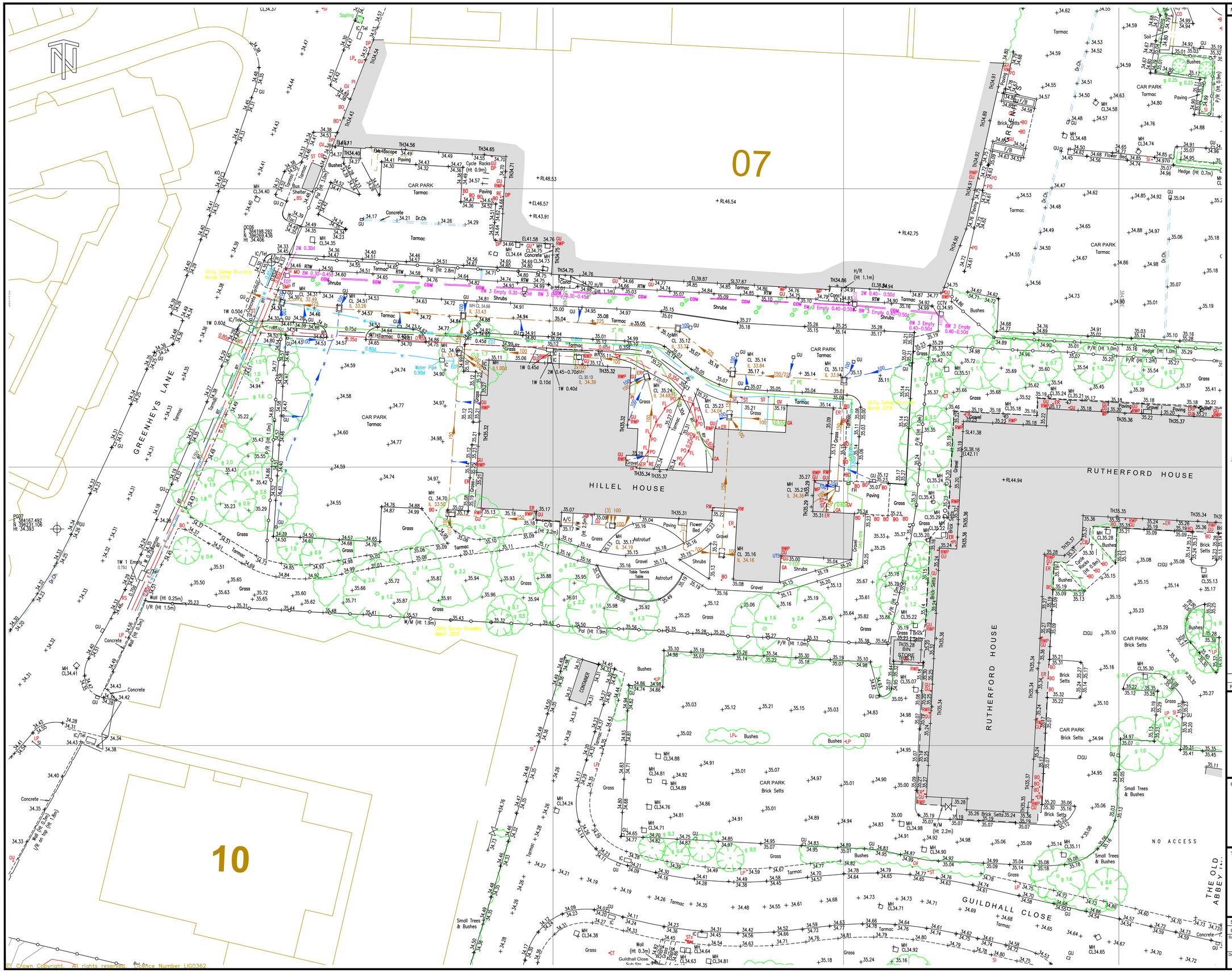


NOTES

STREET FURNITURE

A/C	- AIR CONDITIONING	LC	- LIGHTING COLUMN
AE	- AERIAL	LI	- LIGHT
AL	- ALARM	LP	- LAMP POST
AV	- AIR VALVE	MBO	- MOORING BOLLARD
BA	- BUOYANCY AID	MA	- MAST
BB	- BELISHA BEACON	MH	- MANHOLE
BD	- BUILDING DIVIDE	MO	- MONUMENT
BH	- BOREHOLE	MP	- MILE POST
BL	- BASEMENT LIGHT	MR	- MOORING RING
BO	- BOLLARD	MW	- MONITORING WELL
BP	- BOUNDARY POST	NP	- NAME PLATE
BR	- BOULDER	O/H	- OVERHEAD
BS	- BUS STOP	OSBM	- ORDNANCE SURVEY BENCH MARK
BU	- BUSH	PA	- PLAY APPARATUS
CA	- CABLE	PB	- PILLAR BOX
CB	- CONTROL BOX	PH	- PUBLIC HOUSE
CC	- CLOSE CIRCUIT TV	PI	- PIPE
CIB	- CIGARETTE BIN	PL	- PLANT
Col	- COLUMN	PM	- PARKING METER
CT	- CLOSE CIRCUIT TV POLE	PN	- PLANTER
DP	- DOWN PIPE	PO	- POST
DR	- DRAIN	PP	- PETROL PUMP
Dr Ch	- DRAINAGE CHANNEL	RH	- RIDGE HEIGHT
DU	- DUCT	RS	- ROAD SIGN
EL	- ELECTRIC	RTW	- RETAINING WALL
EP	- ELECTRICITY POLE	RWP	- RAINWATER PIPE
ER	- EARTH ROD	SA	- SEA/FANCHION
FA	- FENDOR ANCHOR	SC	- SPEED CAMERA
F/B	- FLOWER BED	SD	- SATELITTE DISH
FH	- FIRE HYDRANT	SF	- SAFETY FENCE
FL	- FLOODLIGHT	SG	- SIGNAL
FS	- FLAG STAFF	SI	- SIGN
GA	- GAS	SMP	- SERVICE MARKER POST
GM	- GAS METER	SS	- SECURITY SENSOR
G	- GIRTH	ST	- STOP TAP
GP	- GATE POST	SU	- STUMP
GU	- GULLY	SV	- STOP VALVE
GV	- GAS VALVE	SW	- SWITCHGEAR
Hyd	- HYDRANT	SY	- STAY
IC	- INSPECTION COVER	TA	- TAP
IT	- TRAFFIC COVER	TBM	- TEMPORARY BENCH MARK
JB	- JUNCTION BOX	TCB	- TELEPHONE CALL BOX
JO	- JOINT OFFSET	TE	- TELEPHONE
LA	- LADDER	TM	- TRAFFIC MACHINE
LB	- LITTER BIN	TS	- TRAFFIC SIGNAL
		TP	- TELEGRAPH POLE

HEDGE | GATE | BUILDING | TREE CANOPY | CONTROL STATION | TACTILE PAVING | TREE

UNDERGROUND SERVICE KEY

Foul/Combined water drain		Vents	
Foul/Combined drain 300Ø and above		Fuel	
Surface water drain		Offsets	
Surface water drain 300Ø and above		Vapour Recovery	
End of trace	EOT	Gauge Lines	
Electric cables		Unidentified GPR	
HV cables		Unidentified EML	
Gas		Empty Ducts	
Water		Earth Rod	
Telephone		Rising Main	
Catv			
CCTV			
Comms			
Fibre Optics			
Pipe			

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

SHEET LAYOUT

Rev	Date	Drawn	Description	Ch'k'd	App'd

N D OLIVER & CO
CHARTERED GEOMATIC SURVEYORS

Client

BRUNTWOOD
MANCHESTER SCIENCE PARK
GREENHEYS BUSINESS CENTRE
LLOYD STREET NORTH
MANCHESTER M15 6SE

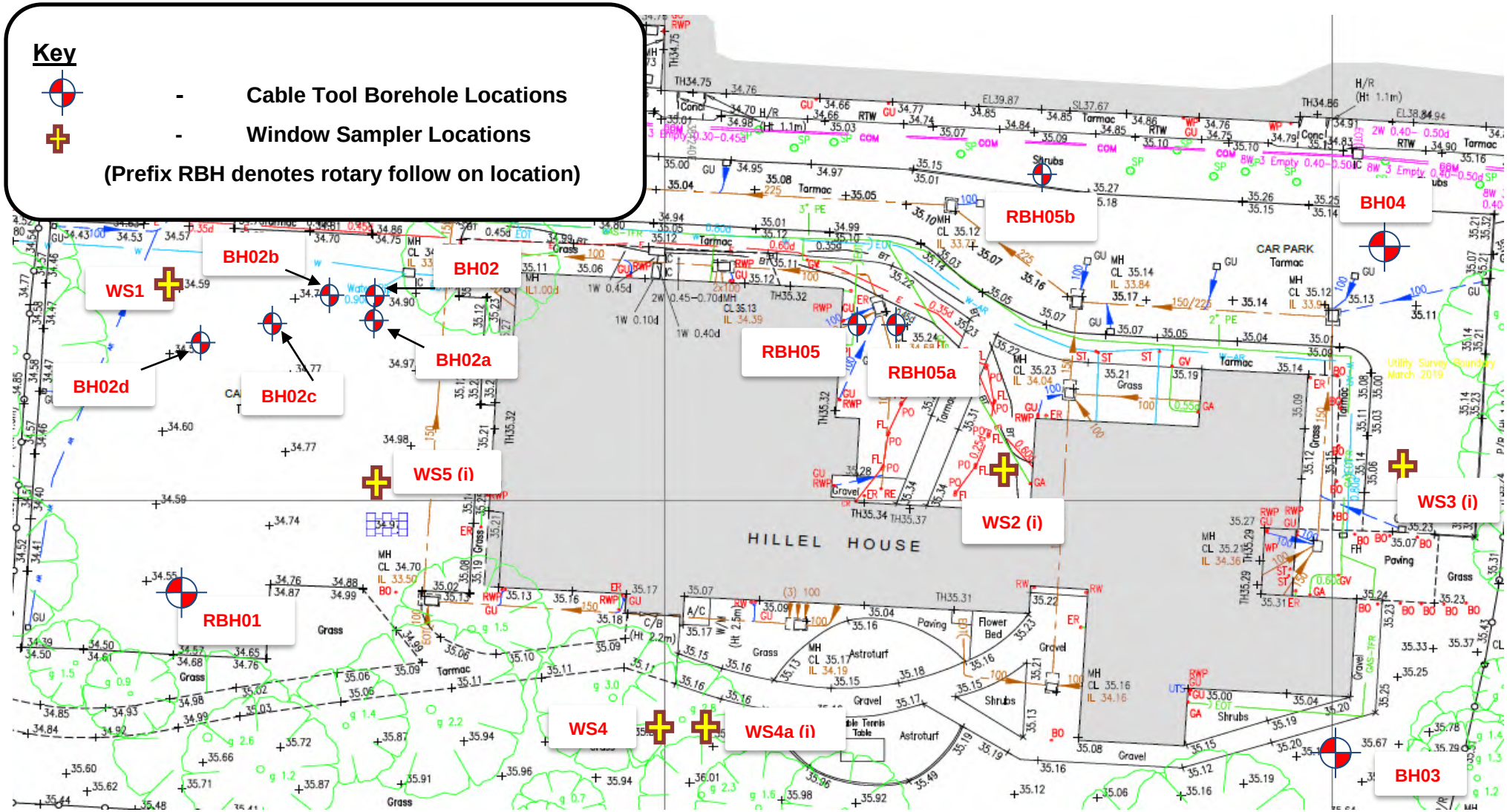
Title

MANCHESTER SCIENCE PARK
PHASE 1 - THE HUB, MANCHESTER

TOPOGRAPHICAL SURVEY

SHEET 1 OF 1

Surveyed	AU	Drawn	BW	Drawn Date:	21/03/2019
Checked	AM	Approved	NDO		
Scale 1:250 @ A1		Project 08074		Status ORIG	
		CAD File \\NDO-SBS\Projects\08074\DRAWING\08074_003.DWG			
Drawing No 08074 / 003				Rev 0	



nxconsulting
Next Generation Engineering Consultancy Services

Tel: 0161 904 0187
E-mail: admin@nxconsulting.org.uk
Web: www.nxconsulting.org.uk

Ref: NX369 Figure 1

Project:

New Base Building MSP

Title:

Proposed Indicative Exploratory Hole Location Plan

Plate 1 – RBH01 Inspection Pit Arisings

Plate 2 – BH02 Inspection Pit Arisings

Plate 3 – BH02A Inspection Pit Arisings

Plate 4 – BH02B Inspection Pit Arisings

Plate 5 – RBH05 Inspection Pit

Plate 1 – WS1 Failed Inspection Pit (Obstruction)

Plate 2a – WS2 Inspection Pit Arisings

Plate 2b – WS2 Arisings

Plate 3a –WS3 Inspection Pit Arisings

Plate 3b – WS3 Arisings

Plate 4a – WS4A Inspection Pit Arisings

Plate 4b – WS4A Arisings

Plate 5a – WS5 Inspection Pit Arisings

Plate 5b - Arisings

Plate 1 – RBH01 Core 11.00m- 14.00m

Plate 2 – RBH01 Core 14.00m – 17.00m

Plate 3 – RBH01 Core 17.00m – 20.00m

Appendix B – NX Phase 1 & Phase 2 Geoenvironmental Report & Updated Gas Monitoring

Job No:	NX369
Date:	11/12/2019
Engineer:	TDS

Site:	New Base Building Manchester
Client:	Bruntwood
Equipment:	GA2000

Next Generation Engineering Consultancy Services

WS2	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base		Barometric Pressure		Barometric Pressure
05/06/2019	0	0	0.0	0.8	19.2	0.0	0.0	0.0	0.8	19.2	0.0	0.0	2.63	2.78		999		999
13/06/2019	0	0.01	0.0	0.6	19.6	0.0	0.0	0.0	0.6	19.4	0.0	0.0	2.60	2.78		1002		1002
19/05/2019	0	0	0.0	0.2	19.8	0.0	0.0	0.0	0.2	19.8	0.0	0.0	2.61	2.78		1010		1010
21/06/2019	0	0.01	0.1	0.1	21.4	0.0	0.0	0.1	0.0	21.4	0.0	0.0	2.52	2.78		1015		1015
06/12/2019	0	0.0	0.0	0.1	21.0	0.0	0.0	0.0	0.1	21.0	0.0	0.0	2.7	2.8		1008		1008
11/12/2019	0	0.0	0.0	0.1	21.2	0.0	0.0	0.0	0.1	21.4	0.0	0.0	2.7	2.8		1001		1001

WS3	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base		Barometric Pressure		Barometric Pressure
05/06/2019	0	0	0.0	0.8	19.7	0.0	0.0	0.0	0.8	19.7	0.0	0.0	2.33	2.55		999		999
13/06/2019	0	0.02	0.0	0.7	19.8	0.0	0.0	0.0	0.7	19.8	0.0	0.0	2.30	2.56		1002		1002
19/05/2019	0	0	0.0	0.7	19.8	0.0	0.0	0.0	0.7	19.8	0.0	0.0	2.32	2.56		1010		1010
21/06/2019	0	0.01	0.1	0.1	21.4	0.0	0.0	0.1	0.0	21.2	0.0	0.0	2.16	2.56		1015		1015
06/12/2019	0	0.0	0.0	0.1	21.0	0.0	0.0	0.0	0.1	21.0	0.0	0.0	2.7	2.8		1008		1008
11/12/2019	0	0.0	0.0	0.1	21.2	0.0	0.0	0.0	0.1	21.4	0.0	0.0	2.7	2.8		1001		1001

WS4A	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base (m)	Time	Barometric Pressure	Time	Barometric Pressure
05/06/2019	0	0	0.0	1.7	19.0	0.0	0.0	0.0	1.7	19.0	0.0	0.0	dry	3.07		999		999
13/06/2019	0	0	0.0	1.5	19.4	0.0	0.0	0.0	1.5	19.4	0.0	0.0	dry	3.06		1002		1002
19/05/2019	0	0.01	0.0	1.3	19.5	0.0	0.0	0.0	1.3	19.5	0.0	0.0	dry	3.06		1010		1010
21/06/2019	0	0.01	0.1	2.6	18.9	0.0	0.0	0.1	2.6	18.9	0.0	0.0	dry	3.06		1015		1015
06/12/2019	0	0.0	0.0	2.1	19.0	0.0	0.0	0.0	2.1	19.0	0.0	0.0	dry	3.04		1008		1008
11/12/2019	0	0.0	0.0	1.8	19.1	0.0	0.0	0.0	1.8	19.1	0.0	0.0	dry	3.04		1001		1001

WS5	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base	Time	Barometric Pressure	Time	Barometric Pressure
05/06/2019	0	0	0.0	0.1	20.1	0.0	0.0	0.0	0.1	20.1	0.0	0.0	dry	2.82		999		999
13/06/2019	0	0	0.0	0.1	20.2	0.0	0.0	0.0	0.1	20.1	0.0	0.0	dry	2.81		1002		1002
19/05/2019	0	0.02	0.0	0.1	20.1	0.0	0.0	0.0	0.1	20.1	0.0	0.0	dry	2.80		1010		1010
21/06/2019	0	0.01	0.1	0.0	21.3	0.0	0.0	0.1	0.0	21.3	0.0	0.0	2.47	2.8		1015		1015
06/12/2019			Unable to access													1008		1008
11/12/2019			Unable to access													1001		1001

CH_4 Above the **1.0%** v/v guideline value in Waste Management Paper no 27 (WMP27).

CO_2 Above the **1.5%** v/v guideline value given in WMP27.

Date	Weather	Pressure Trend	Ground Conditions
05/06/2019	Dry	Low & falling	Damp
13/06/2019	overcast	High and falling	wet
19/05/219	Overcast	High and steady	damp
21/06/2019	sunny light drizzle	High and steady	damp
06/12/2019	Overcast	High and steady	damp
11/12/2019	sunny light drizzle	High and falling to low	Wet

Next Generation Engineering Consultancy Services

Phase 1 Geoenvironmental Desk Study and Preliminary Phase 2 Assessment for New Base Building, Pencroft Way, Manchester Science Park, Manchester M15 6SE.

Project No: 369

Client

bruntwood

DOCUMENT VERIFICATION

Report Reference: **NX369** **Issue:** Final **Date:** 19th June 2019

Written by: James Nairn
Principal Engineer (For and on Behalf of NX Consulting Ltd)

Written & Approved by: Mark Newton
Director (For and on Behalf of NX Consulting Ltd.)

Revision History

Revision	Date	Description	Reviewed by	Approved by
Issue	June 2019	Final		

Issued By:
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EXECUTIVE SUMMARY

Site Location & Access	Base Building, Manchester Science Park, M15 6SE Access to the site is gained from Greenheys Lane to the west of the site.
Grid Reference	384288E, 396140N
Site Area	Approximately 0.53 Hectares.
Site description	The site is rectangular in shape, largely level and located in the west of the wider MSP site, off Greenheys Lane. The west of the site comprises parking and landscaped areas with Hillel House currently present in the central and eastern sectors of the site. Hillel House is a 2/3-storey modern-clad structure. The site is open to the east and west with Palisade fencing and a structural brick wall baring access to the north and high wire fence is present to the south. An access road is present along the northern site boundary which enables vehicular access to the rear of the property. Peripheral light landscaping is noted around the site comprising maintained grassland and public footpaths
Geology	**Artificial Deposits** None indicated. **Drift** Glacial Till (clay, sand, gravel & silt) **Solid** Chester Pebble Bed Formation (Sandstone) **Faults** None indicated in the vicinity of the site.
Mining	The GroundSure report and the Coal Authority Gazetteer indicate that the site is within an area, which may be affected by coal mining activities. However, the risks to the site from shallow coal mining hazards are deemed to be low due to the significant cover of sandstone bedrock directly overlying coal measures strata beneath the site.
Unexploded Ordnance	1st Line Defence Ltd has assessed that there is a Low Risk from items of German aerial delivered UXO and Allied UXO across the majority of the site, with a small area of Medium Risk within the north-western section.
Flood Risk	The west of the site is located within Flood Risk Zones 2 and 3, the east of the site is stated to be located within a Zone 1 floodplain. The west of the site is stated to be at high risk from surface water flooding from rivers. The site does not benefit from Environment Agency defined flood defences. The site is at low risk from groundwater flooding.

Site History	Historical mapping shows the site to have comprised residential terraces between 1891 and c.1980. After 1980, the site appears to have been cleared and replaced by a singular structure denoted 'Hillel House' in the east of the site which is extended to its present-day arrangement c.1989. The wider area also comprised residential terraces with the wider MSP site being largely cleared during the 1960's excluding the north-western sector which retained the garages and McDougall Hall. During the 1980's the wider MSP site became home to numerous commercial structures which have remained largely unchanged to date excluding the recent development of Bright House. The residential area to the west of the site beyond Greenheys Road appears to have been cleared and redeveloped in the 1980's also.
Utility Locations	Underground services are known impact the site and the design team should familiarise themselves with their presence and implications on the development. Electricity cables are present in the western field. Services may impact the site which may have an impact upon development proposals.
Landfill Sites & Ground Gases	No current or former landfill sites have been identified within 250m of the property. The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No Radon protection measures are required.
Geotechnical Assessment	Ground conditions identified from 5no. windowless sample boreholes, 5no. cable tool percussion boreholes and 1no rotary cored borehole have identified Made Ground, to a maximum depth of 3.50m bgl, comprising black macadam overlying dark grey brown/reddish brown gravelly sands and soft-firm dark brown slightly sandy gravelly clays with concrete, timber, metal and brick noted. Numerous obstructions were encountered in the made ground which prevented advancement of several exploratory holes. Topsoil was not encountered within any exploratory hole location at the site, although it is likely to be present within landscaped areas. The Made Ground was underlain by Glaciofluvial drift and Glacial Clay deposits comprising firm sandy gravelly clay and/or medium dense clayey gravelly sand / sandy gravel were encountered where Made Ground was able to be penetrated to maximum depths of 9.80m bgl. Clays were predominantly firm to stiff, however localised deposits within BH03 were found to be soft. SPT testing indicates granular deposits to be medium dense to dense. Where proven, the bedrock was found to comprise extremely weak becoming medium strength dark reddish-brown SANDSTONE. Groundwater was recorded at depths ranging from 7.20-8.90m bgl in the gravel deposits at the base of the superficial deposits recorded.

	Based on the initial ground investigation data and proposed development, it is likely that a piled solution will be required at the site. A piling matt will be required in line with BRE 470. NHBC guidance in relation to trees should be followed, due to the presence of clay. This may require heave protection measures to be used for foundations and drainage were trees are present within influencing distance. <u>Pavement & Drainage Construction</u> An initial design CBR value of 2% is recommended for the made ground deposits. Where access roads are to be adopted, design CBR values should be confirmed by carrying out in-situ plate load tests. <u>Groundwater and Excavations</u> Whilst considered unlikely, any excavations extending below the water table would need to be dewatered in advance of the main excavation works. Sump pumps or possibly well points may be required for this. It is recommended that groundwater levels are continually monitored to enable any dewatering requirements to be identified in advance and advice should be sought from a suitably qualified hydrogeologist, to enable dewatering design. Excavation stability is likely to be good in the clay deposits but poor in the Made Ground. Excavations would need to be battered back to a suitable angle of repose or fully supported during construction. It is thought that excavations should be feasible with conventional plant but tracking heavy plant and placement of cabins, heavy equipment thought previously identified obstructions may prove problematic. A Degree of 'grubbing up' screening/crushing/replacement should be anticipated within the upper 2 to 3.00m of strata.
Contamination	Elevated concentrations of Lead were identified within Made Ground deposits within RBH01 (0.90m) whilst Chrysotile asbestos was identified within 1no. location (BH03 0.60m). It is considered that these are localised exceedences and can be delineated, excavated and managed accordingly during a phase of remediation and enabling works to mininmise risks to future site end users. The risks presented to controlled water receptors are considered to be low post construction. As a contingency measure and to protect construction workers and future end users from any unidentified asbestos contamination, we recommend that protective measures are adopted during the proposed ground preparatory works. Furthermore, we recommend that a 300mm 'clean cover system' is recommended for all new landscaped areas to protection future end users from identified and unidentified contamination. Gas monitoring to date indicates that the commercial development corresponds to Characteristic Situation 1, i.e. no specialist gas protection measures required.

	Prior to the adoption of any gas protection measures, agreement should be sought from the local authority. The results indicate that no specialist protection measures are required in relation to water supply pipework. Though a potable water risk assessment may be required by the regional utility provider. Preliminary testing suggests that site soils required will be predominantly classified as Non-Hazardous waste under current UK Waste Management Regulations, though soils impacted by asbestos will be classified as hazardous. Further confirmatory testing of soils should be undertaken prior to disposal. This report should be issued to the regulatory authorities to prevent delays in the project. A remediation strategy and validation report is likely to be required prior to discharge of any outlying planning conditions.

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1.0 INTRODUCTION

1.1 Instruction

NX Consulting Limited has been commissioned by Manchester Science Parks Limited (The Client) to conduct a phase 1 and interim Phase 2 Geoenvironmental site investigation of land at the Hub Building, Manchester Science Park, Lloyd St North, Manchester M15 6SE.

It is understood that the site is to be redeveloped with a new 5/6-storey commercial office structure with associated access roads, car parking and landscaped areas. No proposed development levels have been provided to NX Consulting as part of this assessment.

1.2 Scope of Work

The aim of any Desk Top Study is to assess the potential ground related risks at the site. To achieve the above stated aims and objectives, the following scope of works has been determined:

- Present a discussion of the current site status and key environmental influences around the site.
- Undertake and present a historical site and area review, primarily referring to old Ordnance Survey Maps.
- Present a discussion of the ground and groundwater conditions within the topographical and area context.
- Undertake preliminary data searches.
- Present a preliminary geotechnical and ground contamination assessment discussing the results of the research above, not only concerning potential on-site conditions and contamination but also with an overview of the potential for migration on or off-site with respect to the surrounding/neighboring sites.
- Present a preliminary qualitative risk assessment and make recommendations for a characterization stage of physical investigation and testing, if appropriate.

The objectives of the NX Consulting preliminary geo-environmental site investigation were as follows:

- To provide further information on ground conditions to facilitate design of buildings and infrastructure for the site.
- To conduct limited chemical analysis on collected soil and groundwater samples of Made Ground and natural soils and provide a semi-quantitative assessment of potential risks from contaminants to human health and/or controlled waters, comprising a further Refined Conceptual Model.
- Provide preliminary recommendations regarding any outline remedial measures necessary to mitigate any risks to human health or controlled waters resulting from contamination on the site; or recommendations for any further work.

The overall scope of the current work comprised 5no. windowless sample boreholes to a maximum depth of 5.45mbgl and 5no. cable percussive boreholes to a maximum depth of 9.80m bgl. Rotary Cored Borehole follow-on was undertaken within 1no. hole to a maximum depth of 20.0m bgl.

1.3 Report Layout

- Section 2 of this report provides a summary of the Phase 1 desk study findings; including the site history, as established from available public record information.
- Section 3 details the preliminary risk assessment and site investigation design.
- Section 4, 5, 6 & 7 details the intrusive investigation carried out to validate the foundation recommendations, geotechnical conditions identified by the investigation and makes recommendations in respect of foundations, pavement construction.
- Section 8 presents the records of the chemical analyses undertaken and gives the results of the qualitative risk assessment carried out using the results of the chemical analyses and taking account of the proposed end use of the site.
- Section 9 provides outlying remedial measures arising from this investigation.

1.4 Limitations

The accuracy of the data supplied by third parties should be considered in the context of any known site conditions for which NX Consulting Limited cannot be held liable.

The comments made in this report are based on the data available at the time of its completion. Any unusual or conflicting evidence discovered during any future site works must be presented to NX Consulting as soon as possible so that any implications may be considered.

This report is provided for the benefit only of the party to whom it is addressed. NX Consulting does not extend responsibility to any third party for the whole or any part of the contents. NX Consulting owes no duty of care in relation to this report to any third party. The investigation and reportage have been undertaken with all reasonable skill, care and due diligence. NX Consulting disclaims any responsibility to the client or others in respect of any matter(s) outside this agreed scope of the above works.

In addition to the above it should be noted that when investigating or developing land, sub-surface conditions might vary both spatially and over time. Whilst this investigation and subsequent interpretation has been undertaken to reasonably characterise current sub-surface conditions at the site within the scope of works and agreed budget, the absence of certain ground, contamination or groundwater conditions at the individual locations is not a guarantee that these conditions do not exist elsewhere on the site. Additional information, changes in legislation or revised practices may necessitate re-interpretation of part or all of this report.

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2.0 PHASE 1 ASSESSMENT SUMMARY

This section summarises pertinent information gained from reviewing the Groundsure Geoinsight, Enviroinsight Reports and Historical Mapping. Full copies are presented in Appendix B and C respectively.

2.1 Site Location & Setting

Table 2.1 – Site location and Setting		
Site Location	Manchester Science Park (MSP) is generally rectangular in shape, generally flat and located off Lloyd Street North, Manchester, M15 6SE. The Base Building comprises the central western sector of this wider plot of land off Greenheys Lane.	
Site Description	The site is rectangular in shape, largely level and located in the west of the wider MSP site off Greenheys Lane. The west of the site comprises parking and landscaped areas with Hillel House currently present in the central and eastern sectors of the site. Hillel House is a 2/3-storey modern-clad structure. The site is open to the east and west with Palisade fencing and a structural brick wall baring access to the north whilst a high wire fence is present to the south. An access road is present along the northern site boundary which enables vehicular access to the rear of the property. Peripheral light landscaping is noted around the site comprising maintained grassland and public footpaths.	
Grid Reference	384288E, 396140N	
Site Area	Approximately 0.53 Hectares.	
Site Setting	Surrounding area:	North: MSP Development inc. the Greenheys Building. East: MSP Development inc. the Rutherford House. South: MSP Development and Darul Amaan Mosque West: Residential.

2.2 Geology, Hydrology and Hydrogeology

Table 2.2 – Summary of Geology Hydrology and Hydrogeology	
Made Ground	On site: None recorded.
	Immediate surrounding area: Area recorded to the East of the site in the wider MSP site.
Drift Geology	On site: Glacial Till (clay, sand, gravel & silt)
	Immediate surrounding area: Glacial Till (clay, sand, gravel & silt)

Table 2.2 – Summary of Geology Hydrology and Hydrogeology	
Solid Geology	On Site: Chester Pebble Beds Formation (Sandstone)
	Immediate surrounding area: Chester Pebble Beds Formation (Sandstone)
Faults	None indicated in the vicinity of the site.
Hydrology	4m northwest - Corn Brook (Hidden River) in culvert.
Hydrogeology	Superficial deposits - Secondary Undifferentiated Aquifer Bedrock deposits - Principal aquifer.
Water Abstractions	13no. historical groundwater abstraction licences are recorded within 1000m for non-potable use. No active groundwater abstraction licences recorded within 1000m. No historical or active surface water abstraction licences are recorded within 1000m.
Source Protection Zone	The site lies within a Source Protection Zone 3 (Outer Catchment) associated with a historic groundwater abstraction <1km to the southwest within a Brewery.
Flood Risk	The west of the site is located within Flood Risk Zones 2 and 3, the east of the site is stated to be located within a Zone 1 floodplain. The west of the site is stated to be at high risk from surface water flooding from rivers. The site does not benefit from Environment Agency defined flood defences. The site is at low risk from groundwater flooding.
Shrink Swell Clays	Very low risk
Landslides	Very low risk
Ground Dissolution of soluble Rocks	Negligible risk
Compressible deposits	Negligible risk
Collapsible Deposits	Very low risk
Running Sands	Very low risk

2.3 Mining Extraction and Natural Cavities

Table 2.3 – Mining and Mineral Extraction	
Coal Mining	The GroundSure report and the Coal Authority Gazetteer indicate that the site is within an area, which may be affected by coal mining activities. However, the risks to the site from shallow coal mining hazards are deemed to be **low** due to the significant cover of sandstone bedrock directly overlying coal measures strata beneath the site.
Johnson Poole and Bloomer	The site is recorded as within 1000m of a JPB coal mining area.
Other mining	None recorded within 750m.
Brine / Gypsum extraction	None recorded within 250m.

2.5 Site History

Historical maps of the site area have been obtained from Groundsure. Pertinent information determined from review of these maps is set out in the following table; a full copy of the maps is presented in Appendix C.

Table 2.4 – Site History

Map Date	On Site Potentially Contaminative Past Uses	Off Site Potentially Contaminative Past Uses
1891 to 1980	The site comprises terraced housing between Gore Street, Orchard Street, Park Street and Greenheys Lane.	The majority of wider MSP site is covered by terraced housing. A Drill hall is situated within the northwest of site. Tramways run along Burlington Street and Carter Street which cross the site. Between 1951 and 1961 a garage is recorded adjacent to the northern site boundary becoming unspecified works till 1980.
1980 to Present Day	The terraced housing has been cleared and replaced with Hillel Houses. These are extended in 1989 and remained unchanged to the present day	The wider MSP site was largely cleared of terrace houses c.1980 being gradually replaced with large commercial properties. The unspecified works is recorded as a depot c.1980 but more recently the Greenheys Business Centre. Assorted small garages and factories are recorded to the north of this structure. A council depot is recorded in the south of the wider MSP after 1980. Housing to the west of the site is noted to be cleared and redeveloped c.1980 also.

2.5 Environmental Information

Table 2.5 – Environmental Information within 250m of the site	
Environmental permits, incidents and registers	None identified with 250m of the subject site boundary.
Landfill Sites and Other Waste Disposal Facilities (within 500m)	No recorded landfill/waste disposal facilities within 250m of the site.
Potentially contaminative land uses (within 500m)	On site: Industrial Coatings and Finishings. Within 250m of the site: Council Depot - 100m south; Electricity Substations - 20m south, 50m northwest, 60m east,150m southeast & 220m north; Vehicle Repairs and Services - 20m north; and, Unspecified factory - 60m north & 200m southwest.
Environmentally sensitive sites	None recorded within 250m of the site.
Radon	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
UXO	1st Line Defence Ltd has assessed that there is a Low Risk from items of German aerial delivered UXO and Allied UXO across the majority of the site, with a small area of Medium Risk within the north-western section.

3.0 PRELIMINARY CONCEPTUAL MODEL

The site characterisation attempts to identify potential previous and existing site sources of contamination. The conceptual model links the identified sources likely to cause significant possibility of significant harm via pathways to identified critical receptors. The conceptual model is therefore based on a number of identified source-pathway-receptor scenarios. For land to be classified as contaminated a significant pollutant linkage will need to be identified which will include each component of the conceptual model. The absence or removal of a source or interception of a pathway will 'break' the pollutant linkage.

The conceptual model is characterised by identification of the following:

- On-site sources, which may impact on-site receptors via plausible pathways.
- On-site source, which may impact off-site receptors via plausible pathways.
- Off-site sources, which may impact on-site receptors via plausible pathways.

The change of land use will require assessment of the new site development layout within the context of introducing new exposure pathways. The planning regime will require assessment of the site to ensure the new development will not be classed as contaminated land under the definition provided by the Part 2A of the Environment Act 1990 as defined in the Environment Protection Act 1995.

The preliminary conceptual model is presented overleaf:

Conceptual Site Model (CSM) and Preliminary Risk Assessment (Current & Proposed End Use)

Table 1.0 (Phase 1)

SOURCE -PATHWAY -RECEPTOR LINKAGE				QUALITATIVE RISK ASSESSMENT		
Potential Contaminant Source	**Location**	**Receptors**	**Pathways to Receptors**	**Associated Hazard (Potential Severity)**	**Likelihood of Occurrence**	**Risk***
Potential contaminants may be present beneath the site associated with significant industrial history of the site and the surrounding area. Numerous phases of demolition and redevelopment potentially resulting in unknown waste disposal. - Ash and clinker - Heavy metals, sulphates and PAHs. - Hydrocarbons - VOC/SVOC - Asbestos Containing Material (ACM), associated with post demolition.	Possibly within sub surface strata & Groundwater.	Ground water (Undifferentiated Aquifer & Principal Aquifer)	Vertical percolation to groundwater	Groundwater (Medium – pollution of sensitive water resource) No potable water abstractions recorded within vicinity of the site.	Low to moderate likelihood, Infiltration and percolation restricted by buildings, & hardstanding. Site history would indicate a high likelihood of potentially elevated mobile contaminants.	**Low/ Moderate**
		Surface Water	Lateral percolation & surface run-off to surface water	Groundwater (Medium – pollution of sensitive water resource)	Low likelihood given distance to nearest receptor	**Low**
		End user of site.	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Severe).	Low likelihood to current use of the site. Potential pathway to receptors will be restricted via full building cover and hardstanding. New development may introduce potential contaminant pathways. Further investigation/assessment required prior to development.	**Low/ Moderate**
		site workers, site workers, construction staff,	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Minor – providing suitable PPE equipment is worn)	ACM contamination recorded in previous investigations.	**Moderate to High** **Low risk (if managed and PPE equipment not worn)**
Hazardous Ground Gas associated with potential Made Ground.	Possibly within strata beneath the site/ surrounding area	End user of site (Staff and patrons)	Migration through strata and accumulation under buildings of explosive and asphyxiating gases.	Human Health (Severe)	Low likelihood. No obvious sources within 250m.	**Low/ Moderate**
		Buildings & Infrastructure		Buildings & Infrastructure (Severe)		**Low/ Moderate**

***** *Risk refers to the potential risk that the Source, Pathway, Receptor linkage is complete and is used to determine if any further investigation/measures are required. It does not indicate immediate emergency risk to any individual or feature present on the site unless specifically noted.*

4.0 FIELDWORKS

4.1 General

An intrusive investigation was carried by Taylor Drilling Services Ltd and monitored by an engineer from NX Consulting on between the 16th and 19th May 2019.

A plan showing all the exploratory hole locations is presented in Appendix A. All locations were checked for services against available service plans and scanned with a cable avoidance tool (CAT) prior to the intrusive investigation; in line with NX Consulting health and safety methodology.

4.2 Windowless Sampler Boreholes

5no. windowless sample boreholes (WS1 through to WS5) were formed to a maximum depth of 5.45mbgl.

Combined gas and groundwater monitoring wells were installed in selected boreholes. These comprised an upper 0.50m of plain pipe connected to a length of slotted pipe with a pea gravel surround. The installation was completed to enable the completion of ground gas monitoring.

Detailed Borehole log sheets are included in Appendix D.

4.2 Cable Percussive Boreholes

5no. Cable percussive boreholes (BH01 and BH05) were formed to a maximum depth of 9.80m bgl.

Detailed Borehole log sheets are included in Appendix D.

4.3 Rotary Cored Borehole

1no. rotary cored borehole (RBH01) was advanced from one of the cable percussive boreholes by use of Rotary follow on were formed to a maximum depth of 20.00m bgl.

Detailed Borehole log sheets are included in Appendix D.

4.4 Sample Collection and Analysis

Environmental sample collection was carried out in accordance with BS EN ISO 22475-1:2006. All soil and groundwater samples were collected using either clean stainless-steel utensils or clean disposable gloves and placed directly into clean containers provided by the laboratory. Samples obtained during the investigation were subjected to a range of geochemical testing at appropriate UKAS accredited laboratories. Testing was carried out in accordance with the procedures outlined in BS EN ISO14688-1:2002, 14688-2:2004, and 14689-1:2003.

5.0 GROUND CONDITIONS

5.1 Ground Conditions

Topsoil/Made Ground

Topsoil was not recorded within any exploratory hole locations.

Made Ground has been identified within all exploratory hole locations to maximum proven depths of 3.50m bgl. where deposits were able to be fully penetrated. Deposits were noted to predominantly comprise black macadam overlying dark grey brown/reddish brown gravelly sands and soft-firm dark brown slightly sandy gravelly clay with concrete, timber, metal and brick noted.

Drift deposits

Glaciofluvial drift and Glacial Clay deposits comprising firm sandy gravelly clay and/or medium dense clayey gravelly sand / sandy gravel were encountered where Made Ground was able to be penetrated to maximum depths of 9.80m bgl.

SPT 'N' values within the natural granular deposits indicate that they are loose to very dense with 'N' values ranging from 5 to 50. SPT's was carried out in the natural cohesive deposits recorded 'N' values ranging from 4 to 50 indicating that they are firm to stiff with locally soft bands present.

Bedrock deposits

Suspected bedrock was encountered within in all deeper exploratory hole locations and proven to a depth of 20.00m bgl within RBH01.

Bedrock deposits were noted to comprise a reddish-brown SANDSTONE of varying strength at depths ranging from 7.90m to 9.40m bgl.

5.2 Groundwater

Groundwater was recorded at depths ranging from 7.20-8.90m bgl in the gravel deposits at the base of the superficial deposits recorded.

5.3 Underground Service Plans

Underground services may impact the site and the design team should familiarise themselves with their presence and implications on the development. Electricity cable are present in the western field.

Services may impact the site which may have an impact upon development proposals.

5.3 Below ground obstructions

Numerous Made Ground and cobble/boulder obstructions were encountered within the upper 2.0m within many exploratory hole locations. Made Ground obstructions were noted to comprises concrete and tarmac features thought to represent historic road and cellar features.

It is likely that extensive relict features are present within the subsurface and require screening and crushing prior to replacement and compaction onsite.

5.4 Contamination

A faint hydrocarbon/organic odour was noted within BH04 between depths of 0.70-1.20m bgl.

No other visual or olfactory evidence of hydrocarbon and/or solvent contamination was identified during drilling works.

6.0 GEOTECHNICAL TESTING

6.1 Laboratory Analysis

A programme of laboratory testing was undertaken in accordance with BS 1377 (1990) "Methods of Test for Soils for Civil Engineering Purposes". The results are presented in Appendix E and are summarised below.

BS Test Number	Description
Part 2:3	Moisture Content
Part 2:5	Plasticity index
Part 2:5	Unconsolidated Undrained Triaxial Compression
Part 3:5,9	pH and Sulphate
Part 2:9	Particle Size Distribution

Moisture Content

7no. samples of sandy occasionally gravelly CLAY were tested for natural moisture content. The results are summarised below:

Property	Range	Mean
Moisture Content	17-20	18.57

Plasticity Index

7no. samples of sandy occasionally gravelly CLAY were analysed for plasticity index and hence shrinkage/swelling potential. The results of testing are summarised below:

Property	Range
Plasticity index	12% - 24%
*Amended Plasticity index	4.8% - 24%

***Amended for percentage of particles passing a 425mm sieve**

The results indicate that the gravelly sandy CLAY alluvial clay is of low to medium plasticity with a corresponding predominantly moderate volume change potential based on amended plasticity.

Unconsolidated Undrained Triaxial Compression Test

8no. samples of sandy occasionally gravelly CLAY were analysed for unconsolidated undrained triaxial compression testing. The results of testing are summarised below:

Property	Range	Mean
UCS (kpa)	80-547	233.25

Sulphate and pH

4no. samples of Made Ground and 6no. sandy slightly gravelly CLAY with occasional cobbles were analysed for pH and soluble sulphate. The results are summarised (overleaf):

Property	Made Ground Range (g/l)	Drift Range (g/l)
Sulphate as SO4	0.033 - 0.37	0.030 - 0.12
pH	7.9 - 8.9	8.1 - 8.7

Particle size distribution

8no. samples were selected for the determination of particle size distribution. The resultant grading curves have been included in Appendix E.

Point Load Testing

10no. samples of orangish brown SANDSTONE were selected for the determination of Point Load compressive testing.

Property	Range	Mean	Approximate UCS (Mpa)
Point Load	0.05 - 0.28	0.16	1.08 - 6.02

The results indicated the underlying SANDSTONE to be of very weak to moderately weak strength.

7.0 GEOTECHNICAL ASSESSMENT

7.1 General

It is understood that the proposed redevelopment will comprise the construction of a 5/6-storey commercial development with associated parking and access road.

No building loads or finished site/building levels have been provided to NX Consulting at the time of drafting this document.

Obstructions in the form of possible relic basement walls, cellar floors and possible relic street/roads were encountered in numerous boreholes; particularly around the area of BH02 between 0.30m and 2.50mbgl.

Groundwater was recorded at depths ranging from 7.20-9.60m bgl in a sandy GRAVEL band within the Glacial Till deposits.

7.2 Foundations

The Made Ground deposits are considered unsuitable as an adequate founding stratum due to the possible risks of unacceptable total and differential settlements occurring. It is recommended that foundations should be taken down through the Made Ground layers to reach competent ground beneath.

SPT 'N' refusal was encountered within the upper weathered mantle of sandstone bedrock deposits at 7.90m and 9.40m. SPT's were undertaken to enable assessment of the in-situ rock mass to be made. CIRIA Report C143 (After Stroud) provides a relationship between unconfined compressive strength (σc) and N as detailed below, suggesting that mass strengths were of the order of 0.5 - 5.0MN/m^2.

Preliminary pile calculations utilising conservative rock strengths, for a single Contiguous Flight Augur pile with a 3.2m to 5m 'rock socket' and end bearing UCS strength of 2.0 to 3.0MPa, at 12.70m & 14.5m depth, produces the following safe working loads:

BH No	Pile Diameter (mm)	Safe Working Load (SWL)	Factor of Safety (F.O.S)
RBH01	450	1000kN	2.5
RBH01	600	2000kN	2.5
RBH01	750	2600kN	2.5

Appropriate piling methods should be employed to restrict 'potential' contamination migration. It is considered that non-displacement or intruded (Continuous Flight Auger) piling methods are likely to offer the greatest environmental benefits (Environment Agency, 2001). Approval will need to be sought from the Environment Agency and a piling risk assessment derived for the proposed development.

Obstructions in the form of relic foundations, infilled cellars/basements and roads/infrastructure should be anticipated across the site. will be required to break out existing slabs/retaining walls/ground beams and cellars/basement slabs.

These materials will require 'grubbing out' and treatment (screening/crushing/segregation and reused (where appropriate) on site to prevent formation of the piled foundations and services formation.

Existing piles and possibly oversize foundation bases may be present beneath the existing building and during site preparation will need to be recorded /surveyed to enable foundations and infrastructure to the new development to be designed.

NHBC guidance in relation to trees should be followed, due to the presence of clay. This may require heave protection measures to be used for foundations and drainage were trees are present within influencing distance.

Plasticity testing indicates that cohesive soils would generally be classified as low to medium plasticity and moderate volume change potential. Heave precautions are therefore required though foundations may be required to be deepened to protect against potential heave near existing or proposed trees.

Foundations would need to be locally deepened in the vicinity of underground services. Stepped foundations should be constructed in accordance with best practice, e.g. NHBC guidance.

Foundation excavations are likely to be stable within natural cohesive deposits though may be locally loose within granular Made Ground deposits. All excavations are likely to require battering back to a suitable angle of repose and suitable support. All man entry excavations should be supported or battered back to a suitable angle of repose in any case.

Where foundations are likely to span differing strata, adequate re-enforcement should be utilised or locally deepened to found within one stratum.

7.3 Earthworks, Excavations and Groundwater

Earthworks materials should be classified in accordance with Table 6/1 of Department of Transports Specification for Highways Works.

The option for classifying soil/fill should be selected and should maximize the potential to win suitable fill from the site. Unsuitable materials will require removal from site to a suitably licensed waste management facility.

Excavation stability is likely to be good within natural clay deposits but poor within the granular Made Ground. Excavations would need to be battered back to a suitable angle of repose or fully supported during construction.

Difficult drilling conditions were encountered in the upper 2.00m which may inhibit excavation with conventional plant.

All excavations and basement construction should be conducted in line with CIRIA Report 97 – Trenching Practice and BRE 440 Foundations, Basements and External Works 2002.

Any replaced 'site won' or imported materials will again need to be compacted in a controlled manner in line with the Department of Transport, Specification for Highway Works.

Where possible all soils should be retained on site to reduce disposal costs.

Groundwater

Any excavations extending below the water table would need to be dewatered in advance of the main excavation works.

The piling contractor should be made aware of the anticipated ground conditions.

7.4 Concrete Classification

The results from the chemical laboratory sulphate and pH analysis for the site indicate concrete of Design Sulphate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) class of AC-1s should be appropriate for use at the site.

8.0 GEOCHEMICAL GROUND AND GROUNDWATER ASSESSMENT

8.1 Introduction

The preliminary conceptual site model identified that, the potential for the existence of contamination beneath the site, was low to moderate. A faint hydrocarbon/organic odour was recorded within BH04, no other visual or olfactory evidence of hydrocarbon/solvent contamination was recorded.

A limited number of selected samples of made ground and natural soils were analysed for a number of general screening tests including pH and metals, cyanide, phenols, asbestos, sulphide and speciated PAH, to confirm, or otherwise, the site's anticipated risk status.

The following contamination assessment sub-sections will discuss the identified risks associated with individual contaminant groups based on contamination testing results, undertaken on samples from the intrusive investigation.

8.2 Rationale

In May of 2008, Contaminated Land: Application in Real Environments (CLAIRE) in conjunction with the Chartered Institute of Environmental Health (CIEH), with support from the Soil and Groundwater Technology Association (SAGTA), released a document entitled 'Guidance on Comparing Soil Contamination Data with a Critical Concentration' [7].

The document provides advice on the use of statistical techniques in the assessment of soil contamination data. It forms part of a package of improved UK guidance highlighted in the Defra discussion paper 'Assessing risks from land contamination – a proportionate approach. Soil Guideline Values: the Way Forward (CLAN 06/2006). The overall aim is to increase understanding of the role statistics can play in quantifying the uncertainty attached to estimates of the mean concentration of contaminants thereby creating a more informed basis for regulatory decision-making.

The guidance presents a structured approach that can be followed when employing statistical techniques for data assessment.

In April 2012 revised Statutory Guidance stated that:

"New technical tools and advice may be developed and used to help regulators and others conform to this Guidance."

"Tools might be developed to help assessors apply the Category 1-4 Screening Levels (C4SLs) approach in relation to specific substances or situations. For example, this might include the development of generic screening levels to help assessors decide when land might be assumed to be in Category 4."

C4SLs are intended as generic screening values to help show when land is within Category 4. They describe a level of risk that whilst above 'minimal' is still 'low', providing a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated.

Current Soil Guideline Values / Generic Assessment Criteria can now be replaced with more pragmatic (but still strongly precautionary) Category 4 Screening Levels and

provide a higher simpler test for deciding that land is suitable for use and definitely not contaminated

C4SL's retained and used the CLEA framework, modified according to considerations of the underlying assumptions and science, within the context of Defra's policy background.

8.3 Soil Guideline Values

The Environment Agency's position on CLEA guidance is as follows:

"The CLEA guidance is non-statutory. It does not purport to interpret the policies or procedures of the Environment Agency and shall not operate as a statutory license, waiver, consent or approval from the Environment Agency"[9].

"The CLEA guidance describes the soil concentrations above which, in the opinion of the Environment Agency, there may be concern that warrants further investigation and risk evaluation for both threshold and non-threshold substances. These levels are a guide to help assessors estimate risk. It does not provide a definitive test for telling when risks are significant"[9].

The soil guideline value (SGV) is derived by estimating the concentration of a substance in soil, which will result in an amount of the contaminant entering the human body that is equal to the relevant Health Criteria Value(s). Revised guidance and software have been published for calculation of generic assessment criteria, which will lead to the publication of SGVs based on the new approach. New TOX and SGV reports for priority substances are due to be published after March 2009. The 'old' ten SGV reports will be replaced.

The Environment Agency and DEFRA have produced two new reports - "Human health toxicological assessment of contaminants in soil" and "Updated technical background to the CLEA model". This has led to the withdrawal of CLR7-10, which no longer reflects the current approach and formed the basis of the existing SGVs, as a result all the existing SGV reports have been withdrawn.

The publication of new substance specific TOX reports will lead to the withdrawal of the existing reports. Practitioners are expected to produce their own generic assessment criteria using the CLEA software and handbook.

8.4 Site Soils

8.4.1 NX Consulting Investigation

The chemistry analysis results, presented in Appendix F, have been compared against the Tier 1 criteria for a *residential end use with plant update* to reflect the development proposals.

The average soil organic matter was calculated to be 1.75%, for risk assessment purposes a conservative value of 2.5% has been assumed for both the Made Ground and natural strata. The average soil pH is slightly alkaline (8.3).

Concentrations of Lead above the Tier 1 thresholds were identified within Made Ground deposits in RBH01 (0.90m). Elevated concentrations of contaminants were not identified within natural soils.

Chrysotile asbestos was recorded within 1no. sample (BH03 0.60m). Quantification determined the material to be hard cementitious at concentration v/v of 0.534%.

8.4.2 Water Supply

In light of the determined low risk to controlled waters receptors and in the absence of any identified evidence of Where relevant, soil results have been compared to the threshold limits published by UKWIR to determine the potential for contaminant ingress into existing water supply pipes, if these pipes are of plastic construction.

The results indicate that no specialist protection measures are required in relation to water supply pipework.

A potable water risk assessment may be required by the regional utility provider.

8.4.3 Phytotoxicity

Phytotoxicity Guidance on the effects of metal contamination on plant growth is provided within the Ministry of Agriculture, Fisheries and Food (MAFF) Code of Good Agricultural Practice for the Protection of Soil.

Thresholds have not been exceeded within all samples analyzed within the made-ground or natural soils with respect to the end use of the site.

8.4.4 Discussion and Recommendations

The environmental chemistry results together with the findings of the intrusive investigation are consistent with the site's historical uses.

Elevated concentrations of lead and asbestos were identified within localized areas of the site. It is recommended that during the remediation and enabling works package that impacted areas are delineated, excavated and managed accordingly to minimize risks posed to future site users.

A slight hydrocarbon or organic odour was noted within BH04, though no evidence of this possible contamination was identified during chemical screening during the NX Consulting investigation.

A 300mm 'clean cover system' is recommended for all new landscaped areas to protection future end users from identified and unidentified contamination.

The risks presented to controlled water receptors are deemed to be low post construction due to the concentrations of solid analysis and significant cover of glacial till underlying the site, over the Principal Aquifer.

8.4.5 *Waste Classification*

In order to prevent excessive costs and reduce the environmental impact of the development it is recommended that removal of wastes from the site, including waste soils, is kept to a minimum. It is however, envisaged that arisings will be created during the works; in particular, within service excavations and any site reprofiling (subject to confirmation of the proposed finalised levels).

To evaluate the various on-site soils for potential offsite disposal, soils are classified in accordance with the Hazardous Waste Directive (HWD) that enables the provision of a European Waste Catalogue (EWC) Code for use during offsite disposal and a Hazardous

or Non-Hazardous Classification. Non-Hazardous material is suitable for disposal in a Non-Hazardous landfill; however, disposal to an Inert Landfill requires further Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457–3. Material classed as Hazardous also requires WAC testing to assign a suitable hazardous classification.

Testing conducted to date would indicate that any site materials to be removed off site; would likely be classified as Non-Hazardous however confirmatory testing is advised to be undertaken. However, asbestos impacted soils would be classified as hazardous should they be disposed of offsite.

The Landfill Regulations require that all Hazardous and Non-Hazardous solid waste must be treated prior to offsite disposal to landfill. You can define 'treatment' by using the following 'three-point test'. All three criteria must be satisfied for all of the waste to qualify as being treated:

1. It must be a physical, thermal, chemical or biological process including sorting.
2. It must change the characteristics of the waste.
3. It must do so in order to:
a. Reduce its volume; or
b. Reduce its hazardous nature; or
c. Facilitate its handling; or
d. Enhance recovery.

If site-won soils are to be removed from site to landfill, testing indicates these materials are likely to be predominantly classified as non-hazardous waste under current UK Waste Management Regulations. Though asbestos impacted soils would be determined to be hazardous.

It should be noted that a site investigation is unable to identify all below ground conditions at a site and therefore, it should be noted that if during construction works soils that require offsite disposal are identified as being different to what has been preliminarily tested in this report, additional testing will be required prior to disposal or recovery at a licensed offsite facility.

It is also recommended that prior to offsite disposal or recovery of any waste soils; the receiving landfill facility should be sent copies of all relevant chemical analysis and written confirmation of acceptance of soils provided.

All producers of waste have a duty of care to ensure that any waste they produce is handled safely and within the law. They must check that anyone they pass waste on to is authorised to take it. This includes the authorised site earmarked to handle the waste and any haulier (licensed waste carrier) used to transport the waste between the sites.

All waste holders must act to keep waste safe against:

1. Corrosion or wear of waste containers;
2. Accidental spilling or leaking or inadvertent leaching from waste unprotected from rainfall;
3. Accident or weather breaking open contained waste and allowing it to escape;
4. Waste blowing away or falling while stored or transported;
5. Scavenging of waste by vandals, thieves, children, trespassers or animals.

Holders should protect waste against the above risks while it is in their possession and they should also protect it for its future handling requirements. Waste should reach not only its next holder but a licensed facility or other appropriate destination without escape. It is recommended that the container used to transport the waste is suitable not only to prevent solid and liquid residues escaping, but also any potentially dangerous vapours or odours associated with the waste.

Segregation of different categories of waste where they are produced may be necessary to prevent the mixing of incompatible wastes. Segregation may assist the disposal of waste to specialist outlets. Where segregation is practiced on sites, the waste holder should ensure that his employees and anyone else handling waste there are aware of the locations and uses of each segregated waste container.

Waste handed over to another person should be in some sort of container, which might include a skip. The only reasonable exception would be loose material loaded into a vehicle and then covered sufficiently to prevent escape before being moved. Waste containers should suit the material put in them.

A waste transfer note (WTN) is a document which must accompany any transfer of waste between different holders. The purpose of a WTN is to allow other people who handle your waste to know what they are dealing with so that they can manage it safely and properly.

A WTN must be created for each load of waste that leaves the site.

The WTN must contain enough information about the waste to enable anyone coming into contact with it to handle it safely, and either dispose of it or allow it to be recovered within the law. If insufficient information is given on the WTN the responsible party may liable to be prosecuted.

Records of all waste transferred or received must keep for at least two years.

8.5 Ground Gases

8.5.1 Asphyxiant, Noxious or Explosive Gases

The preliminary risk assessment identified the risk from hazardous ground gas as low/moderate due to the presence of Made Ground onsite.

Made Ground has been proven to be present to significant depths onsite and is recorded to the east of the site though no landfill sites have been recorded within 250m of the site.

As a precaution gas monitoring has been undertaken to confirm this potential low/moderate risk.

To date 4No. rounds of ground gas monitoring have been undertaken with atmospheric pressure ranging from 999mb to 1015mb.

A summary of the soil gas monitoring results from within the commercial site development) is presented in Table 8.5.1 below and copies of the log sheets presented in Appendix G.

Table 8.5.1 – Summary of Gas Monitoring Results

Borehole Reference	Flow (l/hr)	CO2 Range (%v/v)	Max GSV (l/hr)	CH4 Range (%v/v)	Max GSV (l/hr)
WS2	<0.10	0.6-0.8	<0.05	0.0	<0.05
WS3	<0.10	0.7-0.8	<0.05	0.0	<0.05
WS4a	<0.10	1.5-2.6	<0.05	0.0	<0.05
WS5	<0.10	0.1	<0.05	0.0	<0.05

In line with CIRIA 665 Guidance on methane and carbon dioxide, the site is to be developed for a commercial end use and the ground gas investigation has identified a maximum carbon dioxide concentration of 2.6% with no flows recorded to date. The maximum-recorded concentration for methane was 0.0%. In addition, hydrogen sulphide concentrations of 0.0 ppm were recorded.

Based on the results recorded to date, identifies that GSV values fall into Characteristic Situations 1, i.e. no specialist gas protection measures required for the proposed development. The monitoring undertaken to date supports the initial conceptual model that no significant hazardous ground gas risk is likely to be posed to the development.

Prior to the adoption of any gas protection measures, the approval of the local authority should be sought to confirm the low and moderate risk status.

8.5.2 Radon

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are necessary.

9.0 PRE-REMEDIATION CONSTRAINTS AND OUTLINE REMEDIATION STRATEGY

9.1 Invasive Plants

The presence of Japanese Knotweed and/or other invasive plants was not apparent during the fieldwork; however, advice should be sought from a suitably qualified ecologist should any suspicious plant growth be encountered.

9.2 Services

Underground services, comprising BT Lines, gas mains, combined and foul sewers, CCTV, electric cables and possible fibre optic cables may all impact the site and the design team and Client should familiarise themselves with their presence. Other services may be present not identified in this assessment.

9.3 Hardstanding & Surface Cover

Photographs presented in Appendix A and the Exploratory Hole Logs presented in Appendix D shows the nature of surface cover in the area of the proposed development.

9.4 Land Condition and Outline Remediation

9.4.1 Foundations and Ground Stability

The Made Ground and localised soft clay deposits are considered unsuitable as an adequate founding stratum due to the possible risks of unacceptable total and differential settlements occurring.

Based on the initial ground investigation data and proposed structures, a piled solution is likely to be required. A piling matt will be required in line with BRE 470.

Heave precautions may be required.

Any excavations are likely to be stable within natural cohesive deposits though may be locally loose within granular Made Ground.

Site won and imported suitable earthworks materials will need to be classified and compacted in accordance with Table 6/1 of Department of Transport Specification for Highways Works.

Unsuitable materials, that cannot be reused on site, will require removal from site to suitably licensed waste management facility. Preliminary testing suggest material required to be removed from site will be classified as Non-Hazardous. Asbestos has been identified in BH03 0.60m and impacted materials which are required to be disposed offsite will be classified as Hazardous. Confirmatory testing will likely be required prior to disposal.

<u>Concrete Design</u>

The results from the chemical laboratory sulphate and pH analysis for the site indicate concrete of Design Sulphate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) class of AC-1s should be appropriate for use at the site.

<u>Groundwater & Excavations</u>

Although considered unlikely, any excavations extending below the water table would need to be dewatered in advance of the excavation works. Sump pumps or possibly well

points may be required for this. It is recommended that groundwater levels are continually monitored to enable any dewatering requirements to be identified in advance and advice should be sought from a suitably qualified hydrogeologist, to enable dewatering design.

Excavation stability is likely to be good in the clay deposits but poor in Made Ground. Excavations would need to be battered back to a suitable angle of repose or fully supported during construction.

If groundwater or surface water flows into foundation excavations, 'blinding' concrete should be used at the base of the foundation and excavations.

Unexploded Ordnance

1st Line Defence Ltd has assessed that there is a Low Risk from items of German aerial delivered UXO and Allied UXO across the majority of the site, with a small area of Medium Risk within the north-western section.

9.4.2 Contamination

The environmental chemistry results together with the findings of the intrusive investigation are consistent with the site's historical uses and present a low to moderate risk to human health receptors post construction given the localized identification of elevated lead concentrations and the presence of asbestos.

As a contingency measure and to protect construction workers and future end users from any unidentified asbestos contamination, we recommend that the following protective measures are adopted during the proposed ground preparatory works:

- All site personnel should be provided with PPE including P3 type face masks, disposable gloves, safety glasses and disposable overalls when excavations and demolition works are taking place.
- Asbestos rubble disposal sacks should be provided for disposal of used gloves and overalls etc.
- A water bowser or other dust suppression equipment shall be provided in order to dampen exposed surfaces; during the movement of plant and removal of arisings.
- Provision of personal monitors for site staff to measure individual exposure to asbestos fibres.

If asbestos fibres are found on personal monitors then risks from asbestos should be re-assessed by NX Consulting and daily boundary monitoring for potential airborne asbestos fibres carried out during vehicle movements and removal of arisings.

A 300mm 'clean cover system' is recommended for all new landscaped areas to protection future end users from identified and unidentified contamination.

Site workers involved in excavations for foundations, roads, sewers etc should adopt precautionary measures i.e. good personal hygiene, provision of suitable welfare facilities and basic personnel protective equipment.

The risks presented to controlled water receptors are deemed to be low.

Gas monitoring to date indicates that the site corresponds to a precautionary Characteristic Situation 1 measures and no specialist measures are envisaged.

We recommend that the local authority be approached to confirm the sites 'low to moderate source generating potential' and establish if further visits are required to adequately characterize the risk at the site.

Prior to the adoption of any gas protection measures, agreement should be sought from the local authority.

The results indicate that no specialist protection measures are required in relation to water supply pipework. A potable water risk assessment may be required by the regional utility provider.

Preliminary testing suggests that site soils required will be predominantly classified as Non-Hazardous waste under current UK Waste Management Regulations. Further confirmatory testing of soils should be undertaken prior to disposal.

This report should be issued to the regulatory authorities to prevent delays in the project. A remediation strategy and validation report may be required prior to discharge of any outlying planning conditions.

APPENDICES

Appendix A – Drawings & Site Photographs

Appendix B – GroundSure Information

Appendix C – Historical Mapping

Appendix D – Exploratory Hole Logs

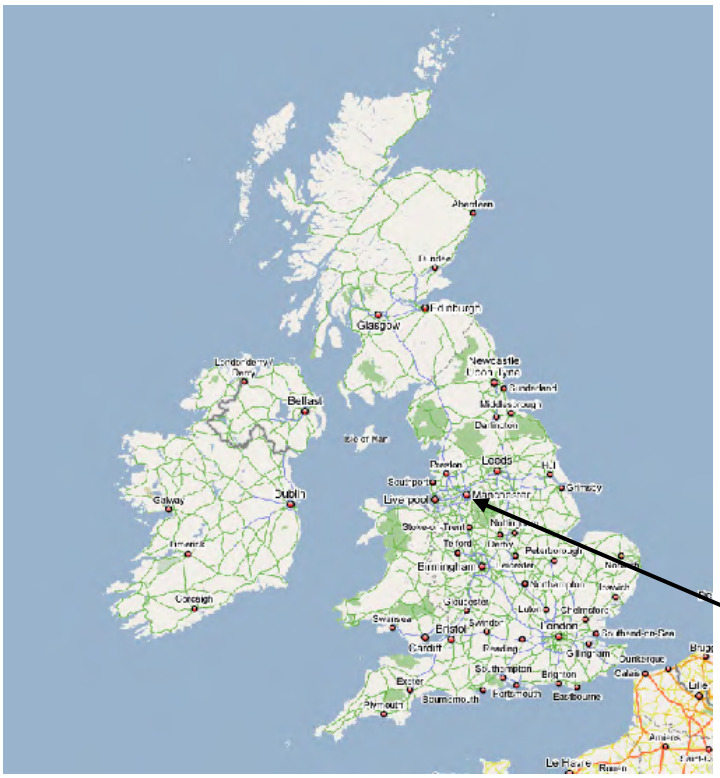
Appendix E – Geotechnical Laboratory Test Results

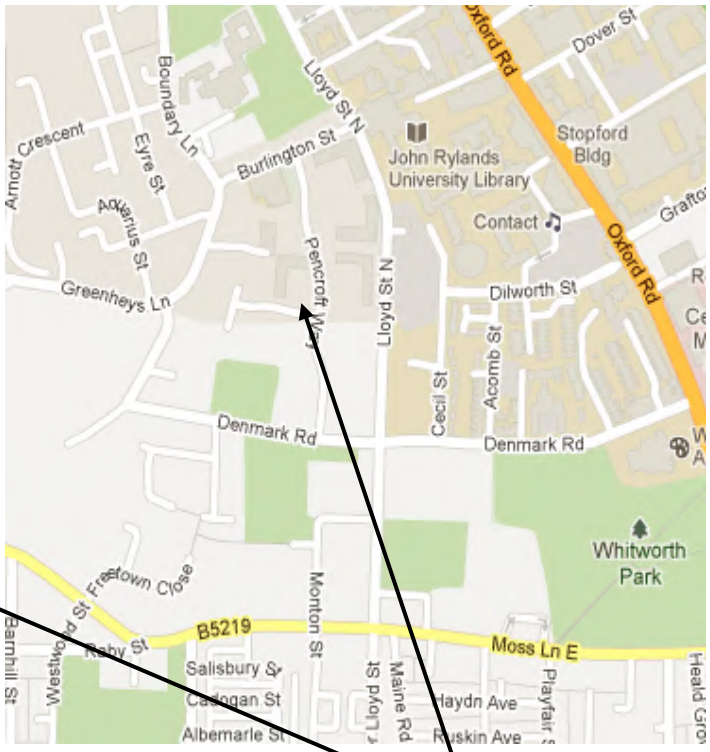
Appendix F – Chemical Test Results

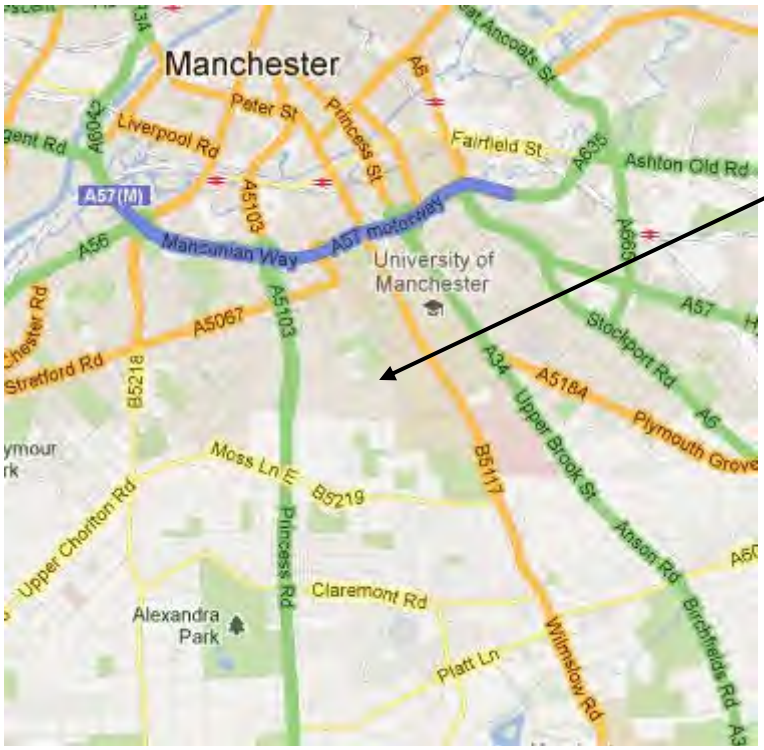
Appendix G – Gas monitoring Record Sheet

Appendix H – Conceptual Models & Risk Assessments

Appendix A – Drawings & Site Photographs







SITE

Site Centre:
OS X (Eastings) 384440
OS Y (Northings) 396280

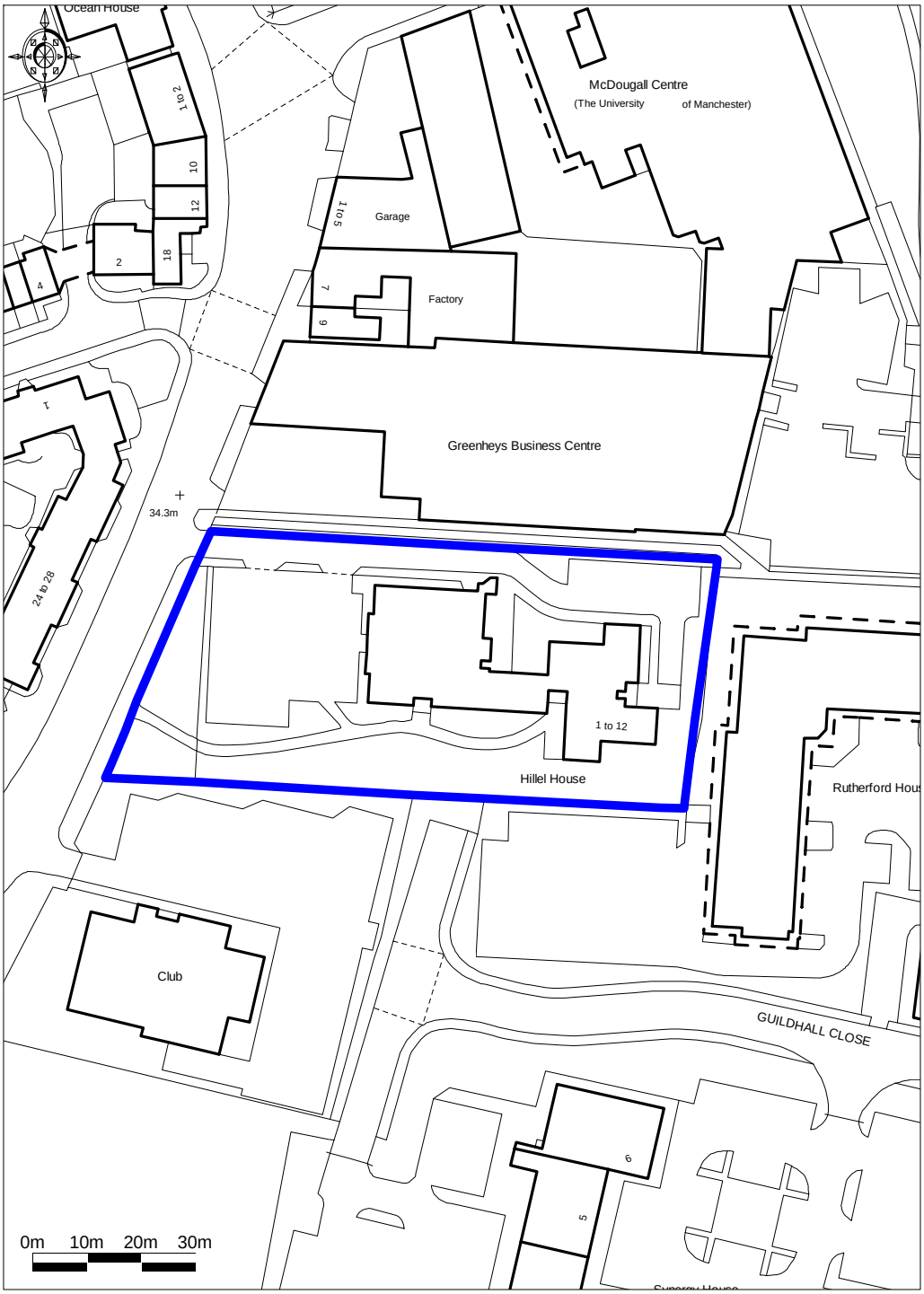
nxconsulting
Next Generation Engineering Consultancy Services
Tel: 0161 904 0187
E-mail: admin@nxconsulting.org.uk
Web: www.nxconsulting.org.uk

Ref: NX323 Figure 1

Project: Manchester Science Park

Title: SITE LOCATION MAP

Hillel House



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BASE
New-Build Office Building
Manchester Science Park

Aerial view of site

Existing Site

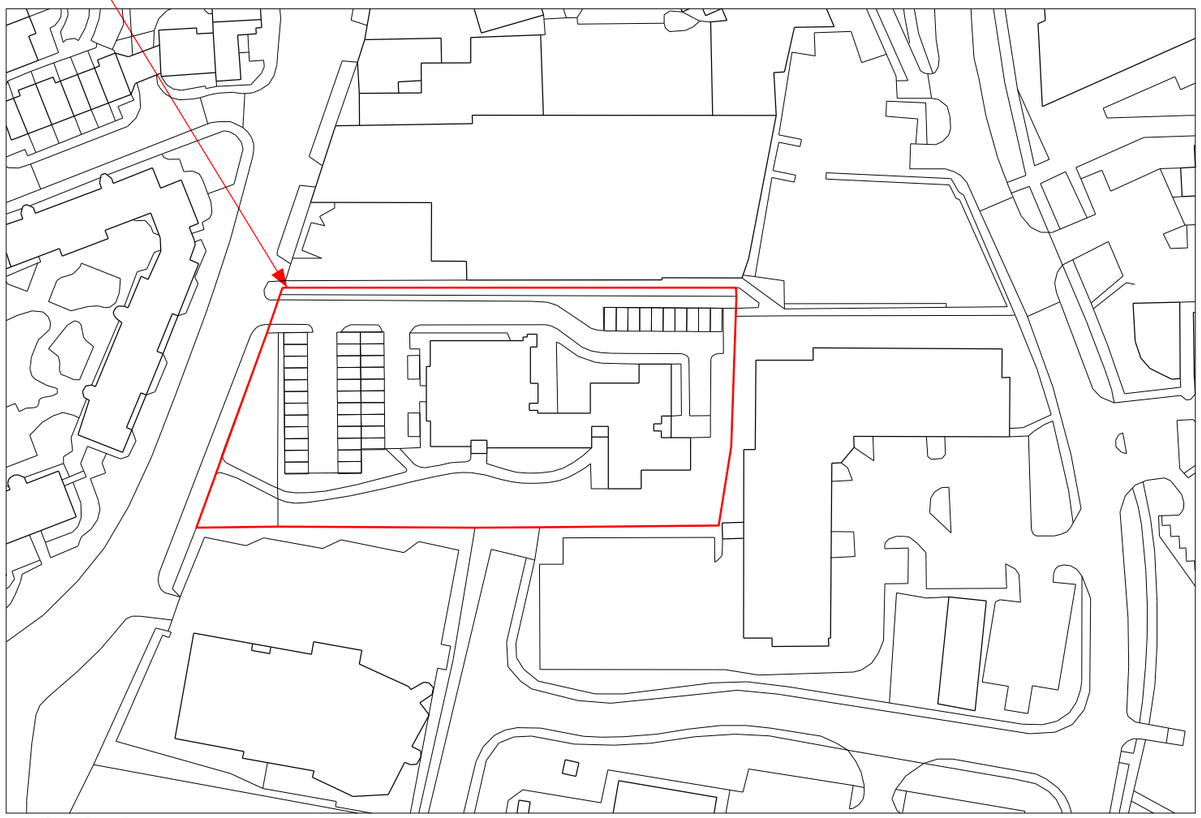
The site is effectively flat across the full extent.
The existing building on site is to be demolished.
There are 47 car parking spaces on site at present.
None of the trees are TPO'd (confirmed by MCC).

Bright building missing from aerial image

Bright Building

Photographs of surrounding buildings

Site



Existing site plan

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directors Russell Bridge RIBA ARB Victoria Kirkpatrick ARB **company #** 07793934 **email** info@bridgearchitects.com

revision notes

project	Base, MSP	**drawing title**	Existing Site
client	Bruntwood	**drawing scale**	not to scale
job no.	0100	**drawing created**	Dec 2018
drawing no.	SK003-01	**drawing rev**	-

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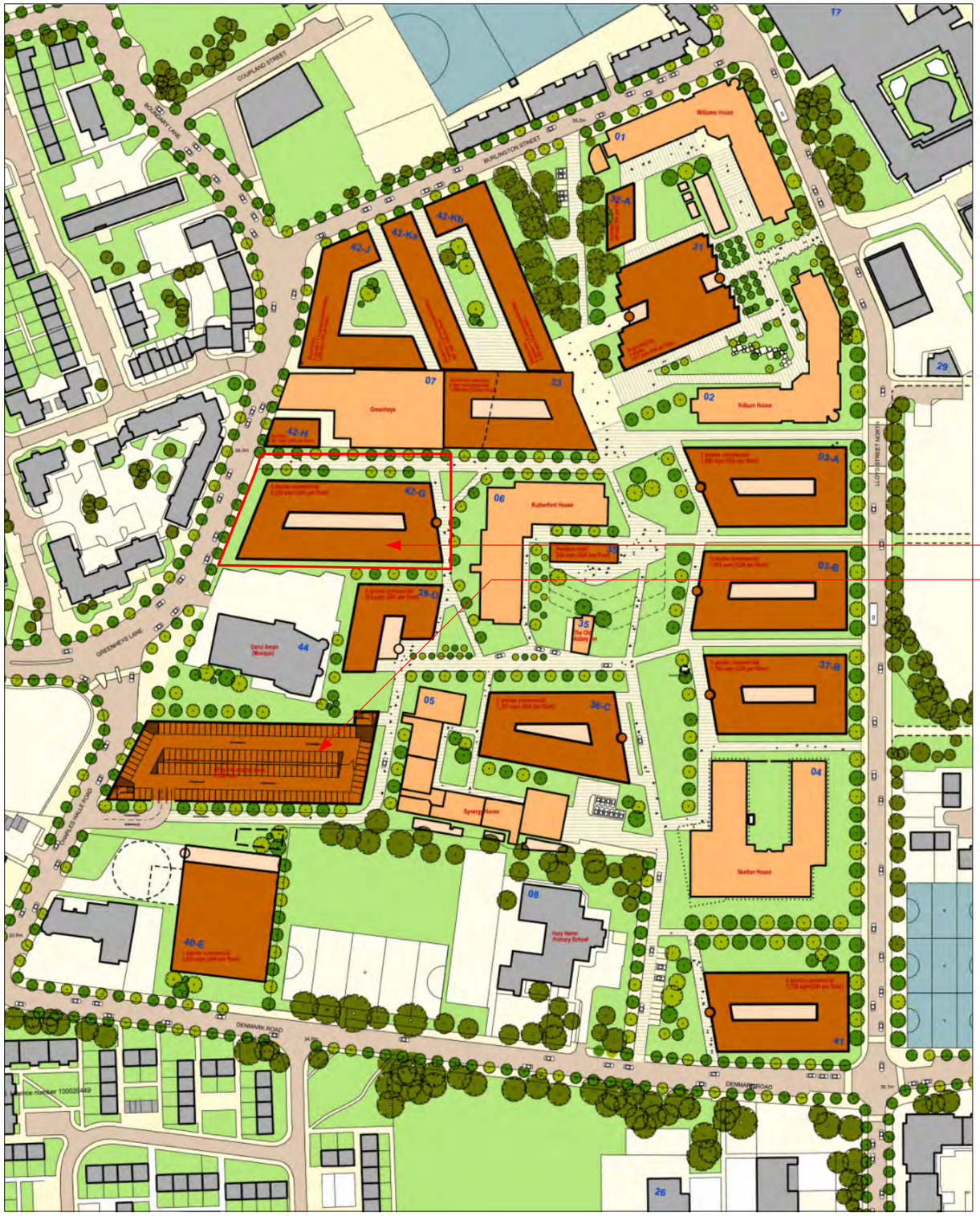

BDP Masterplan - Rev R

Client Brief

The client brief, as verbally communicated by Tom Darby of Bruntwood SciTech, is as follows:

- approx 70,000 to 80,000 ft² net area
- conventional office space to all upper floors
- height not dictated (other than by Masterplan)
- an economical building form is preferred
- office floorplates to be splittable into 4-6 suites
- 'maker' space to be provided at ground floor (brief, extent not decided as yet - we understand this to be open workshop space)
- co-working space to be provided in addition to 'maker' space at ground floor
- cycle store and showers provision at ground floor
- no underground car park, but temp car parking may be required until the adjacent, proposed multi-storey car park is completed (20 spaces available in adjacent surface car park)
- the preferred entrance location is the north-east corner of the site to link with the Bright Building effectively

Masterplan

We understand that the BDP masterplan (see image left) has been agreed in outline with Manchester City Council.

Deloitte Real Estate have informed us that an amendment is in progress which raises the proposed masterplan building heightsfrom '4 storeys' to '5/6 storeys'

Site

Proposed multi-storey car park

Design Development

Options 1-9 were presented to Bruntwood and Deloittes Mon 10th Dec. Following this, preferred Option 10 has been developed to take on board all comments received at this meeting, and a further request to incorporate a mezzanine floor in order to acheive net area closer to 80,000 ft²

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revision notes

project	Base, MSP	**drawing title**	Masterplan and Client Brief
client	Bruntwood	**drawing scale**	not to scale
job no.	0100	**drawing created**	Dec 2018
drawing no.	SK003-02	**drawing rev**	-

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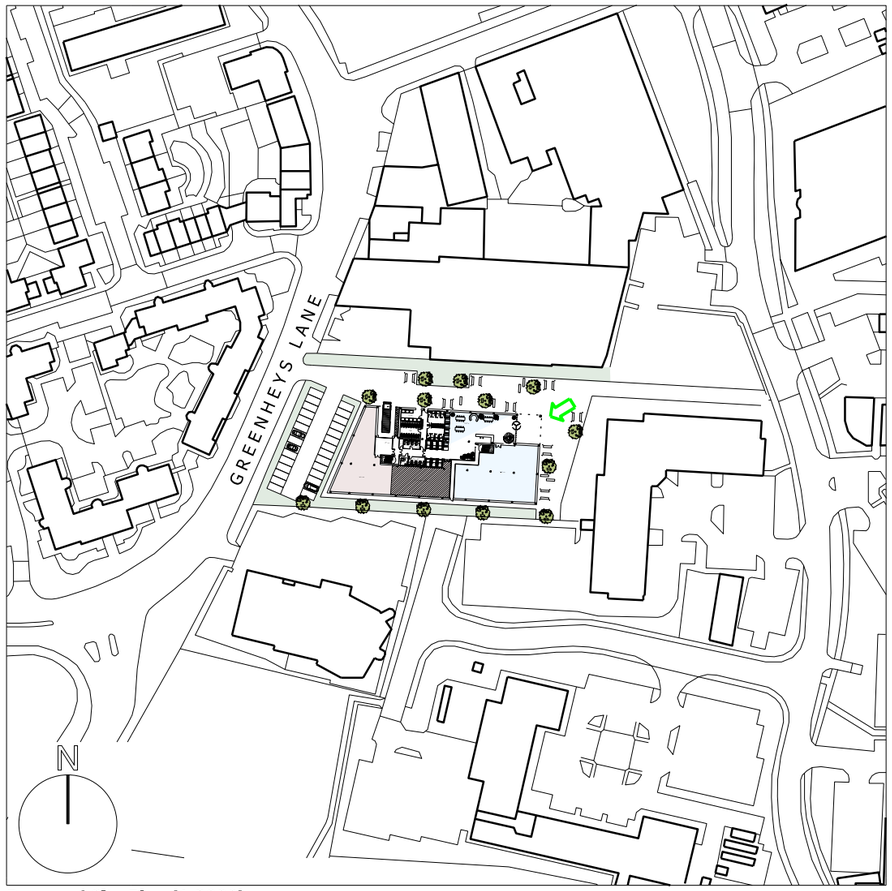
Proposed Site Plan - 3D (NTS)



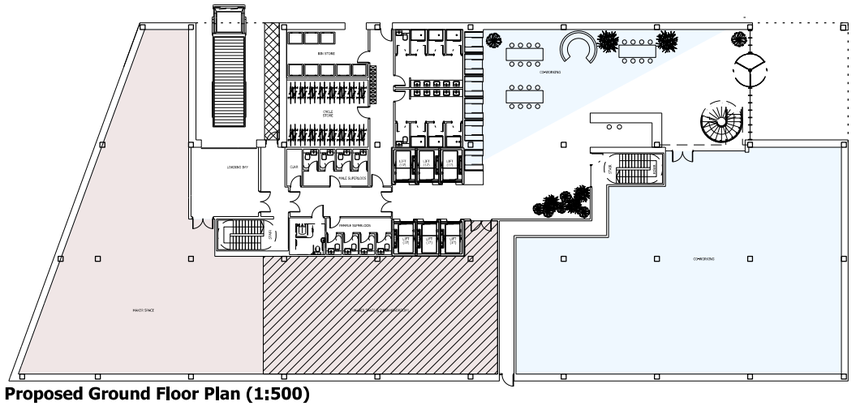
Proposed Site Plan (1:2000)

OPTION 10 - AREA SCHEDULE

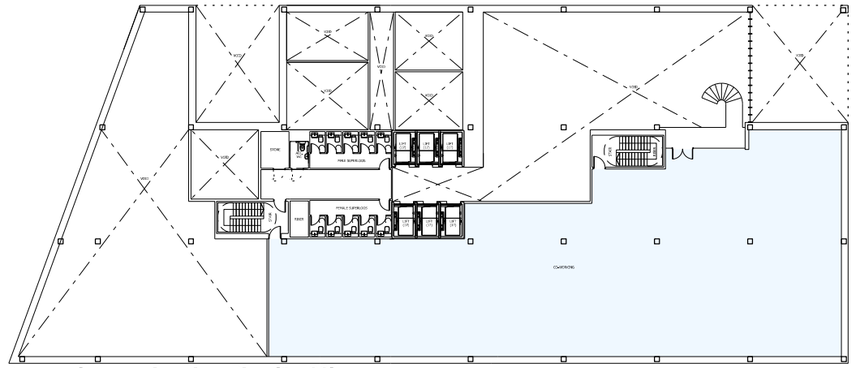
5 Storeys (plus mezzanine at ground floor)

ground floor: (6m floor to floor)		
- 'maker' space	501.5m² (5,396ft²)	
- co-working	541.2m² (5,832ft²)	
mezzanine	629.5m² (6,773ft²)	
floors 1-3 (office):	1,507.7m² (16,222ft²)	**(84.7% net to gross)**
floor 4 (office):	1,170.7m² (12,596ft²)	
TOTAL NET LETTABLE AREA	**7,366.0m² (79,258ft²)**	

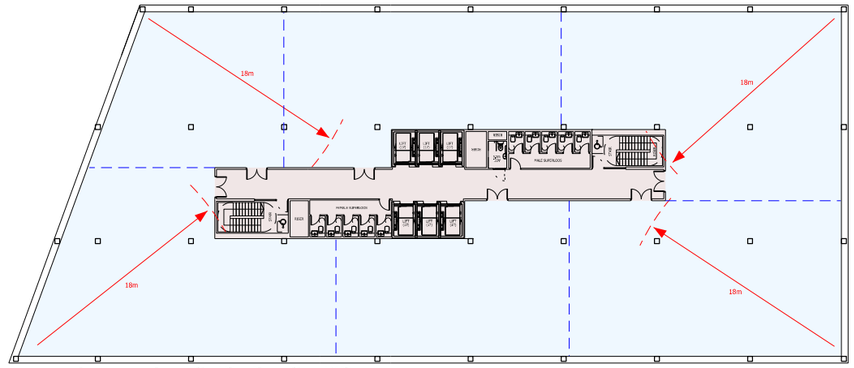
(please note: we have also produced a floorplate plan for this option with two separate cores, however one large core works more effectively at ground floor to provide access to bins, bikes etc from the main lifts)



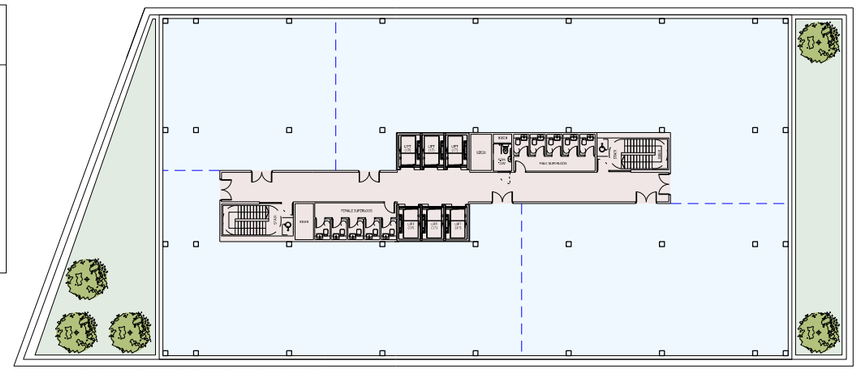
Proposed Ground Floor Plan (1:500)



Proposed Mezzanine Floor Plan (1:500)



Proposed Upper Floor (1-3) Plan (1:500)



Proposed Top Floor (4) Plan (1:500)

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revision notes
rev A - 2018-12-18 mezzanine floor added

project Base, MSP
client Bruntwood
job no. 0100
drawing no. SK003-03

drawing title OPTION 10 - Proposed Plans (with mezzanine)
drawing scale 1;500, 1:2000 @ A3
drawing created December 2018
drawing rev

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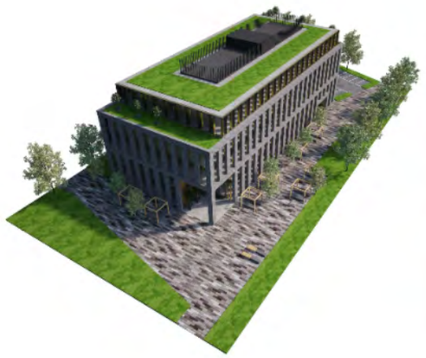
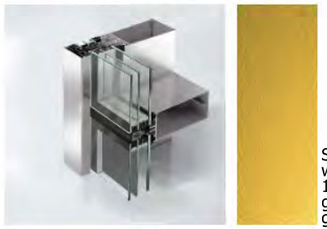


Premilinary CGI

Standard curtain walling windows in standard RAL 1036 with box section capping to mullions

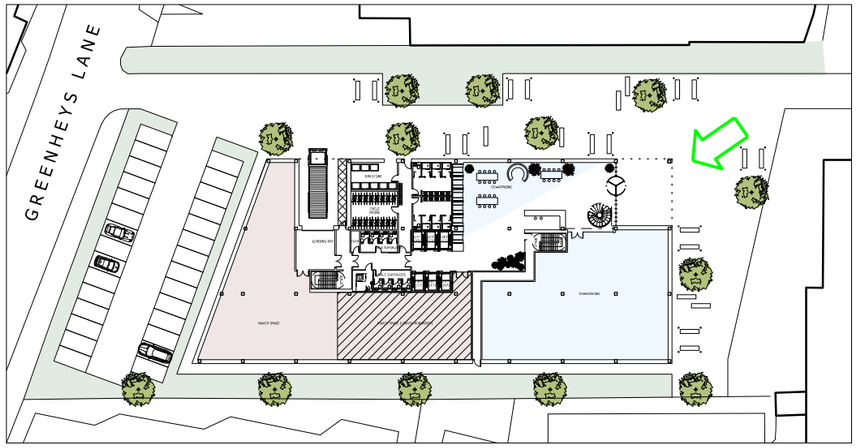
Grey multi brick



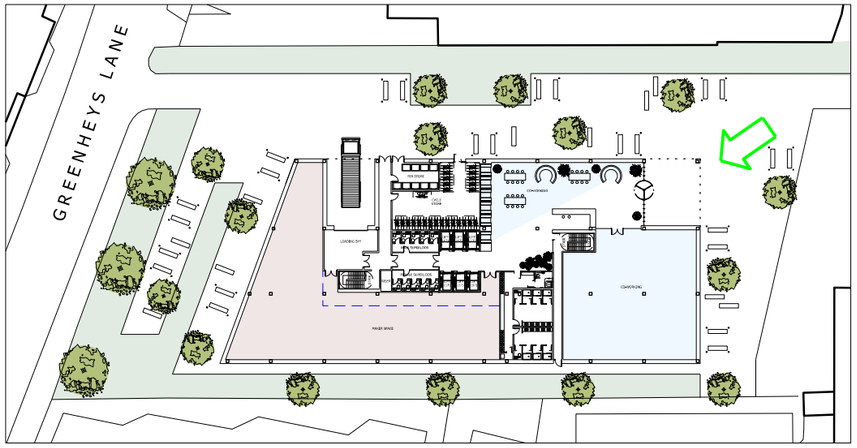
Standard curtain walling windows in standard RAL 1036 with sillicone glazed, back painted glass spandrel panels

Brass 'Teku' type cladding to localised area around main entrance

Premilinary materials palette



Site plan with temporary car park



Site plan with temporary car park removed and extended public realm

bridge
architects

address 14 Old Mill Street, Manchester, M4 6DZ **phone** 0161 879 2828 **web** www.bridgearchitects.com
directors Russell Bridge RIBA ARB Victoria Kirkpatrick ARB **company #** 07793934 **email** info@bridgearchitects.com

revision notes

project	Base, MSP
client	Bruntwood
job no.	0100
drawing no.	SK003-04
drawing title	OPTION 10 - CGI and Site Plans
drawing scale	NTS @ A3
drawing created	December 2018
drawing rev	

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architects

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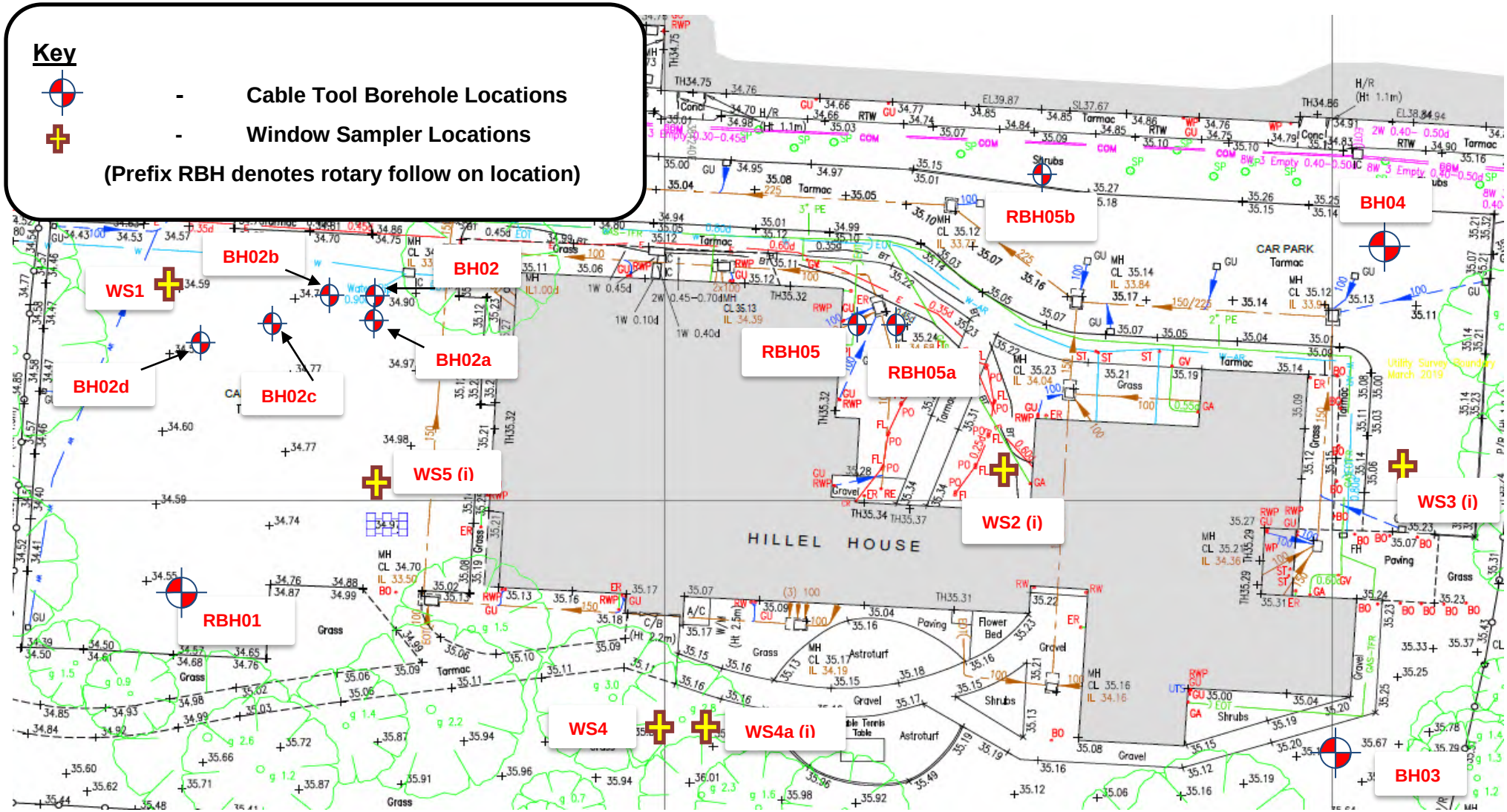


nxconsulting
Next Generation Engineering Consultancy Services

Tel: 0161 904 0187
E-mail: admin@nxconsulting.org.uk
Web: www.nxconsulting.org.uk

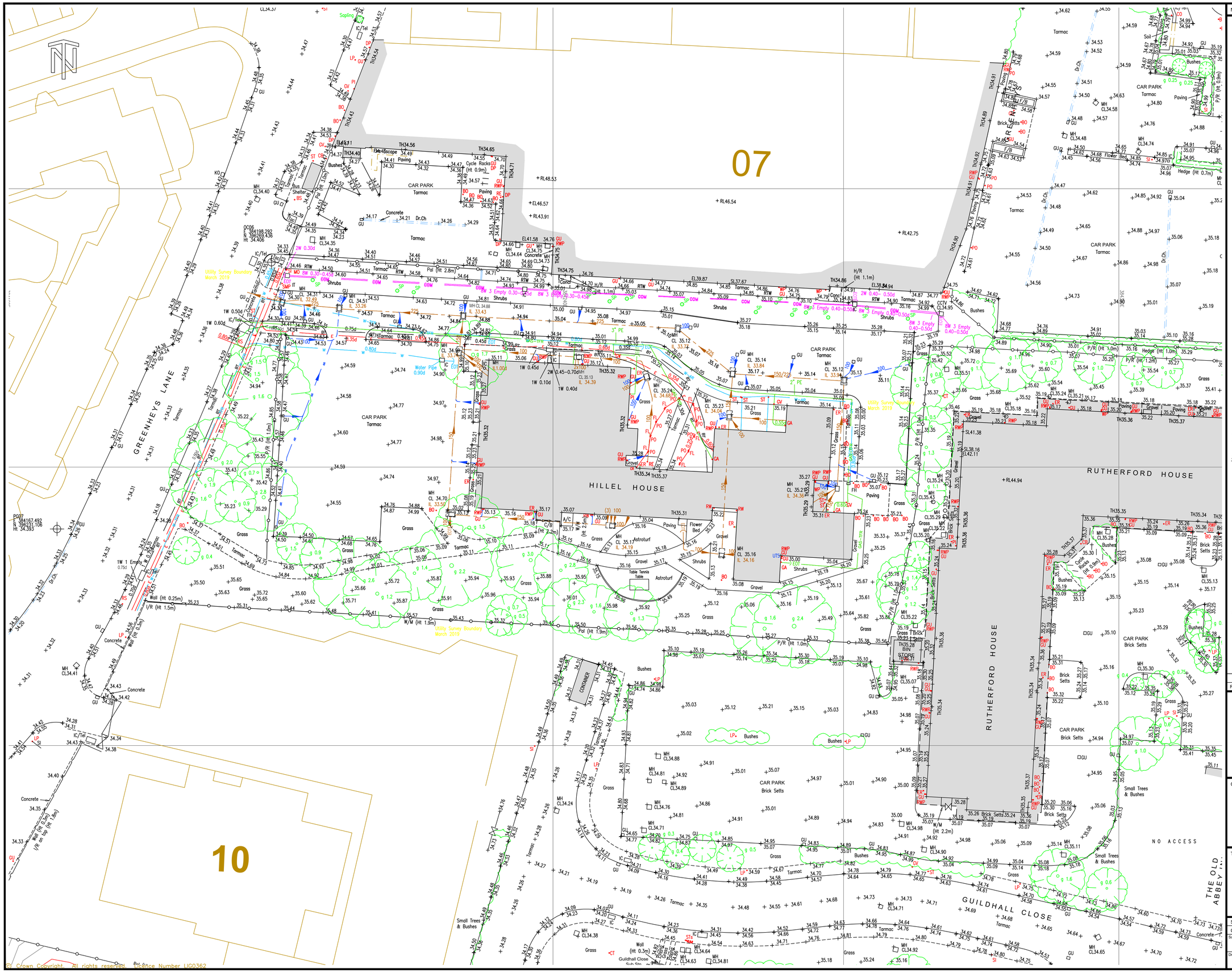
Ref: NX369 Figure 1

Project:

New Base Building MSP

Title:

Proposed Indicative Exploratory Hole Location Plan



NOTES

STREET FURNITURE

A/C	- AIR CONDITIONING	LC	- LIGHTING COLUMN
AE	- AERIAL	LI	- LIGHT
AL	- ALARM	LP	- LAMP POST
AV	- AIR VALVE	MBO	- MOORING BOLLARD
BA	- BUOYANCY AID	MA	- MAST
BB	- BELISHA BEACON	MH	- MANHOLE
BD	- BUILDING DIVIDE	MO	- MONUMENT
BH	- BOREHOLE	MP	- MILE POST
BL	- BASEMENT LIGHT	MR	- MOORING RING
BO	- BOLLARD	MW	- MONITORING WELL
BP	- BOUNDARY POST	NP	- NAME PLATE
BR	- BOULDER	O/H	- OVERHEAD
BS	- BUS STOP	OSBM	- ORDNANCE SURVEY BENCH MARK
BU	- BUSH	PA	- PLAY APPARATUS
CA	- CABLE	PB	- PILLAR BOX
CB	- CONTROL BOX	PH	- PUBLIC HOUSE
CC	- CLOSE CIRCUIT TV	PI	- PIPE
CIB	- CIGARETTE BIN	PL	- PLANT
Col	- COLUMN	PM	- PARKING METER
CT	- CLOSE CIRCUIT TV POLE	PN	- PLANTER
DP	- DOWN PIPE	PO	- POST
DR	- DRAIN	PP	- PETROL PUMP
Dr Ch	- DRAINAGE CHANNEL	RH	- RIDGE HEIGHT
DU	- DUCT	RS	- ROAD SIGN
EL	- ELECTRIC	RTW	- RETAINING WALL
EP	- ELECTRICITY POLE	RWP	- RAINWATER PIPE
ER	- EARTH ROD	SA	- SEA/FANCHION
FA	- FENDOR ANCHOR	SC	- SPEED CAMERA
F/B	- FLOWER BED	SD	- SATELITTE DISH
FH	- FIRE HYDRANT	SF	- SAFETY FENCE
FL	- FLOODLIGHT	SG	- SIGNAL
FS	- FLAG STAFF	SI	- SIGN
GA	- GAS	SMP	- SERVICE MARKER POST
GM	- GAS METER	SS	- SECURITY SENSOR
G	- GIRTH	ST	- STOP TAP
GP	- GATE POST	SU	- STUMP
GU	- GULLY	SV	- STOP VALVE
GV	- GAS VALVE	SW	- SWITCHGEAR
Hyd	- HYDRANT	SY	- STAY
IC	- INSPECTION COVER	TA	- TAP
IT	- TRAFFIC COVER	TBM	- TEMPORARY BENCH MARK
JB	- JUNCTION BOX	TCB	- TELEPHONE CALL BOX
JO	- JOINT OFFSET	TE	- TELEPHONE
LA	- LADDER	TM	- TRAFFIC MACHINE
LB	- LITTER BIN	TS	- TRAFFIC SIGNAL
		TP	- TELEGRAPH POLE

HEDGE | GATE | BUILDING | TREE CANOPY | CONTROL STATION | TACTILE PAVING | TREE

UNDERGROUND SERVICE KEY

Foul/Combined water drain		Vents	
Foul/Combined drain 300Ø and above		Fuel	
Surface water drain		Offsets	
Surface water drain 300Ø and above		Vapour Recovery	
End of trace	EOT	Gauge Lines	
Electric cables		Unidentified GPR	
HV cables		Unidentified EML	
Gas		Empty Ducts	
Water		Earth Rod	
Telephone		Rising Main	
Catv			
CCTV			
Comms			
Fibre Optics			
Pipe			

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

SHEET LAYOUT

Rev	Date	Drawn	Description	Ch'k'd	App'd

N D OLIVER & CO
CHARTERED GEOMATIC SURVEYORS

Client

BRUNTWOOD
MANCHESTER SCIENCE PARK
GREENHEYS BUSINESS CENTRE
LLOYD STREET NORTH
MANCHESTER M15 6SE

Title

MANCHESTER SCIENCE PARK
PHASE 1 - THE HUB, MANCHESTER

TOPOGRAPHICAL SURVEY

SHEET 1 OF 1

Surveyed	AU	Drawn	BW	Drawn Date:	21/03/2019
Checked	AM	Approved	NDO		
Scale 1:250 @ A1		Project 08074		Status ORIG	
		CAD File \\NDO-SBS\Projects\08074\DRAWING\08074_003.DWG			
Drawing No 08074 / 003				Rev 0	

Plate 1 – RBH01 Core 11.00m- 14.00m

Plate 2 – RBH01 Core 14.00m – 17.00m

Plate 3 – RBH01 Core 17.00m – 20.00m

Plate 1 – WS1 Failed Inspection Pit (Obstruction)

Plate 2a – WS2 Inspection Pit Arisings

Plate 2b – WS2 Arisings

Plate 3a –WS3 Inspection Pit Arisings

Plate 3b – WS3 Arisings

Plate 4a – WS4A Inspection Pit Arisings

Plate 4b – WS4A Arisings

Plate 5a – WS5 Inspection Pit Arisings

Plate 5b - Arisings

Plate 1 – RBH01 Inspection Pit Arisings

Plate 2 – BH02 Inspection Pit Arisings

Plate 3 – BH02A Inspection Pit Arisings

Plate 4 – BH02B Inspection Pit Arisings

Plate 5 – RBH05 Inspection Pit

Appendix B – GroundSure Information

Groundsure
LOCATION INTELLIGENCE

NX Consulting Limited

11, Thorpe Close,
Altrincham, WA15 7WZ

Groundsure Reference:	GS-4827348
Your Reference:	NX332
Report Date	21 Mar 2018
Report Delivery Method:	Email - pdf

Geo Insight

Address: MANCHESTER SCIENCE PARK, LLOYD STREET NORTH, MANCHESTER, M15 6SE

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

Managing Director
Groundsure Limited

Enc.
Groundsure Geo Insight

Geo Insight

Address:	**MANCHESTER SCIENCE PARK, LLOYD STREET NORTH, MANCHESTER, M15 6SE**
Date:	**21 Mar 2018**
Reference:	**GS-4827348**
Client:	**NX Consulting Limited**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	11-Jun-2015
Grid Reference:	384288,396140
Site Size:	8.32ha

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Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Geology 1:10,000 Scale		
1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	Yes
	1.2.2 Are there any records of landslip within 500m of the study site boundary at 1:10,000 scale?	No
1.3 Bedrock, Solid Geology and linear features	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale?	Yes

Section 2: Geology 1:50,000 Scale		
2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	No
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

Groundsure
LOCATION INTELLIGENCE

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and linear features	2.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?	Yes
	2.3.3 Are there any records of linear features within 500m of the study site boundary?	Yes

Section 3: Radon

3. Radon	3.1Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
	3.2Radon Protection	No radon protective measures are necessary.

Section 4: Ground Workings	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	0	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	0
5.2 Coal Mining	1	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	2	0	2	0	6
5.4 Non-Coal Mining*	0	0	0	0	0
5.5 Non–Coal Mining Cavities	0	0	0	0	1
5.5 Natural Cavities	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0

Section 6: Natural Ground Subsidence	On-site
6.1 Shrink-Swell Clay	Very Low
6.2 Landslides	Very Low
6.3 Ground Dissolution of Soluble Rocks	Negligible
6.4 Compressible Deposits	Negligible
6.5 Collapsible Deposits	Very Low
6.5 Running Sand	Very Low

Section 7: Borehole Records	On-site	0-50m	51-250
7 BGS Recorded Boreholes	14	2	10

Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250
8 Records of Background Soil Chemistry	3	1	0

Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500
9.1 Tunnels	0	0	0	Not Searched
9.2 Historical Railway and Tunnel Features	0	0	0	Not Searched
9.3 Historical Railways	0	0	0	Not Searched
9.4 Active Railways	0	0	0	Not Searched
9.5 Railway Projects	0	0	0	0

1:10,000 Scale Availability

NW N NE

W E

SW S SE

1_10,000 Availability Legend

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Site Outline

Full Coverage

Partial Coverage

No Coverage

50
250
Search Buffers (m)

Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	Some deposits are mapped	Full	Full	No coverage
2	538.0	Some deposits are mapped	Full	Full	Some deposits are mapped
3	996.0	Some deposits are mapped	Full	Full	No coverage
4	1139.0	Some deposits are mapped	Full	Full	No coverage

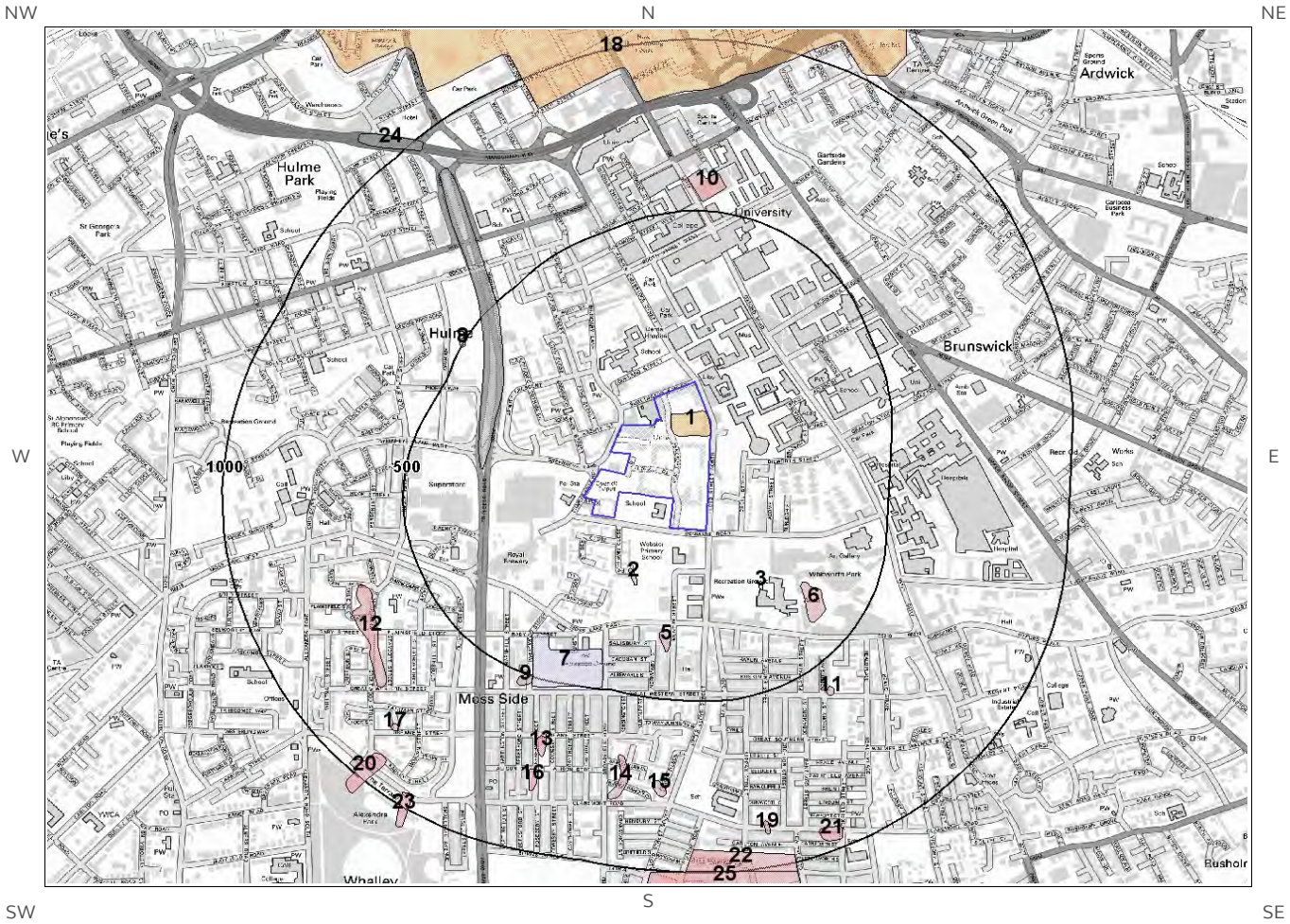
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

Geology	Full Coverage	Partial Coverage	No Coverage
Bedrock	The whole tile has been mapped	Some but not all the tile has been mapped	No coverage
Superficial	The whole tile has been mapped	Some but not all of the tile has been mapped	No coverage
Artificial	Some deposits are mapped on this tile	-	No deposits are mapped
Mass Movement	Some deposits are mapped on this tile	-	No coverage

1 Geology (1:10,000 scale).

1.1 Artificial Ground map (1:10,000 scale)



Artificial Ground Legend

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Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

1. Geology 1:10,000 scale

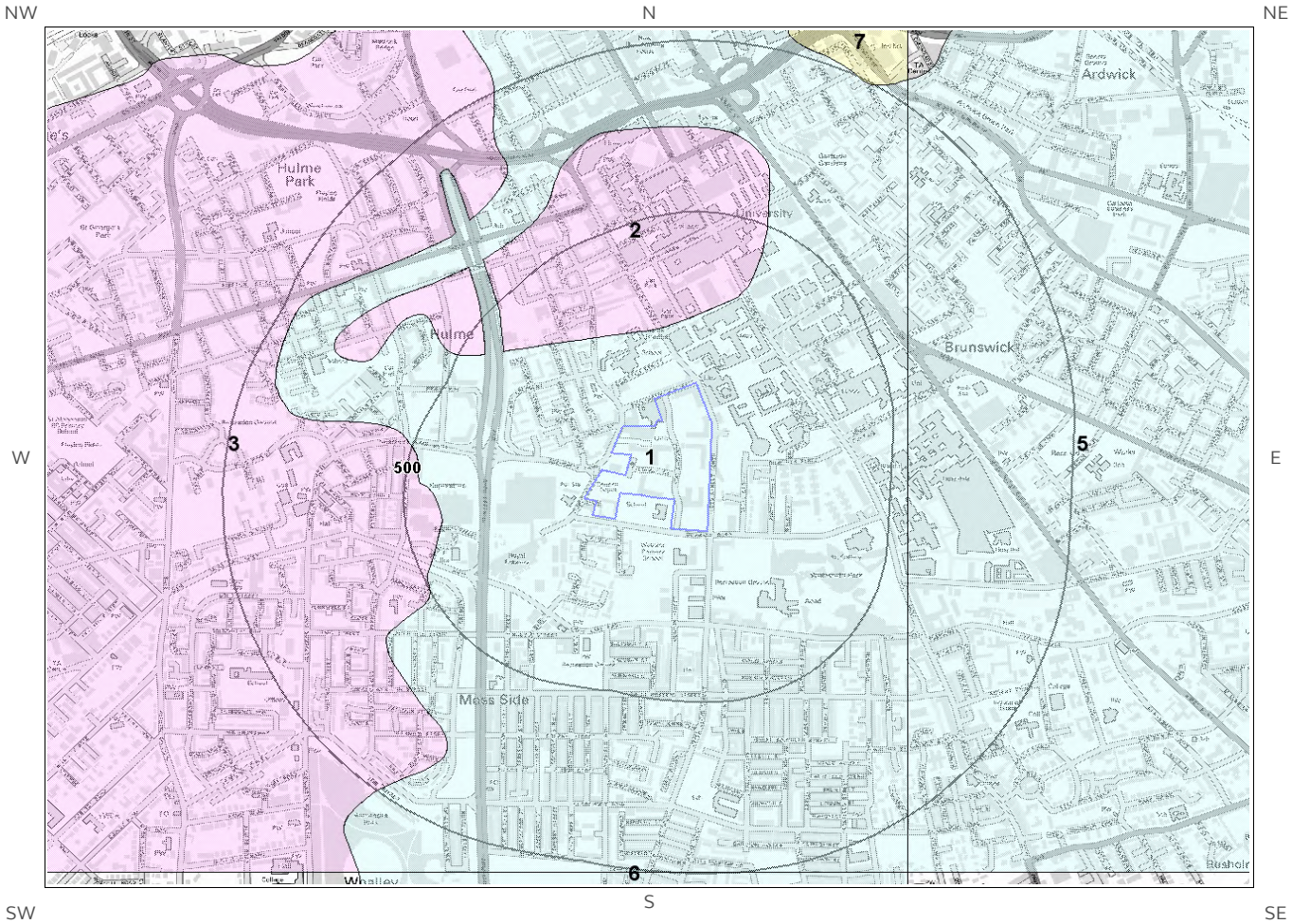
1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
2	151.0	S	WMGR-ARTDP	Infilled Ground	Artificial Deposit
3	210.0	SE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	291.0	W	WGR-VOID	Worked Ground (Undivided)	Void
5	301.0	S	WMGR-ARTDP	Infilled Ground	Artificial Deposit
6	306.0	SE	WMGR-ARTDP	Infilled Ground	Artificial Deposit
7	367.0	S	LSGR-ARTDP	Landscaped Ground (Undivided)	Artificial Deposit
8	493.0	NW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
9	495.0	S	WMGR-ARTDP	Infilled Ground	Artificial Deposit

1.2 Superficial Deposits and Landslips map (1:10,000 scale)



Artificial Ground Legend

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Site Outline

500
1000
Search Buffers (m)

1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
2	184.0	N	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel
3	400.0	W	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel
4	436.0	NW	GFSDD-XSV	Glaciofluvial Sheet Deposits, Devensian - Sand And Gravel	Sand And Gravel

1.2.2 Landslip

Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale?

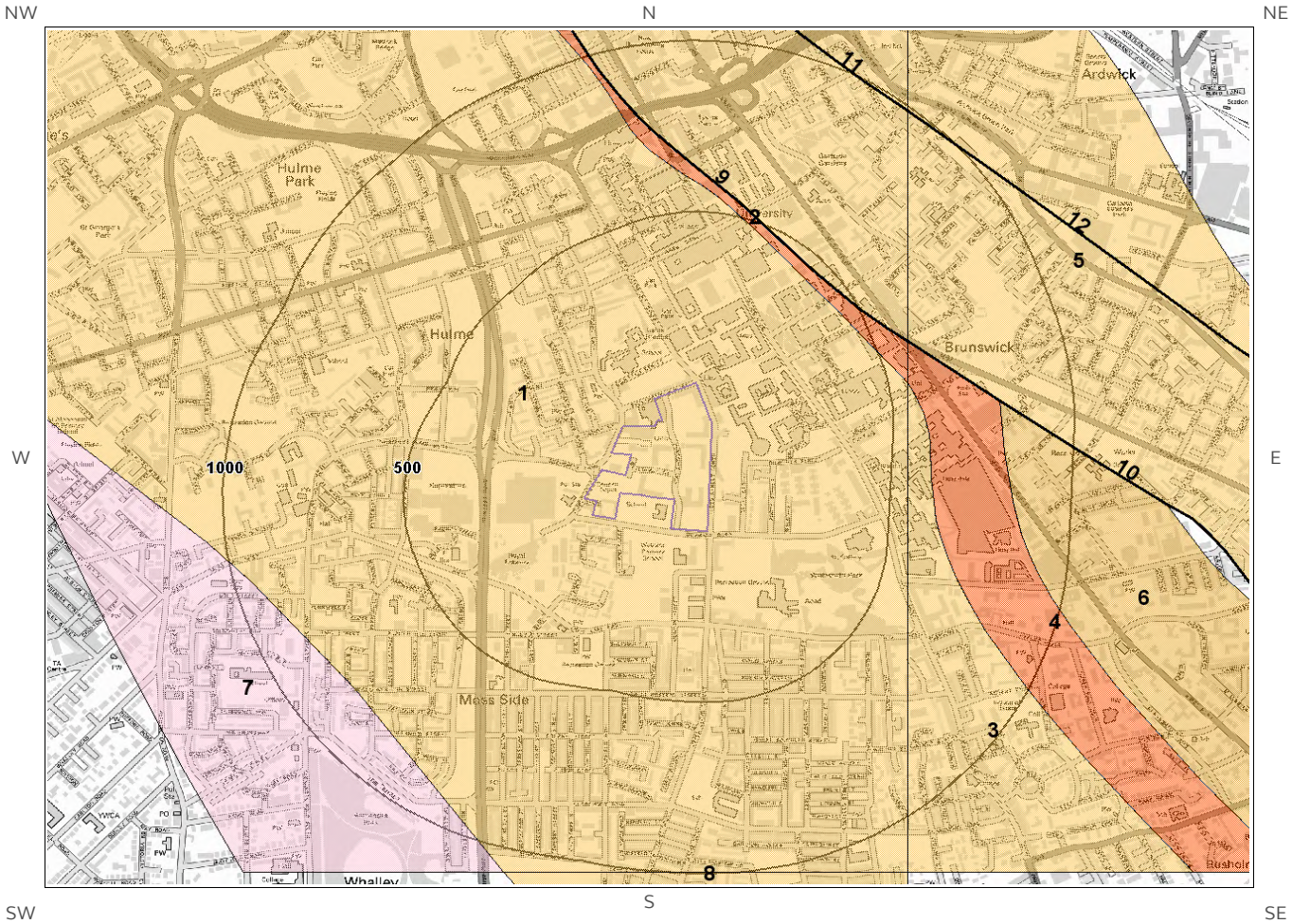
No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3 Bedrock and linear features map (1:10,000 scale)



Bedrock and linear features Legend

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Site Outline

500
1000
Search Buffers (m)

1.3 Bedrock and linear features

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	CPB-SDST	Chester Pebble Beds Formation - Sandstone	Early Triassic Epoch
2	428.0	NE	MM-MDST	Manchester Marls Formation - Mudstone	Late Permian Epoch [Obsolete name]

1.3.2 Linear features

Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	Category Description	Feature Description
9	462.0	NE	FAULT	Normal fault, inferred; crossmarks on downthrow side

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

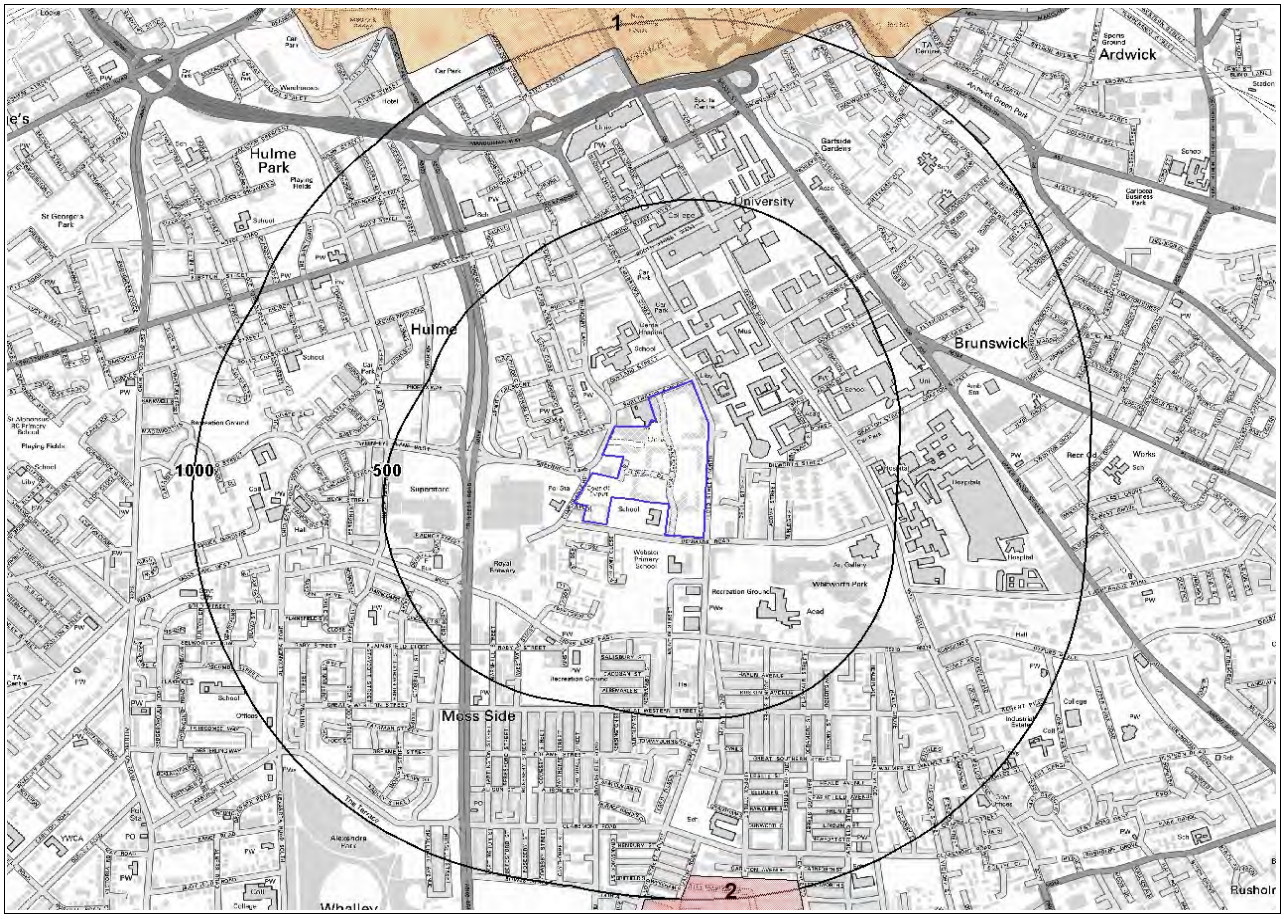
This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2 Geology 1:50,000 Scale

2.1 Artificial Ground map

NW N NE

W E



SW S SE

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Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 085

2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? No

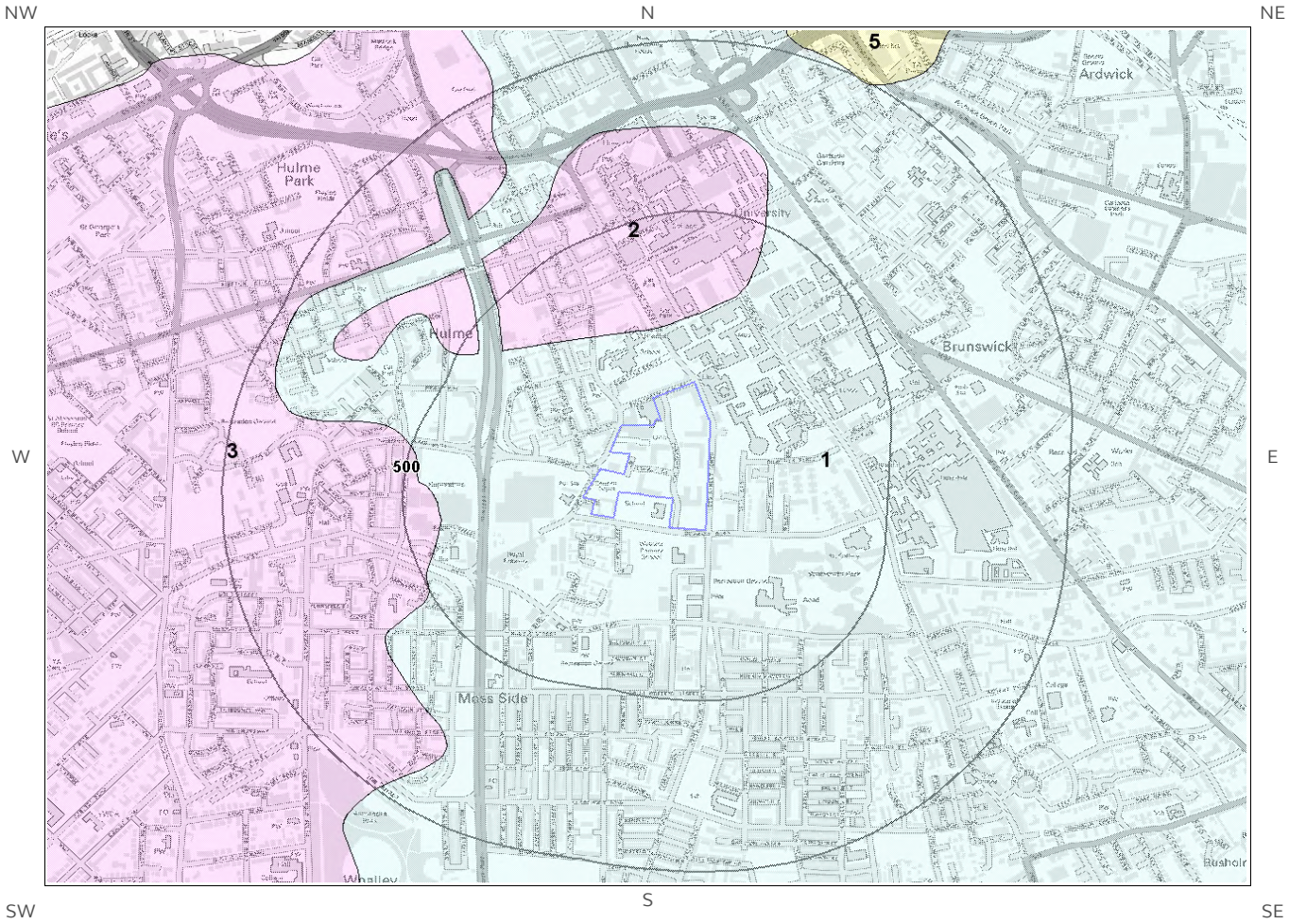
Database searched and no data found.

2.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

2.2 Superficial Deposits and Landslips map (1:50,000 scale)



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Site Outline

500
1000
Search Buffers (m)

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
2	184.0	N	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
3	399.0	W	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL
4	449.0	NW	GFSDD-XSV	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN	SAND AND GRAVEL

2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	High	Low

2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

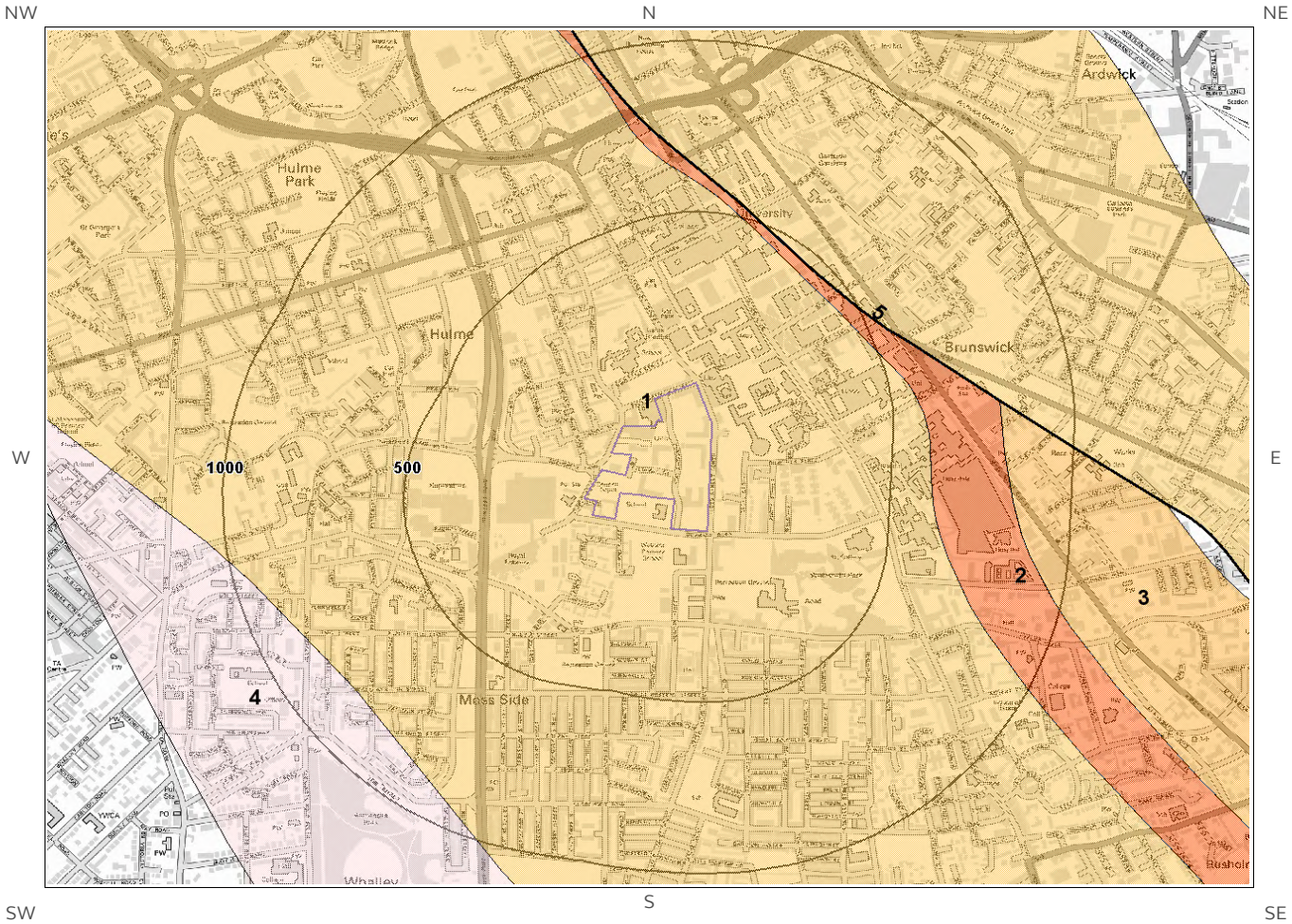
This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

2.3 Bedrock and linear features map (1:50,000 scale)



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Site Outline

500
1000
Search Buffers (m)

2.3 Bedrock, Solid Geology & linear features

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 085

2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	CHES-SDST	CHESTER FORMATION - SANDSTONE	OLENEKIAN
2	428.0	NE	MM-MDST	MANCHESTER MARLS FORMATION - MUDSTONE	-

2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	High	Moderate

2.3.3 Linear features

Are there any records of linear features within 500m of the study site boundary? Yes

ID	Distance	Direction	Category Description	Feature Description
5	462.0	NE	FAULT	Fault, inferred

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

3 Radon Data

3.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

3.2 Radon Protection

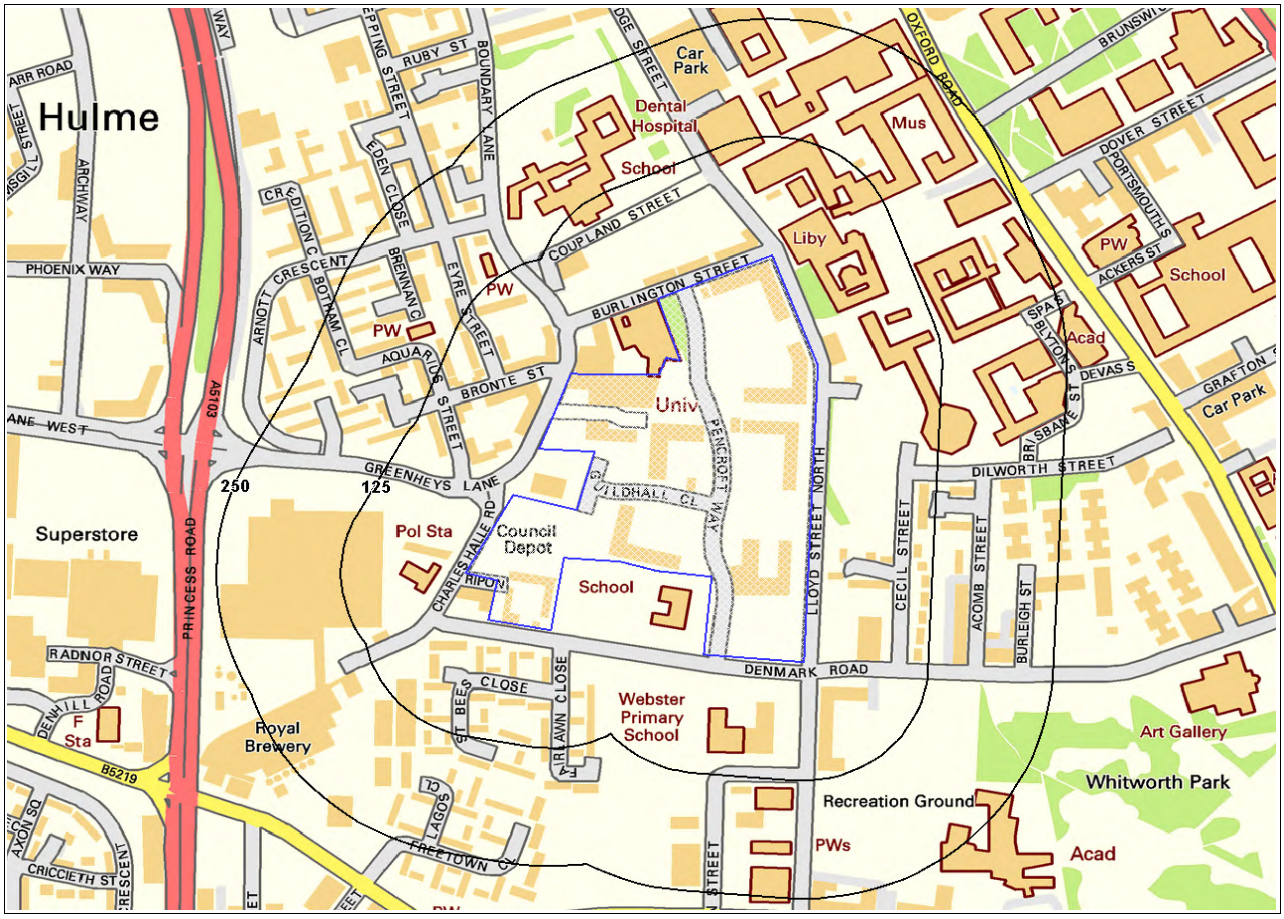
Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

---

4 Ground Workings map

NW N NE

W E



SW S SE

Ground Workings Legend

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Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? No

Database searched and no data found.

4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

4.3 Current Ground Workings

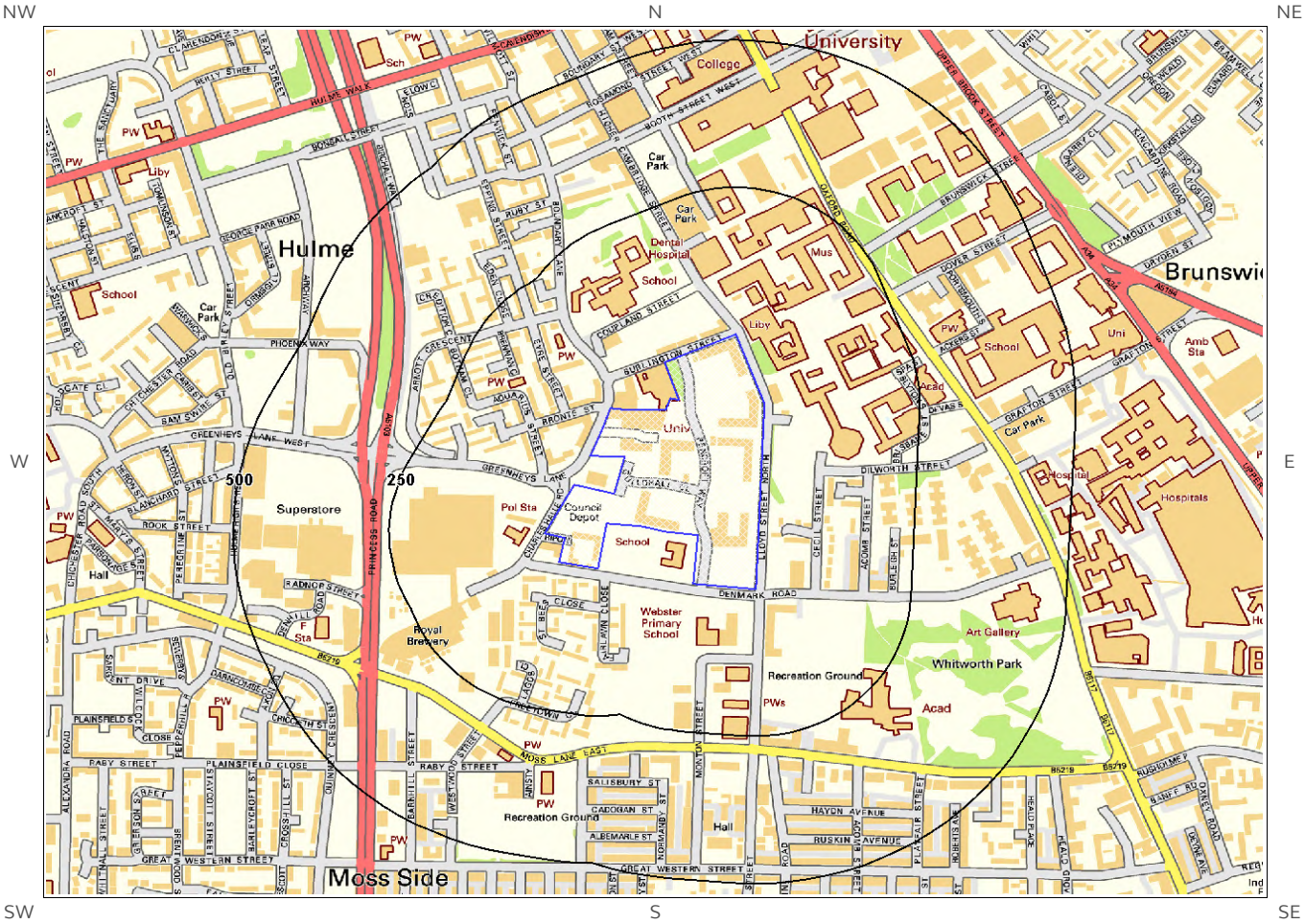
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

Database searched and no data found.

---

5 Mining, Extraction & Natural Cavities map



Mining, Extraction and Natural Cavities Legend

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Site Outline

250
500
Search Buffers (m)

Historical Mining

Non-Coal Mining Cavities

Natural Cavities (point data)

Natural Cavities (polygon data)

Non-Coal Mining

Highly likely

Likely

Unlikely

Highly unlikely

Rare

5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? Yes

The following Coal Mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
0.0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? Yes

The following information provided by JPB is not represented on mapping: In addition to being located inside an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. Further details and a quote for services can be obtained by emailing this report to enquiries.gs@jpb.co.uk.

5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? Yes

The following Non-Coal Mining Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Address	Superficial Deposits	Bedrock Deposits	Extracted Mineral
Not shown	829.0	NE	384900 397100	Manchester, Greater Manchester	Glacial Till	Bunter Sandstone, Manchester Marls, Collyhurst Sandstone	Firestone, Freestone, Hearthstone, Honestone, Ragstone, Sandstone, Scythestone, Silver Sand, Whetstone

5.6 Natural Cavities

This dataset provides information based on the Peter Brett Associates natural cavities database. The dataset is made up of points and polygons. Where polygons are used these represent an area in which it is expected the cavities could be found. It does not indicate that cavities are present everywhere within the polygon, and caution should be used in the interpretation of this data.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.10 Clay Mining

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay map

Shrink Swell Clay Legend

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6.2 Landslides map

Landslides Legend

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6.3 Ground Dissolution of Soluble Rocks map

Ground Dissolution Soluble Rocks Legend

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6.4 Compressible Deposits map

Compressible Deposits Legend

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6.5 Collapsible Deposits map

Collapsible Deposits Legend

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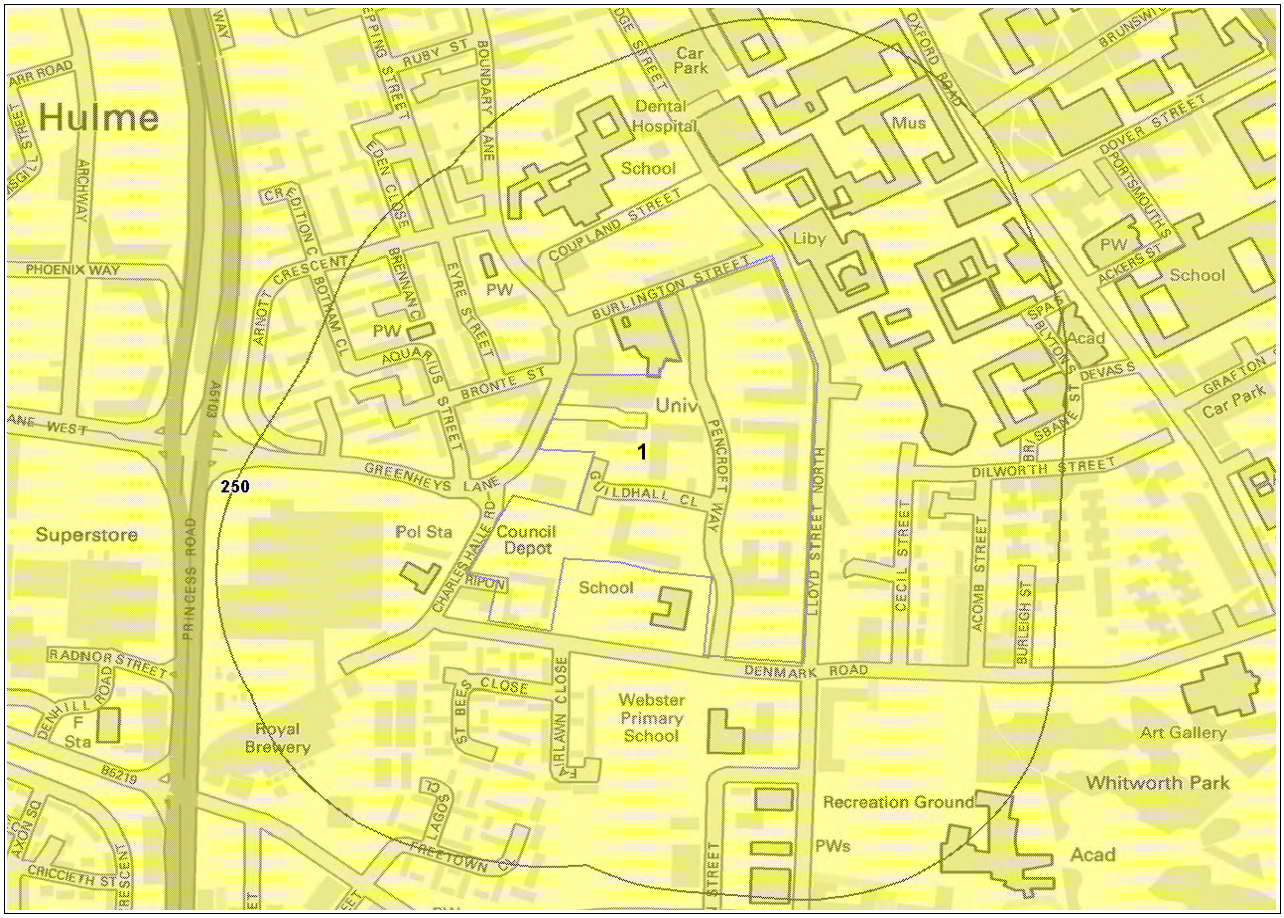
6.6 Running Sand map

NW N NE

W E

SW S SE



Running Sand Legend

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Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site*[*] boundary? Very Low

6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

6.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This includes an automatically generated 50m buffer zone around the site

6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

6.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

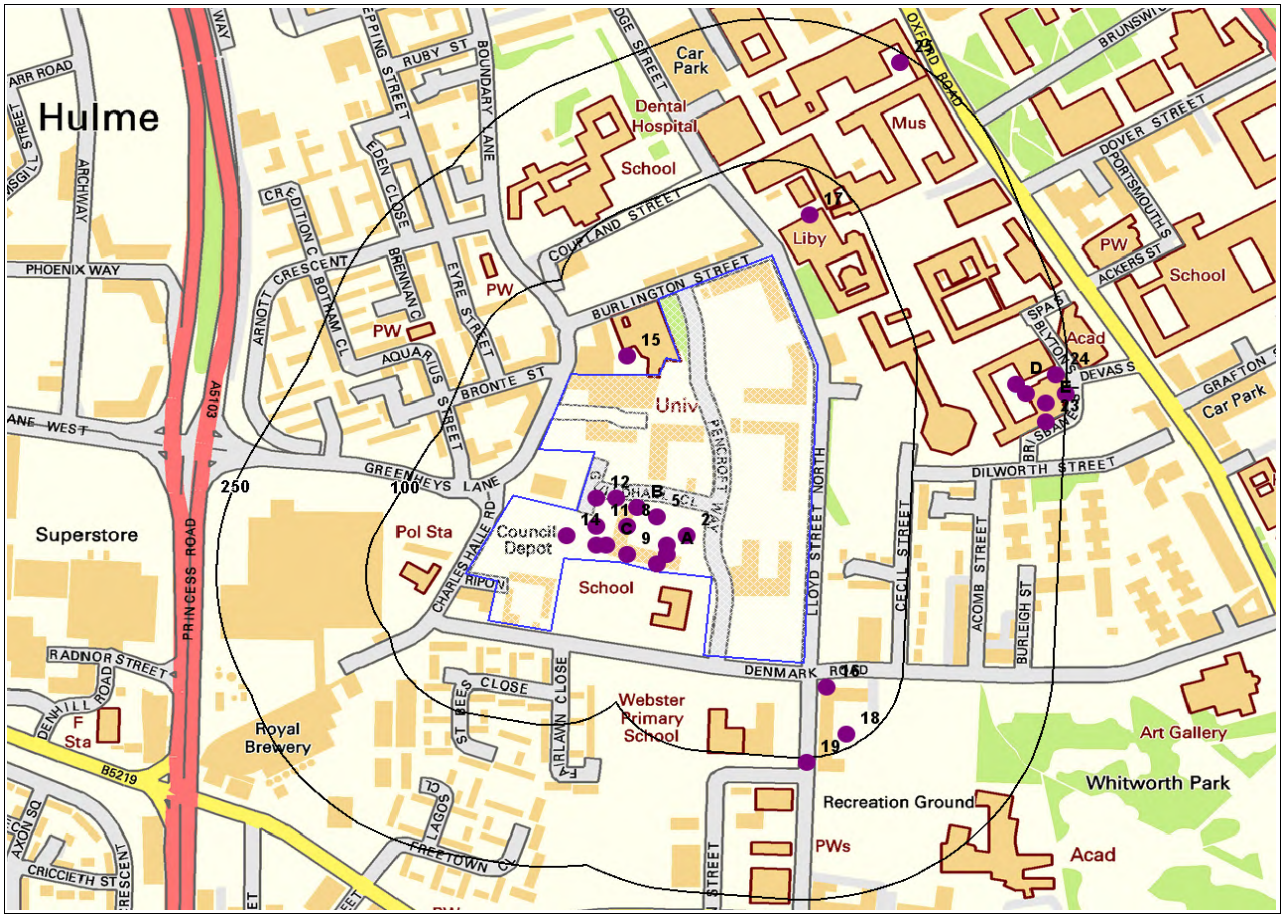
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

7 Borehole Records map

NW N NE

W E

SW S SE



Borehole Records Legend

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Site Outline

Borehole Locations

125
250
Search Buffers (m)

7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: 26

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1C	0.0	On Site	384250 396120	SJ89NW1988	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPD
2	0.0	On Site	384330 396130	SJ89NW1995	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPK
3A	0.0	On Site	384310 396110	SJ89NW1984	-1.0	MACHESTER SCIENCE PARK PHASE 3 3
4A	0.0	On Site	384310 396120	SJ89NW1993	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPI
5	0.0	On Site	384300 396150	SJ89NW1992	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPH
6A	0.0	On Site	384300 396100	SJ89NW1994	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPJ
7B	0.0	On Site	384280 396160	SJ89NW1985	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPA
8	0.0	On Site	384270 396140	SJ89NW1986	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPB
9	0.0	On Site	384270 396110	SJ89NW1987	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPC
10B	0.0	On Site	384260 396170	SJ89NW1982	-1.0	MACHESTER SCIENCE PARK PHASE 3 1
11	0.0	On Site	384240 396140	SJ89NW1990	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPF
12	0.0	On Site	384240 396170	SJ89NW1991	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPG
13C	0.0	On Site	384240 396120	SJ89NW1983	-1.0	MACHESTER SCIENCE PARK PHASE 3 2
14	0.0	On Site	384210 396130	SJ89NW1989	-1.0	MACHESTER SCIENCE PARK PHASE 3 TPE
15	20.0	N	384270 396320	SJ89NW3286	237.0	UNIVERSITY OF MANCHESTER MONITORING
16	34.0	SE	384470 395970	SJ89NW4150	-1.0	DUCIE HIGH SCHOOL MANCHESTER 1A
17	56.0	NE	384453 396469	SJ89NW251	91.44	UNIVERSITY OF MANCHESTER, N. OF BURLINGTON STREET
18	87.0	SE	384490 395920	SJ89NW4152	-1.0	DUCIE HIGH SCHOOL MANCHESTER 3A
19	106.0	S	384450 395890	SJ89NW4151	-1.0	DUCIE HIGH SCHOOL MANCHESTER 2A
20D	199.0	E	384660 396290	SJ89NW961	-1.0	CONTACT THEATRE BRISBANE STREET 3
21D	209.0	E	384670 396280	SJ89NW958	-1.0	CONTACT THEATRE BRISBANE STREET TP 3

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
22E	230.0	E	384690 396270	SJ89NW957	-1.0	CONTACT THEATRE BRISBANE STREET TP 2
23	231.0	E	384690 396250	SJ89NW956	-1.0	CONTACT THEATRE BRISBANE STREET TP 1
24	238.0	E	384700 396300	SJ89NW960	-1.0	CONTACT THEATRE BRISBANE STREET 2
25	240.0	NE	384544 396630	SJ89NW284	7.62	MANCHESTER MUSEUM, OXFORD ROAD
26E	249.0	E	384710 396280	SJ89NW959	-1.0	CONTACT THEATRE BRISBANE STREET 1

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

#15: scans.bgs.ac.uk/sobi_scans/boreholes/1045480
#17: scans.bgs.ac.uk/sobi_scans/boreholes/1042405
#25: scans.bgs.ac.uk/sobi_scans/boreholes/1042443

8 Estimated Background Soil Chemistry

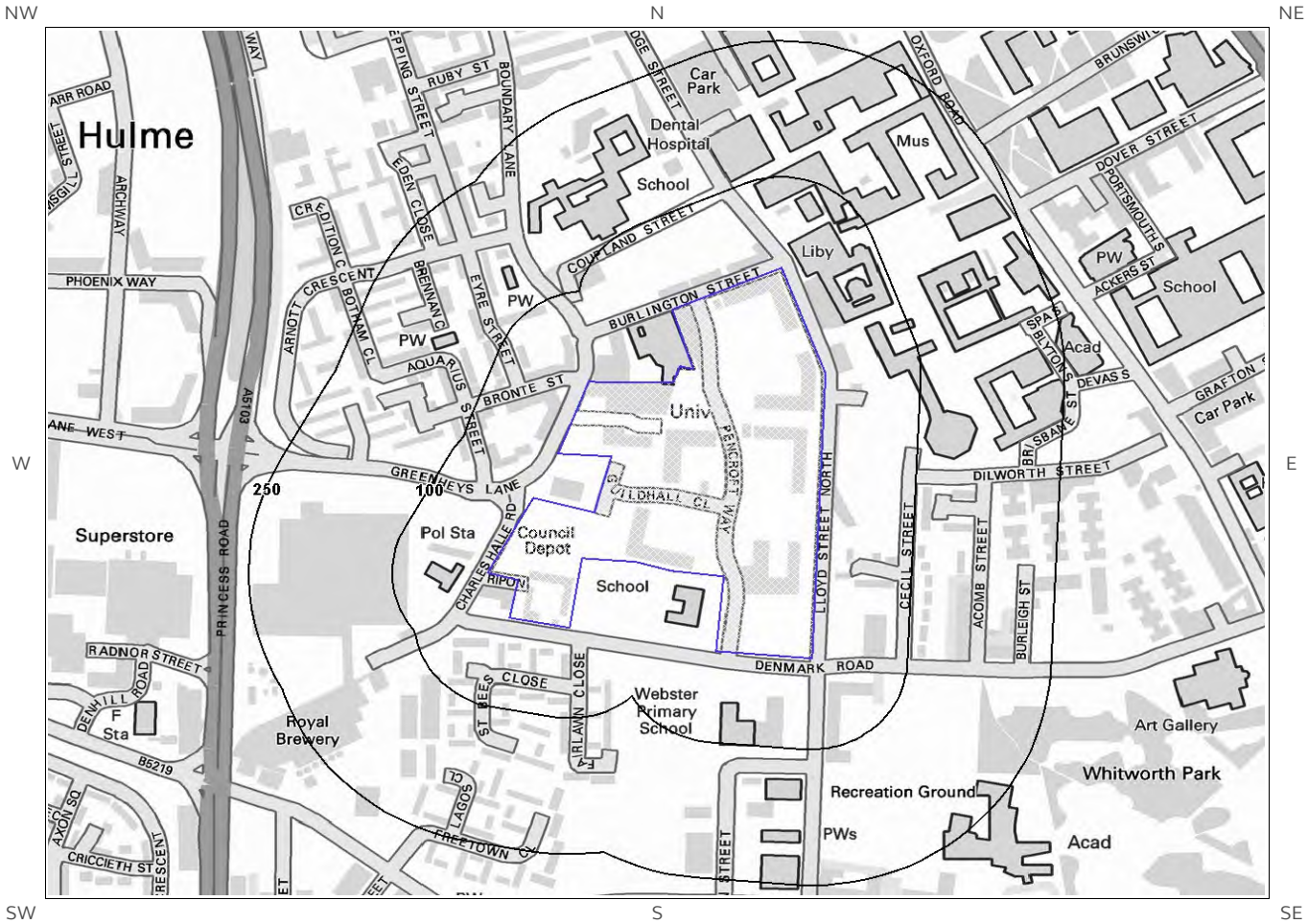
Records of background estimated soil chemistry within 250m of the study site boundary: 4

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg
38.0	E	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	100 - 200 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

9 Railways and Tunnels map



Railways and Tunnels Legend

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- Site Outline
- Search Buffers (m): 250, 500
- Underground or Partially Underground Railway / Subway System
- Railway Tunnel (OS Mapping)
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Railway Track (OpenStreetMap)
- High Speed 2
- High Speed 2 Revised Proposed Route
- Crossrail 1
- Railway and/or Tunnel Feature from Historical Mapping

9 Railways and Tunnels

9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary?	No
Have any underground railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary?	No
Have any other railway tunnels been identified within 250m of the site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary?	No
Have any historical railway or tunnel features been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary?	No
Have any historical railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels map.

9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary?	No
Have any active railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above
Any records that have been identified are represented on the Railways and Tunnels map.

9.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project?	Yes
Is the study site within 500m of the route of the Crossrail 1 rail project?	No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

Contact Details

Groundsure Helpline

Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:**enquiries@bgs.ac.uk**
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
https://www.gov.uk/government/organisations/public-health-england
Email: **enquiries@phe.gov.uk**
Main switchboard: 020 7654 8000

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Brierley Hill, West Midlands
DY5 3LH
Tel: +44 (0) 1384 262 000
Email:**enquiries.gs@jpb.co.uk**
Website: **www.jpb.co.uk**

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SO16 0AS

Tel: 08456 050505
Website: http://www.ordnancesurvey.co.uk/

Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444
Website:**http://www1.getmapping.com/**

Peter Brett Associates

Caversham Bridge House
Waterman Place
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Tel: +44 (0)118 950 0761 E-mail:**reading@pba.co.uk**
Website:**http://www.peterbrett.com/home**

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Standard Terms and Conditions

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https://www.groundsure.com/terms-and-conditions-march-2018/

Groundsure
LOCATION INTELLIGENCE

NX Consulting Limited

11, Thorpe Close,
Altrincham, WA15 7WZ

Groundsure Reference:	GS-4827347
Your Reference:	NX332
Report Date	21 Mar 2018
Report Delivery Method:	Email - pdf

Enviro Insight

Address: MANCHESTER SCIENCE PARK, LLOYD STREET NORTH, MANCHESTER, M15 6SE

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

Managing Director
Groundsure Limited

Enc.
Groundsure Enviroinsight

Enviro Insight

Address:	**MANCHESTER SCIENCE PARK, LLOYD STREET NORTH, MANCHESTER, M15 6SE**
Date:	**21 Mar 2018**
Reference:	**GS-4827347**
Client:	**NX Consulting Limited**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	11-Jun-2015
Grid Reference:	384288,396140
Site Size:	8.32ha

Report Reference: GS-4827347
Client Reference: NX332

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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	5	24	41
1.2 Additional Information – Historical Tank Database	0	9	9	13
1.3 Additional Information – Historical Energy Features Database	5	0	26	33
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	4	11	0	8
1.6 Potentially Infilled Land	1	1	2	9

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	23
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	1
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	6	0	0	36
2.1.8 Records of Licensed Discharge Consents	0	0	0	3
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	1	0
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

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Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	0	1	0	0
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	0	0	3	5

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	10	3	20	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	2
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Records of Artificial Ground and Made Ground present beneath the study site	None identified
5.2 Records of Superficial Ground and Drift Geology present beneath the study site	Identified
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site	Identified
6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site	Identified

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	8	8	7
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	1	0	2	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	0	0	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	0	1	0	0	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	No	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Enviroment Agency Zone 2 floodplains within 250m of the study site	Identified
7.2 Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Identified
7.3 Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site	High
7.4 Flood Defences within 250m of the study site	None identified
7.5 Areas benefiting from Flood Defences within 250m of the study site	None identified
7.6 Areas used for Flood Storage within 250m of the study site	None identified
7.7 Maximum BGS Groundwater Flooding susceptibility within 50m of the study site	Limited potential
7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas	Low

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	0	0	0	0	0	1
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 Maximum risk of natural ground subsidence	Very Low
9.1.1 Maximum Shrink-Swell hazard rating identified on the study site	Very Low
9.1.2 Maximum Landslides hazard rating identified on the study site	Very Low
9.1.3 Maximum Soluble Rocks hazard rating identified on the study site	Negligible
9.1.4 Maximum Compressible Ground hazard rating identified on the study site	Negligible
9.1.5 Maximum Collapsible Rocks hazard rating identified on the study site	Very Low
9.1.6 Maximum Running Sand hazard rating identified on the study site	Very Low
9.2 Radon	
9.2.1 Radon Affected Area rating	The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Radon protection measures requirements	No radon protective measures are necessary.

Section 10: Mining

10.1 Coal mining areas within 75m of the study site	Identified
10.2 Non-Coal Mining areas within 50m of the study site boundary	None identified
10.3 Brine affected areas within 75m of the study site	None identified

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

Note: Maps

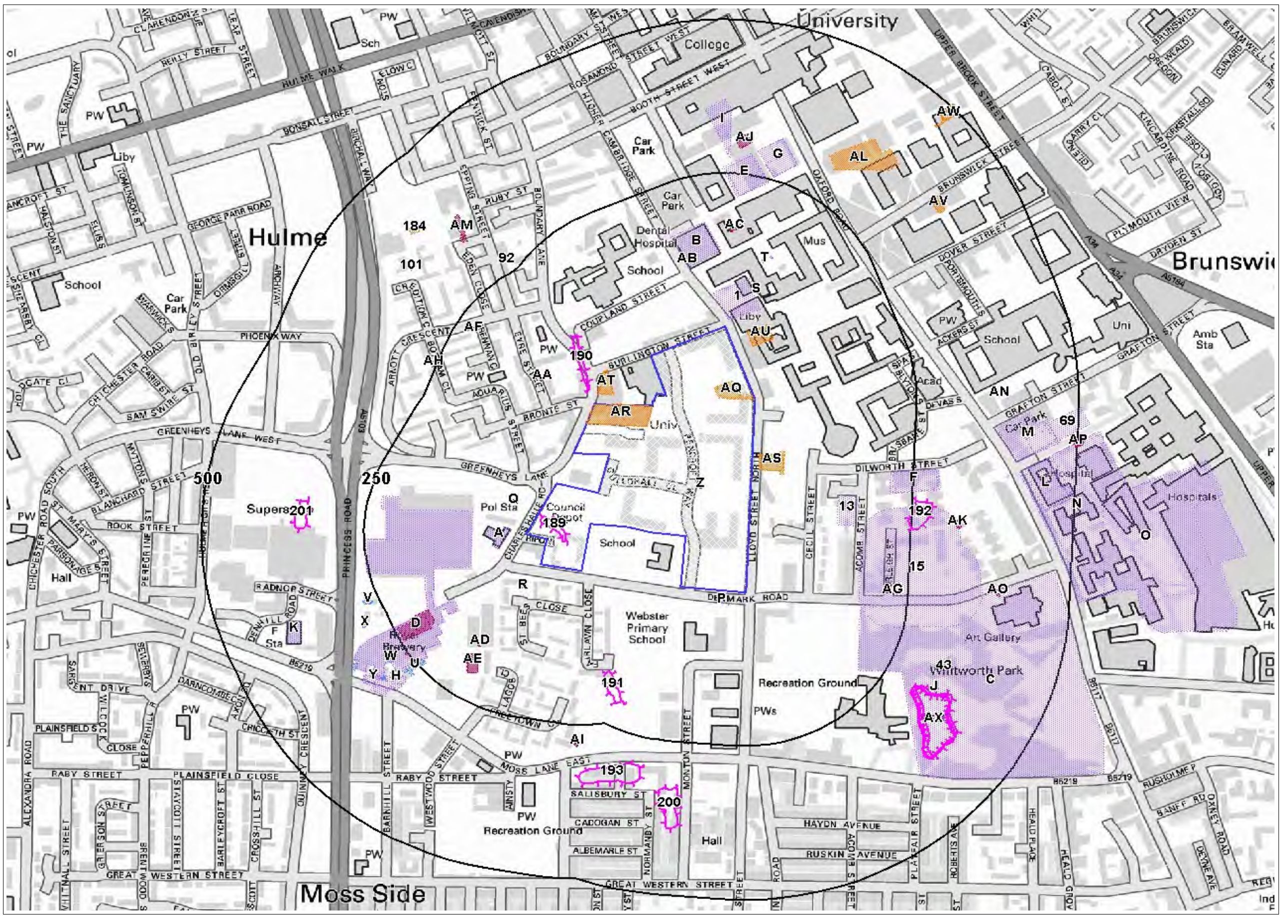
Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use

NW N NE



W E

SW S SE

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Historical 1:10,000 and 1:10,560 scale mapping

- Site Outline
- Industrial Land Use
- Potentially Infilled Land
- 250 / 500 Search Buffers (m)

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

- Energy Features
- Petrol Stations
- Tanks
- Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 70

ID	Distance [m]	Direction	Use	Date
1	11	N	Brewery	1923
2A	24	W	Police Station	1978
3A	24	W	Police Station	1994
4A	24	W	Police Station	1985
5A	24	W	Police Station	1988
6	84	W	Brewery	1994
7B	111	N	Hospital	1971
8B	111	N	Hospital	1956
9B	111	N	Hospital	1988
10B	111	N	Hospital	1985
11B	111	N	Hospital	1994
12B	111	N	Hospital	1978
13	136	E	Hospital	1956
14	142	W	Brewery	1988
15	174	E	Infirmary	1971
16C	178	E	Infirmary	1978
17C	178	E	Infirmary	1985
18C	178	E	Infirmary	1988
19C	178	E	Infirmary	1994
20D	194	SW	Electricity Station	1916
21D	196	SW	Electricity Station	1923
22E	212	N	Corporation Yard	1915
23E	212	N	Corporation Yard	1934
24E	212	N	Corporation Yard	1938
25E	214	N	Corporation Yard	1923
26F	214	E	Laundry	1934
27F	214	E	Laundry	1915
28F	214	E	Laundry	1938
29F	218	E	Laundry	1923
30G	254	N	Hospital	1938
31G	254	N	Hospital	1915
32G	254	N	Hospital	1934
33I	274	N	Unspecified Works	1916
34H	277	SW	Police Station	1971

35H	277	SW	Police Station	1956
36H	286	SW	Police Station	1916
37H	287	SW	Police Station	1923
38H	291	SW	Police Station	1932
39H	291	SW	Police Station	1938
40I	305	N	Police Station	1971
41Y	306	SW	Fire Station	1971
42J	323	SE	Boat House	1923
43	326	E	Unspecified Tank	1915
44J	359	SE	Boat House	1915
45M	373	E	Unspecified Works	1923
46K	374	W	Fire Station	1978
47K	374	W	Fire Station	1994
48K	374	W	Fire Station	1985
49K	374	W	Fire Station	1988
50L	412	E	Eye Hospital	1934
51L	412	E	Eye Hospital	1915
52L	412	E	Eye Hospital	1938
53M	416	E	Hospital	1994
54M	416	E	Hospital	1988
55M	416	E	Eye Hospital	1985
56M	416	E	Hospital	1978
57L	417	E	Eye Hospital	1923
58L	418	E	Eye Hospital	1905
59M	420	E	Hospital	1971
60N	421	E	Infirmary	1985
61N	421	E	Infirmary	1994
62N	421	E	Hospital	1971
63N	421	E	Hospital	1956
64N	421	E	Infirmary	1988
65N	421	E	Hospital	1978
66O	446	E	Infirmary	1934
67O	446	E	Infirmary	1915
68O	446	E	Infirmary	1938
69	448	E	Unspecified Works	1915
70O	452	E	Infirmary	1923

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 31

ID	Distance (m)	Direction	Use	Date
71P	18	S	Unspecified Tank	1950
72P	18	S	Unspecified Tank	1951
73P	18	S	Unspecified Tank	1950
74P	20	S	Unspecified Tank	1951
75Q	41	NW	Unspecified Tank	1993
76Q	42	NW	Unspecified Tank	1985
77R	46	SW	Unspecified Tank	1951
78R	46	SW	Unspecified Tank	1963
79R	46	SW	Unspecified Tank	1961
80S	71	NE	Unspecified Tank	1977
81S	72	NE	Unspecified Tank	1963
82T	120	NE	Unspecified Tank	1949
83T	131	NE	Unspecified Tank	1948
84T	131	NE	Unspecified Tank	1951
85B	152	N	Unspecified Tank	1891
86U	238	SW	Tanks	1989
87U	238	SW	Tanks	1989
88U	238	SW	Tanks	1995
89V	261	SW	Tanks	1995
90V	262	SW	Tanks	1989
91V	262	SW	Tanks	1989
92	268	NW	Unspecified Tank	1891
93W	275	SW	Unspecified Tank	1977
94W	276	SW	Unspecified Tank	1985
95X	286	W	Unspecified Tank	1995
96X	286	W	Unspecified Tank	1989
97X	286	W	Unspecified Tank	1989
98H	300	SW	Unspecified Tank	1977
99H	301	SW	Unspecified Tank	1985
100Y	319	SW	Unspecified Tank	1995
101	356	NW	Unspecified Tank	1891

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 64

ID	Distance (m)	Direction	Use	Date

102Z	0	On Site	Electricity Substation	1993
103Z	0	On Site	Electricity Substation	1995
104Z	0	On Site	Electricity Substation	1985
105Z	0	On Site	Electricity Substation	1985
106Z	0	On Site	Electricity Substation	1998
107AA	87	NW	Electricity Substation	1998
108AA	87	NW	Electricity Substation	1995
109AA	87	NW	Electricity Substation	1993
110AA	88	NW	Electricity Substation	1985
111AA	89	NW	Electricity Substation	1985
112AB	118	N	Electricity Substation	1997
113AB	118	N	Electricity Substation	1995
114AB	118	N	Electricity Substation	1976
115AC	154	N	Electricity Substation	1976
116AC	155	N	Electricity Substation	1997
117AC	155	N	Electricity Substation	1995
118AD	156	SW	Electricity Substation	1989
119AD	157	SW	Electricity Substation	1992
120AE	174	SW	Electricity Substation	1976
121AE	174	SW	Electricity Substation	1989
122AE	174	SW	Electricity Substation	1984
123AE	175	SW	Electricity Substation	1992
124D	187	SW	Electricity Substation	1949
125D	196	SW	Electricity Substation	1922
126AF	219	NW	Electricity Substation	1993
127AF	220	NW	Electricity Substation	1977
128AF	220	NW	Electricity Substation	1985
129AF	220	NW	Electricity Substation	1985
130AG	224	E	Electricity Substation	1989
131AG	224	E	Electricity Substation	1994
132W	250	SW	Electricity Substation	1908
133AH	252	W	Electricity Substation	1995
134AH	252	W	Electricity Substation	1996
135AH	252	W	Electricity Substation	1978
136AH	252	W	Electricity Substation	1988
137AH	252	W	Electricity Substation	1990
138AI	278	S	Electricity Substation	1976
139AI	278	S	Electricity Substation	1984
140AI	278	S	Electricity Substation	1989
141AI	280	S	Electricity Substation	1992
142AJ	291	N	Electricity Substation	1949
143AJ	291	N	Electricity Substation	1948
144AJ	291	N	Electricity Substation	1951
145AK	316	E	Electricity Substation	1987
146AK	318	E	Electricity Substation	1998
147AK	318	E	Electricity Substation	1994

148AK	318	E	Electricity Substation	1993
149AK	318	E	Electricity Substation	1980
150AM	330	NW	Electricity Substation	1976
151AL	336	NE	Electricity Substation	1987
152AL	336	NE	Electricity Substation	1989
153AL	337	NE	Electricity Substation	1992
154AM	337	NW	Electricity Substation	1997
155AM	337	NW	Electricity Substation	1995
156AN	374	E	Electricity Substation	1993
157AN	374	E	Electricity Substation	1994
158AN	374	E	Electricity Substation	1998
159AO	384	E	Electricity Substation	1989
160AO	385	E	Electricity Substation	1994
161AP	494	E	Electricity Substation	1987
162AP	495	E	Electricity Substation	1994
163AP	495	E	Electricity Substation	1993
164AP	495	E	Electricity Substation	1998
165AP	495	E	Electricity Substation	1980

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 23

ID	Distance (m)	Direction	Use	Date
166AR	0	On Site	Garage	1961
167AQ	0	On Site	Garage	1961
168AQ	0	On Site	Garage	1951
169AR	0	On Site	Garage	1951
170AS	11	E	Garage	1961
171AS	12	E	Garage	1963
172AT	17	N	Garage	1985
173AT	17	N	Garage	1985

174AT	17	N	Garage	1995
175AT	17	N	Garage	1993
176AT	17	N	Garage	1998
177AU	28	E	Garage	1949
178AU	29	E	Garage	1949
179AU	29	E	Garage	1951
180AS	42	E	Garage	1961
181AL	305	NE	Carriage and Motor Manufactory	1922
182AV	377	NE	Garage	1961
183AV	378	NE	Garage	1961
184	388	NW	Garage	1955
185AW	459	NE	Garage	1948
186AW	476	NE	Garage	1961
187AW	477	NE	Garage	1961
188AW	477	NE	Garage	1949

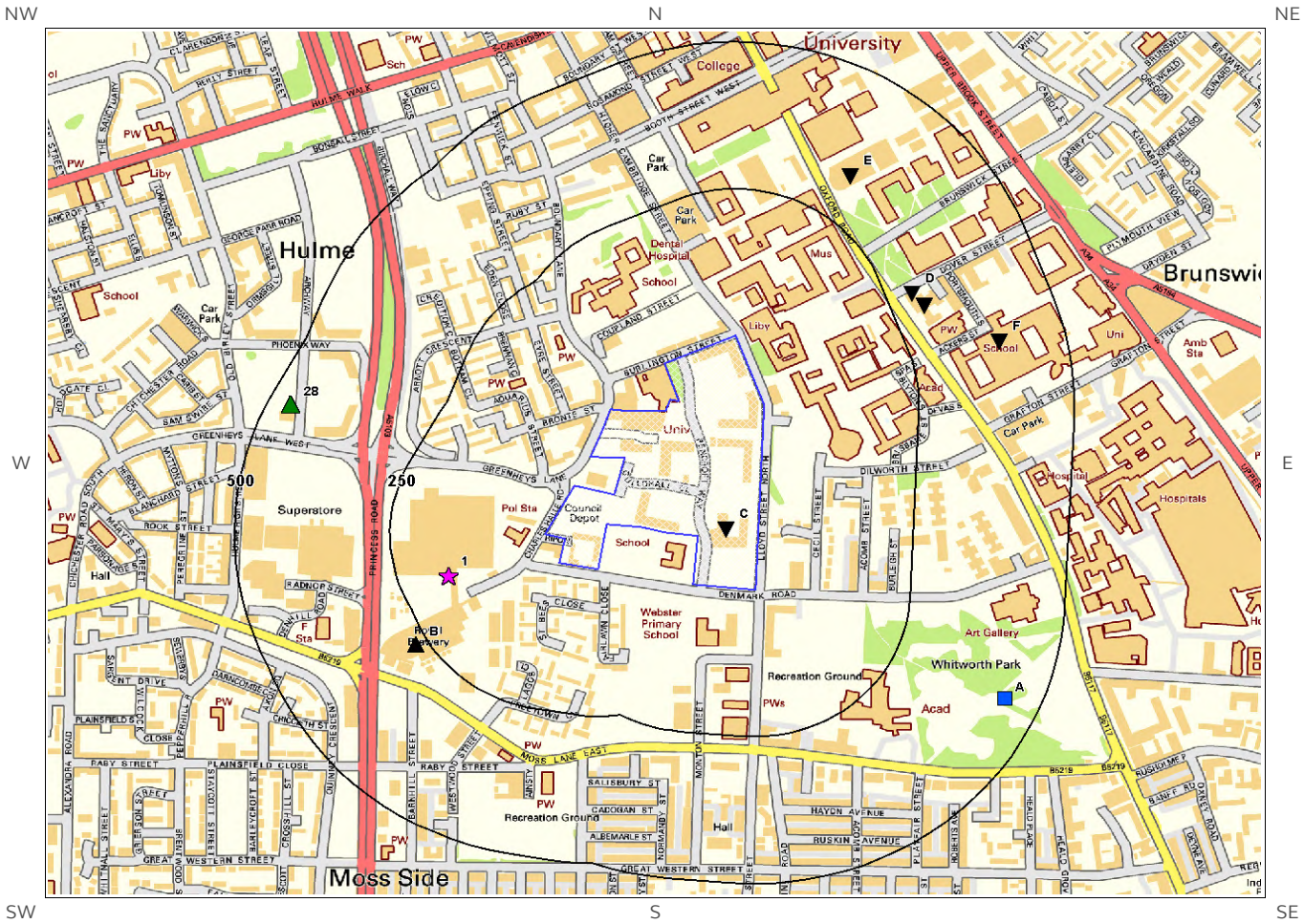
1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 13

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
189	0	On Site	Pond	1851
190	25	N	Pond	1851
191	169	S	Pond	1851
192	246	E	Pond	1851
193	297	S	Pond	1851
194AX	301	SE	Pond	1915
195AX	301	SE	Pond	1938
196AX	301	SE	Pond	1934
197AX	305	SE	Pond	1905
198AX	305	SE	Pond	1923
199AX	307	SE	Pond	1956
200	326	S	Pond	1851
201	337	W	Pond	1851

2. Environmental Permits, Incidents and Registers Map



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Site Outline

250 / 500 Search Buffers (m)

Recorded Pollution Incident

Dangerous Substances (List 1)

Dangerous Substances (List 2)

Water Industry Referrals

Licenced Discharge Consents

Red List Discharge Consents

RAS 3 & 4 Authorisations

Part A(1) Authorised Processes and Historic IPC Authorisations

Part A(2) and Part B Authorised Processes

COMAH / NIHHS Sites

Sites Determined as Contaminated Land

Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

23

The following Part A(1) and IPPC Authorised Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
71B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: ASSOCIATED PROCESS	Permit Number: ZP3037VD Original Permit Number: CP3531GM EPR Reference: - Issue Date: 23/6/2014 Effective Date: 23/6/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
72B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: BV7796IW Original Permit Number: BV7796IW EPR Reference: - Issue Date: 22/12/2005 Effective Date: 22/12/2005 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
73B	271	SW	383900 395900	Operator: Suez Industrial Water Ltd Installation Name: Royal Brewery Epr/cp3531gm Process: DISPOSAL OF > 50 T/D NON-HAZARDOUS WASTE (> 100 T/D IF ONLY AD) INVOLVING BIOLOGICAL TREATMENT	Permit Number: UP3232YC Original Permit Number: CP3531GM EPR Reference: - Issue Date: 8/5/2017 Effective Date: 8/5/2017 00:00:00 Last date noted as effective: 2018-03-01 Status: Effective

ID	Distance (m)	Direction	NGR	Details	
74B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: UP3131UM Original Permit Number: BV7796IW EPR Reference: - Issue Date: 6/2/2008 Effective Date: 22/2/2008 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
75B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: CP3531GM Original Permit Number: CP3531GM EPR Reference: - Issue Date: 1/4/2009 Effective Date: 1/4/2009 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
76B	271	SW	383900 395900	Operator: Suez Industrial Water Ltd Installation Name: Royal Brewery Epr/cp3531gm Process: ASSOCIATED PROCESS	Permit Number: RP3335DD Original Permit Number: CP3531GM EPR Reference: - Issue Date: 30/6/2016 Effective Date: 30/6/2016 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
77B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: DISPOSAL OF > 50 T/D NON-HAZARDOUS WASTE (> 100 T/D IF ONLY AD) INVOLVING BIOLOGICAL TREATMENT	Permit Number: ZP3037VD Original Permit Number: CP3531GM EPR Reference: - Issue Date: 23/6/2014 Effective Date: 23/6/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
78B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: DISPOSAL OF > 50 T/D NON-HAZARDOUS WASTE (> 100 T/D IF ONLY AD) INVOLVING BIOLOGICAL TREATMENT	Permit Number: KP3630WM Original Permit Number: CP3531GM EPR Reference: - Issue Date: 5/12/2014 Effective Date: 5/12/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
79B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: ASSOCIATED PROCESS	Permit Number: HP3836KU Original Permit Number: CP3531GM EPR Reference: - Issue Date: 15/3/2010 Effective Date: 15/3/2010 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
80B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: SP3736UP Original Permit Number: BV7796IW EPR Reference: - Issue Date: 2/7/2008 Effective Date: 1/8/2008 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
81B	271	SW	383900 395900	Operator: Vws (uk) Ltd Installation Name: Royal Brewery Effluent Treatment Plant Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: EP3637PU Original Permit Number: EP3637PU EPR Reference: - Issue Date: 13/1/2006 Effective Date: 13/1/2006 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded

ID	Distance (m)	Direction	NGR	Details	
82B	271	SW	383900 395900	Operator: Vws (uk) Ltd Installation Name: Royal Brewery Effluent Treatment Plant Process: ASSOCIATED PROCESS	Permit Number: EP3637PU Original Permit Number: EP3637PU EPR Reference: - Issue Date: 13/1/2006 Effective Date: 13/1/2006 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
83B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: HP3836KU Original Permit Number: CP3531GM EPR Reference: - Issue Date: 15/3/2010 Effective Date: 15/3/2010 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
84B	271	SW	383900 395900	Operator: Suez Industrial Water Ltd Installation Name: Royal Brewery Epr/cp3531gm Process: DISPOSAL OF > 50 T/D NON-HAZARDOUS WASTE (> 100 T/D IF ONLY AD) INVOLVING BIOLOGICAL TREATMENT	Permit Number: RP3335DD Original Permit Number: CP3531GM EPR Reference: - Issue Date: 30/6/2016 Effective Date: 30/6/2016 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
85B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Manchester Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: QP3438EM Original Permit Number: BV7796IW EPR Reference: - Issue Date: 26/3/2014 Effective Date: 26/3/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
86B	271	SW	383900 395900	Operator: Suez Industrial Water Ltd Installation Name: Royal Brewery Epr/cp3531gm Process: ASSOCIATED PROCESS	Permit Number: UP3232YC Original Permit Number: CP3531GM EPR Reference: - Issue Date: 8/5/2017 Effective Date: 8/5/2017 00:00:00 Last date noted as effective: 2018-03-01 Status: Effective
87B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: ASSOCIATED PROCESS	Permit Number: KP3630WM Original Permit Number: CP3531GM EPR Reference: - Issue Date: 5/12/2014 Effective Date: 5/12/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
88B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: JP3631CT Original Permit Number: BV7796IW EPR Reference: - Issue Date: 6/11/2012 Effective Date: 6/11/2012 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
89B	271	SW	383900 395900	Operator: Ondeo Industrial Solutions Limited Installation Name: Royal Brewery Epr/cp3531gm Process: ASSOCIATED PROCESS	Permit Number: CP3531GM Original Permit Number: CP3531GM EPR Reference: - Issue Date: 1/4/2009 Effective Date: 1/4/2009 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded

ID	Distance (m)	Direction	NGR	Details	
90B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Manchester Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: KP3830WK Original Permit Number: BV7796IW EPR Reference: - Issue Date: 5/12/2014 Effective Date: 5/12/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
91B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: DP3431LK Original Permit Number: BV7796IW EPR Reference: - Issue Date: 27/11/2006 Effective Date: 27/11/2006 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
92B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Manchester Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: LP3732VH Original Permit Number: BV7796IW EPR Reference: - Issue Date: 28/8/2014 Effective Date: 28/8/2014 00:00:00 Last date noted as effective: 2018-03-01 Status: Superceded
93B	271	SW	383900 395900	Operator: Heineken Uk Ltd Installation Name: Royal Brewery Manchester Process: ANIMAL VEGETABLE AND FOOD; TREATING ETC VEGETABLE RAW MATERIALS FOR FOOD >300T/D	Permit Number: DP3530YY Original Permit Number: BV7796IW EPR Reference: - Issue Date: 18/4/2017 Effective Date: 18/4/2017 00:00:00 Last date noted as effective: 2018-03-01 Status: Effective

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
28	465	NW	383697 396307	Address: Asda Hulme, 100 Princess Road, Hulme, M15 5AS Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

42

The following RAS Licence (3 or 4) records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
94C	0	On Site	384400 396100	Medeval Ltd, Skelton House, Manchester Science Park, Lloyd Street North, Manchester, Greater Manchester, M15 6SH	Medeval Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AC8525	Date of Approval:12/5/2006 Effective from:8/6/2006 Last date of update:2015-01-01	Revoked/cancelled
95C	0	On Site	384400 396100	Cyprotex Discovery Ltd, Skelton House, Manchester Science Park, Lloyd Street North, Manchester, Greater Manchester, M15 6SH	Cyprotex Discovery Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL8023	Date of Approval:4/10/2001 Effective from:1/11/2001 Last date of update:2015-01-01	Superseded By Variation
96C	0	On Site	384400 396100	Medeval Ltd, Skelton House,manchester Science Park,lloyd Street North, Manchester, Greater Manchester, M15 6SH	Medeval Ltd	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AC8533	Date of Approval:31/3/1991 Effective from:31/3/1991 Last date of update:2015-01-01	Superseded By Variation
97C	0	On Site	384400 396100	Medeval Ltd, Skelton House,manchester Science Park,lloyd Street North, Manchester, Greater Manchester, M15 6SH	Medeval Ltd	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AC8533	Date of Approval:12/5/2006 Effective from:12/5/2006 Last date of update:2015-01-01	Revoked/cancelled

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
98C	0	On Site	384400 396100	Medeval Ltd, Skelton House, Manchester Science Park, Lloyd Street North, Manchester, Greater Manchester, M15 6SH	Medeval Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AC8525	Date of Approval:31/3/1991 Effective from:31/3/1991 Last date of update:2015-01-01	Superseded By Variation
99C	0	On Site	384400 396100	Medeval Ltd, Skelton House, Manchester Science Park, Lloyd Street North, Manchester, Greater Manchester, M15 6SH	Medeval Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AC8525	Date of Approval:1/12/2003 Effective from:1/1/2004 Last date of update:2015-01-01	Superseded By Variation
100D	291	E	384700 396500	University Of Manchester, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AD0180	Date of Approval:31/3/1991 Effective from:31/3/1991 Last date of update:2015-01-01	Revoked/cancelled
101D	302	E	384720 396480	University Of Manchester, Health And Safety Services, Radiological Protection, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AG3983	Date of Approval:1/12/2003 Effective from:1/1/2004 Last date of update:2015-01-01	Revoked/cancelled
102D	302	E	384720 396480	University Of Manchester, Health And Safety Services, Radiological Protection, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AG3983	Date of Approval:11/9/2001 Effective from:9/10/2001 Last date of update:2015-01-01	Superseded By Variation
103D	302	E	384720 396480	University Of Manchester, North Campus,sackville Street, Manchester, M60 1QD	University Of Manchester	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BX8661	Date of Approval:1/10/2004 Effective from:1/10/2004 Last date of update:2015-01-01	Effective
104D	302	E	384720 396480	University Of Manchester, Health And Safety Services, Radiological Protection, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AG3983	Date of Approval:20/10/1994 Effective from:20/11/1994 Last date of update:2015-01-01	Superseded By Variation

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
105D	302	E	384720 396480	University Of Manchester, Health And Safety Services, Radiological Protection, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AG3983	Date of Approval:10/7/1997 Effective from:1/11/1997 Last date of update:2015-01-01	Superseded By Variation
106D	302	E	384720 396480	University Of Manchester, Health And Safety Services, Radiological Protection, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AG3983	Date of Approval:28/2/2002 Effective from:1/4/2002 Last date of update:2015-01-01	Superseded By Variation
107D	302	E	384720 396480	University Of Manchester, Health And Safety Services, Radiological Protection, 327 Oxford Road, Manchester, Greater Manchester, M13 9PG	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AG3983	Date of Approval:16/2/1996 Effective from:16/2/1996 Last date of update:2015-01-01	Superseded By Variation
108D	302	E	384720 396480	University Of Manchester, North Campus, Sackville Street, Manchester, M60 1QD	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BX8645	Date of Approval:2/9/2004 Effective from:1/10/2004 Last date of update:2015-01-01	Effective
109D	302	E	384720 396480	University Of Manchester, North Campus,sackville Street, Manchester, M60 1QD	University Of Manchester	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BX8653	Date of Approval:1-10-2004 Effective from:1-10-2004 Last date of update:2005-04-01	Effective
110E	329	NE	384600 396700	Victoria University Of Manchester,,oxford Road, Manchester, Greater Manchester, M13 9PL	Victoria University Of Manchester	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AP8713	Date of Approval:16/8/1999 Effective from:16/8/1999 Last date of update:2015-01-01	Superseded By Variation
111E	329	NE	384600 396700	University Of Manchester, South Campus, Oxford Road, Manchester, M13 9PL	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BX8564	Date of Approval:28/6/2005 Effective from:22/7/2005 Last date of update:2015-01-01	Superseded By Variation

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
112E	329	NE	384600 396700	University Of Manchester, South Campus, Oxford Road, Manchester, M13 9PL	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BX8564	Date of Approval:8/12/2006 Effective from:3/12/2007 Last date of update:2015-01-01	Effective
113E	329	NE	384600 396700	Central Manchester University Hospitals Nhs Foundation Trust, Radiological Protection Service,327 Oxford Road, Manchester, M13 9PL	Central Manchester University Hospitals Nhs Foundation Trust	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AP9353	Date of Approval:6/3/1998 Effective from:6/3/1998 Last date of update:2015-01-01	Superseded By Variation
114E	329	NE	384600 396700	University Of Manchester, South Campus, Oxford Road, Manchester, M13 9PL	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BX8564	Date of Approval:2/9/2004 Effective from:1/10/2004 Last date of update:2015-01-01	Superseded By Variation
115E	329	NE	384600 396700	Central Manchester University Hospitals Nhs Foundation Trust, Radiological Protection Service,327 Oxford Road, Manchester, M13 9PL	Central Manchester University Hospitals Nhs Foundation Trust	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AP9353	Date of Approval:19/9/2005 Effective from:19/9/2005 Last date of update:2015-01-01	Superseded By Variation
116E	329	NE	384600 396700	University Of Manchester, South Campus,oxford Road, Manchester, M13 9PL	University Of Manchester	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BX8556	Date of Approval:27-1-2006 Effective from:27-1-2006 Last date of update:2006-04-06	Effective
117E	329	NE	384600 396700	Central Manchester University Hospitals Nhs Foundation Trust, Radiological Protection Service,327 Oxford Road, Manchester, M13 9PL	Central Manchester University Hospitals Nhs Foundation Trust	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AP9353	Date of Approval:19/11/2001 Effective from:19/11/2001 Last date of update:2015-01-01	Superseded By Variation
118E	329	NE	384600 396700	Central Manchester University Hospitals Nhs Foundation Trust, Radiological Protection Service,327 Oxford Road, Manchester, M13 9PL	Central Manchester University Hospitals Nhs Foundation Trust	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AP9353	Date of Approval:26/10/2006 Effective from:26/10/2006 Last date of update:2015-01-01	Superseded By Variation

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
119E	329	NE	384600 396700	University Of Manchester, Oxford Road, Manchester, Greater Manchester, M13 9PL	University Of Manchester	Disposal Of Radioactive Waste (was Rsa60 Section 6).	AD0155	Date of Approval:31/3/1991 Effective from:31/3/1991 Last date of update:2015-01-01	Revoked/cancelled
120E	329	NE	384600 396700	Central Manchester University Hospitals Nhs Foundation Trust, Radiological Protection Service,327 Oxford Road, Manchester, M13 9PL	Central Manchester University Hospitals Nhs Foundation Trust	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	AP9353	Date of Approval:17/3/2009 Effective from:17/3/2009 Last date of update:2015-01-01	Effective
121E	329	NE	384600 396700	University Of Manchester, South Campus,oxford Road, Manchester, M13 9PL	University Of Manchester	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BX8556	Date of Approval:22-8-2006 Effective from:22-8-2006 Last date of update:2006-10-01	Effective
122E	329	NE	384600 396700	University Of Manchester, South Campus,oxford Road, Manchester, M13 9PL	University Of Manchester	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BX8548	Date of Approval:1/10/2004 Effective from:1/10/2004 Last date of update:2015-01-01	Effective
123F	394	E	384840 396420	Renovo Ltd, Manchester Incubator Building,grafton Street, Manchester, M13 9XX	Renovo Ltd	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BL1959	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Revoked/cancelled
124F	394	E	384840 396420	Manchester Incubator Co Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Manchester Incubator Co Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1932	Date of Approval:4/2/2005 Effective from:7/3/2005 Last date of update:2015-01-01	Superseded By Variation
125F	394	E	384840 396420	Motac Neuroscience Ltd, Manchester Incubator Building,grafton Street, Manchester, M13 9XX	Motac Neuroscience Ltd	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BL1924	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Revoked/cancelled
126F	394	E	384840 396420	Syngenta Ltd, Manchester Incubator Building,grafton Street, Manchester, M13 9XX	Syngenta Ltd	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BL2955	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Revoked/cancelled

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
127F	394	E	384840 396420	Manchester Incubator Co Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Manchester Incubator Co Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1932	Date of Approval:1/12/2003 Effective from:1/1/2004 Last date of update:2015-01-01	Superseded By Variation
128F	394	E	384840 396420	Manchester Incubator Co Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Manchester Incubator Co Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1932	Date of Approval:23/6/2005 Effective from:22/7/2005 Last date of update:2015-01-01	Effective
129F	394	E	384840 396420	Manchester Incubator Co Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Manchester Incubator Co Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1932	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Superseded By Variation
130F	394	E	384840 396420	Syngenta Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Syngenta Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL2963	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Revoked/cancelled
131F	394	E	384840 396420	Motac Neuroscience Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Motac Neuroscience Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1916	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Revoked/cancelled
132F	394	E	384840 396420	Renovo Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Renovo Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1967	Date of Approval:19/10/2004 Effective from:21/10/2004 Last date of update:2015-01-01	Superseded By Variation
133F	394	E	384840 396420	Renovo Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Renovo Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1967	Date of Approval:27/7/2001 Effective from:27/7/2001 Last date of update:2015-01-01	Superseded By Variation
134F	394	E	384840 396420	Renovo Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Renovo Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1967	Date of Approval:4/2/2005 Effective from:7/3/2005 Last date of update:2015-01-01	Revoked/cancelled

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
135F	394	E	384840 396420	Renovo Ltd, Manchester Incubator Building, Grafton Street, Manchester, M13 9XX	Renovo Ltd	Disposal Of Radioactive Waste (was Rsa60 Section 6).	BL1967	Date of Approval:1/12/2003 Effective from:1/1/2004 Last date of update:2015-01-01	Superseded By Variation

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

3

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
2A	443	SE	384850 395810	Address: OXFORD ROAD CSO, MANCHESTER, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982917 Permit Version: 3	Receiving Water: MALKIN BROOK TRIB CORN BK Status: REVOKED - UNSPECIFIED Issue date: 08/11/1995 Effective Date: 08-Nov-1995 Revocation Date: 13/07/2005
3A	443	SE	384850 395810	Address: OXFORD ROAD CSO, MANCHESTER, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982917 Permit Version: 1	Receiving Water: MALKIN BROOK TRIB CORN BK Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01-Jan-1995 Revocation Date: 10/05/1995
4A	443	SE	384850 395810	Address: OXFORD ROAD CSO, MANCHESTER, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016982917 Permit Version: 2	Receiving Water: MALKIN BROOK TRIB CORN BK Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 11-May-1995 Revocation Date: 07/11/1995

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

1

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	171	SW	383953 396019	Incident Date: 13-May-2003 Incident Identification: 158099 Pollutant: Inorganic Chemicals/Products Pollutant Description: Acids	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

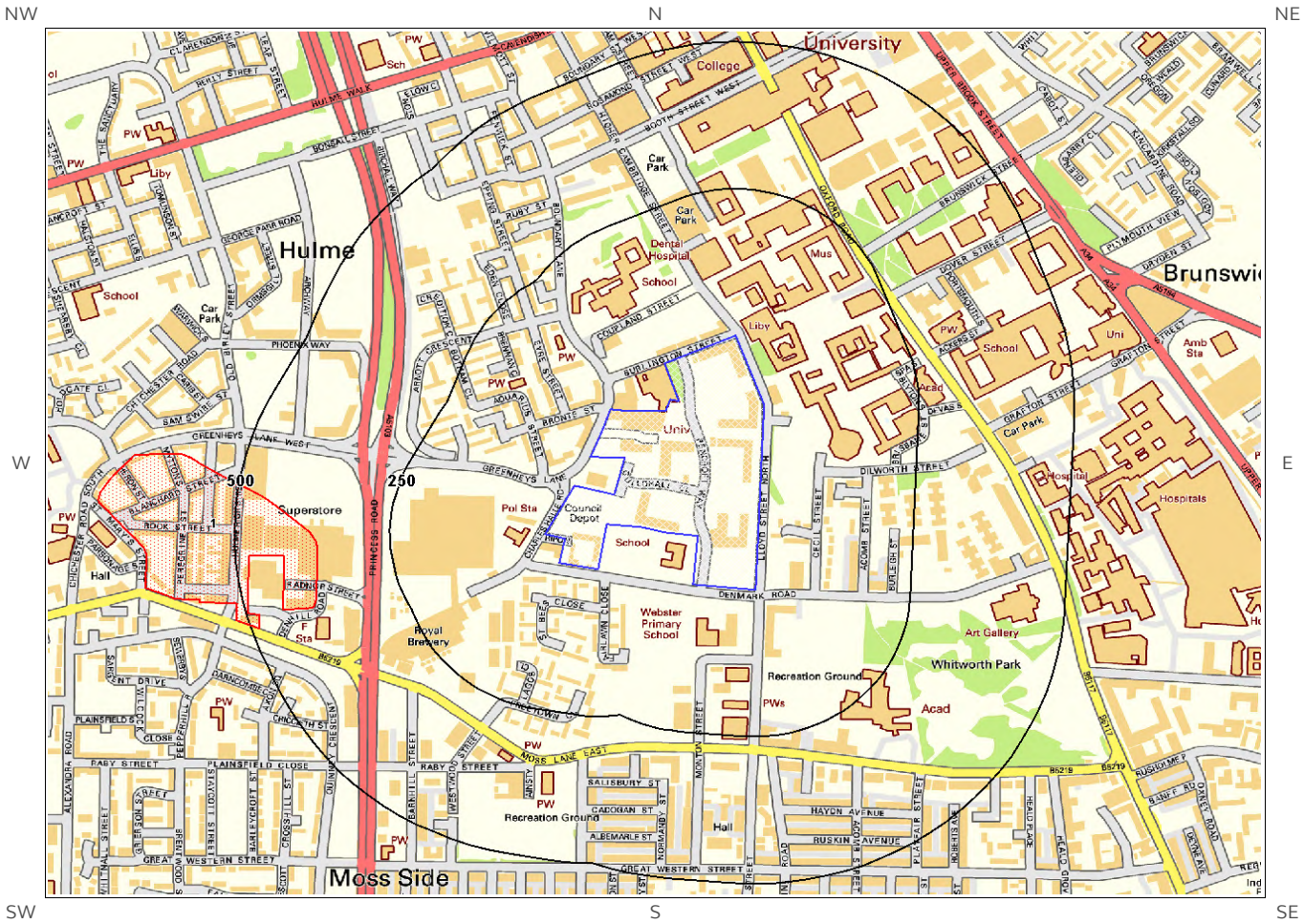
Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

Records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



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Site Outline

250 — 500 — Search Buffers (m)

EA/NRW Active Landfill

EA/NRW Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

EA/NRW Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

1

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
1	368	W	383500 396000	Site Address: Moss Side Shopping Centre, Hulme, Manchester Waste Licence: Yes Site Reference: F061 ,0103, RD/LIC/1036/93 Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 11-Apr-1994 Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: Demolition Service Limited First Recorded: 31-May-1994 Last Recorded: 05-Jun-1995

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

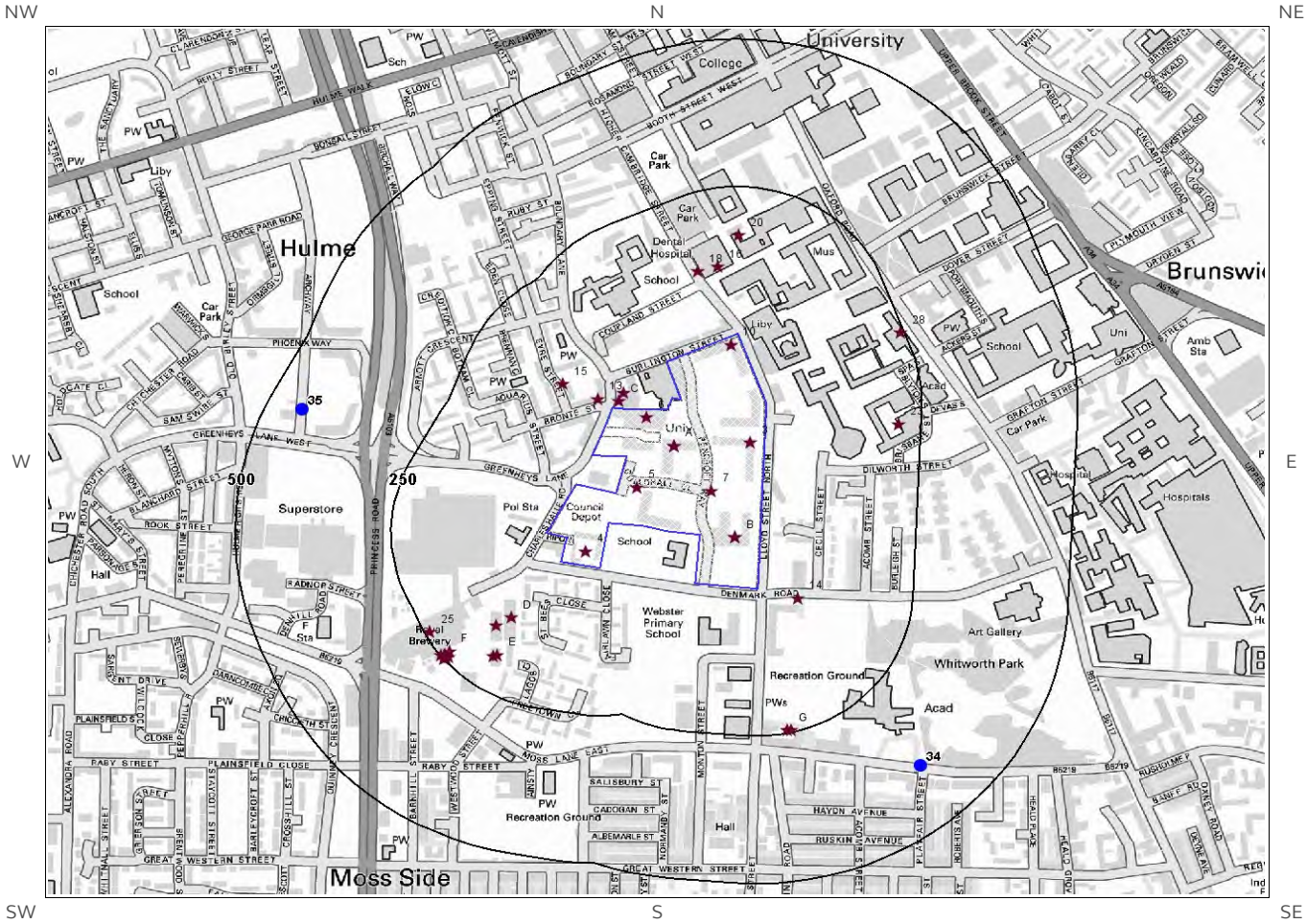
8

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	957	E	385400 395900	Site Address: - Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CMH001 EPR reference: - Operator: Central Manchester Area Health Authority Waste Management licence No: 53906 Annual Tonnage: 417.0	Issue Date: 18/04/1990 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Manchester Royal Infirmary Correspondence Address: Facilities Directorate, Gate 9, Oxford Road, Manchester, M13 9WL
Not shown	957	E	385400 395900	Site Address: Manchester Royal Infirmary, Oxford Road, Manchester, M13 9WL Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CMH001 EPR reference: EA/EPR/PP3391CE/A001 Operator: Central Manchester & Manchester Childrens University Hospital Nhs Trust Waste Management licence No: 53906 Annual Tonnage: 417.0	Issue Date: 18/04/1990 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Central Manchester & Manchester Childrens University Hospital Nhs Trust Correspondence Address: -
Not shown	957	E	385400 395900	Site Address: Manchester Royal Infirmary, Oxford Road, Manchester, M13 9WL Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CMH001 EPR reference: EA/EPR/PP3391CE/S002 Operator: Central Manchester University Hospitals N H S Foundation Trust Waste Management licence No: 53906 Annual Tonnage: 110088.0	Issue Date: 18/04/1990 Effective Date: - Modified: - Surrendered Date: 24/08/2012 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Central Manchester University Hospitals N H S Foundation Trust Correspondence Address: -

ID	Distance (m)	Direction	NGR	Details	
Not shown	1035	N	383998 397374	Site Address: Little Ireland Phase B, Great Marlborough Street, Manchester, M1 5NN Type: Mobile Plant Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: TER003 EPR reference: - Operator: Terra Vac (uk) Ltd Waste Management licence No: 50191 Annual Tonnage: 0.0	Issue Date: 17/06/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Terra Vac (uk) Ltd Correspondence Address: Unit 7a, Whitwood Enterprise Park, Castleford, WF10 5PX
Not shown	1329	NE	385200 397500	Site Address: 2, Hoyle Street, Ardwick, Manchester, M12 6HG Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ADO001 EPR reference: EA/EPR/AP3092CD/A001 Operator: Donnelly Mr. A. Waste Management licence No: 53582 Annual Tonnage: 310.0	Issue Date: 11/10/1996 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Suspended Site Name: Ardwick Auto Spares Correspondence Address: -
Not shown	1355	NE	385235 397506	Site Address: Hoyle Trading Estate, Hoyle Street, Manchester, M12 6HL Type: Treatment of waste to produce soil <75,000 tpy Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: DEL043 EPR reference: EA/EPR/CB3601KL/A001 Operator: E Delaney Demolition Ltd Waste Management licence No: 402157 Annual Tonnage: 74999.0	Issue Date: 26/02/2015 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Aggregate Recycling Yard Correspondence Address: -
Not shown	1398	NE	385300 397510	Site Address: Temperance Street, Ardwick, Manchester, M12 6HS Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: PML001 EPR reference: EA/EPR/AP3992CN/A001 Operator: Pye Metals Ltd Waste Management licence No: 53583 Annual Tonnage: 1733.33	Issue Date: 11/10/1996 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired Site Name: Pye Metals Ltd Correspondence Address: -
Not shown	1453	NE	385296 397583	Site Address: Hoyle Street, Hoyle Trading Estate, Manchester, M12 6JL Type: Inert & excavation Waste TS + treatment Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CIT060 EPR reference: EA/EPR/CB3905MR/A001 Operator: City Excavations Ltd Waste Management licence No: 402399 Annual Tonnage: 75000.0	Issue Date: 01/06/2015 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: City Excavations Aggregate Yard Correspondence Address: -

4. Current Land Use Map



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Site Outline

Current Industrial Sites

Electricity Transmission Cables

250
500
Search Buffers (m)

Petrol & Fuel Sites

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 33

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1A	0	On Site	I P E C	384312 396238	Rutherford House 40, Pencroft Way, Manchester Science Park, Manchester, M15 6SZ	Electrical and Electronic Engineers	Engineering Services
2A	0	On Site	Premaitha Health	384312 396238	Rutherford House 40, Pencroft Way, Manchester Science Park, Manchester, M15 6SZ	Medical Equipment, Supplies and Pharmaceuticals	Industrial Products
3	0	On Site	Mimic	384435 396244	Enterprise House, Lloyd Street North, Manchester Science Park, Manchester, M15 6SE	Marine Engineers and Services	Engineering Services
4	0	On Site	Council Depot	384171 396060	M15	Container and Storage	Transport, Storage and Delivery
5	0	On Site	Electricity Sub Station	384254 396168	M15	Electrical Features	Infrastructure and Facilities
6	0	On Site	Idvac	384268 396287	Unit 15 Greenheys Business Centre, Pencroft Way, Manchester, M15 6JJ	Industrial Coatings and Finishings	Industrial Products
7	0	On Site	Electricity Sub Station	384373 396162	M15	Electrical Features	Infrastructure and Facilities
8B	0	On Site	Peak Service	384410 396083	Skelton House, Lloyd Street North, Manchester Science Park, Manchester, M15 6SH	Industrial Repairs and Servicing	Repair and Servicing
9B	0	On Site	Qiagen	384410 396083	Skelton House, Lloyd Street North, Manchester Science Park, Manchester, M15 6SH	Medical Equipment, Supplies and Pharmaceuticals	Industrial Products
10	0	On Site	Lig Biowise Ltd	384405 396409	Williams House, Lloyd Street North, Manchester Science Park, Manchester, M15 6SE	Measurement and Inspection Equipment	Industrial Products
11C	13	N	Factory	384225 396314	M15	Unspecified Works Or Factories	Industrial Features
12C	28	N	Cedric's Motors	384232 396328	1-5, Greenheys Lane, Manchester, M15 6NQ	Vehicle Repair, Testing and Servicing	Repair and Servicing
13	29	NW	Machete Records & Productions	384190 396318	18b, Greenheys Lane, Manchester, M15 6NQ	Recording Studios and Record Companies	IT, Advertising, Marketing and Media Services
14	65	E	Electricity Sub Station	384511 395980	M15	Electrical Features	Infrastructure and Facilities

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
15	91	NW	Electricity Sub Station	384134 396343	M15	Electrical Features	Infrastructure and Facilities
16	120	N	University Dental Hospital of Manchester	384383 396542	University Dental Hospital of Manchester, Higher Cambridge Street, Manchester, M15 6FH	Hospitals	Health Practitioners and Establishments
17D	123	SW	Warehouse	384051 395947	M14	Container and Storage	Transport, Storage and Delivery
18	124	N	Electricity Sub Station	384351 396534	M15	Electrical Features	Infrastructure and Facilities
19D	149	SW	Works	384027 395934	M14	Unspecified Works Or Factories	Industrial Features
20	168	N	Electricity Sub Station	384417 396595	M15	Electrical Features	Infrastructure and Facilities
21E	187	SW	Electricity Sub Station	384029 395884	M14	Electrical Features	Infrastructure and Facilities
22E	193	SW	Electricity Sub Station	384022 395882	M15	Electrical Features	Infrastructure and Facilities
23	213	E	Electricity Sub Station	384673 396275	M15	Electrical Features	Infrastructure and Facilities
24F	233	SW	Silo	383953 395890	M15	Hoppers and Silos	Farming
25	242	SW	Heineken	383920 395922	Royal Brewery 201, Denmark Road, Manchester, M15 6LD	Alcoholic Drinks	Foodstuffs
26F	242	SW	Silo	383950 395880	M15	Hoppers and Silos	Farming
27F	243	SW	Silo	383945 395885	M15	Hoppers and Silos	Farming
28	243	E	U-print	384676 396430	Steve Biko Building, Oxford Road, Manchester, M13 9PR	Published Goods	Industrial Products
29G	244	S	Electricity Sub Station	384495 395756	M14	Electrical Features	Infrastructure and Facilities
30G	245	S	Electricity Sub Station	384501 395756	M14	Electrical Features	Infrastructure and Facilities
31F	246	SW	Silo	383946 395879	M15	Hoppers and Silos	Farming
32F	249	SW	Silo	383939 395883	M15	Hoppers and Silos	Farming
33F	250	SW	Silo	383943 395877	M15	Hoppers and Silos	Farming

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 2

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
34	398	SE	384708 395695	Obsolete	Cordingley Service Station, 353, Moss Lane East, Moss Lane East, Manchester, Greater Manchester, M14 4PY	Not Applicable	Obsolete
35	445	NW	383716 396299	Asda	Asda Hulme, Greenhays Lane West, Greenhays Lane West, Archway, Hulme, Manchester, Greater Manchester, M15 5AQ	No	Open

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON

5.3 Bedrock and Solid Geology

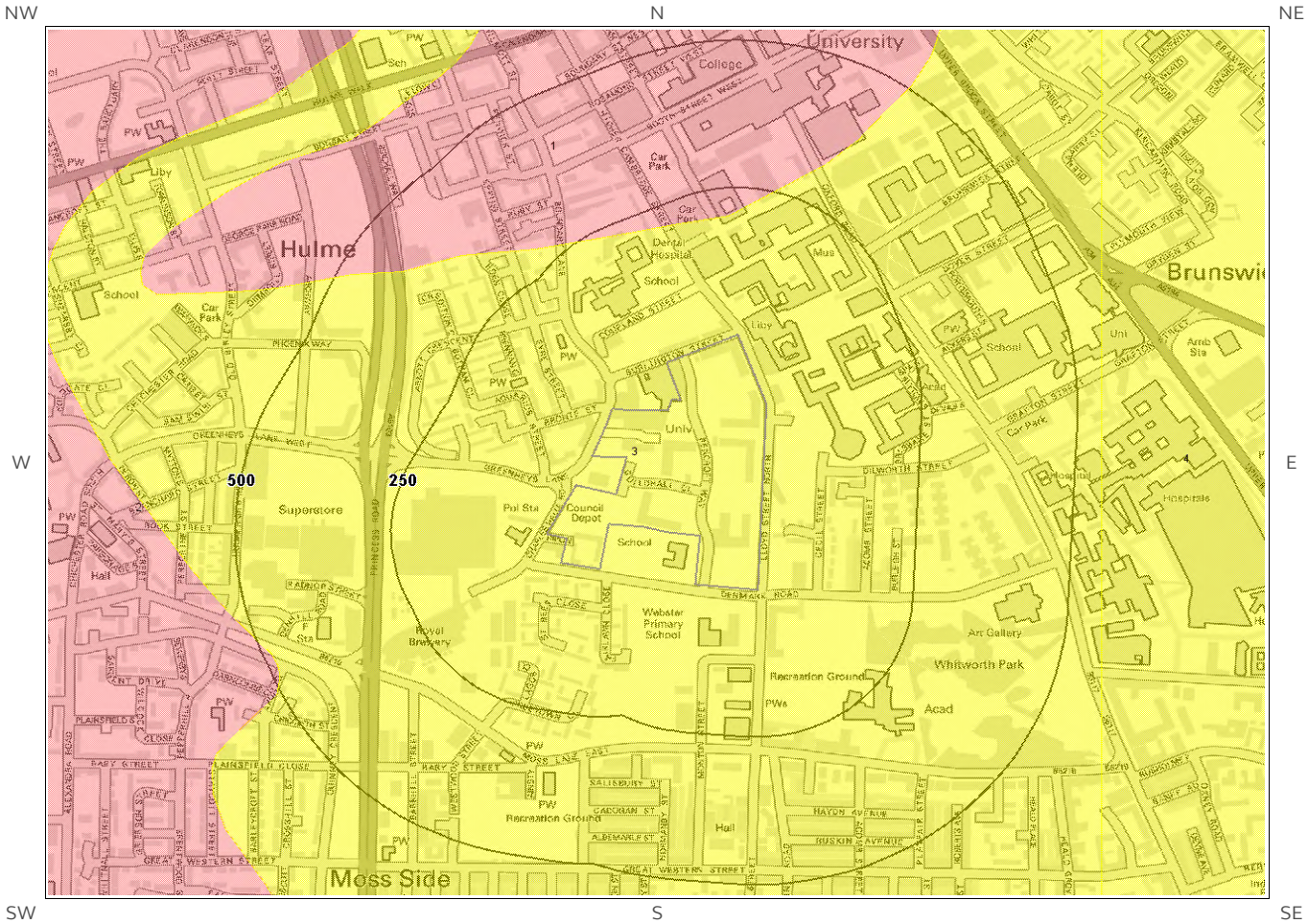
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
CHES-SDST	CHESTER FORMATION	SANDSTONE

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



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Site Outline

250 — 500 — Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

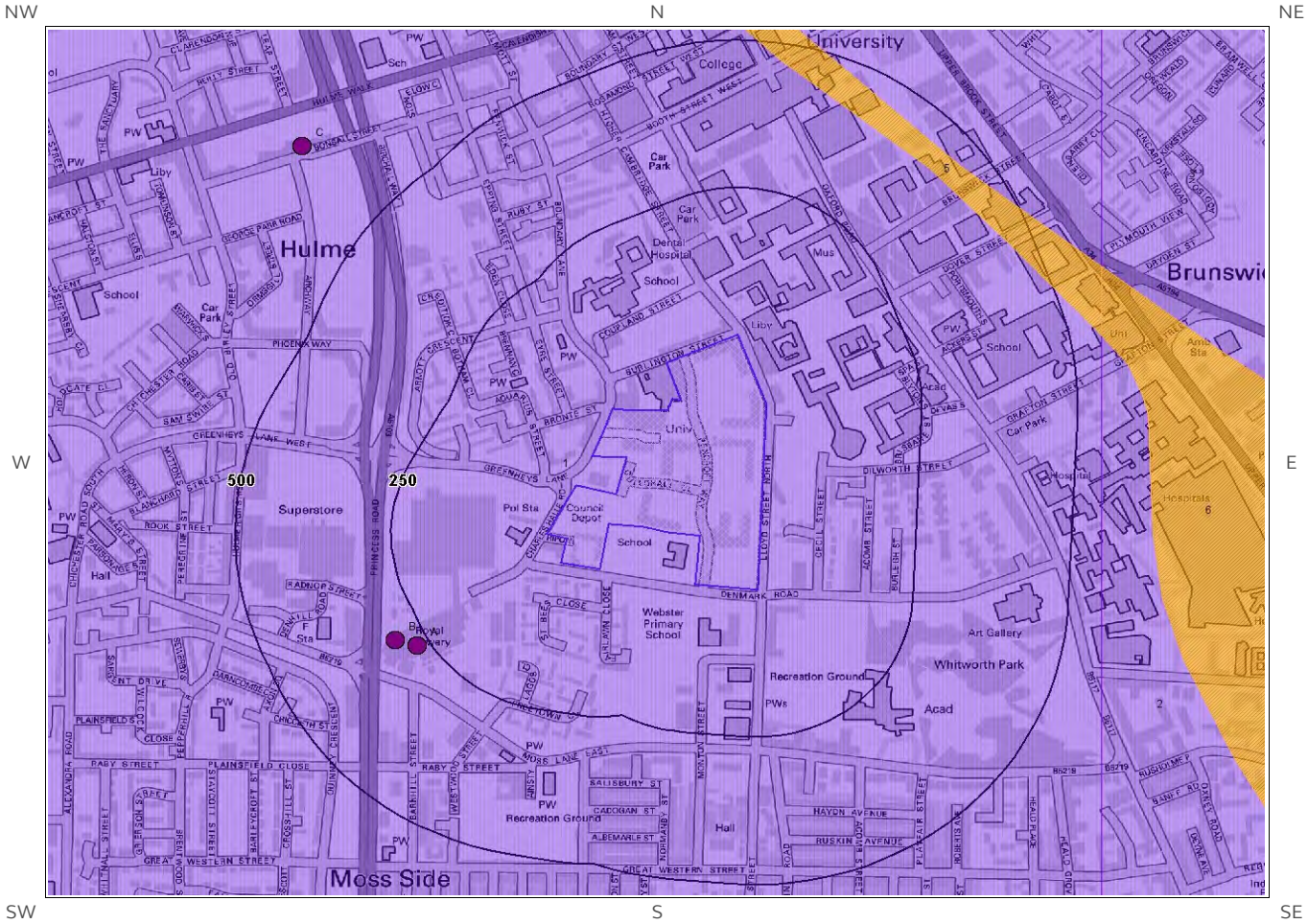
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



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Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses

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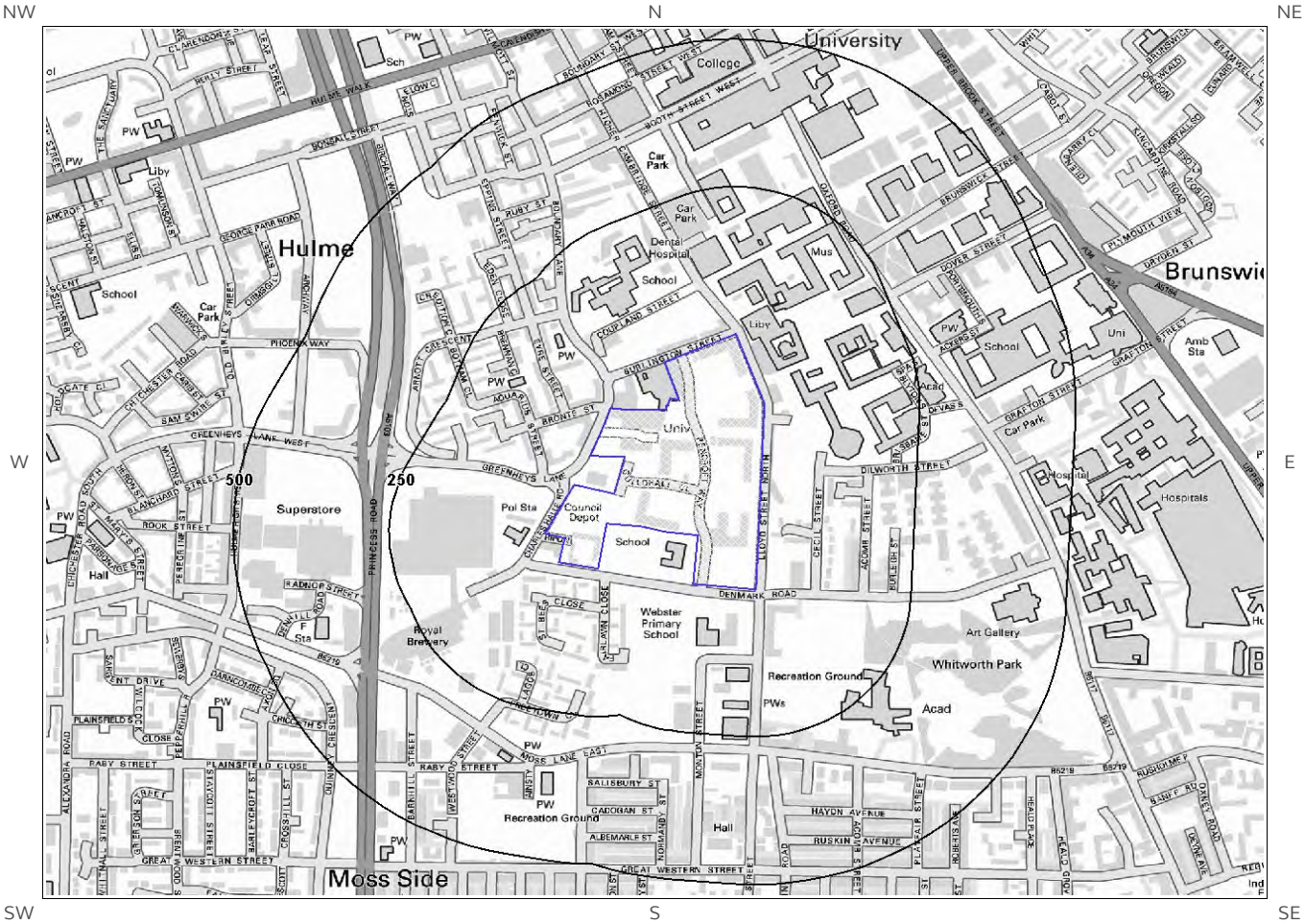
6d. Hydrogeology – Source Protection Zones within confined aquifer



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Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

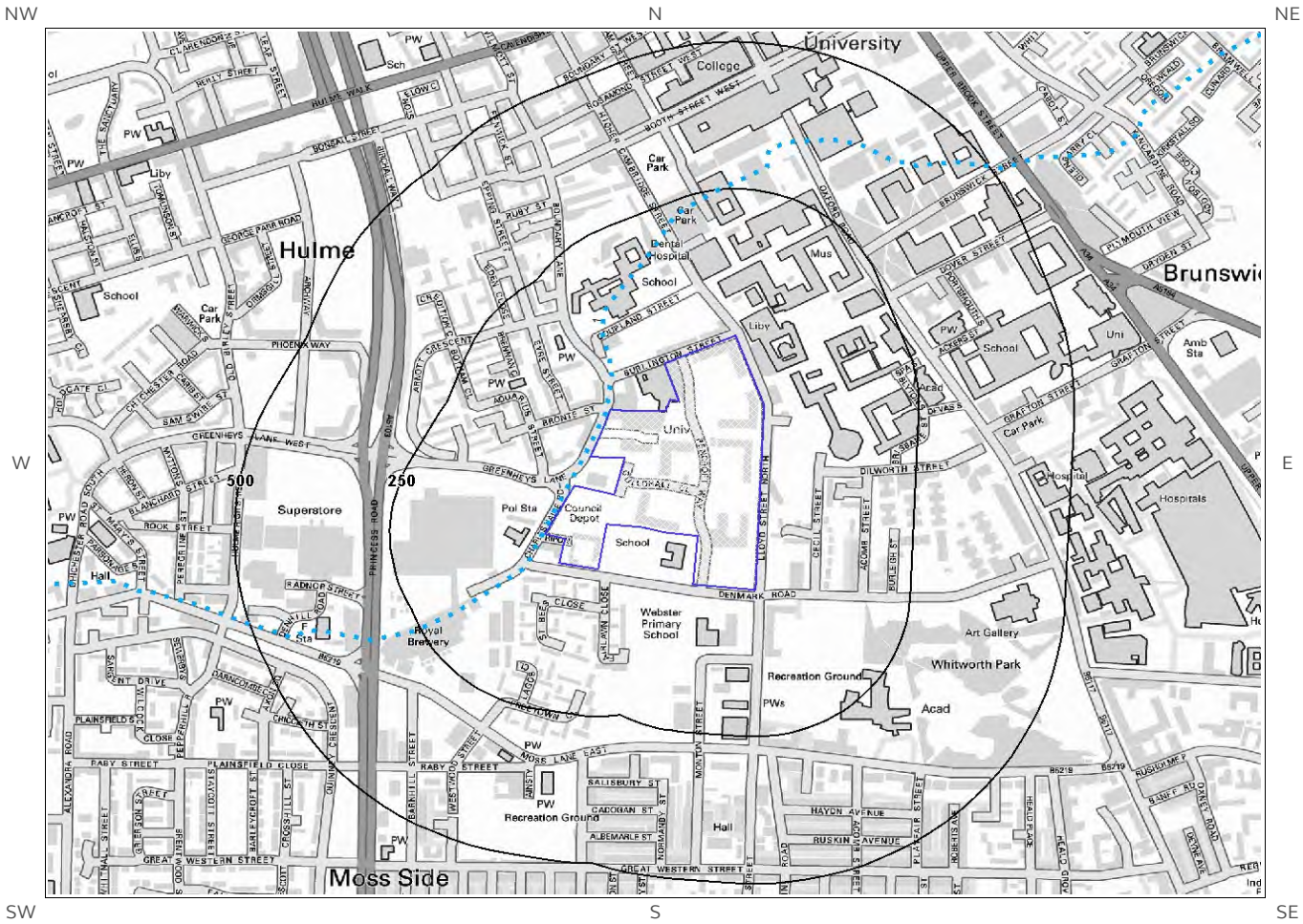
Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

Site Outline

250 500 Search Buffers (m)

6e. Hydrology – Detailed River Network and River Quality



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Site Outline

250 — 500 — Search Buffers (m)

Primary River
Secondary River
Tertiary River
Lake/Reservoir
Underground River (inferred)
General Quality Assessment: Biology
General Quality Assessment: Chemistry
Canal
Canal Tunnel
Culvert
Multiple Channel Culvert
Underground River (Potential Sewer)
Underground River (local knowledge)

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
3	0	On Site	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
1	202	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	487	SW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.2 Aquifer within Bedrock Deposits

Records of strata classification within the bedrock geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
5	412	NE	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeablehorizons and weathering. These are generally the water-bearing parts of the former non-aquifers

6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site — Identified

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
7A	271	SW	383900 395900	Status: Historical Licence No: 2569007007 Details: Process water Direct Source: Ground Water - North West Region Point: "borehole At Premises, Moss Side, Manchester" Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 389 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 16/8/1995 Version End Date:
8A	271	SW	383900 395900	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: "borehole At Premises, Moss Side, Manchester" Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 389 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 16/8/1995 Version End Date:
9A	271	SW	383900 395900	Status: Historical Licence No: 2569007007 Details: Process water Direct Source: Ground Water - North West Region Point: Borehole At Premises, Moss Side, Manchester Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 0389 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 31/12/2003 Version End Date:
10A	271	SW	383900 395900	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: Borehole At Premises, Moss Side, Manchester Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 0389 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 31/12/2003 Version End Date:
11A	271	SW	383900 395900	Status: Historical Licence No: 2569007007 Details: Process Water Direct Source: Ground Water - North West Region Point: Borehole At Premises Moss Side Manchester Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: NPS/WR/002641 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 102 Version Start Date: 23/11/2009 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
12A	271	SW	383900 395900	Status: Historical Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: Borehole At Premises Moss Side Manchester Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: NPS/WR/002641 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 102 Version Start Date: 23/11/2009 Version End Date:
13B	297	SW	383865 395909	Status: Active Licence No: 2569007007 Details: Process Water Direct Source: Ground Water - North West Region Point: Borehole At Premises Moss Side Manchester Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: NPS/WR/015793 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 103 Version Start Date: 8/5/2014 Version End Date:
14B	297	SW	383865 395909	Status: Active Licence No: 2569007007 Details: General Cooling (Existing Licences Only) (High Loss) Direct Source: Ground Water - North West Region Point: Borehole At Premises Moss Side Manchester Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 227000 Max Daily Volume (m^3): 900 Original Application No: NPS/WR/015793 Original Start Date: 15/2/1966 Expiry Date: - Issue No: 103 Version Start Date: 8/5/2014 Version End Date:
15C	669	NW	383715 396746	Status: Active Licence No: NW/069/0004/003 Details: Heat Pump Direct Source: Ground Water - North West Region Point: Borehole At Manchester Metropolitan University Data Type: Point Name: Manchester Metropolitan University	Annual Volume (m^3): 274115 Max Daily Volume (m^3): 751 Original Application No: NPS/WR/008077 Original Start Date: 20/9/2013 Expiry Date: 31/3/2027 Issue No: 1 Version Start Date: 1/1/2015 Version End Date:
16C	669	NW	383715 396746	Status: Active Licence No: NW/069/0004/003 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: Borehole At Manchester Metropolitan University Data Type: Point Name: Manchester Metropolitan University	Annual Volume (m^3): 274115 Max Daily Volume (m^3): 751 Original Application No: NPS/WR/008077 Original Start Date: 20/9/2013 Expiry Date: 31/3/2027 Issue No: 1 Version Start Date: 1/1/2015 Version End Date:
Not shown	705	N	384180 397091	Status: Active Licence No: NW/069/0006/003 Details: Heat Pump Direct Source: Ground Water - North West Region Point: Borehole 1 At Lower Chatham Street Data Type: Point Name: Manchester Metropolitan University	Annual Volume (m^3): 283240 Max Daily Volume (m^3): 1532 Original Application No: NPS/WR/015264 Original Start Date: 4/4/2014 Expiry Date: 31/3/2027 Issue No: 2 Version Start Date: 4/4/2014 Version End Date:
Not shown	705	N	384180 397091	Status: Active Licence No: NW/069/0006/003 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: Borehole 1 At Lower Chatham Street Data Type: Point Name: Manchester Metropolitan University	Annual Volume (m^3): 283240 Max Daily Volume (m^3): 1532 Original Application No: NPS/WR/015264 Original Start Date: 4/4/2014 Expiry Date: 31/3/2027 Issue No: 2 Version Start Date: 4/4/2014 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	921	W	383220 395850	Status: Active Licence No: 2569007009 Details: Process Water Direct Source: Ground Water - North West Region Point: Borehole At Premises, Moss Lane West Manchester Data Type: Point Name: HYDES BREWERY LTD	Annual Volume (m^3): 66826.2 Max Daily Volume (m^3): 372.77 Original Application No: 0703 Original Start Date: 21/2/1966 Expiry Date: - Issue No: 102 Version Start Date: 12/4/2006 Version End Date:
Not shown	921	W	383220 395850	Status: Historical Licence No: 2569007009 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "borehole At Premises, Moss Lane West Manchester" Data Type: Point Name: HYDES BREWERY LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: CW0703 Original Start Date: 21/2/1966 Expiry Date: - Issue No: 101 Version Start Date: 7/10/2000 Version End Date:
Not shown	921	W	383220 395850	Status: Historical Licence No: 2569007009 Details: Process water Direct Source: Ground Water - North West Region Point: "borehole At Premises, Moss Lane West Manchester" Data Type: Point Name: HYDES BREWERY LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: CW0703 Original Start Date: 21/2/1966 Expiry Date: - Issue No: 101 Version Start Date: 7/10/2000 Version End Date:
Not shown	921	W	383220 395850	Status: Historical Licence No: 2569007009 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: Borehole At Premises, Moss Lane West Manchester Data Type: Point Name: HYDES BREWERY LTD	Annual Volume (m^3): 66826.2 Max Daily Volume (m^3): 372.772 Original Application No: CW0703 Original Start Date: 21/2/1966 Expiry Date: - Issue No: 101 Version Start Date: 7/10/2000 Version End Date:
Not shown	1306	N	384378 397733	Status: Historical Licence No: NW/069/0006/001 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: Boreholes At Origin Developments, Manchester Data Type: Point Name: West Contracting	Annual Volume (m^3): 139128 Max Daily Volume (m^3): 1010 Original Application No: 7623 Original Start Date: 19/1/2009 Expiry Date: 31/3/2015 Issue No: 1 Version Start Date: 19/1/2009 Version End Date:
Not shown	1306	N	384378 397733	Status: Historical Licence No: NW0690006001 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: Boreholes At Origin Developments, Manchester Data Type: Point Name: West Contracting	Annual Volume (m^3): 139128 Max Daily Volume (m^3): 1010 Original Application No: 7623 Original Start Date: 19/1/2009 Expiry Date: 31/3/2015 Issue No: 1 Version Start Date: 19/1/2009 Version End Date:
Not shown	1326	E	385729 396778	Status: Active Licence No: NW/069/0004/005 Details: Heat Pump Direct Source: Ground Water - North West Region Point: Area Of Abstraction - Lower Carboniferous Limestone Data Type: Region Name: G T Energy UK Limited	Annual Volume (m^3): 2049840 Max Daily Volume (m^3): 8640 Original Application No: NPS/WR/013554 Original Start Date: 17/1/2013 Expiry Date: 16/1/2037 Issue No: 2 Version Start Date: 11/6/2013 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1385	NE	385240 397540	Status: Historical Licence No: 2569006001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: Borehole At Premises, Broadie St, Ardwick, Manchester Data Type: Point Name: MOSELEY RUBBER CO LTD	Annual Volume (m^3): 331858 Max Daily Volume (m^3): 909.2 Original Application No: 0006 Original Start Date: 8/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 8/2/1966 Version End Date:
Not shown	1385	NE	385240 397540	Status: Historical Licence No: 2569006001 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "borehole At Premises, Broadie St, Ardwick, Manchester" Data Type: Point Name: MOSELEY RUBBER CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 6 Original Start Date: 8/2/1966 Expiry Date: - Issue No: 100 Version Start Date: 8/2/1966 Version End Date:
Not shown	1604	N	384100 398000	Status: Historical Licence No: 2569007069 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: Borehole At George St, Manchester Data Type: Point Name: BRITISH TELECOMMUNICATIONS PLC	Annual Volume (m^3): 1100 Max Daily Volume (m^3): 860 Original Application No: 2332 Original Start Date: 1/4/1984 Expiry Date: - Issue No: 100 Version Start Date: 1/4/2007 Version End Date:
Not shown	1604	N	384100 398000	Status: Historical Licence No: 2569007069 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "borehole At George St, Manchester" Data Type: Point Name: BRITISH TELECOM	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: 2332 Original Start Date: 27/1/1971 Expiry Date: - Issue No: 100 Version Start Date: 27/1/1971 Version End Date:

6.4 Surface Water Abstraction Licences

Surface Water Abstraction Licences within 2000m of the study site — None identified

Database searched and no data found.

6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site — None identified

Database searched and no data found.

6.6 Source Protection Zones

Source Protection Zones within 500m of the study site Identified

The following Source Protection Zones records are represented on the SPZ and Potable Water Abstraction Map (6c):

ID	Distance (m)	Direction	Zone	Description
3	0	On Site	3	Total catchment
2A	65	SW	2	Outer catchment
1A	201	SW	1	Inner catchment

6.7 Source Protection Zones within Confined Aquifer

Source Protection Zones within the Confined Aquifer within 500m of the study site None identified

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site Identified

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.

6.9 River Quality

Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site None identified

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Database searched and no data found.

6.10 Detailed River Network

Detailed River Network entries within 500m of the study site — Identified

The following Detailed River Network records are represented on the Hydrology Map (6e):

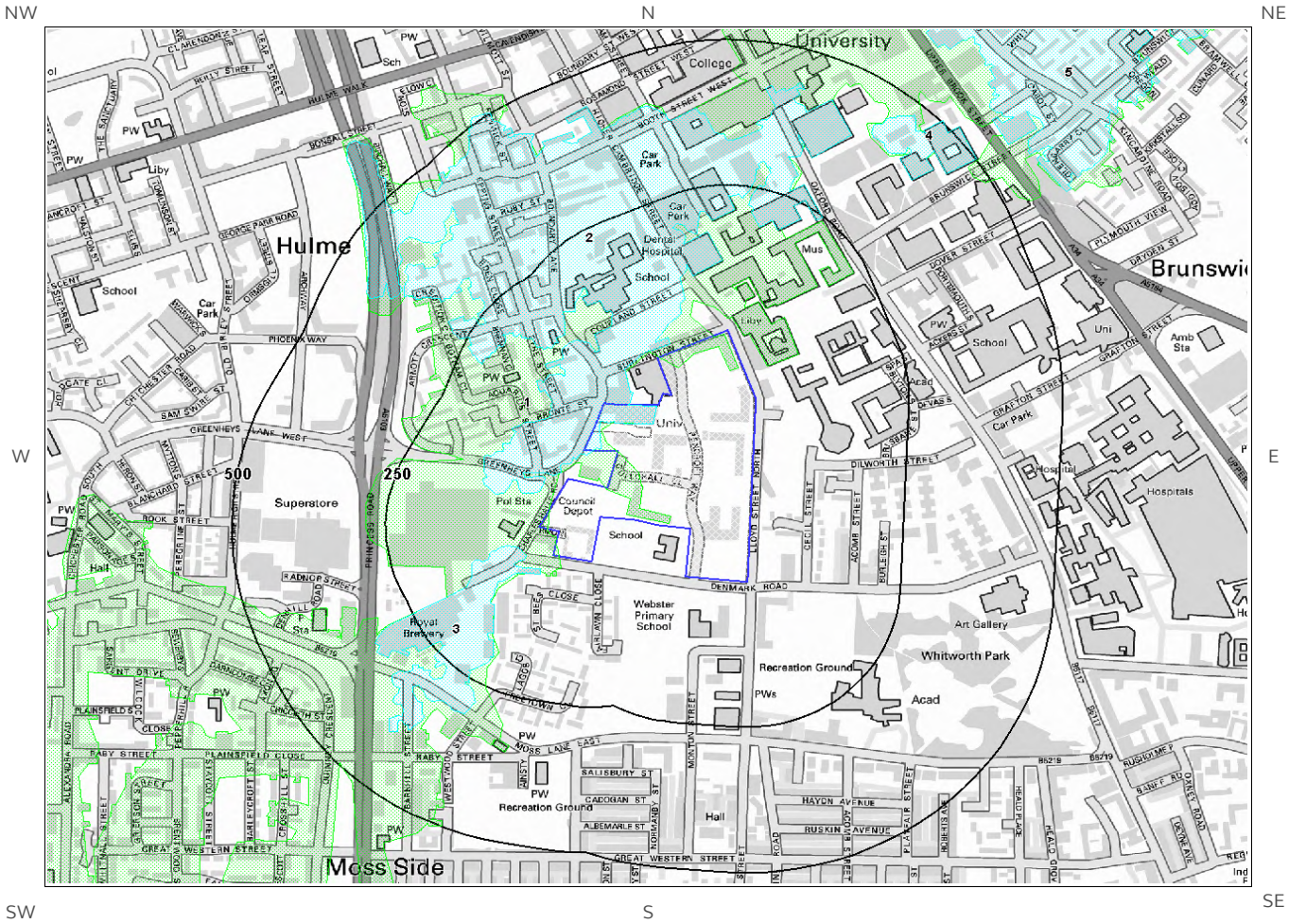
ID	Distance (m)	Direction	Details	
1	4	NW	River Name: Corn Brook Welsh River Name: - Alternative Name: -	River Type: Underground River (inferred) Main River Status: Currently Undefined

6.11 Surface Water Features

Surface water features within 250m of the study site — None identified

Database searched and no data found.

7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



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Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

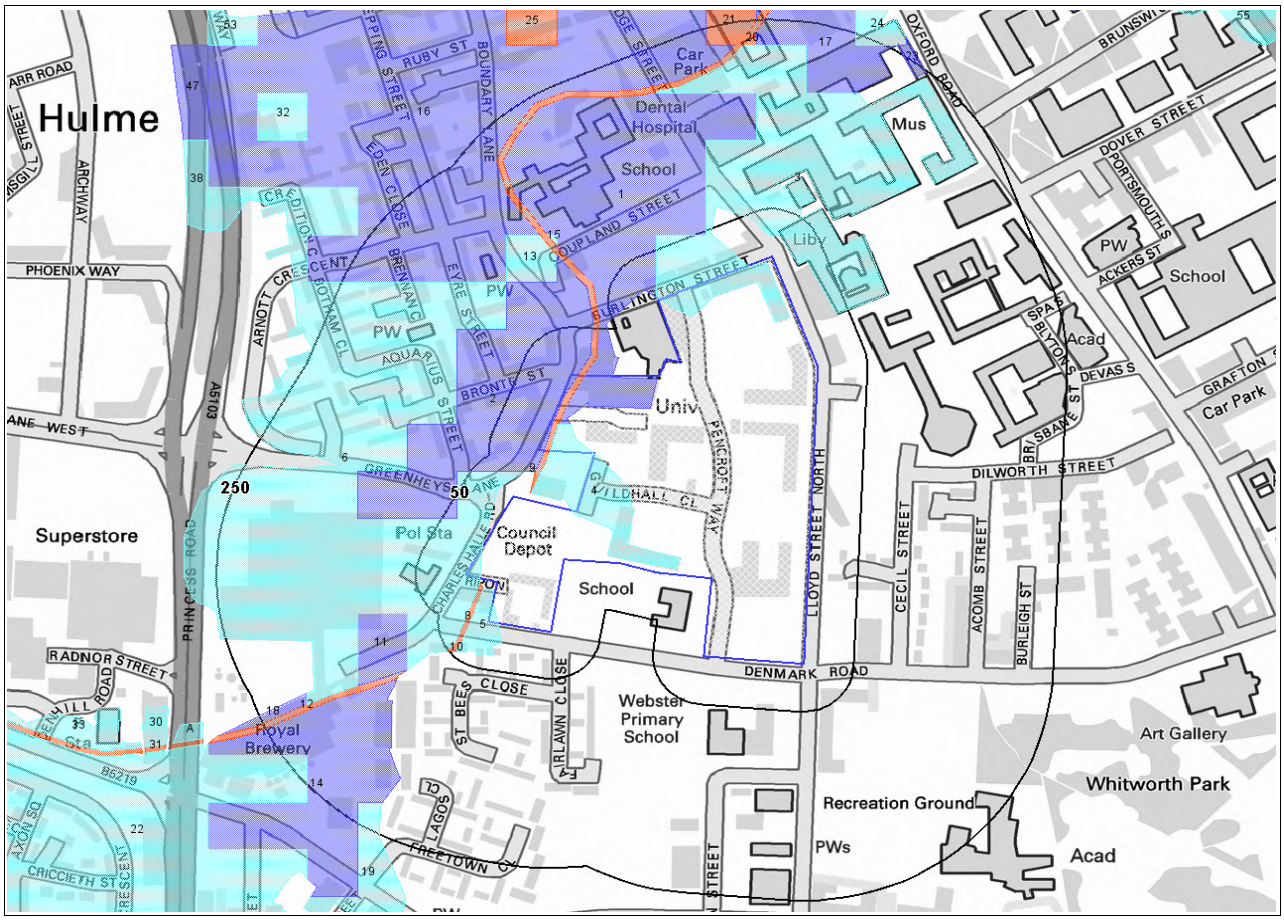
Area Benefiting from Flood Defences

7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map

NW N NE

W E

SW S SE



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Site Outline

100 250 Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

Report Reference: GS-4827347
Client Reference: NX332

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Environment Agency/Natural Resources Wales Zone 2 floodplain within 250m — Identified

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	24-Nov-2017	Zone 2 - (Fluvial /Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Environment Agency/Natural Resources Wales Zone 3 floodplain within 250m — Identified

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	0	On Site	24-Nov-2017	Zone 3 - (Fluvial Models)
	31	SW	24-Nov-2017	Zone 3 - (Fluvial Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

Highest risk of flooding onsite — High

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRas flood Risk

1	0.0	On Site	Medium
2	0.0	On Site	Medium
3	0.0	On Site	Low
4	0.0	On Site	Low
5	0.0	On Site	Low
6	0.0	On Site	Low
7	0.0	On Site	High
8	5.0	S	High
9	22.0	S	Low
10	43.0	SW	Medium

7.4 Flood Defences

Flood Defences within 250m of the study site — None identified

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Areas benefiting from Flood Defences within 250m of the study site — None identified

7.6 Areas benefiting from Flood Storage

Areas used for Flood Storage within 250m of the study site — None identified

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site

Identified

Clearwater Flooding or Superficial Deposits Flooding — Clearwater Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 Highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions

Limited potential

Where limited potential for groundwater flooding to occur is indicated, this means that although given the geological conditions there may be a groundwater flooding hazard, unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area, you need take no further action in relation to groundwater flooding hazard.

7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result Low

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

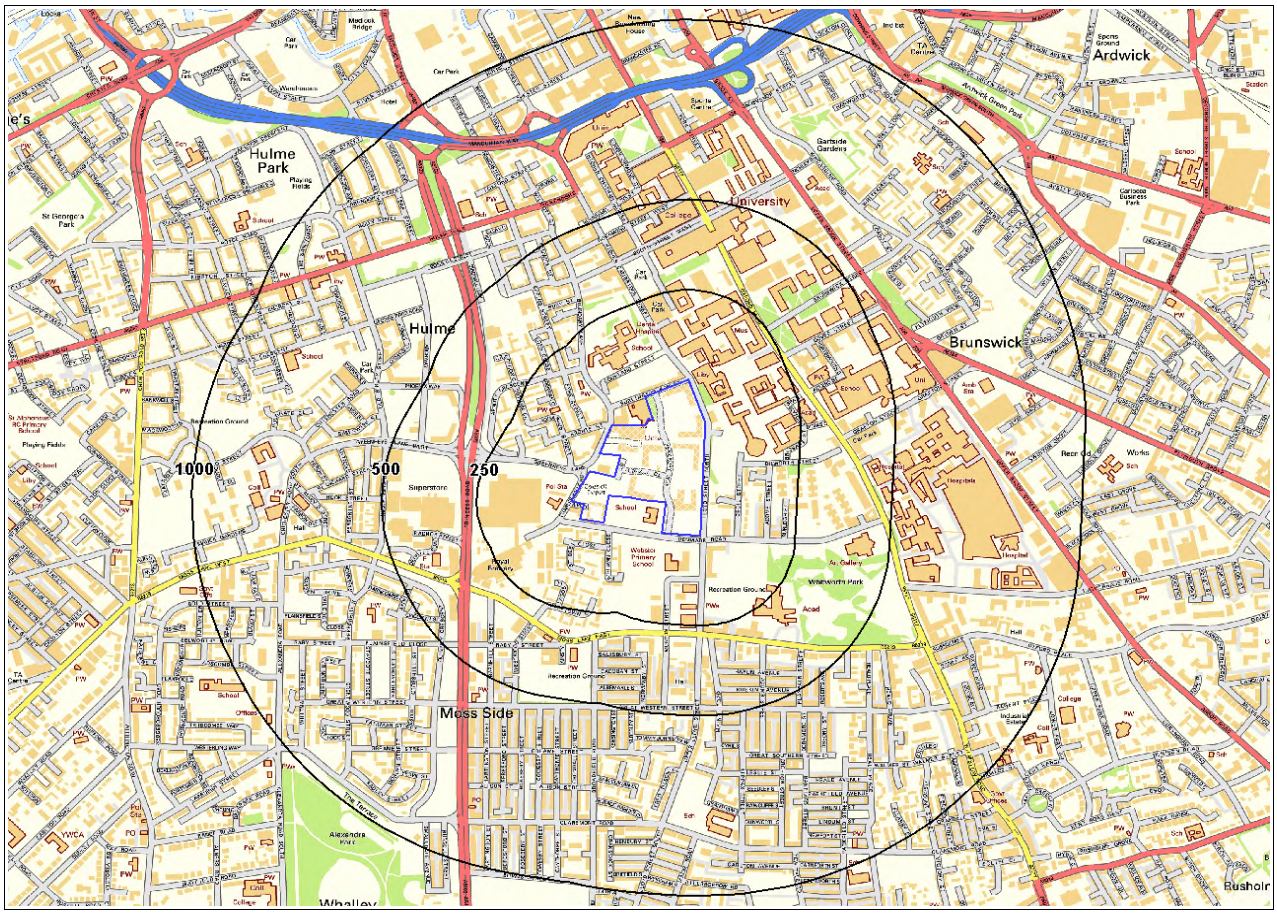
The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map

NW N NE

W E

SW S SE



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Site Outline

100 250 Search Buffers (m)

AONB

National Park

SSSI

Special Protection Areas

Nitrate Vulnerable Zones

Green Belt

Environmentally Sensitive Areas

Special Areas of Conservation

World Heritage Sites

Nitrate Sensitive Areas

Ancient Woodland

National Nature Reserve

Local Nature Reserves

Ramsar Sites

8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site	Identified

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

0

Database searched and no data found.

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

1

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
Not shown	1973	N	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure Geo Insight, available from our website. The following information has been found:

9.1.1 Shrink Swell

Maximum Shrink-Swell*[*] hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

9.1.2 Landslides

Maximum Landslide* hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

Maximum Soluble Rocks* hazard rating identified on the study site — Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

Maximum Compressible Ground* hazard rating identified on the study site — Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

9.1.5 Collapsible Rocks

Maximum Collapsible Rocks* hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

Maximum Running Sand** hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

* This indicates an automatically generated 50m buffer and site.

9.2 Radon

9.2.1 Radon Affected Areas

Radon Affected Area assessment: The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

9.2.2 Radon Protection

Radon protection measures requirements for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment: No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Coal mining areas within 75m of the study site — Identified

The following coal mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

10.2 Non-Coal Mining

Non-Coal Mining areas within 50m of the study site boundary — None identified

Database searched and no data found.

10.3 Brine Affected Areas

Brine affected areas within 75m of the study site — None identified
Guidance: No Guidance Required.

Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency
National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506
Web: **www.environment-agency.gov.uk**
Email: enquiries@environment-agency.gov.uk

Public Health England
Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email:**enquiries@phe.gov.uk**
Main switchboard**: 020 7654 8000**

The Coal Authority
200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority
Authority: Manchester City Council
Phone: 0161 234 5000
Web: http://www.manchester.gov.uk/
Address: Town Hall, Albert Square, Manchester, M60 2LA

Gemapping PLC
Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England who retain the Copyright and Intellectual Property Rights for the data.
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https://www.groundsure.com/terms-and-conditions-march-2018

Appendix C – Historical Mapping

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **2011**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2011

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W: www.groundsure.com

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Production date: 20 February 2012

To view map legend click here *Legend*

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: 1:10,000 Raster

Map date: **2002**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2002

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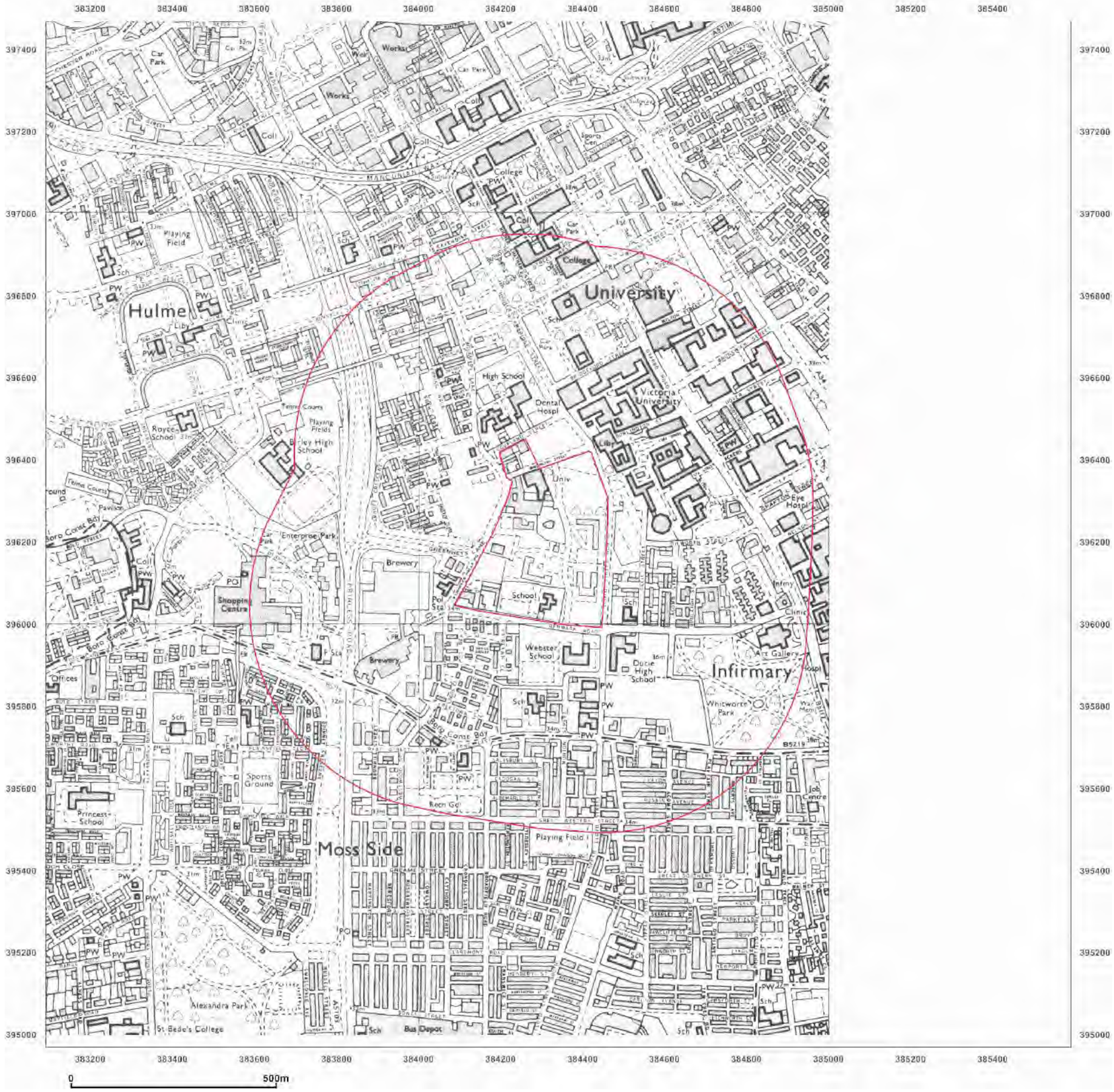

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ENVIRONMENTAL INSIGHT

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1994**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1986
Revised 1994
Edition NA
Copyright NA
Levelled NA

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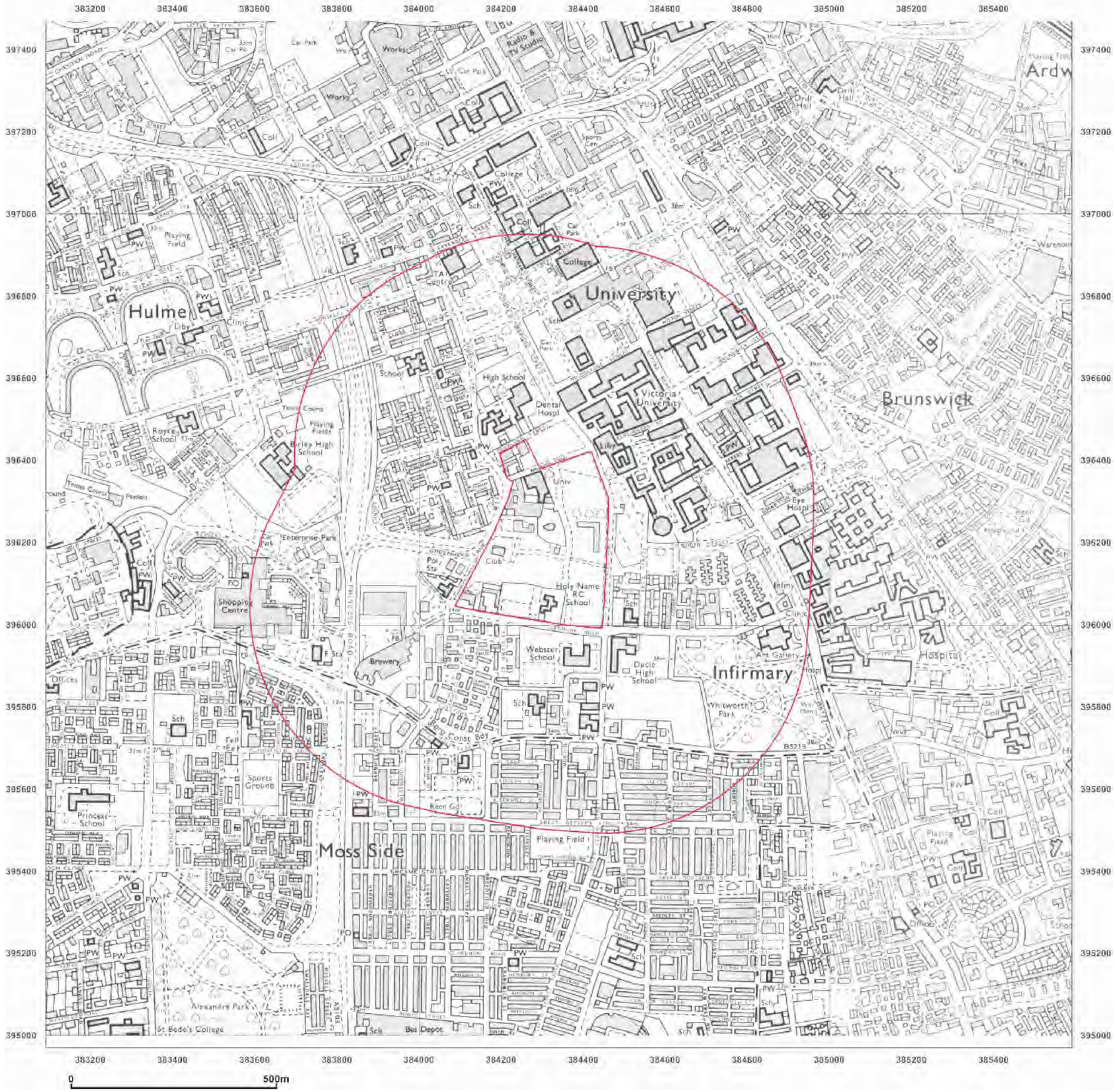

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1988-1991**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1956
Revised 1988
Edition NA
Copyright NA
Levelled NA

Surveyed 1985
Revised 1991
Edition NA
Copyright NA
Levelled NA

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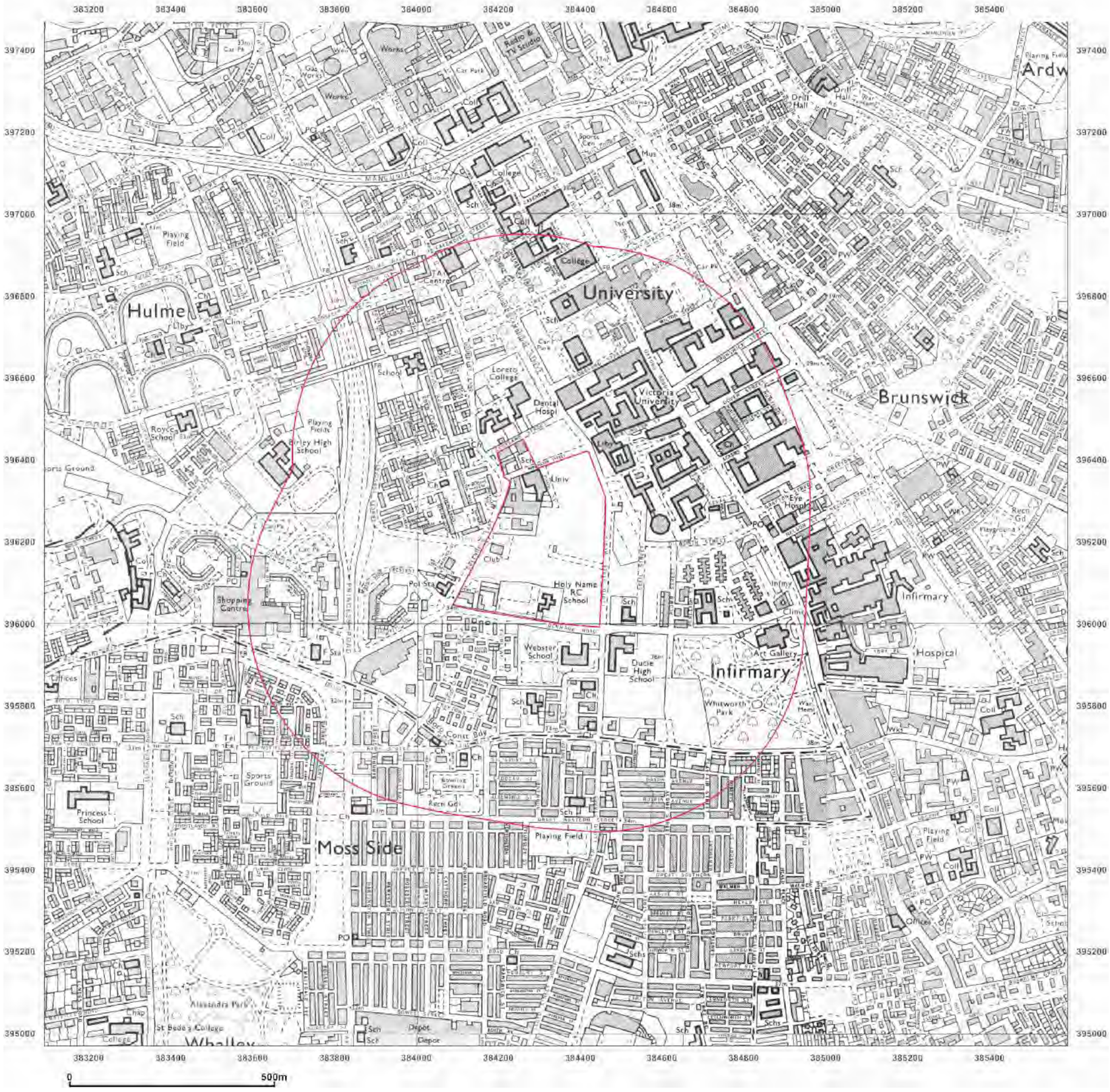

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ENVIRONMENTAL INSIGHT

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1985-1989**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1953
Revised 1985
Edition NA
Copyright NA
Levelled NA

Surveyed 1985
Revised 1985
Edition NA
Copyright NA
Levelled NA

Surveyed 1985
Revised 1988
Edition NA
Copyright NA
Levelled NA

Surveyed 1985
Revised 1989
Edition NA
Copyright NA
Levelled NA

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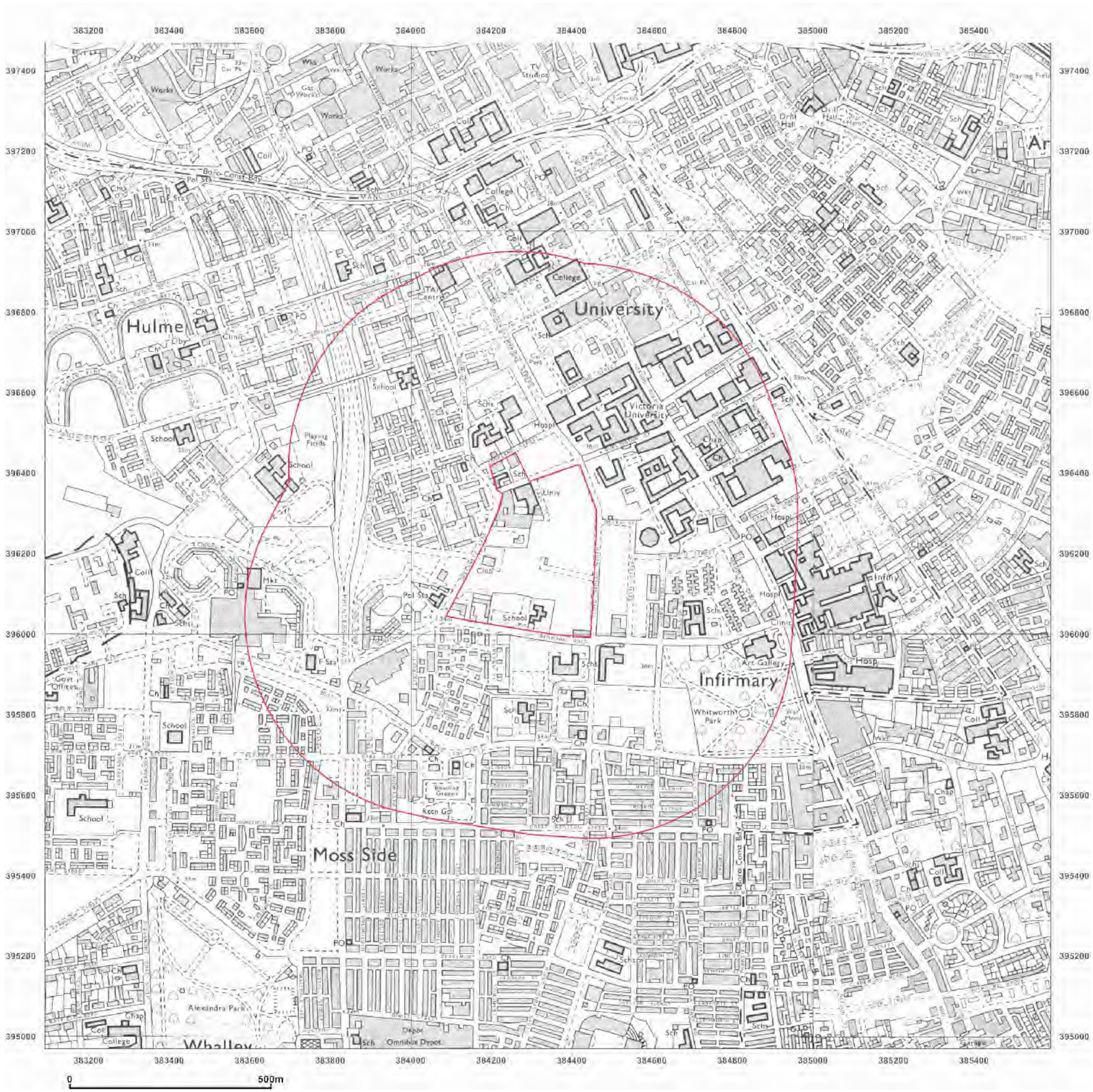

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1978-1983**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1976
Revised 1978
Edition NA
Copyright NA
Levelled NA

Surveyed 1976
Revised 1978
Edition NA
Copyright NA
Levelled NA

Surveyed 1977
Revised 1978
Edition NA
Copyright NA
Levelled NA

Surveyed 1981
Revised 1985
Edition NA
Copyright NA
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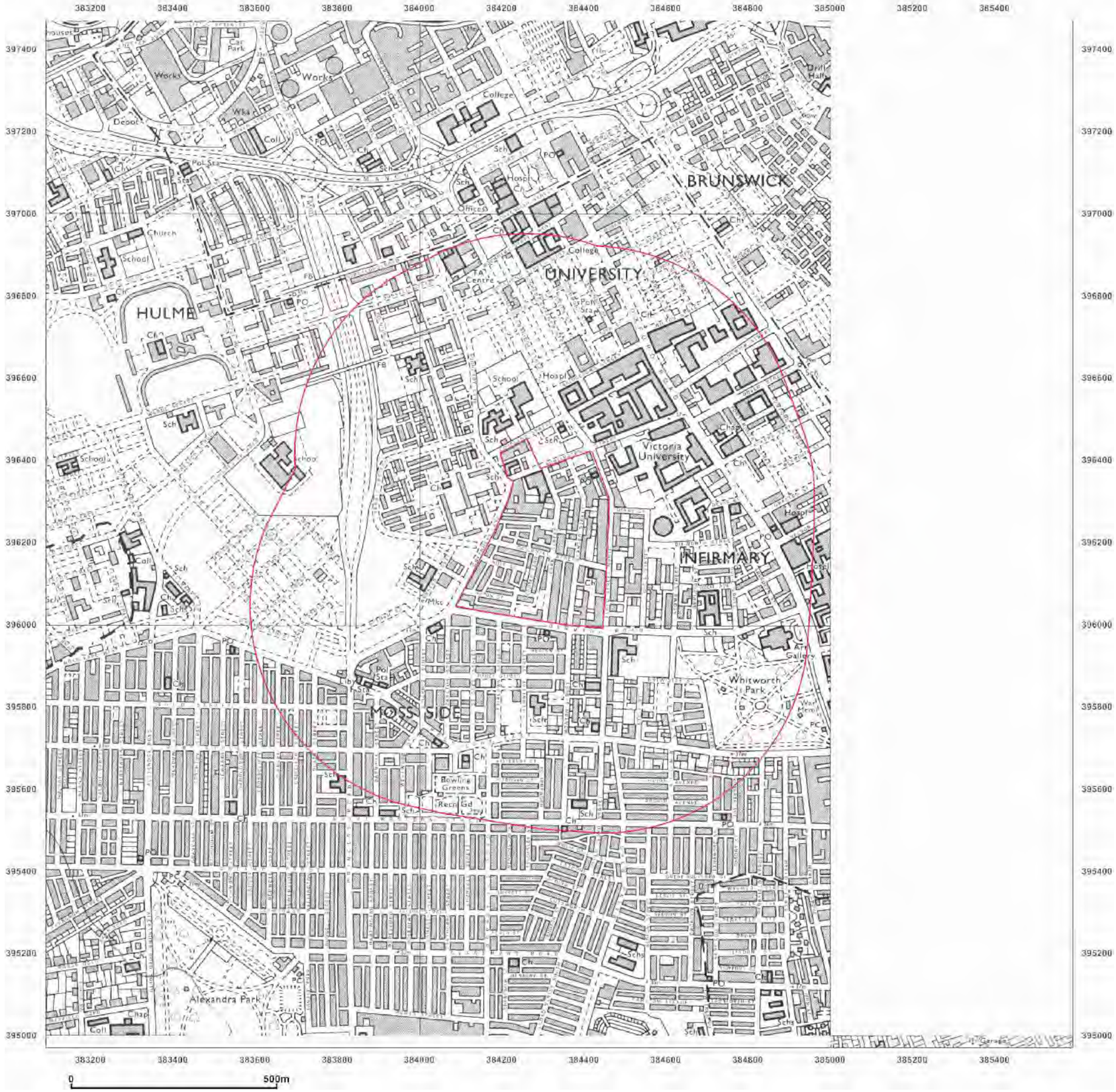

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1971-1974**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1971
Revised 1971
Edition NA
Copyright NA
Levelled NA

Surveyed 1974
Revised 1974
Edition NA
Copyright NA
Levelled NA

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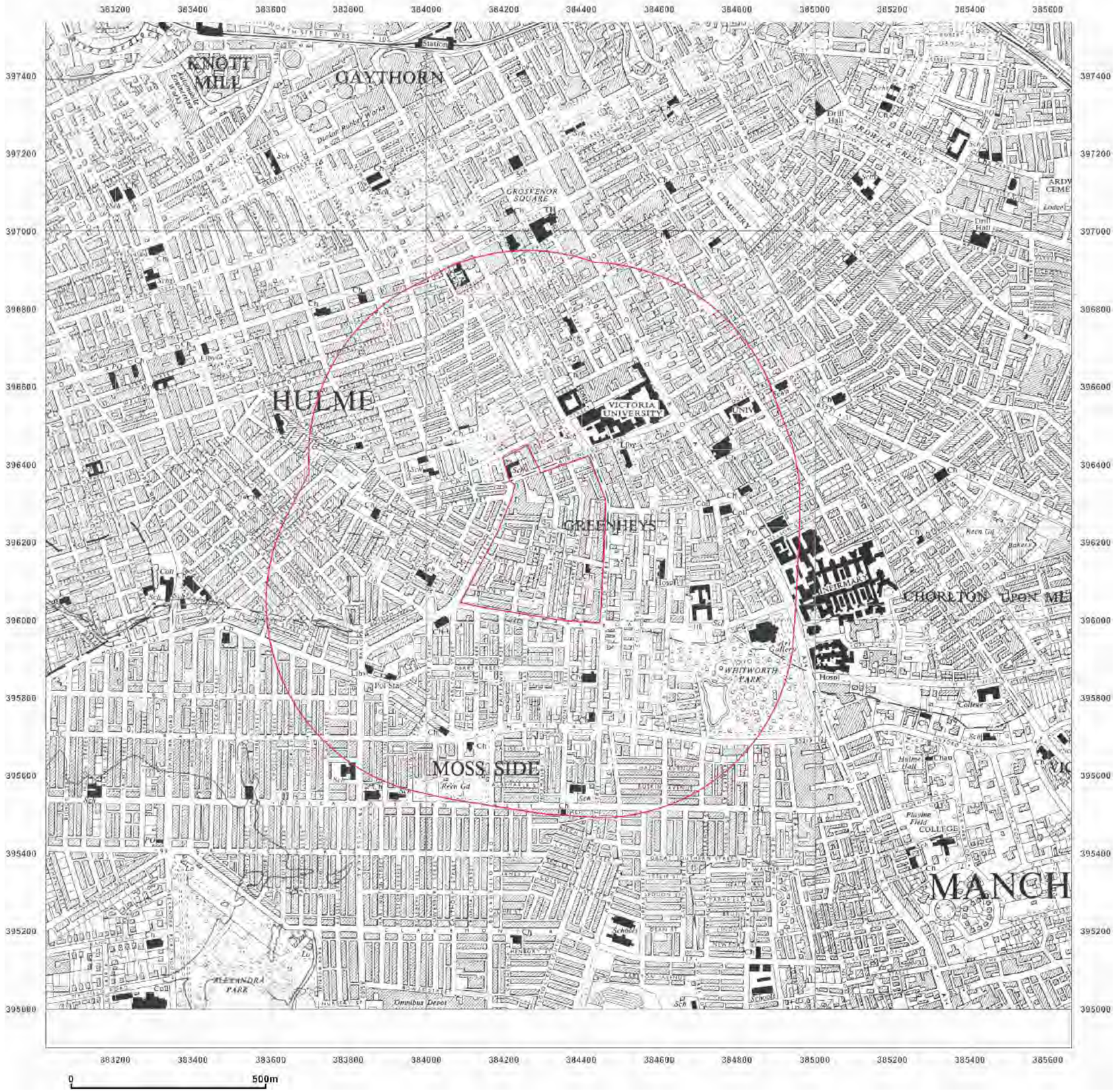

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: Provisional

Map date: **1956**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1956
Revised 1956
Edition NA
Copyright NA
Levelled NA

Surveyed 1956
Revised 1956
Edition NA
Copyright NA
Levelled NA

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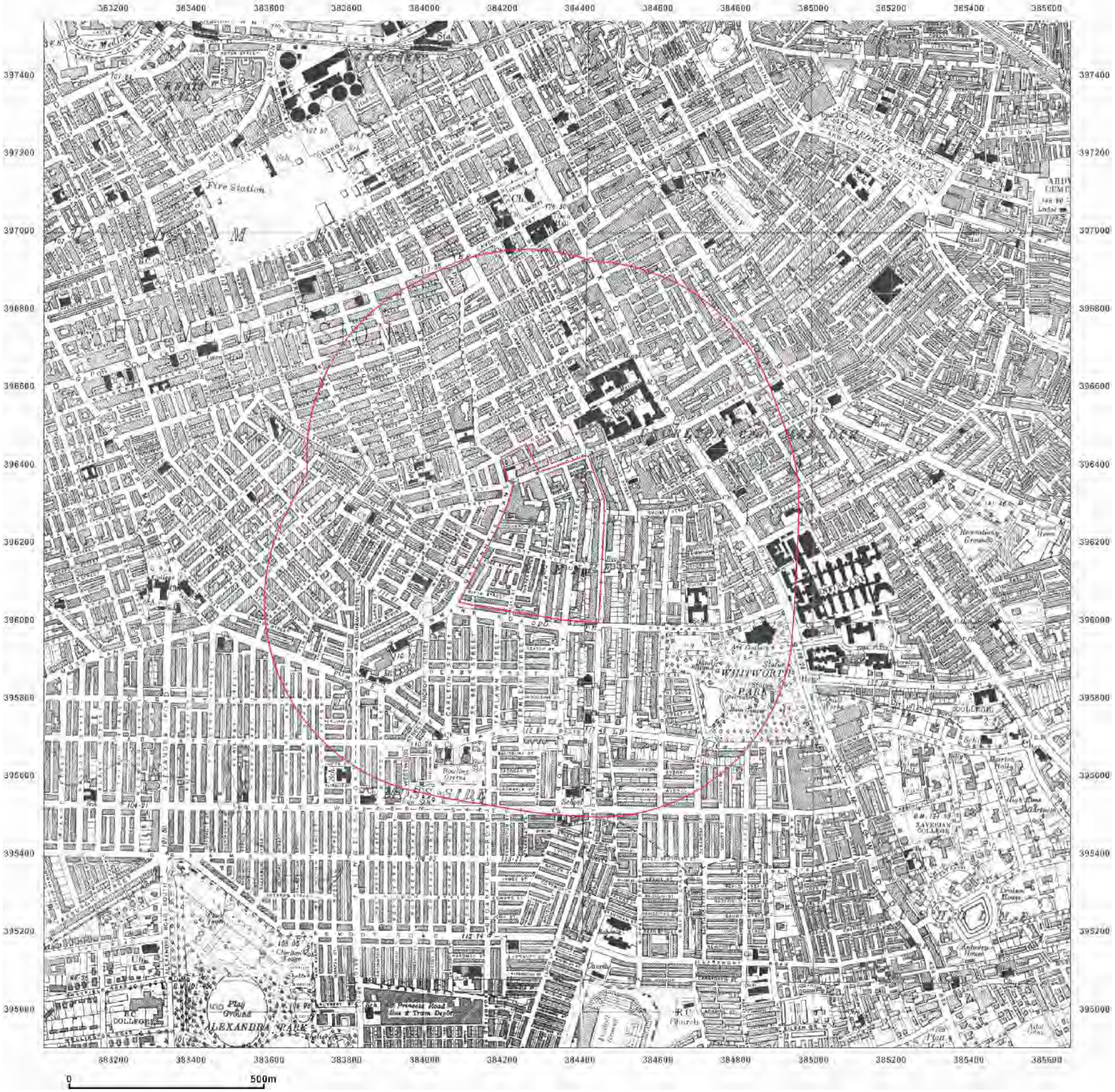

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ENVIRONMENTAL INSIGHT

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1844
Revised 1938
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1938
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1938
Edition 1938
Copyright NA
Levelled NA

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Revised 1938
Edition NA
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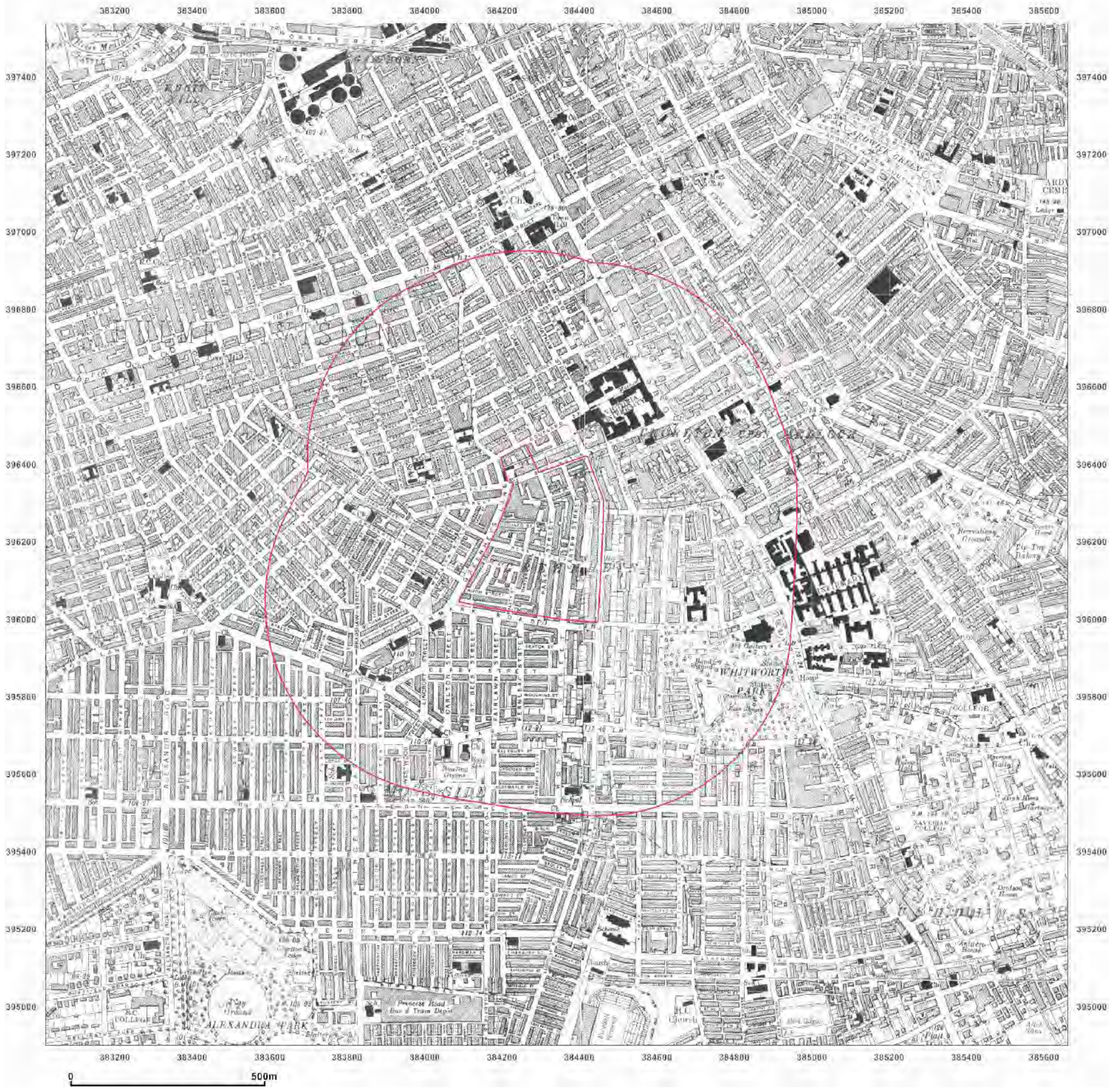

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1932-1934**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1844
Revised 1932
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1934
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1934
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1934
Edition NA
Copyright NA
Levelled NA

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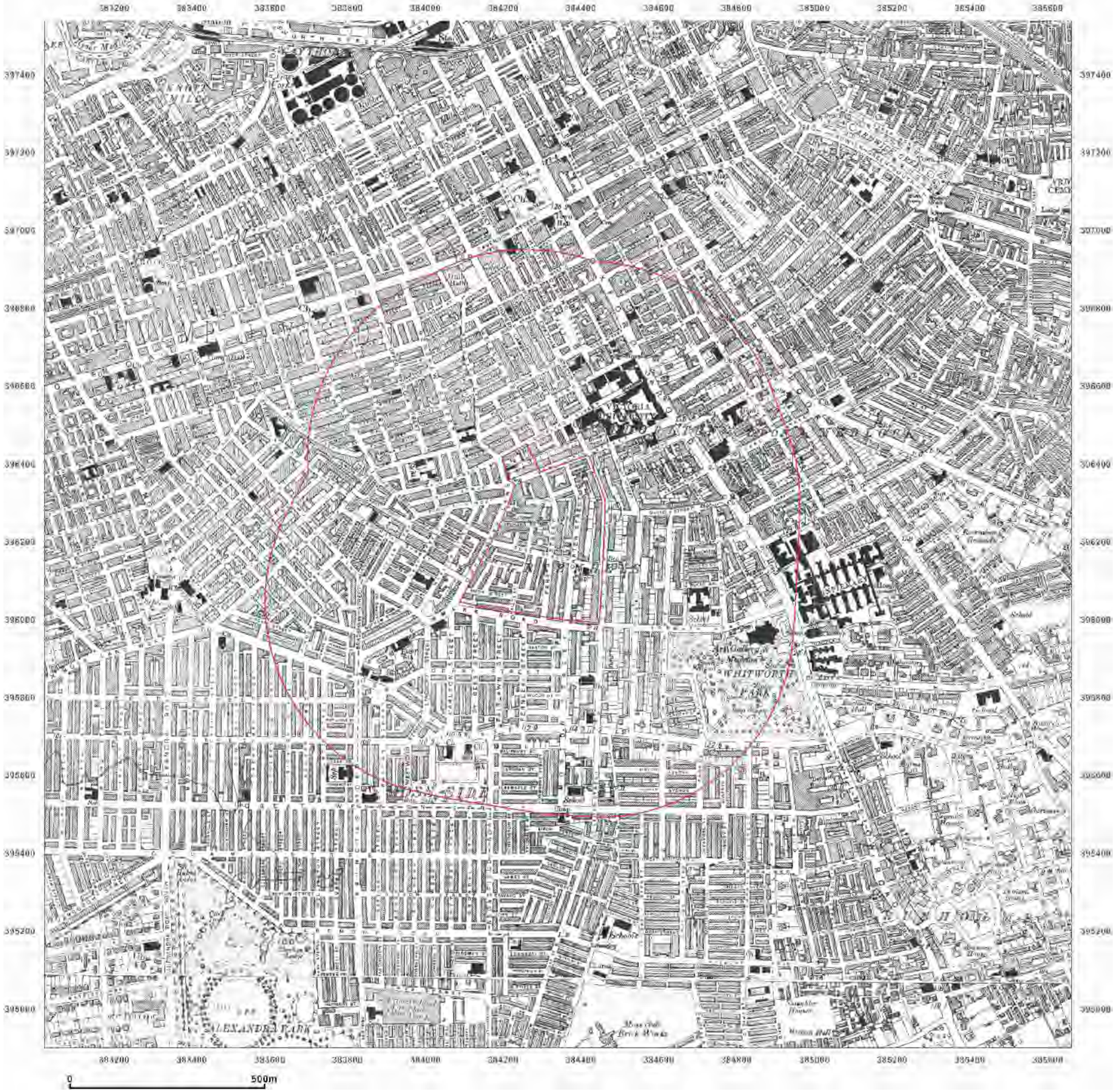

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Site Details:

MANCHESTER SCIENCE
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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1844
Revised 1923
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1923
Edition NA
Copyright NA
Levelled NA

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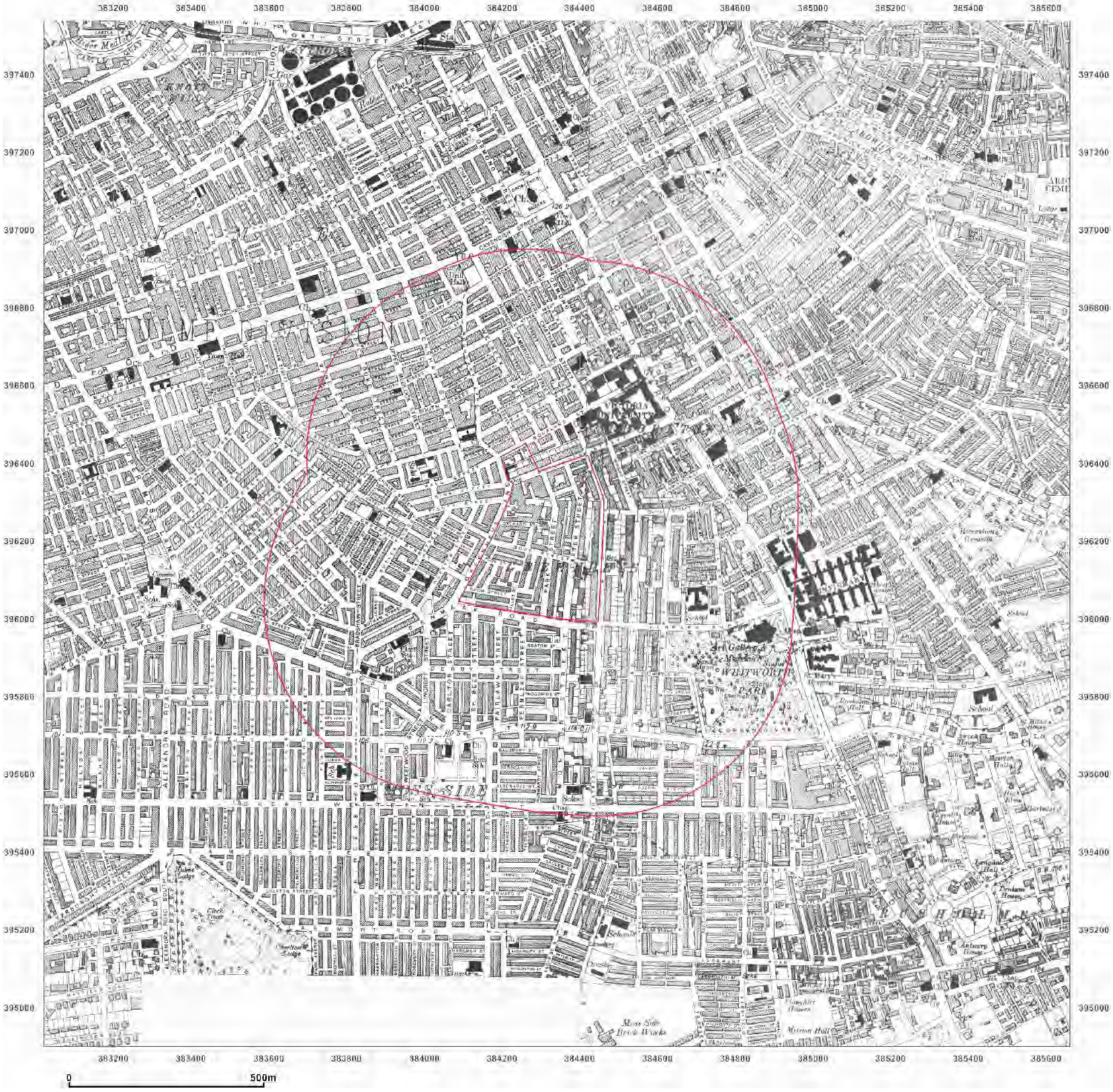

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

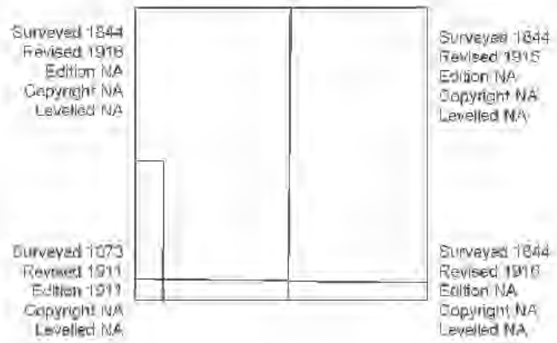
Map Name: County Series

Map date: **1911-1916**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1905**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1844
Revised 1905
Edition NA
Copyright NA
Levelled NA

Surveyed 1844
Revised 1905
Edition NA
Copyright NA
Levelled NA

Surveyed 1892
Revised 1905
Edition NA
Copyright NA
Levelled NA

Surveyed 1892
Revised 1905
Edition NA
Copyright NA
Levelled NA

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1890-1894**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1894
Revised 1894
Edition NA
Copyright NA
Levelled NA

Surveyed 1890
Revised 1890
Edition NA
Copyright NA
Levelled NA

Surveyed 1892
Revised 1892
Edition NA
Copyright NA
Levelled NA

Surveyed 1892
Revised 1892
Edition NA
Copyright NA
Levelled NA

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Site Details:

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: MasterMap

Map date: **2011**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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2011

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Site Details:

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1995**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1995
Revised 1995
Edition N/A
Copyright 1995
Levelled N/A

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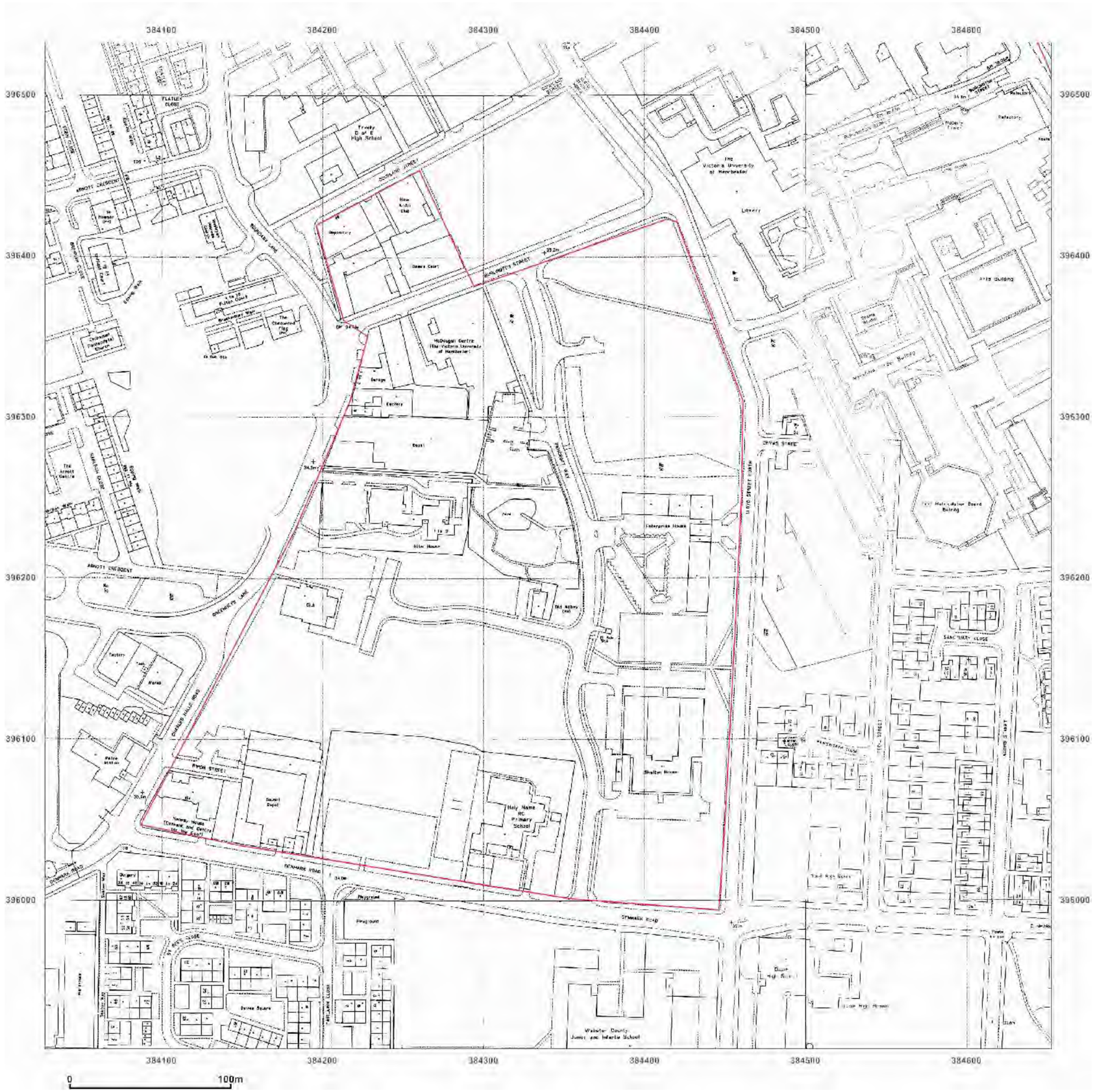

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1992-1995**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1995
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1994
Levelled N/A

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Site Details:

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1989-1992**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1957
Levelled N/A

Surveyed 1948
Revised 1988
Edition N/A
Copyright 1989
Levelled 1963

Surveyed 1948
Revised 1990
Edition N/A
Copyright 1985
Levelled 1962

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

Surveyed 1989
Revised 1989
Edition N/A
Copyright 1989
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1992
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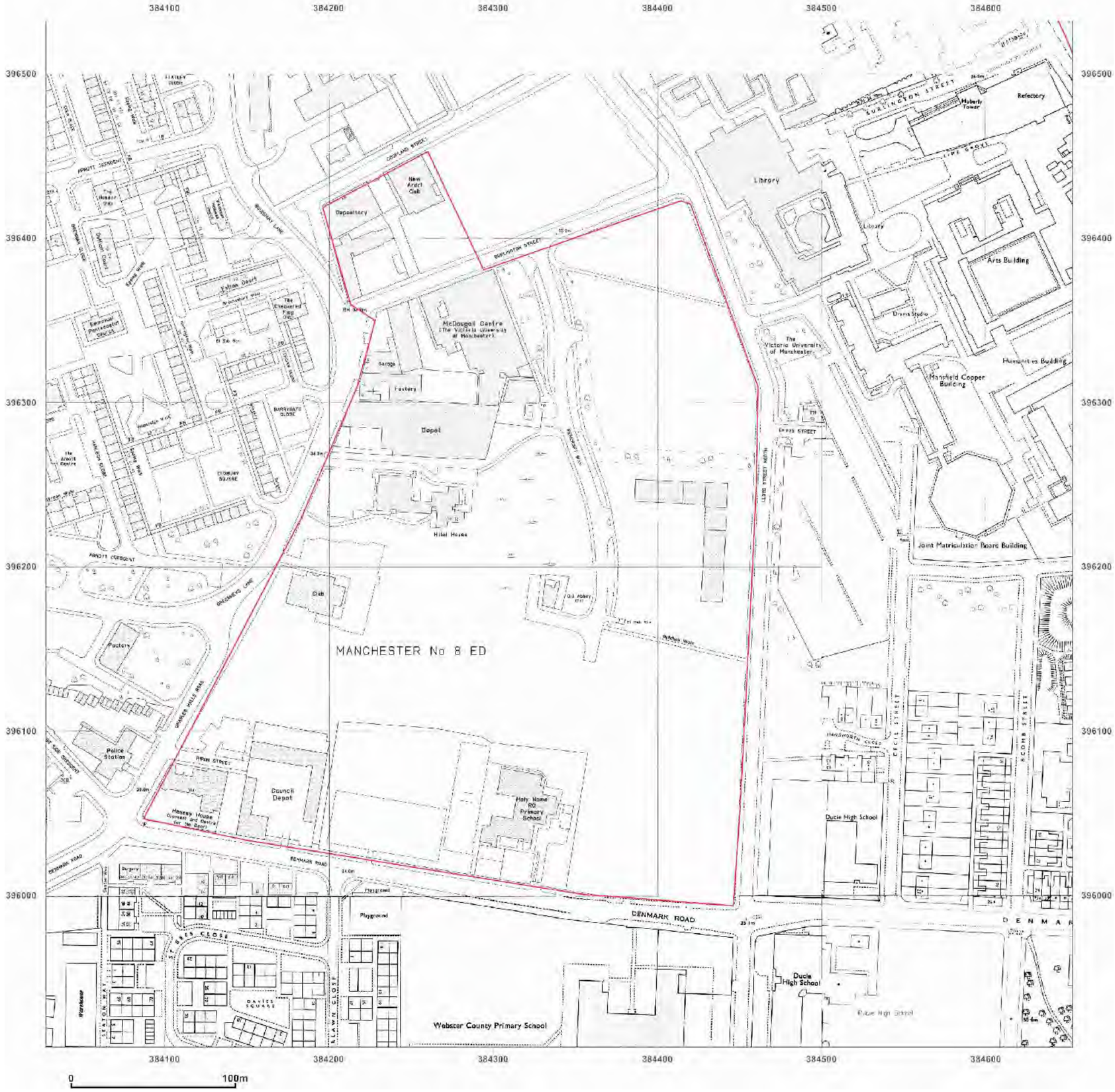

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1984-1989**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1983
Revised 1986
Edition N/A
Copyright 1987
Levelled 1963

Surveyed 1949
Revised 1984
Edition N/A
Copyright 1985
Levelled 1963

Surveyed 1963
Revised 1987
Edition N/A
Copyright 1987
Levelled 1963

Surveyed 1958
Revised 1984
Edition N/A
Copyright 1984
Levelled 1958

Surveyed 1989
Revised 1989
Edition N/A
Copyright 1989
Levelled N/A

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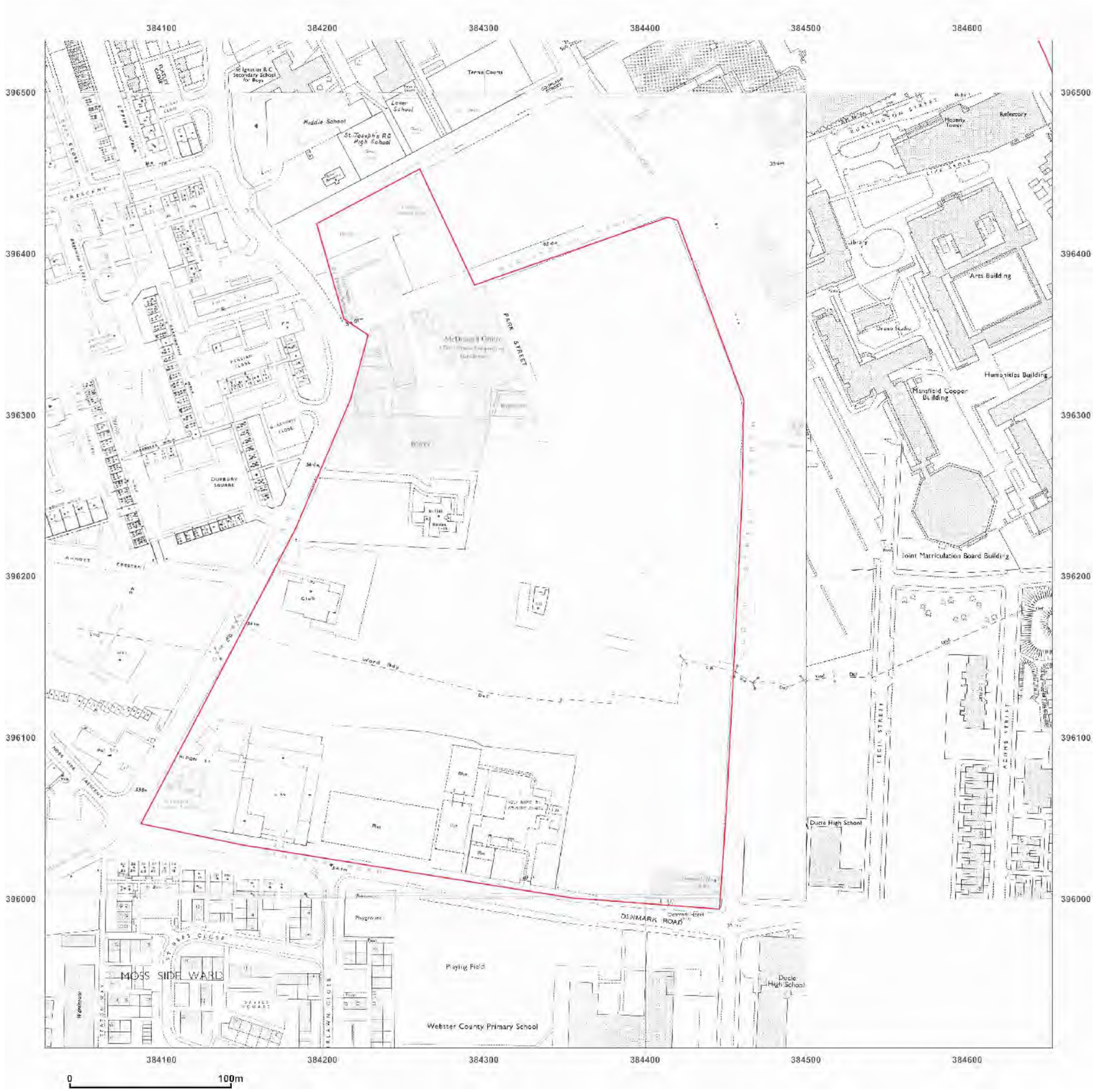

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Site Details:

MANCHESTER SCIENCE
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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1976-1980**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1948
Revised 1975
Edition N/A
Copyright 1976
Levelled 1958

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

Surveyed 1948
Revised 1979
Edition N/A
Copyright 1980
Levelled 1963

Surveyed 1950
Revised 1975
Edition N/A
Copyright 1976
Levelled 1958

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Site Details:

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1961-1963**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1945
Revised 1945
Edition N/A
Copyright 1951
Levelled 1956

Surveyed 1949
Revised 1951
Edition N/A
Copyright 1951
Levelled 1960

Surveyed 1949
Revised 1963
Edition N/A
Copyright 1964
Levelled 1958

Surveyed 1960
Revised 1960
Edition N/A
Copyright 1961
Levelled 1960

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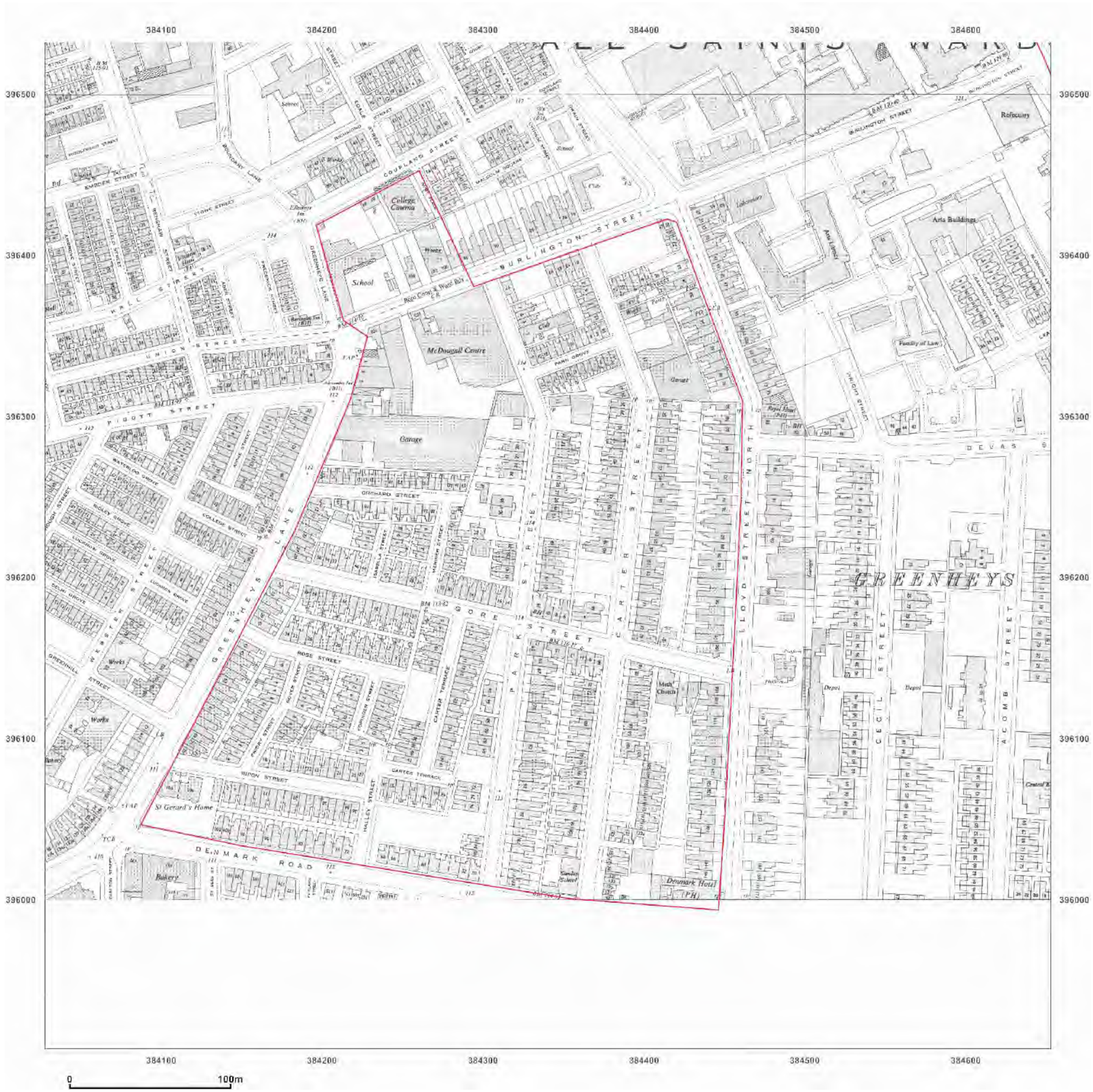

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Site Details:

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1961**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1961
Revised 1961
Edition 1963
Copyright 1963
Levelled 1958

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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1951**

Scale: 1:1,250

Printed at: 1:2,500

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Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled 1927

Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled 1928

Surveyed 1951
Revised 1951
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Surveyed 1951
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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: National Grid

Map date: **1949-1950**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1948
Revised 1949
Edition N/A
Copyright N/A
Levelled 1929

Surveyed 1950
Revised 1950
Edition N/A
Copyright N/A
Levelled 1936

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GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1932-1933**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1932
Revised 1932
Edition NA
Copyright NA
Levelled NA

Surveyed 1933
Revised 1933
Edition NA
Copyright NA
Levelled NA

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Site Details:

MANCHESTER SCIENCE
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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1922
Revised 1922
Edition NA
Copyright NA
Levelled NA

Surveyed 1922
Revised 1922
Edition NA
Copyright NA
Levelled NA

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Site Details:

MANCHESTER SCIENCE
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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1908**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1908
Revised 1908
Edition NA
Copyright NA
Levelled NA

Surveyed 1908
Revised 1908
Edition NA
Copyright NA
Levelled NA

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Site Details:

MANCHESTER SCIENCE
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Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series

Map date: **1889-1893**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1889
Revised 1889
Edition NA
Copyright NA
Levelled NA

Surveyed 1893
Revised 1893
Edition NA
Copyright NA
Levelled NA

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Site Details:

MANCHESTER SCIENCE
PARK, MANCHESTER, M15 6SE

Client Ref: NX128 Manchester Science Park
Report Ref: GS-262158
Grid Ref: 384340, 396220

Map Name: County Series Town Plan

Map date: **1891**

Scale: 1:500

Printed at: 1:1,000

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Surveyed ?
Revised ?
Edition NA
Copyright NA
Levelled NA

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Appendix D - Exploratory Hole Logs

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 16/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02	CP		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Black macadam.
					0.50			MADE GROUND: Soft dark brown slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete, brick, sandstone, wood and rare metal. Occasional angular to sub-rounded cobbles of concrete and brick and wood fragments noted.
					0.51			MADE GROUND: Concrete slab encountered.
								End of Borehole at 0.51m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated due to obstruction. 2. Mexe Probe Test at 0.30mbgl: 2/4/14/14 (cobble refusal), 1/2/3/14 (refusal), 2/2/5/14 (refusal).

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 16/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02A	CP		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Black macadam.
		0.50	ES		0.65			MADE GROUND: Soft dark brown slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete, brick, sandstone, wood and rare metal. Occasional angular to sub-rounded cobbles of concrete and brick and wood fragments noted.
					0.66			MADE GROUND: Concrete slab encountered.
								End of Borehole at 0.66m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated due to obstruction. 2. Mexe Probe Test at 0.30mbgl: 2/3/3/3, 2/1/2/3, 1/1/3/2.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 16/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02B	CP		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Black macadam.
					0.50			MADE GROUND: Soft dark brown slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete, brick, sandstone, wood and rare metal. Occasional angular to sub-rounded cobbles of concrete and brick and wood fragments noted.
					0.51			MADE GROUND: Concrete slab encountered.
								End of Borehole at 0.51m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated due to obstruction.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 16/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02C	CP		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Black macadam.
					0.50			MADE GROUND: Soft dark brown slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete, brick, sandstone, wood and rare metal. Occasional angular to sub-rounded cobbles of concrete and brick and wood fragments noted.
					0.51			MADE GROUND: Concrete slab encountered.
								End of Borehole at 0.51m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated due to obstruction.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 17/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH02D	CP		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Black macadam.
		0.50 - 1.00	B					MADE GROUND: Dark red and brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, occasional concrete and sandstone. Frequent angular to sub-rounded cobbles of brick noted.
		1.20 - 1.65 1.20	D SPT	N=21 (2,9/12,4,3,2)				
		2.00	SPT	N=7 (1,4/1,1,2,3)				
		2.30 - 2.50 2.50	D ES		2.40			Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone. [GLACIAL TILL]
		3.00 - 3.45	U					
		3.50	D					
		4.00 - 4.45 4.00 - 4.50 4.00	D B SPT	N=10 (1,2/3,2,2,3)				
		4.80 - 5.00 5.00 - 5.45	D U					
		5.50	D					
		6.00 - 6.45 6.00 - 6.50 6.00	D B SPT	N=33 (4,4/5,7,9,12)	6.00			Very stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone. [GLACIAL TILL]
	▼	7.10	SPT	50 (25 for 95mm/50 for 20mm)	7.20			Very dense brown sandy GRAVEL of fine to coarse, sub-angular to rounded sandstone. Sand is fine to coarse. Occasional cobbles of sub-angular to sub-rounded sandstone noted.
		7.20 - 7.50 7.50 - 7.95	D B					
		8.70	SPT	50 (25 for 70mm/50 for 20mm)	9.00			
		9.00 - 9.45 9.00	D SPT	50 (25 for 60mm/50 for 30mm)	9.50			Extremely weak, destructured, dark reddish brown SANDSTONE. Recovered as gravelly fine to coarse SAND. Gravel is fine to coarse, angular to sub-angular of sandstone.
		9.30 - 9.50	D					End of Borehole at 9.50m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Complete at 9.50mbgl. 2. Groundwater encountered at 7.20mbgl. 3. Hand Vane test at 3.45mbgl refused (too stiff). 4. Mexe Probe test at 0.30mbgl failed due to cobble content.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH03	CP		AB	1:50	Sheet 1 of 2

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 - 1.00	B		0.50			MADE GROUND: Dark brown slightly gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, rare brick and concrete. Roots noted.
		0.60	ES					MADE GROUND: Medium dense, brown and grey slightly clayey, gravelly sand. Sand is fine to coarse with much ash. Gravel is fine to coarse, angular to sub-rounded of brick and concrete. Occasional sub-angular to sub-rounded cobbles of brick noted.
		1.20 - 1.65	B					
		1.20	SPT	N=21 (2,9/6,4,4,7)				
		2.00 - 2.45	B					
		2.00	SPT	N=10 (4,4/4,3,2,1)				
		2.50 - 3.00	D		2.50			Medium dense dark greyish brown slightly clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone.
		2.60	ES					
		3.00	D					
		3.00	SPT	N=4 (1,1/1,1,1,1)	3.10			Soft brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		3.10 - 3.60	B					
		4.00 - 4.45	U					
		4.45		HVP=69				
		4.50	D					
		5.00 - 5.45	D		5.00			Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		5.00 - 5.50	B					
		5.00	SPT	N=18 (2,3/4,5,4,5)				
		6.00 - 6.45	U					
		6.50	D					
		7.50 - 8.00	B					
		7.50	SPT	50 (25 for 125mm/50 for 95mm)				
	▼	8.60 - 9.00	D		8.60			Very dense brown sandy GRAVEL of fine to coarse, sub-angular to rounded sandstone. Sand is fine to coarse. Occasional cobbles of sub-angular to sub-rounded sandstone noted.
		9.00	SPT	36 (4,9/36 for 160mm)				
					9.40			Extremely weak, destructured, dark reddish brown SANDSTONE, recovered as gravelly sand, gravel is fine to coarse, angular to sub-angular sandstone.
		10.00 - 10.45	D					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Completed at 10.30mbgl. 2. Groundwater encountered at 8.60mbgl. 3. Mexe Probe test at 0.30m: 3/5/5/4, 3/6/4/3.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH03	CP		AB	1:50	Sheet 2 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00	SPT	50 (25 for 75mm/50 for 50mm)	10.30			Extremely weak, destructured, dark reddish brown SANDSTONE, recovered as gravelly sand, gravel is fine to coarse, angular to sub-angular sandstone.
		10.30	SPT	50 (25 for 50mm/50 for 50mm)				End of Borehole at 10.30m

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Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Completed at 10.30mbgl. 2. Groundwater encountered at 8.60mbgl. 3. Mexe Probe test at 0.30m: 3/5/5/4, 3/6/4/3.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 19/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH04	CP		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			MADE GROUND: Black macadam.
		0.50 - 1.00	B		0.70			MADE GROUND: Brown and red gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular of brick and occasional concrete. Frequent angular to sub-angular cobbles of brick noted.
		1.20 - 1.65 1.20	B SPT	N=21 (1,4/4,9,6,2)	1.20			MADE GROUND: Dark brownish grey slightly sandy, gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular of brick, concrete and occasional sandstone. Driller notes faint hydrocarbon odour.
		2.00 - 2.45 2.00	B SPT	N=6 (0,1/2,1,2,1)				MADE GROUND: Soft dark brownish grey slightly sandy, gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular of brick, concrete and occasional sandstone.
		3.20 - 3.65 3.20 - 3.70 3.20	D B SPT	N=13 (1,2/3,3,3,4)	3.00			Firm brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Occasional sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		4.00 - 4.45	U		4.00			Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Occasional sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		4.45 4.50	D	HVP=121				
		5.00 - 5.50 5.00	B SPT	N=19 (2,3/4,5,4,6)	5.00			Very stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Occasional sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		6.00 - 6.45	U					
		6.50	D					
		7.00	D		6.80			Very stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Frequent sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
	▼	7.50 - 7.95 7.50	B SPT	N=33 (2,4/6,8,9,10)	7.40			Dense brown sandy GRAVEL of fine to coarse, sub-angular to rounded sandstone. Sand is fine to coarse. Occasional cobbles of sub-angular to sub-rounded sandstone noted.
		9.00 - 9.45 9.00	D SPT	50 (25 for 125mm/50 for 50mm)	8.90			Extremely weak, destructured, dark reddish brown SANDSTONE, recovered as gravelly sand, gravel is fine to coarse, angular to sub-angular sandstone.
		9.40 - 9.45 9.40	D SPT	50 (25 for 125mm/50 for 20mm)	9.60			End of Borehole at 9.60m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Completed at 9.60mbgl. 2. Groundwater encountered as damp at 7.90-8.90mbgl.

Rotary Core Log

Project Name: New Base Building	Client: MSP	Date: 16/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RBH01	RC		AB	1:50	Sheet 1 of 2

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.60	B					0.20			MADE GROUND: Black macadam.
		0.30	ES								MADE GROUND - Dark grey and brown gravelly sand. Sand is fine to coarse with occasional ash,. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and occasional sandstone. Rare angular to sub-rounded cobbles of brick noted.
		0.70	ES					0.70			
		0.90	ES								
		1.20 - 1.65	B				(4)				MADE GROUND: Loose dark greyish brown, slightly gravelly clayey sand. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone and occasional brick.
		1.20 - 1.70	D								
								1.60			
							(10)				Medium dense dark brown slightly clayey, gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone.
		2.30 - 2.60	B					2.30			
		2.50	D								
		2.60 - 3.00	D								Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		3.50 - 3.95	U								
		4.00	B				(27)				
		4.00 - 4.50	D								
		5.00 - 5.45	U								
		5.50	D								
		6.50 - 7.00	B				50 (6,13/50 for 85mm)				
		7.80	D					7.90			
		8.00 - 8.50	B				50 (25 for 70mm/ 50 for 20mm)				Extremely weak, destructured, dark reddish brown SANDSTONE, recovered as gravelly sand, gravel is fine to coarse, angular to subangular sandstone.
		9.40 - 9.60	D				50 (25 for 60mm/ 50 for 10mm)	9.50			Extremely weak distinctly weathered dark reddish brown SANDSTONE. Fractures are generally closely spaced, sub-horizontal,

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Complete at 20.0mbgl.

Rotary Core Log

Project Name: New Base Building	Client: MSP	Date: 16/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Dando 2000

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RBH01	RC		AB	1:50	Sheet 2 of 2

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.50 - 11.00		0	0	0					Extremely weak distinctly weathered dark reddish brown SANDSTONE. Fractures are generally closely spaced, sub-horizontal, planar and smooth, no infill.
		11.00 - 14.00		78	67	37		12.00			Weak partially unweathered dark reddish brown SANDSTONE. Fractures are generally closely spaced, sub-horizontal, planar and smooth, no infill.
		14.00 - 17.00		98	98	46		14.00			Medium strong unweathered dark reddish brown SANDSTONE. Fractures are generally closely spaced, sub-horizontal, planar and smooth, no infill.
		17.00 - 20.00		98	88	61		17.00			Weak unweathered dark reddish brown SANDSTONE. Fractures are generally closely spaced, sub-horizontal, planar and smooth, no infill.
								18.50			Medium strong unweathered dark reddish brown SANDSTONE. Fractures are generally closely spaced, sub-horizontal, planar and smooth, no infill.
								20.00			End of Borehole at 20.00m

11 12 13 14 15 16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Complete at 20.0mbgl.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Tracked Archway Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RBH05	WLS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40			MADE GROUND: Dark brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse angular to sub-rounded of brick and concrete.
					0.80			MADE GROUND: Dark greyish brown, slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and occasional sandstone. Frequent angular to sub-rounded cobbles of brick noted.
					0.81			MADE GROUND: Black macadam (possible relic road).
								End of Borehole at 0.81m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated due to obstruction.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Tracked Archway Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RBH05A	WLS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40			MADE GROUND: Dark brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse angular to sub-rounded of brick and concrete.
					0.80			MADE GROUND: Dark greyish brown, slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and occasional sandstone. Frequent angular to sub-rounded cobbles of brick noted.
					0.81			MADE GROUND: Black macadam (possible relic road).
								End of Borehole at 0.81m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated due to obstruction.

Rotary Borehole Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Commachio

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RBH05B	CP		AB	1:50	Sheet 1 of 1

Sample and In Situ Testing			Depth (m)	Stratum Description
Depth (m)	Type	Results		
			0.10	MADE GROUND: Black macadam.
			0.20	MADE GROUND: Brownish grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete and sandstone. [Engineered subbase fill]
0.60	D		0.50	
0.60	ES			MADE GROUND: Dark orangish brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular of limestone. [Engineered subbase fill]
			1.20	MADE GROUND: Dark brown slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete, sandstone and wood fragments. Frequent angular to sub-rounded cobbles of brick and concrete noted.
1.50	SPT	N=4 (0,1/1,1,1,1)	1.50	
			1.80	MADE GROUND: Concrete obstruction.
1.90	D			MADE GROUND: Dark brown slightly sandy, gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete, sandstone and wood fragments. Frequent angular to sub-rounded cobbles of brick and concrete noted.
1.90	ES			
			2.50	Dark yellowish brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of sandstone and occasional mudstone.
2.60	D			
3.00	SPT	N=9 (2,2/2,2,2,3)		Brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Occasional sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
3.60	D			
4.50	SPT	N=8 (2,3/2,2,2,2)		
4.60	D			
5.60	D			
6.00	SPT	N=10 (2,2/3,3,2,2)		
			6.80	Dark yellowish brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of sandstone and occasional mudstone. Occasional sub-rounded cobbles of sandstone noted.
6.90	D			
			9.10	Extremely weak, destructured, dark reddish brown SANDSTONE, recovered as gravelly sand, gravel is fine to coarse, angular to sub-angular sandstone.
			9.20	End of Borehole at 9.20m

Well: | Water Strikes: | Legend: | Level (m): | Scale: 1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated at 9.20mbgl due to cobble/ boulder obstruction.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS1	WS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Black macadam.
					0.30			MADE GROUND: Grey and brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete, brick and sandstone. Frequent angular cobbles of brick and sandstone noted.
					0.31			MADE GROUND: Sandstone obstruction encountered across base of pit, possible relic wall/foundation.
								End of Borehole at 0.31m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated on obstruction.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS2	WS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	D		0.20			MADE GROUND: Dark brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick and concrete.
		0.70 0.70	D ES		0.60			MADE GROUND: Dark brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone.
		1.20	SPT	N=19 (2,7/7,5,4,3)				MADE GROUND: Firm dark brown slightly sandy gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Frequent angular to sub-angular cobbles of brick noted.
		2.00	SPT	N=11 (2,1/2,3,2,4)				
		2.50 2.50	D ES		2.40			Medium dense dark brown slightly clayey, gravelly fine to coarse SAND. Gravel of fine to coarse, sub-angular to rounded sandstone.
		3.00	SPT	N=11 (3,1/1,3,3,4)				
		3.60	D		3.50			Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		4.00 4.00	D SPT	N=24 (5,5/6,6,6,6)				
					4.45			End of Borehole at 4.45m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Complete at 4.45mbgl. 2. No groundwater encountered.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS3	WS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Black macadam.
		0.60	D		0.50			MADE GROUND: Dark grey gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of concrete and sandstone. [Engineered subbase fill]
		0.60	ES					
		1.20	SPT	N=4 (2,3/1,1,1,1)	1.20			MADE GROUND: Reddish brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick and sandstone. Frequent angular to sub-rounded cobbles of brick noted.
		2.00	SPT	N=5 (1,1/0,1,2,2)	2.10			MADE GROUND: Loose reddish brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick and sandstone. Frequent angular to sub-rounded cobbles of brick noted.
		2.20	D					Medium dense dark brown slightly clayey, gravelly fine to coarse SAND. Gravel of fine to coarse, sub-angular to rounded sandstone.
		2.20	ES		2.50			
		2.60	D					Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse, Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		3.00	D					
		3.00	SPT	N=23 (3,4/5,6,6,6)				
		4.00	D					
		4.00	SPT	N=26 (5,6/7,7,6,6)				
					4.45			End of Borehole at 4.45m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Complete at 4.45mbgl. 2. No groundwater encountered.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS4	WS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.45			MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Occasional sub-angular cobbles of concrete and brick noted.
					0.46			MADE GROUND: Concrete boulder covering entirety of pit.
								End of Borehole at 0.46m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Terminated on obstruction.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS4A	WS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 0.50	D ES		0.40			MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Occasional sub-angular cobbles of concrete and brick noted.
		1.20	SPT	N=6 (2,2/2,2,1,1)	1.20			MADE GROUND: Dark brown slightly clayey slightly gravelly sand. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Occasional sub-angular cobbles of concrete and brick noted.
		1.50	D					MADE GROUND: Soft dark brown slightly sandy gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Occasional sub-angular to sub-rounded cobbles of concrete and brick noted.
		2.00	SPT	N=1 (1,0/0,0,0,1)	2.00			MADE GROUND: Firm dark brown slightly sandy gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Occasional sub-angular to sub-rounded cobbles of concrete and brick noted.
		2.50	D					
		3.00 - 3.45 3.00	D SPT	N=15 (5,3/5,4,3,3)				
		3.60 3.60	D ES		3.50			Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		4.00 - 4.45 4.00	D SPT	N=21 (3,4/5,5,6,5)				
		5.00	SPT	N=23 (4,5/6,6,5,6)				
					5.45			End of Borehole at 5.45m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Complete at 5.45mbgl. 2. No groundwater encountered.

Percussion Drilling Log

Project Name: New Base Building	Client: MSP	Date: 18/05/2019
Location: Manchester	Contractor: TDS	
Project No. : NX342	Crew Name: PL	Drilling Equipment: Window Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS5	WS		AB	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			MADE GROUND: Black macadam.
		0.20	D		0.40			MADE GROUND: Brown gravelly fine to coarse sand. Gravel is fine to coarse, angular to sub-rounded of brick, concrete, sandstone and rare metal. Frequent angular cobbles of brick noted.
		0.60	D					MADE GROUND: Firm dark brown slightly sandy gravelly clay (reworked). Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of brick, concrete and sandstone. Frequent angular to sub-angular cobbles of brick noted.
		0.60	ES					
		1.20	SPT	N=11 (1,1/3,2,3,3)	1.40			
		1.50	D					Medium dense yellowish brown slightly clayey, gravelly fine to coarse SAND. Gravel of fine to coarse, sub-angular to rounded sandstone and occasional mudstone.
		1.50	ES					
		2.00	SPT	N=13 (5,5/4,3,3,3)	2.70			
		2.80	D					Stiff brown slightly sandy, slightly gravelly CLAY. Sand is fine to coarse, Gravel is fine to coarse, sub-angular to sub-rounded of sandstone, occasional mudstone and rare coal. Rare sub-rounded cobbles of sandstone noted. [GLACIAL TILL]
		3.00	D					
		3.00	SPT	N=22 (3,4/5,5,6,6)	3.45			End of Borehole at 3.45m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Complete at 3.45mbgl. 2. No groundwater encountered.

Appendix E – Geotechnical Laboratory Test Results

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

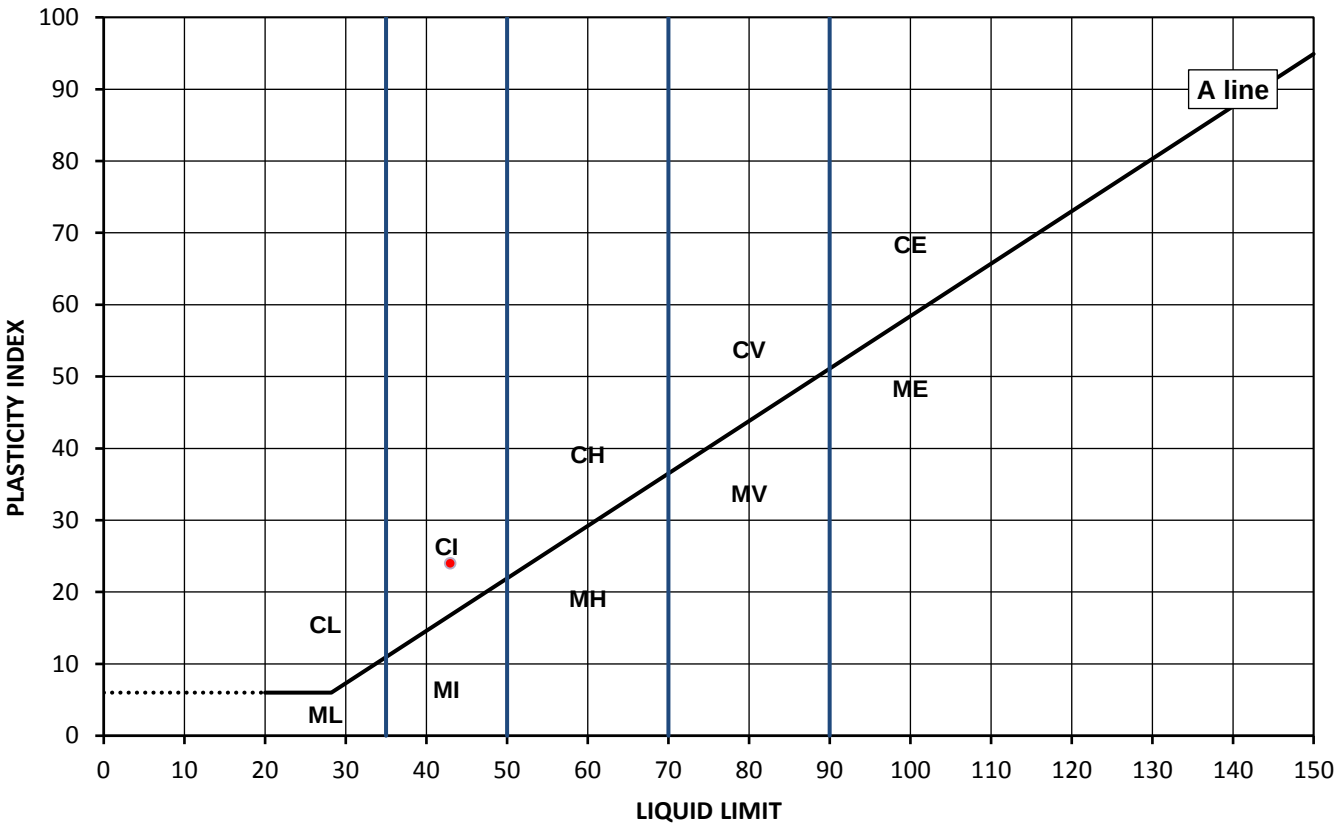
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229224	Depth Top [m]:	3.60
Hole No.:	WS2	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown sandy CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	43	19	24	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 232.5**

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The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

"Any assessment of compliance with specifications based the analytical results in a report take in to account 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."

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

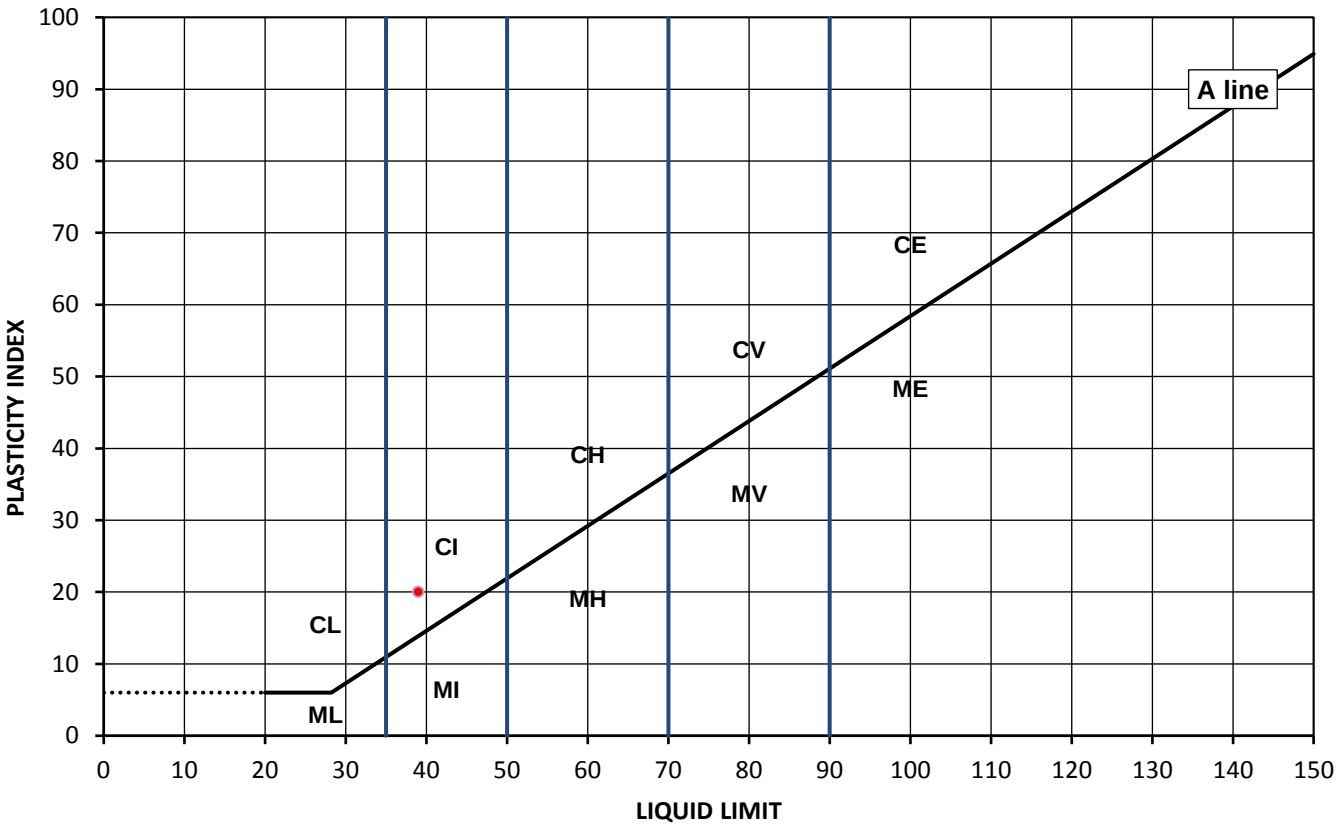
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229225	Depth Top [m]:	2.60
Hole No.:	WS3	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown sandy CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
20	39	19	20	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 232.5**

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TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

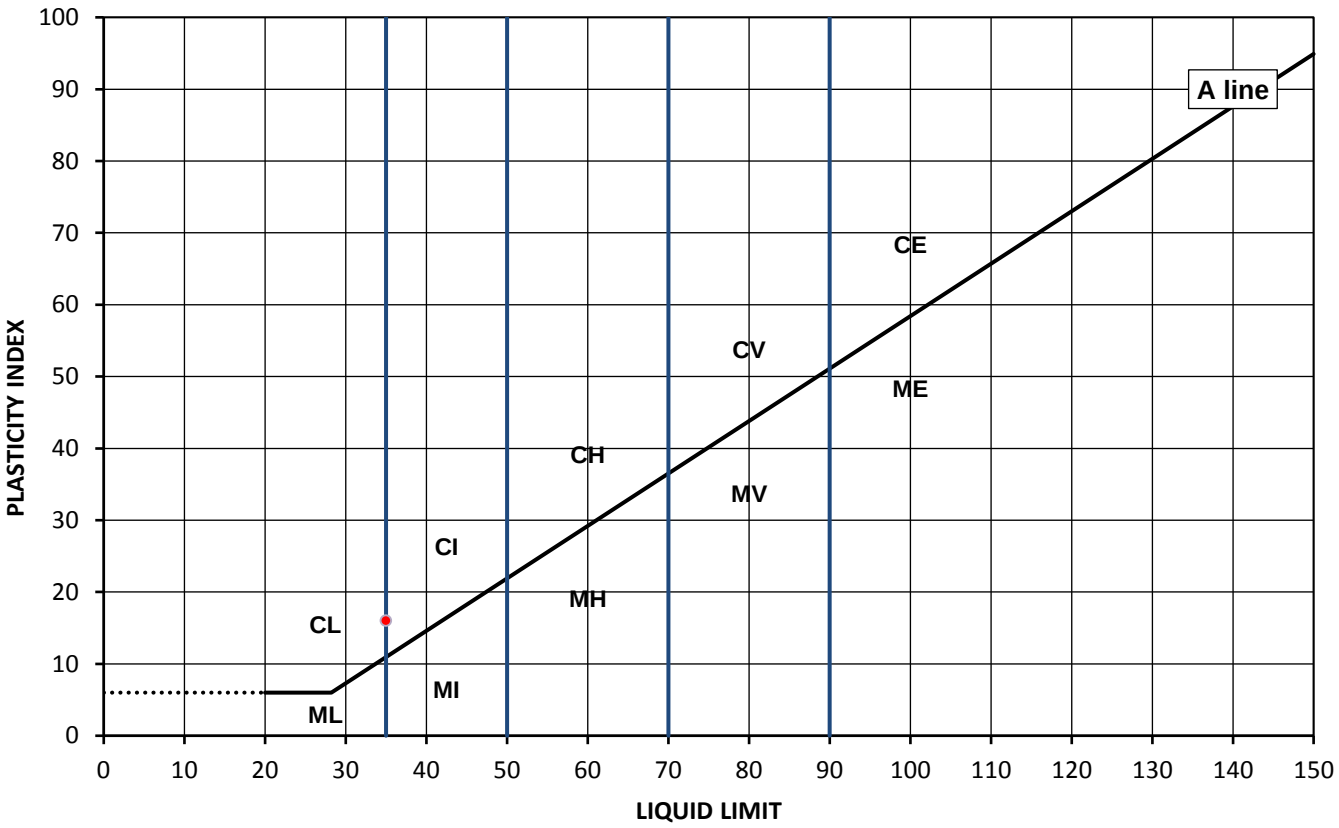
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229226	Depth Top [m]:	1.20
Hole No.:	WS5	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown slightly gravelly sandy CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
20	35	19	16	86



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 232.5**

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TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

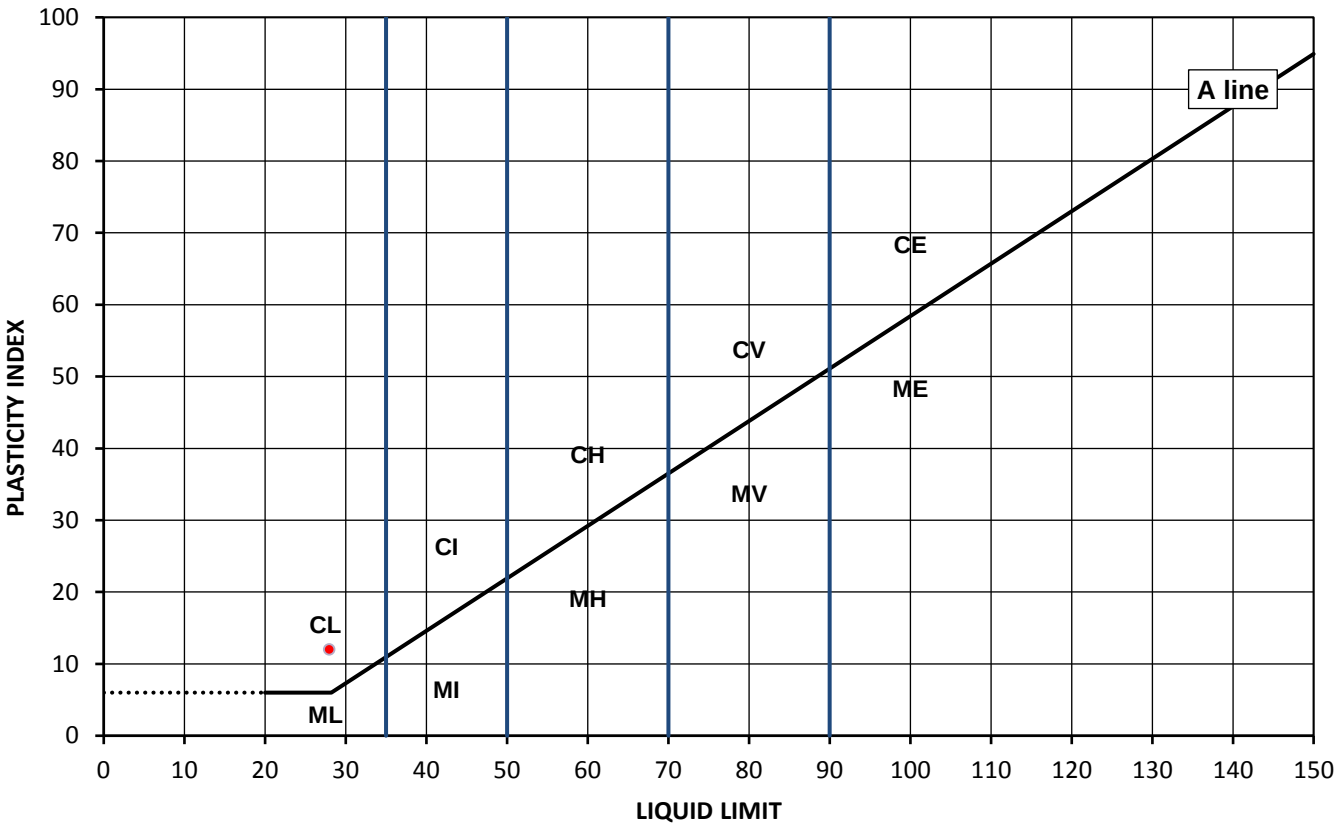
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229227	Depth Top [m]:	2.50
Hole No.:	RBH01	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
17	28	16	12	40



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 232.5**

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TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

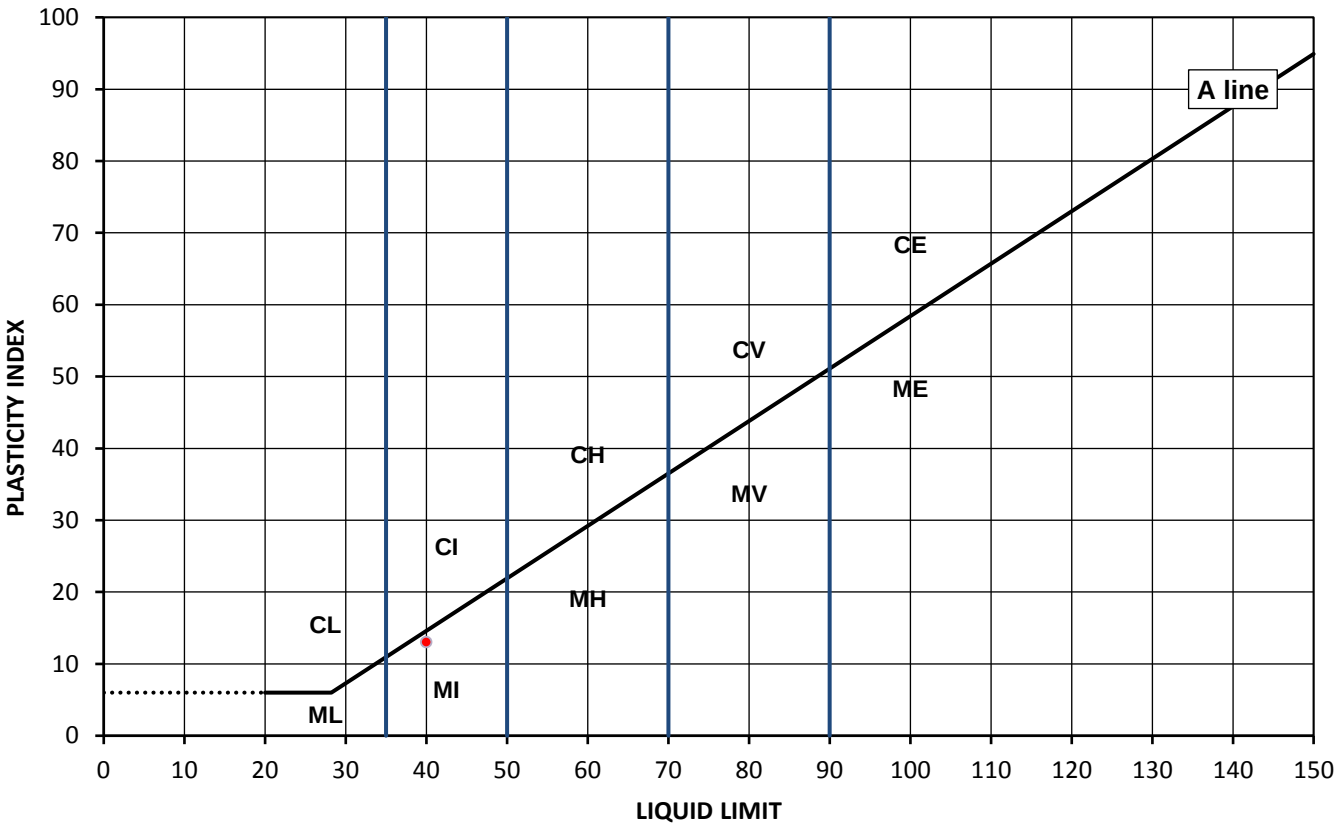
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229228	Depth Top [m]:	2.60
Hole No.:	RBH056	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown sandy CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
20	40	27	13	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
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TEST CERTIFICATE

Liquid and Plastic Limits

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Watford Herts WD18 8YS

UKAS TESTING 4041

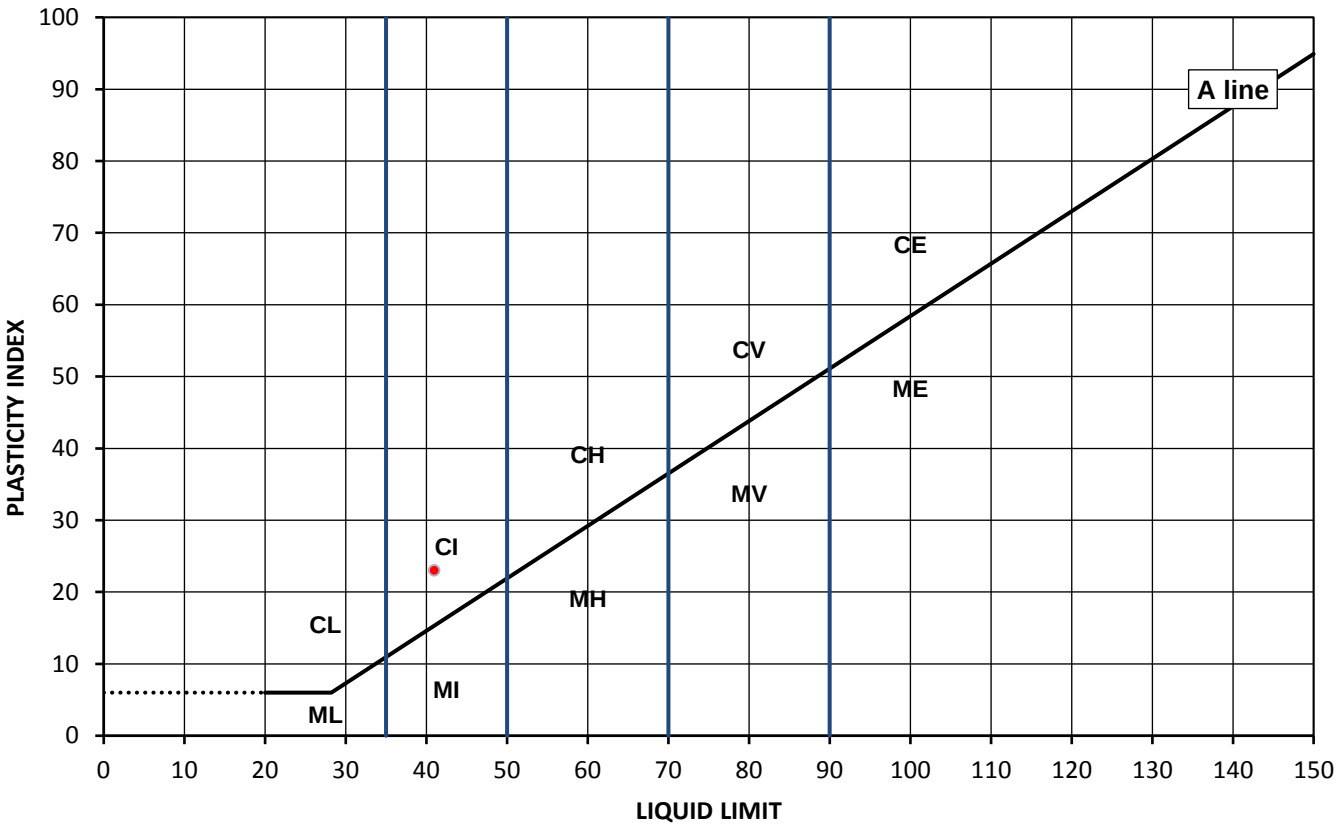
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229229	Depth Top [m]:	3.00
Hole No.:	BH03	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	41	18	23	97



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
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for and on behalf of i2 Analytical Ltd **GF 232.5**

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TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

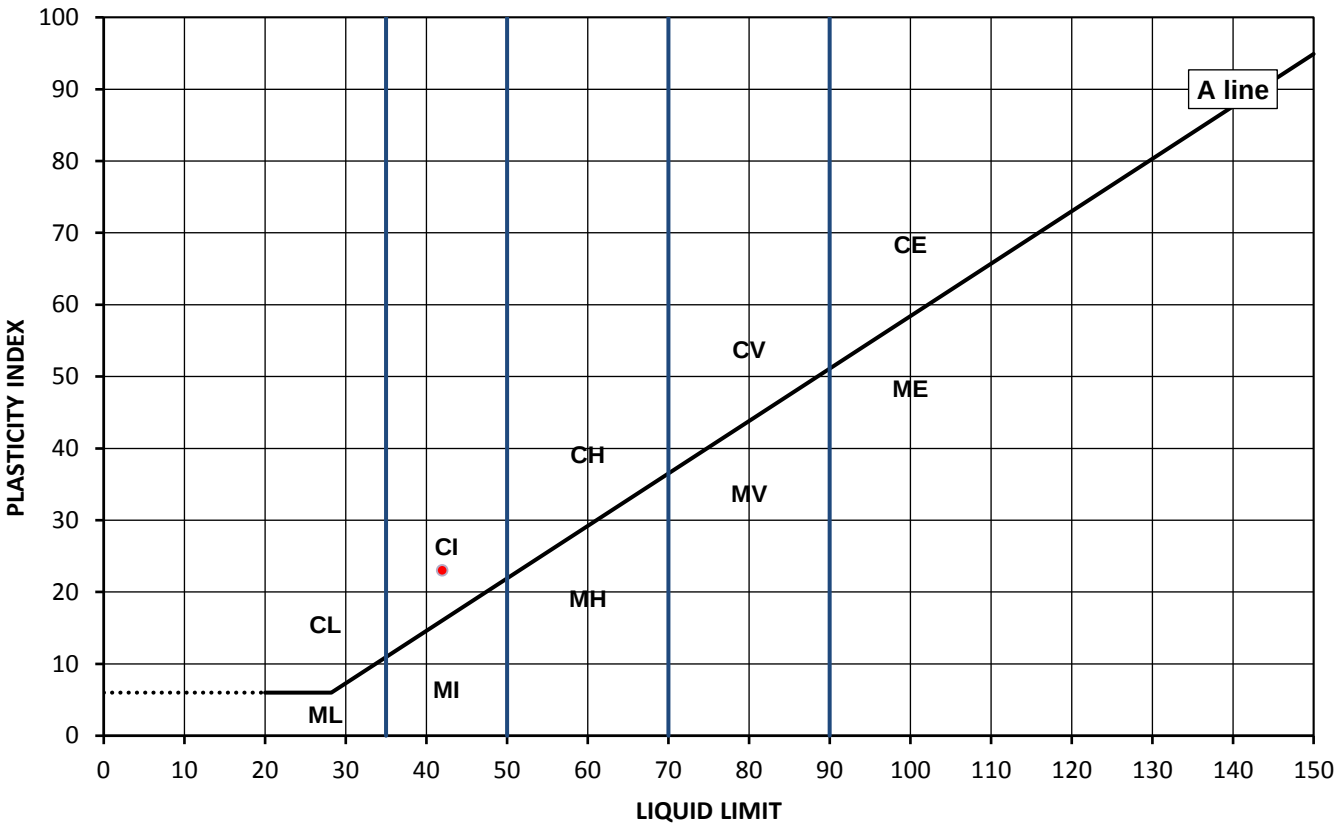
Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229230	Depth Top [m]:	3.20
Hole No.:	BH04	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
17	42	19	23	98



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 232.5**

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SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: NX Consulting
Client Address: Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ
Contact: Mark Newton
Site Name: New Base Building
Site Address: Not Given

Client Reference: NC369
Job Number: 19-42603
Date Sampled: Not Given
Date Received: 21/05/2019
Date Tested: 28/05/2019
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	LL	PL	PI	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
1229229	BH03	Not Given	3.00	3.45	D	Brown slightly gravelly sandy CLAY	Atterberg 1 Point	18		97	41	18	23						
1229230	BH04	Not Given	3.20	3.45	D	Brown slightly gravelly sandy CLAY	Atterberg 1 Point	17		98	42	19	23						
1229227	RBH01	Not Given	2.50	Not Given	D	Brown gravelly very sandy CLAY	Atterberg 1 Point	17		40	28	16	12						
1229228	RBH056	Not Given	2.60	Not Given	D	Brown sandy CLAY	Atterberg 1 Point	20		100	40	27	13						
1229224	WS2	Not Given	3.60	Not Given	D	Brown sandy CLAY	Atterberg 1 Point	18		100	43	19	24						
1229225	WS3	Not Given	2.60	Not Given	D	Brown sandy CLAY	Atterberg 1 Point	20		100	39	19	20						
1229226	WS5	Not Given	1.20	Not Given	D	Brown slightly gravelly sandy CLAY	Atterberg 1 Point	20		86	35	19	16						

Note: # Non accredited; NP - Non plastic

Comments:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 234.7**

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

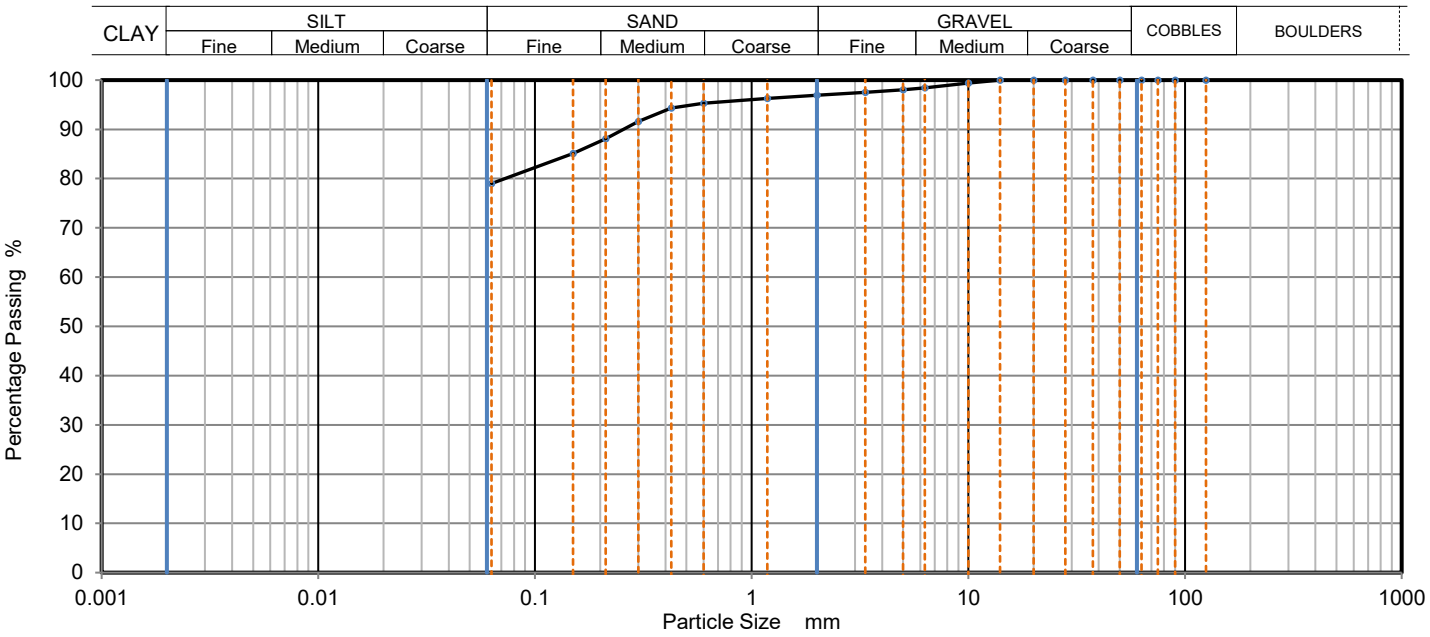
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229233	Depth Top [m]:	3.00
Hole No.:	BH20	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5	98		
3.35	98		
2	97		
1.18	96		
0.6	95		
0.425	94		
0.3	92		
0.212	88		
0.15	85		
0.063	79		

Dry Mass of sample [g]: 439

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	3.10
Sand	17.90
Fines <0.063mm	79.00

Grading Analysis		
D100	mm	14
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

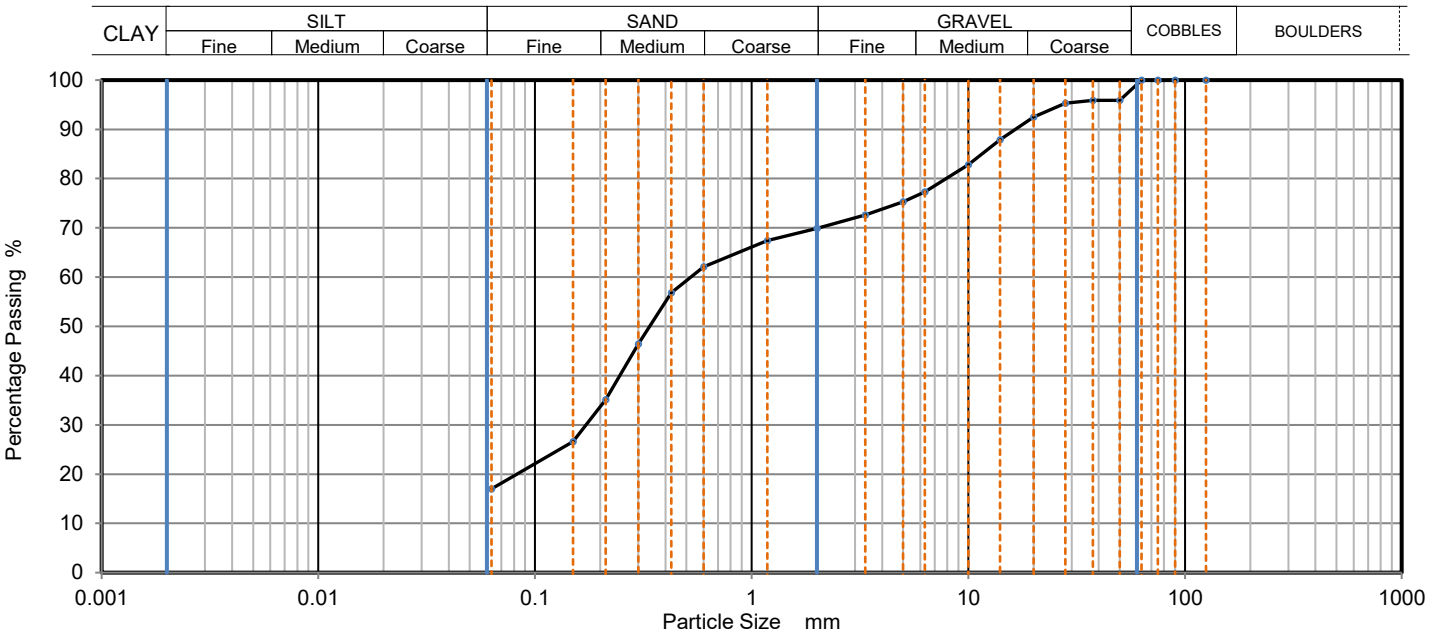
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229239	Depth Top [m]:	2.30
Hole No.:	RBH01	Depth Base [m]:	2.60
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Greyish brown clayey very gravelly SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	96		
37.5	96		
28	95		
20	93		
14	88		
10	83		
6.3	77		
5	75		
3.35	73		
2	70		
1.18	67		
0.6	62		
0.425	57		
0.3	46		
0.212	35		
0.15	27		
0.063	17		

Dry Mass of sample [g]: 5697

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	30.10
Sand	52.50
Fines <0.063mm	17.40

Grading Analysis		
D100	mm	63
D60	mm	0.524
D30	mm	0.172
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

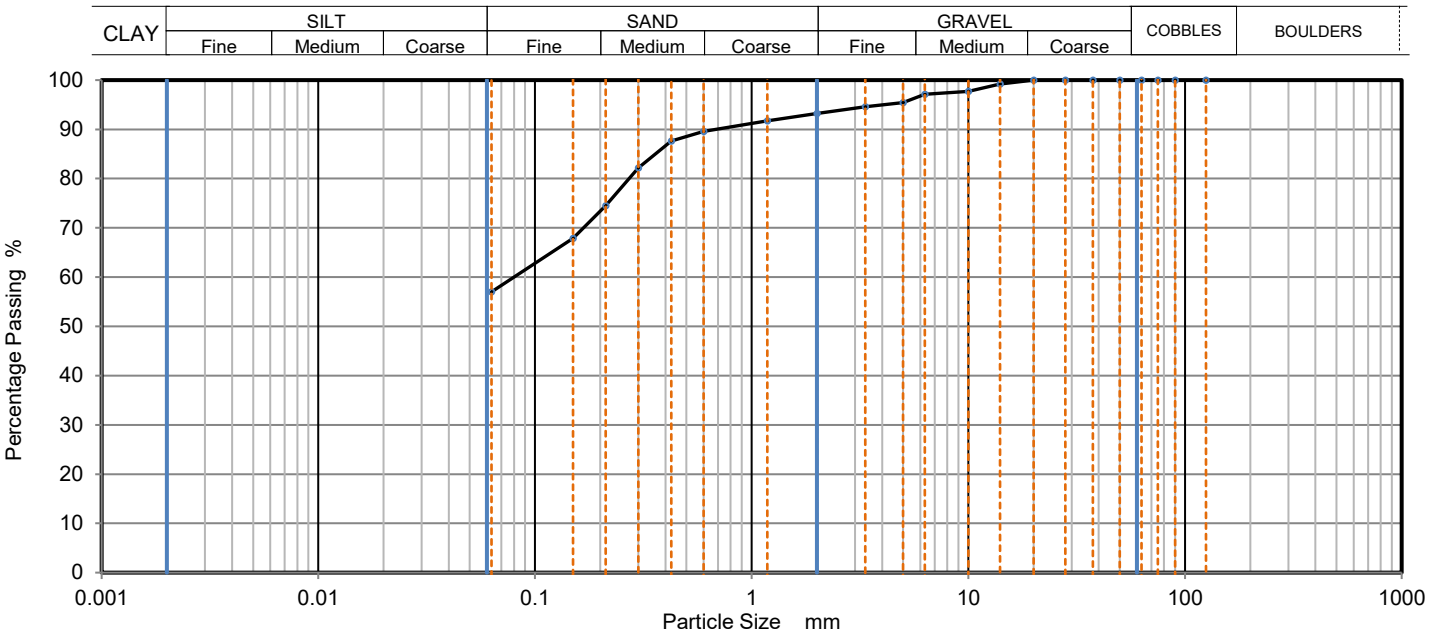
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229240	Depth Top [m]:	6.50
Hole No.:	RBH01	Depth Base [m]:	7.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly very sandy CLAY		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	98		
6.3	97		
5	95		
3.35	95		
2	93		
1.18	92		
0.6	90		
0.425	88		
0.3	82		
0.212	75		
0.15	68		
0.063	57		

Dry Mass of sample [g]: 1096

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	6.80
Sand	35.90
Fines <0.063mm	57.30

Grading Analysis		
D100	mm	20
D60	mm	0.0784
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

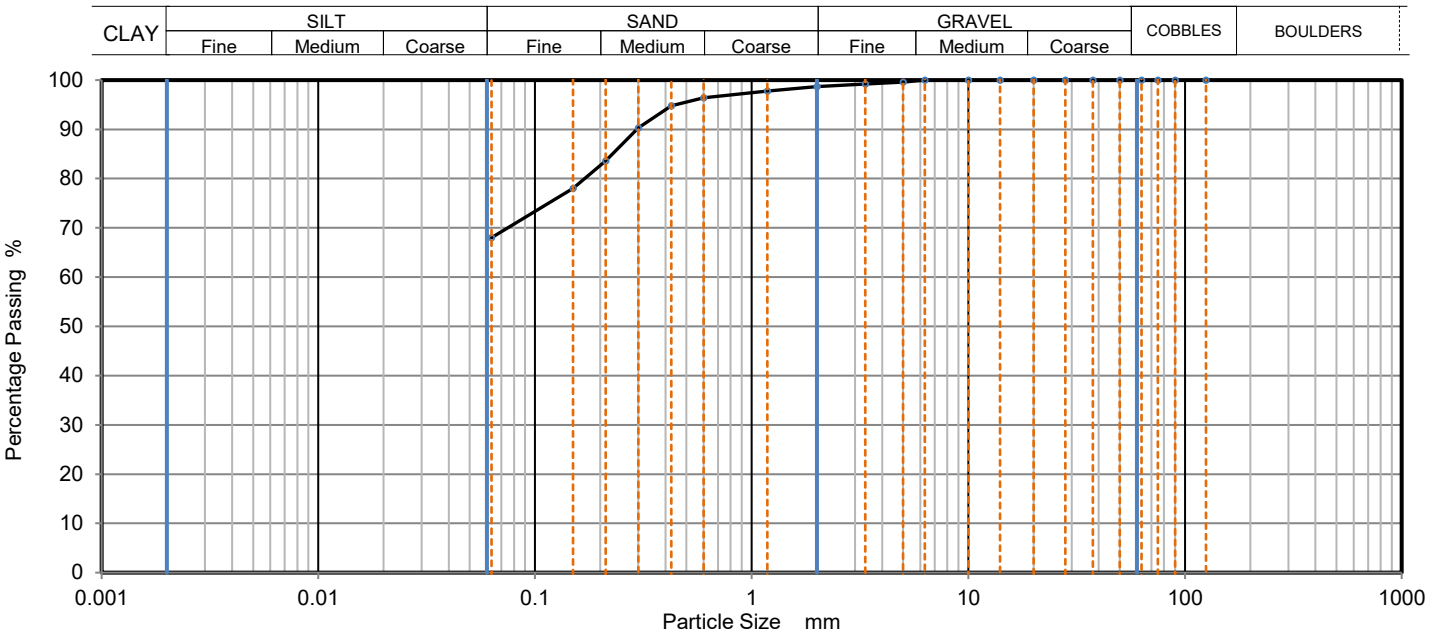
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229241	Depth Top [m]:	4.00
Hole No.:	BH20	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown sandy CLAY		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	96		
0.425	95		
0.3	90		
0.212	84		
0.15	78		
0.063	68		

Dry Mass of sample [g]: 336

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	1.30
Sand	30.50
Fines <0.063mm	68.20

Grading Analysis		
D100	mm	6.3
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

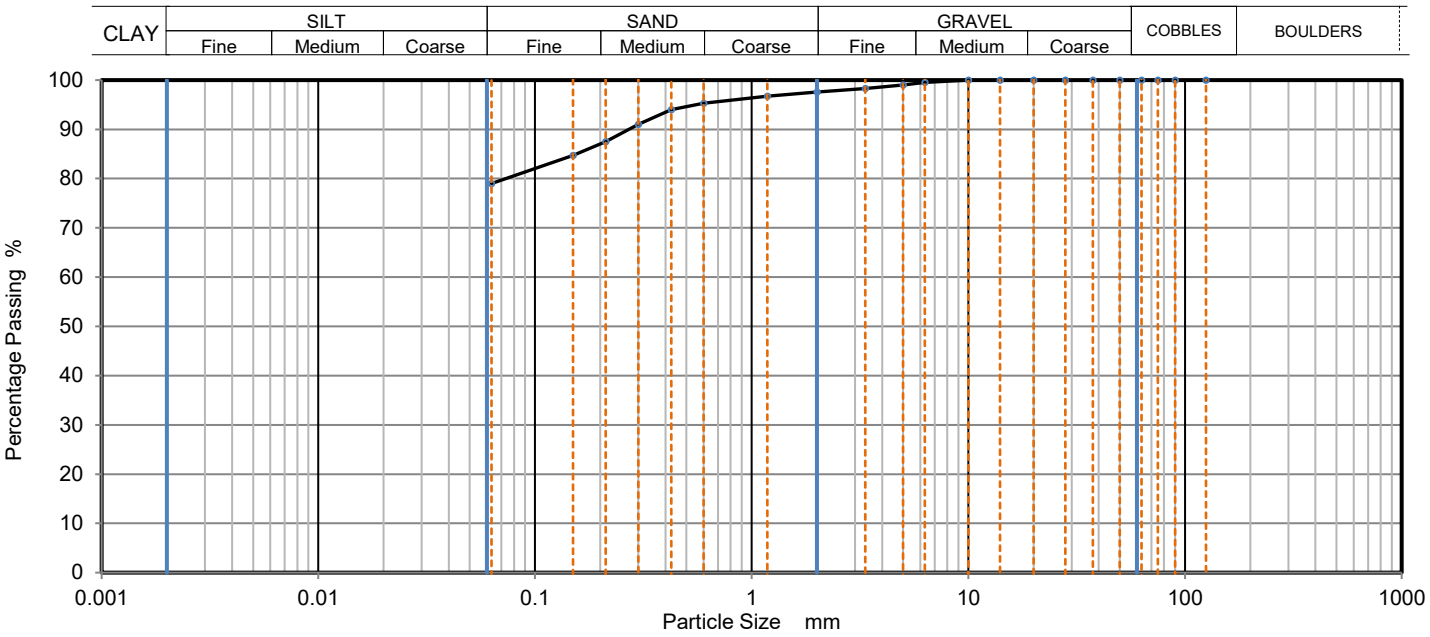
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229242	Depth Top [m]:	3.10
Hole No.:	BH3	Depth Base [m]:	3.60
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy CLAY		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	98		
1.18	97		
0.6	95		
0.425	94		
0.3	91		
0.212	88		
0.15	85		
0.063	79		

Dry Mass of sample [g]: 530

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	2.40
Sand	18.20
Fines <0.063mm	79.40

Grading Analysis		
D100	mm	10
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

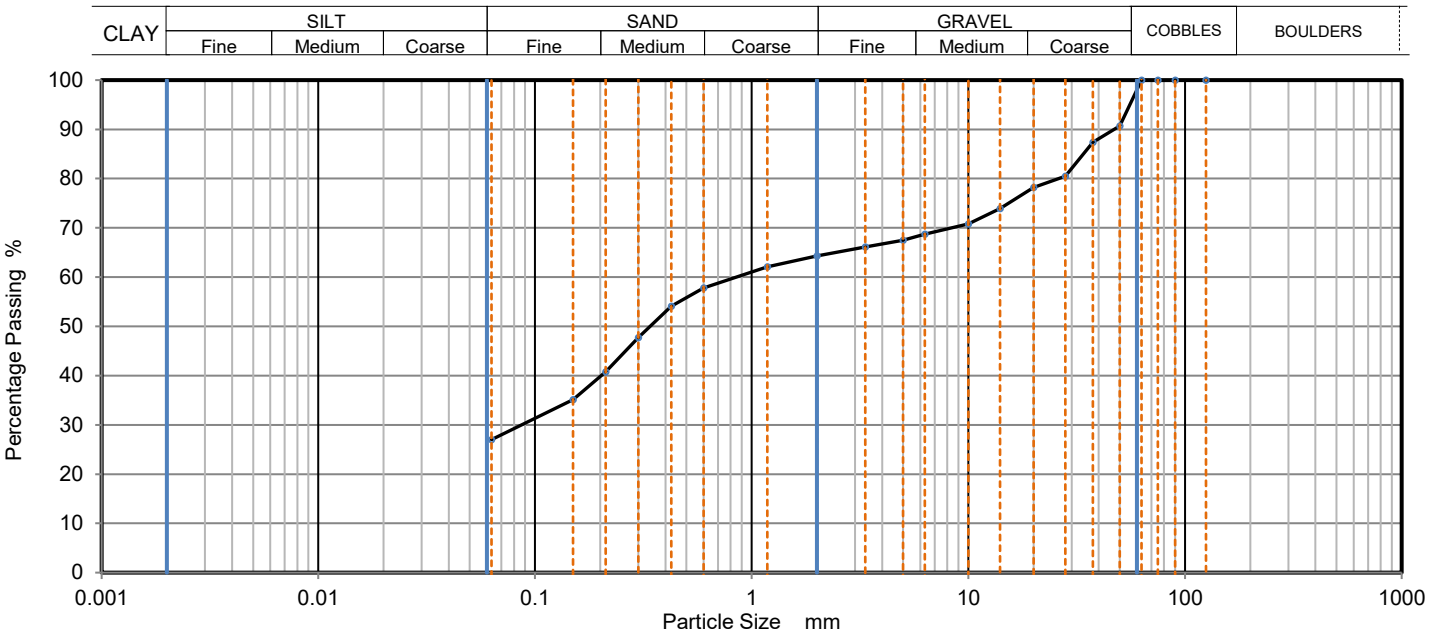
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229243	Depth Top [m]:	7.50
Hole No.:	BH3	Depth Base [m]:	8.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Greyish brown very gravelly very clayey SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	91		
37.5	87		
28	81		
20	78		
14	74		
10	71		
6.3	69		
5	68		
3.35	66		
2	64		
1.18	62		
0.6	58		
0.425	54		
0.3	48		
0.212	41		
0.15	35		
0.063	27		

Dry Mass of sample [g]: 5758

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	35.70
Sand	37.30
Fines <0.063mm	27.10

Grading Analysis		
D100	mm	63
D60	mm	0.852
D30	mm	0.0865
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

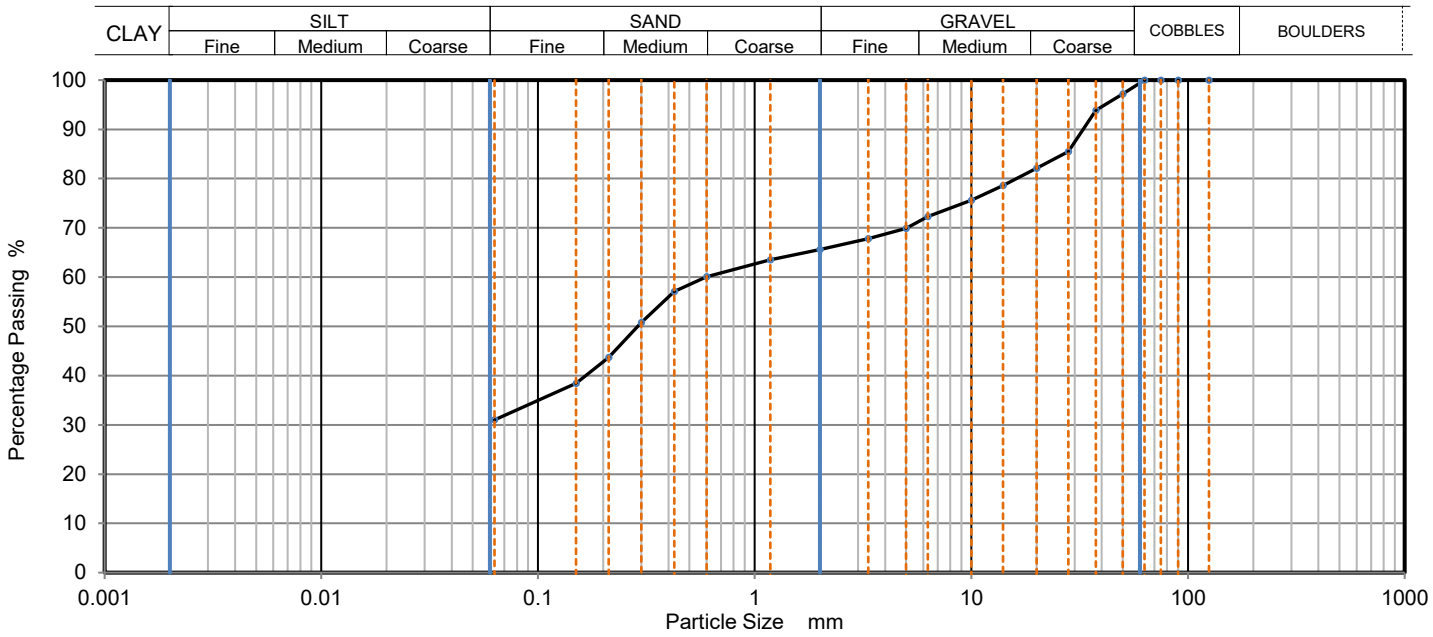
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229244	Depth Top [m]:	1.20
Hole No.:	BH4	Depth Base [m]:	1.65
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown very clayey GRAVEL and SAND		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	94		
28	86		
20	82		
14	79		
10	76		
6.3	72		
5	70		
3.35	68		
2	66		
1.18	64		
0.6	60		
0.425	57		
0.3	51		
0.212	44		
0.15	38		
0.063	31		

Dry Mass of sample [g]: 4813

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	34.40
Sand	34.50
Fines <0.063mm	31.10

Grading Analysis		
D100	mm	63
D60	mm	0.593
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3
Made Ground various of waste materials

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

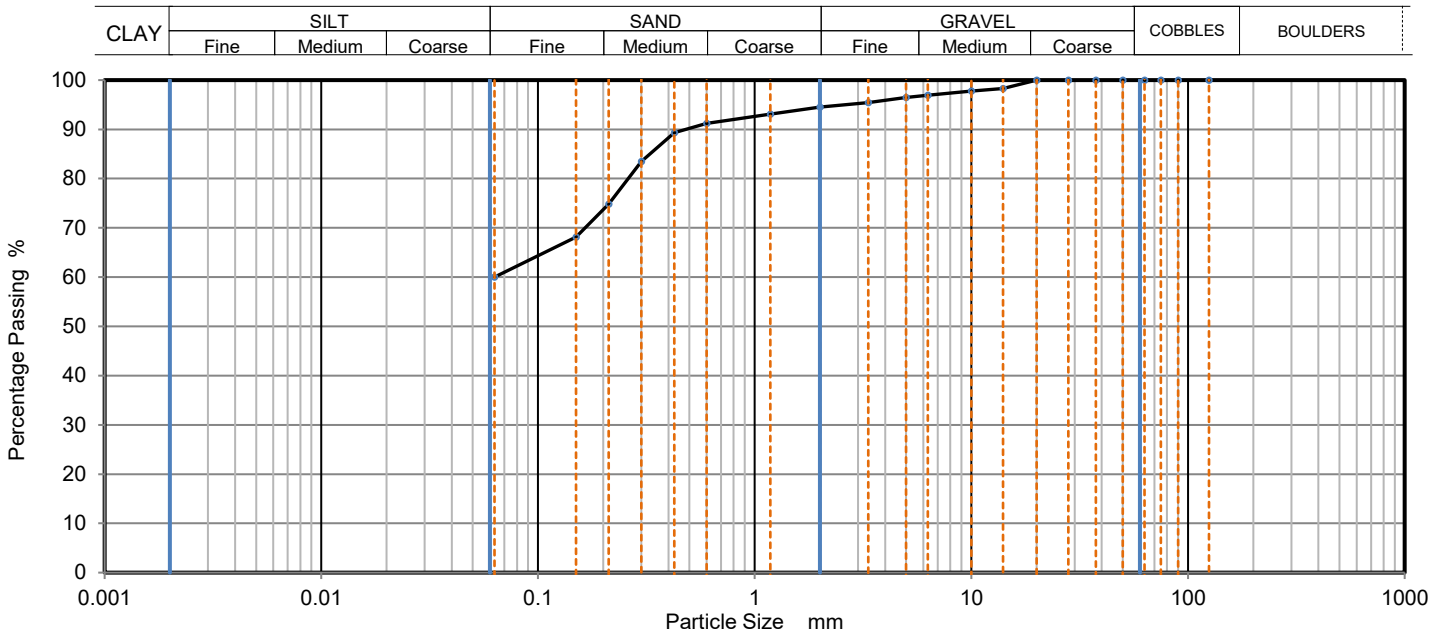
i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

Laboratory Reference:	1229245	Depth Top [m]:	5.00
Hole No.:	BH4	Depth Base [m]:	5.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy CLAY		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	98		
6.3	97		
5	97		
3.35	95		
2	95		
1.18	93		
0.6	91		
0.425	89		
0.3	84		
0.212	75		
0.15	68		
0.063	60		

Dry Mass of sample [g]: 1064

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	5.50
Sand	34.40
Fines <0.063mm	60.10

Grading Analysis		
D100	mm	20
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd GF 100.11

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SUMMARY REPORT

Summary of Point Load Strength Index Tests Results

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	04/06/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top	Depth Base	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)
			m	m								mm	mm	mm	mm	kN	mm	MPa	MPa
1229044	RBH01	Not Given	11.10	Not Given	C	Orangish brown SANDSTONE	w = 12.0%	1	I	U	YES	48.1	53.4	44.0	41.0	0.3	52.8	0.12	0.12
1229050	RBH01	Not Given	12.00	Not Given	C	Orangish brown SANDSTONE	w = 7.5%	1	A	U	YES	-	85.9	45.0	40.0	0.8	66.1	0.18	0.20
1229045	RBH01	Not Given	12.50	Not Given	C	Orangish brown SANDSTONE	w = 11.4%	1	A	U	YES	-	85.6	52.0	43.0	0.3	68.5	0.06	0.06
1229051	RBH01	Not Given	13.50	Not Given	C	Orangish brown SANDSTONE	w = 11.6%	1	A	U	YES	-	85.8	48.0	40.0	0.5	66.1	0.11	0.13
1229046	RBH01	Not Given	14.00	Not Given	C	Orangish brown SANDSTONE	w = 10.8%	1	A	U	YES	-	86.1	47.0	43.0	0.8	68.7	0.16	0.19
1229047	RBH01	Not Given	15.50	Not Given	C	Orangish brown SANDSTONE	w = 12.4%	1	A	U	YES	-	85.8	51.0	47.0	0.6	71.7	0.12	0.14
1229052	RBH01	Not Given	17.50	Not Given	C	Orangish brown SANDSTONE	w = 11.8%	1	A	U	YES	-	85.9	46.0	43.0	0.7	68.6	0.14	0.17
1229048	RBH01	Not Given	18.00	Not Given	C	Orangish brown SANDSTONE	w = 11.1%	1	A	U	YES	-	85.7	59.0	55.0	1.0	77.5	0.17	0.21
1229053	RBH01	Not Given	18.50	Not Given	C	Orangish brown SANDSTONE	w = 11.6%	1	A	U	YES	-	85.9	48.0	44.0	0.2	69.4	0.04	0.05
1229049	RBH01	Not Given	19.50	Not Given	C	Orangish brown SANDSTONE	w = 11.0%	1	A	U	YES	-	86.1	42.0	38.0	1.0	64.5	0.25	0.28

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Comments:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 134.8**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

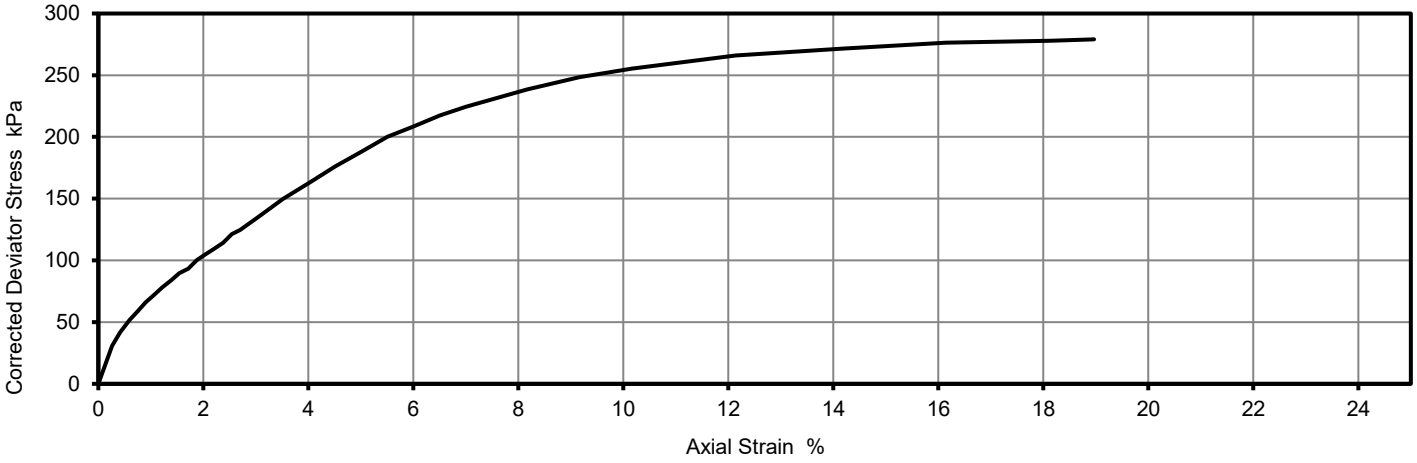
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

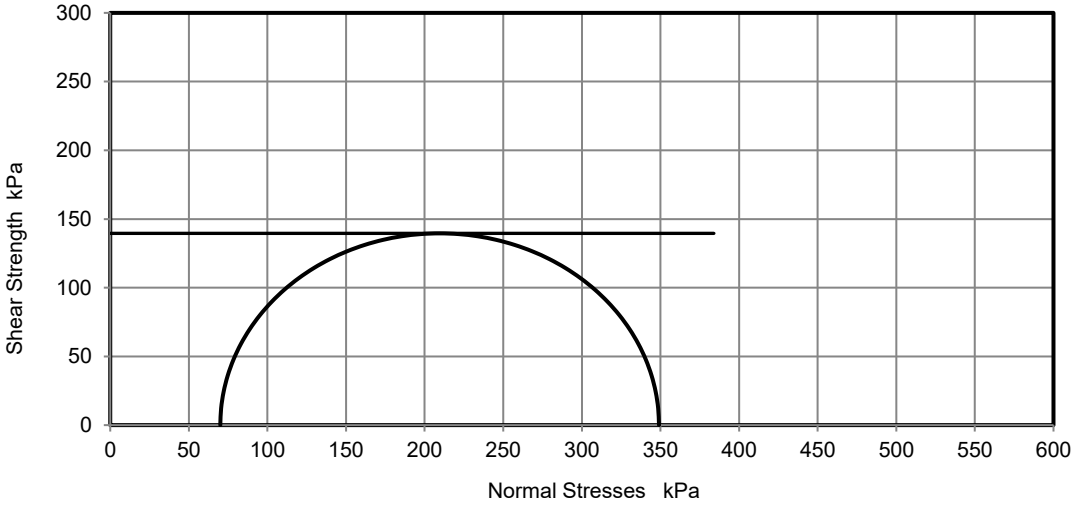
Laboratory Reference:	1229231	Depth Top [m]:	3.50
Hole No.:	RBH01	Depth Base [m]:	3.95
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	199.99	mm	Cell Pressure	70	kPa	
Diameter	101.62	mm	Axial Strain at failure	19.0	%	
Bulk Density	2.09	Mg/m3	Deviator Stress, (σ1 - σ3)f	279	kPa	
Moisture Content	18	%	Undrained Shear Strength, cu	140	kPa	½(σ1 - σ3)f
Dry Density	1.78	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.69	kPa	Membrane thickness	0.19	mm	

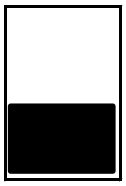
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

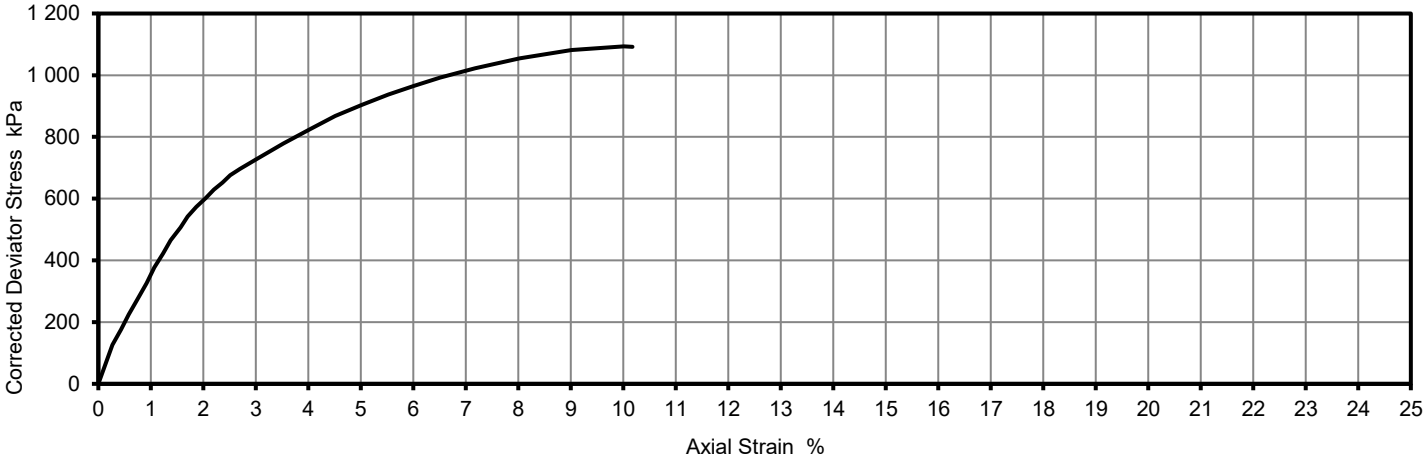
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

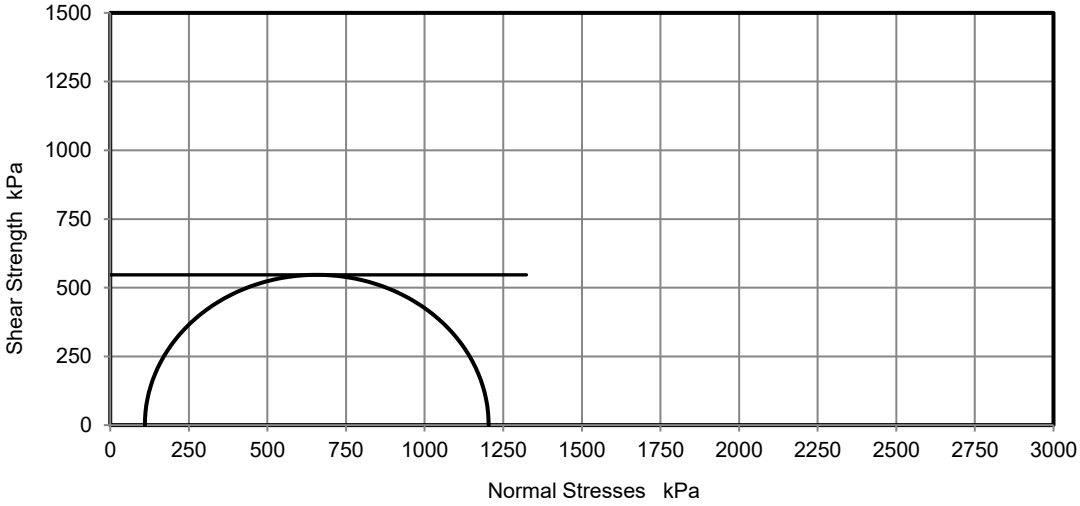
Laboratory Reference:	1229232	Depth Top [m]:	5.50
Hole No.:	RBH01	Depth Base [m]:	5.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	1.89	%/min
Length	74.01	mm	Cell Pressure	110	kPa
Diameter	37.76	mm	Axial Strain at failure	10.0	%
Bulk Density	2.29	Mg/m3	Deviator Stress, (σ1 - σ3)f	1094	kPa
Moisture Content	9.6	%	Undrained Shear Strength, cu	547	kPa ½(σ1 - σ3)f
Dry Density	2.09	Mg/m3	Mode of Failure	Plastic	
Membrane Correction	0.94	kPa	Membrane thickness	0.16	mm

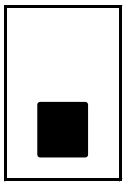
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

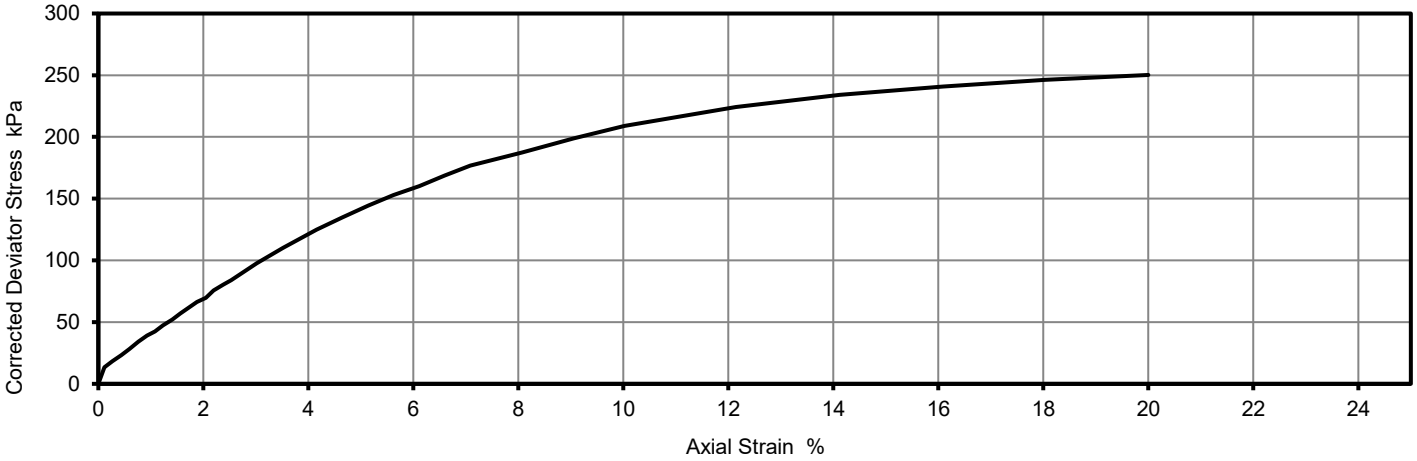
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

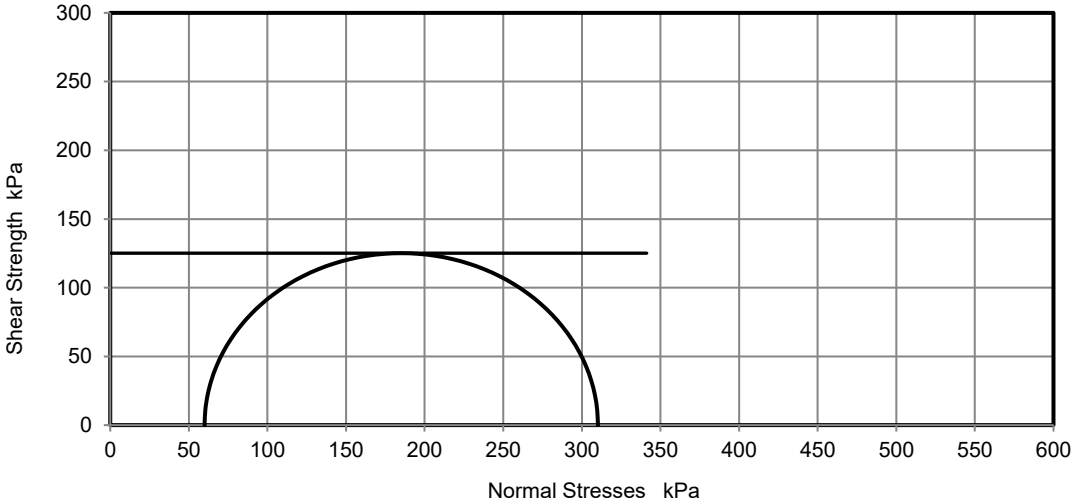
Laboratory Reference:	1229233	Depth Top [m]:	3.00
Hole No.:	BH20	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	1.97	%/min
Length	203.40	mm	Cell Pressure	60	kPa
Diameter	101.70	mm	Axial Strain at failure	20.0	%
Bulk Density	2.17	Mg/m3	Deviator Stress, (σ1 - σ3)f	250	kPa
Moisture Content	18	%	Undrained Shear Strength, cu	125	kPa ½(σ1 - σ3)f
Dry Density	1.84	Mg/m3	Mode of Failure	Compound	
Membrane Correction	0.91	kPa	Membrane thickness	0.24	mm

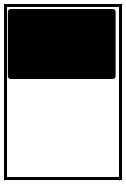
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

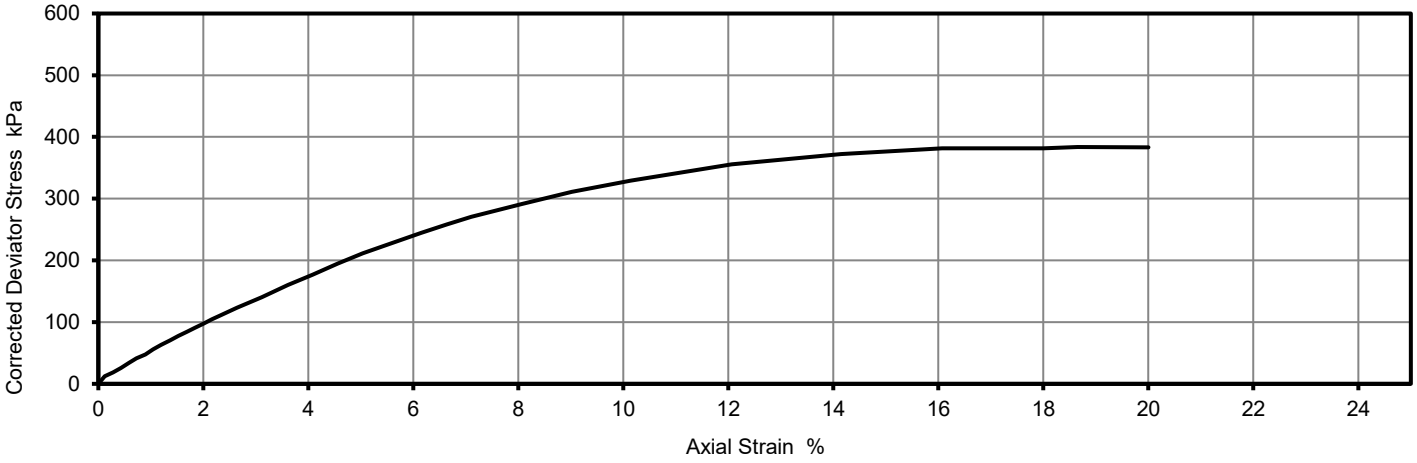
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

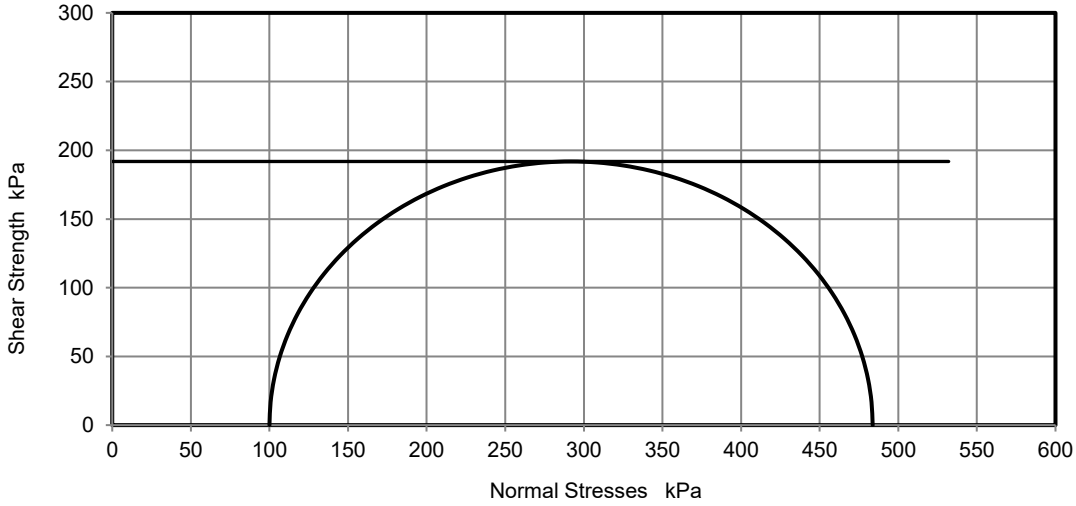
Laboratory Reference:	1229234	Depth Top [m]:	5.00
Hole No.:	BH20	Depth Base [m]:	5.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown sandy CLAY		

Test Number	1		Rate of Strain	1.92	%/min
Length	208.23	mm	Cell Pressure	100	kPa
Diameter	101.72	mm	Axial Strain at failure	18.6	%
Bulk Density	2.20	Mg/m3	Deviator Stress, (σ1 - σ3)f	384	kPa
Moisture Content	13	%	Undrained Shear Strength, cu	192	kPa ½(σ1 - σ3)f
Dry Density	1.96	Mg/m3	Mode of Failure	Plastic	
Membrane Correction	0.71	kPa	Membrane thickness	0.20	mm

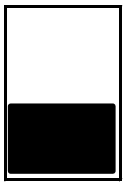
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

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for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

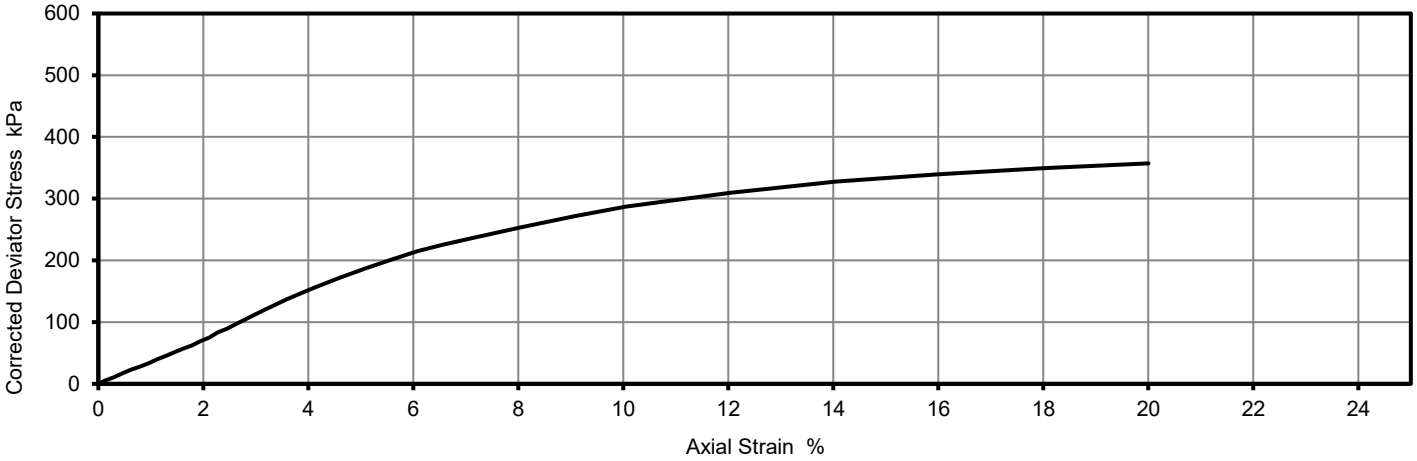
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

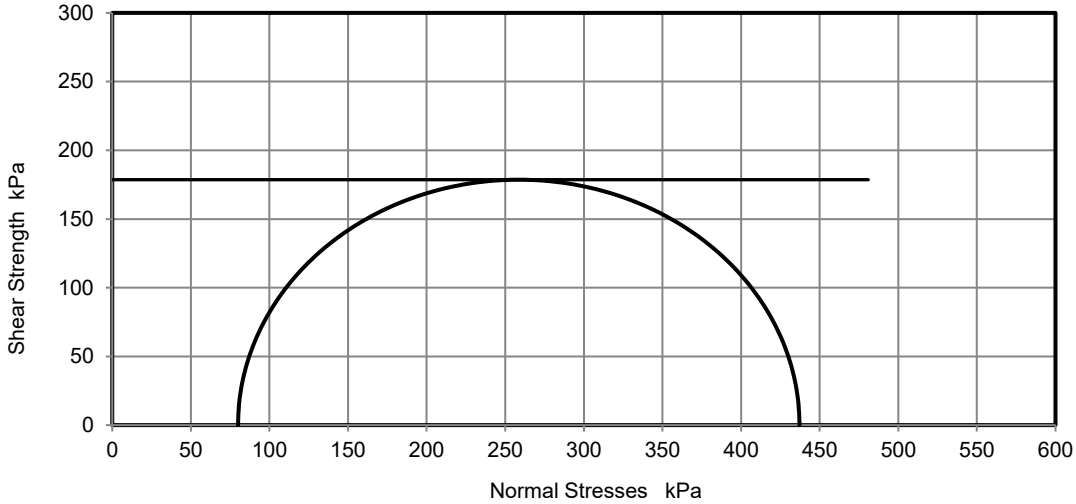
Laboratory Reference:	1229235	Depth Top [m]:	4.00
Hole No.:	BH3	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min
Length	199.28	mm	Cell Pressure	80	kPa
Diameter	102.07	mm	Axial Strain at failure	20.0	%
Bulk Density	2.23	Mg/m3	Deviator Stress, (σ1 - σ3)f	357	kPa
Moisture Content	13	%	Undrained Shear Strength, cu	179	kPa ½(σ1 - σ3)f
Dry Density	1.98	Mg/m3	Mode of Failure	Plastic	
Membrane Correction	1.62	kPa	Membrane thickness	0.43	mm

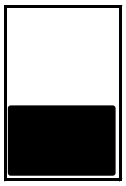
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

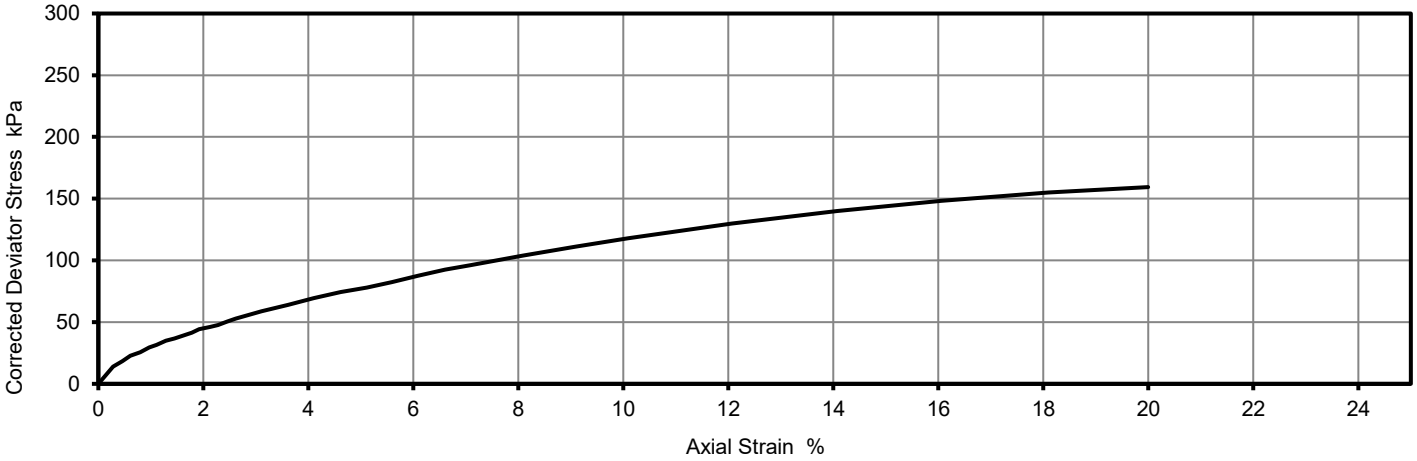
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

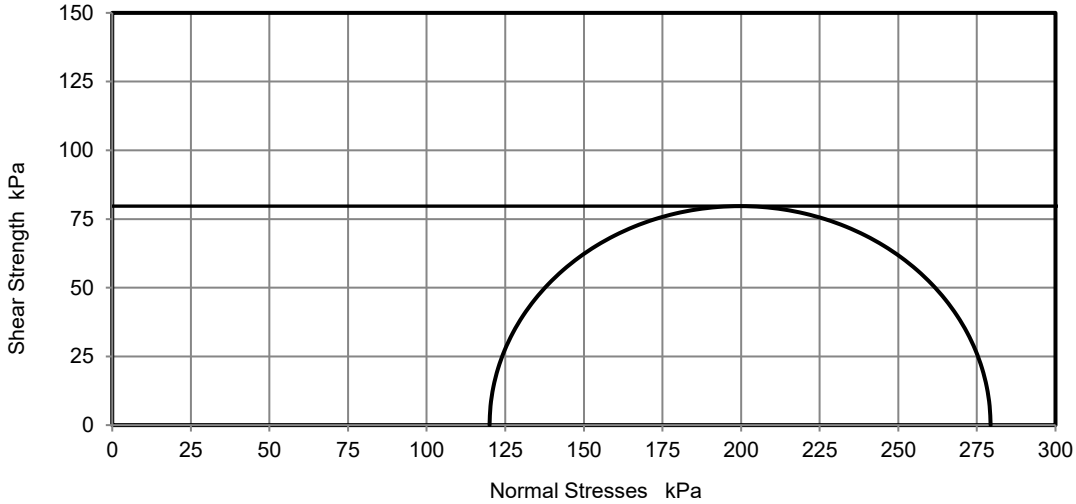
Laboratory Reference:	1229236	Depth Top [m]:	6.00
Hole No.:	BH3	Depth Base [m]:	6.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min	
Length	100.12	mm	Cell Pressure	120	kPa	
Diameter	50.49	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.19	Mg/m3	Deviator Stress, (σ1 - σ3)f	159	kPa	
Moisture Content	15	%	Undrained Shear Strength, cu	80	kPa	½(σ1 - σ3)f
Dry Density	1.90	Mg/m3	Mode of Failure	Plastic		
Membrane Correction	1.68	kPa	Membrane thickness	0.22	mm	

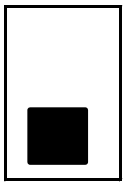
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

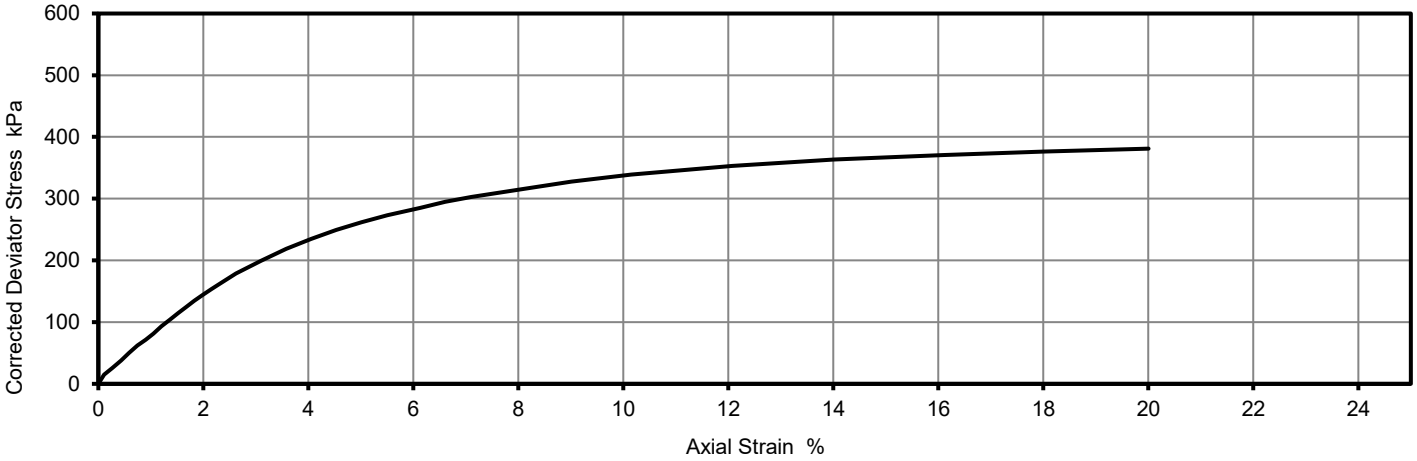
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

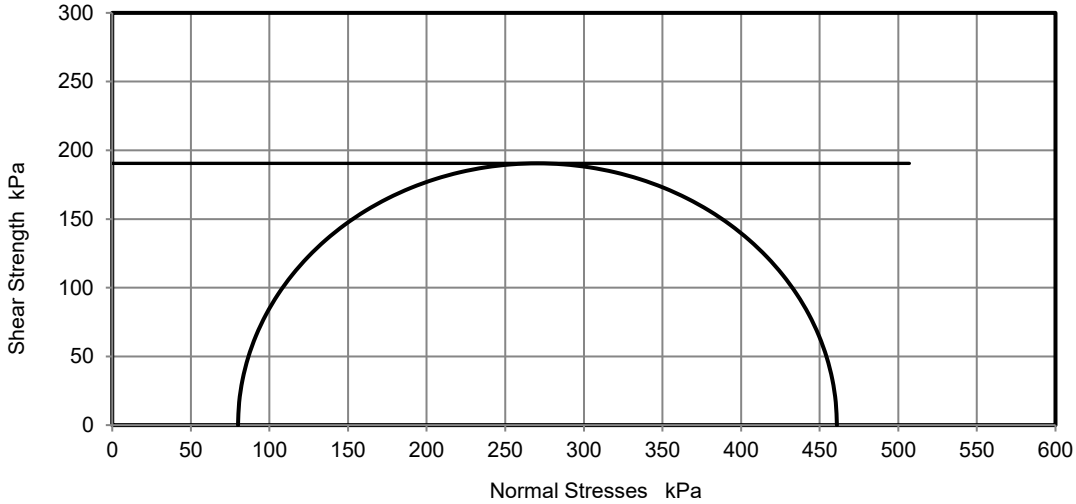
Laboratory Reference:	1229237	Depth Top [m]:	4.00
Hole No.:	BH4	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly sandy CLAY		

Test Number	1		Rate of Strain	1.93	%/min
Length	207.21	mm	Cell Pressure	80	kPa
Diameter	101.91	mm	Axial Strain at failure	20.0	%
Bulk Density	2.24	Mg/m3	Deviator Stress, (σ1 - σ3)f	381	kPa
Moisture Content	13	%	Undrained Shear Strength, cu	190	kPa ½(σ1 - σ3)f
Dry Density	1.98	Mg/m3	Mode of Failure	Compound	
Membrane Correction	0.68	kPa	Membrane thickness	0.18	mm

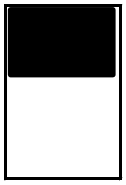
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks: Air void

Approved: Dariusz Piotrowski
PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
Geotechnical General Manager
for and on behalf of i2 Analytical Ltd **GF 184.7**

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TEST CERTIFICATE

Unconsolidated Undrained

Triaxial Compression

Tested in Accordance with:
BS 1377-7: 1990: Clause 8

4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

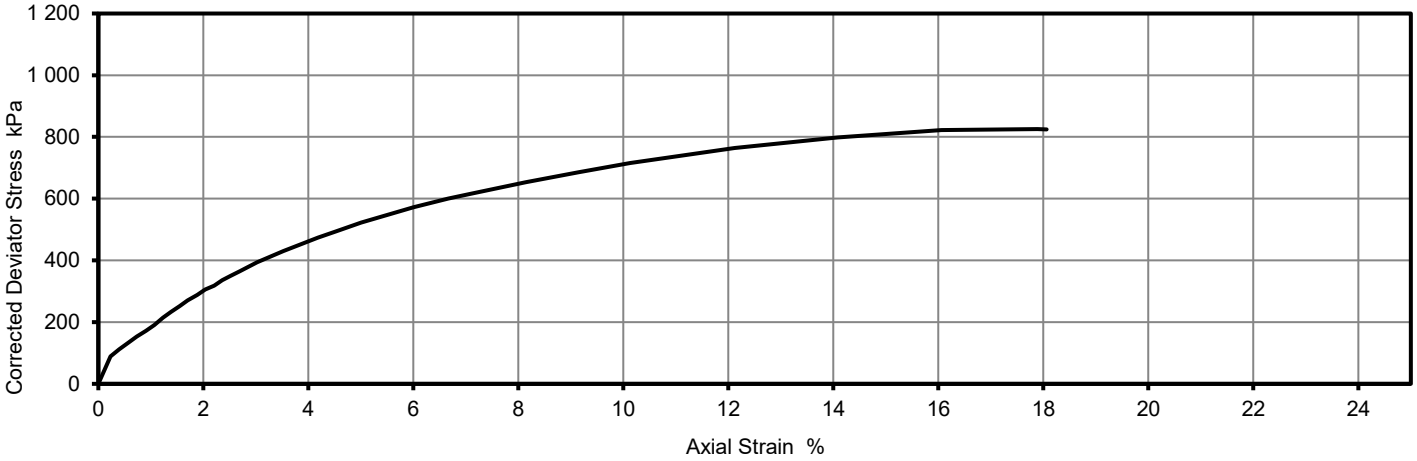
Client:	NX Consulting	Client Reference:	NC369
Client Address:	Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ	Job Number:	19-42603
		Date Sampled:	Not Given
		Date Received:	21/05/2019
Contact:	Mark Newton	Date Tested:	28/05/2019
Site Name:	New Base Building	Sampled By:	Not Given
Site Address:	Not Given		

Test Results:

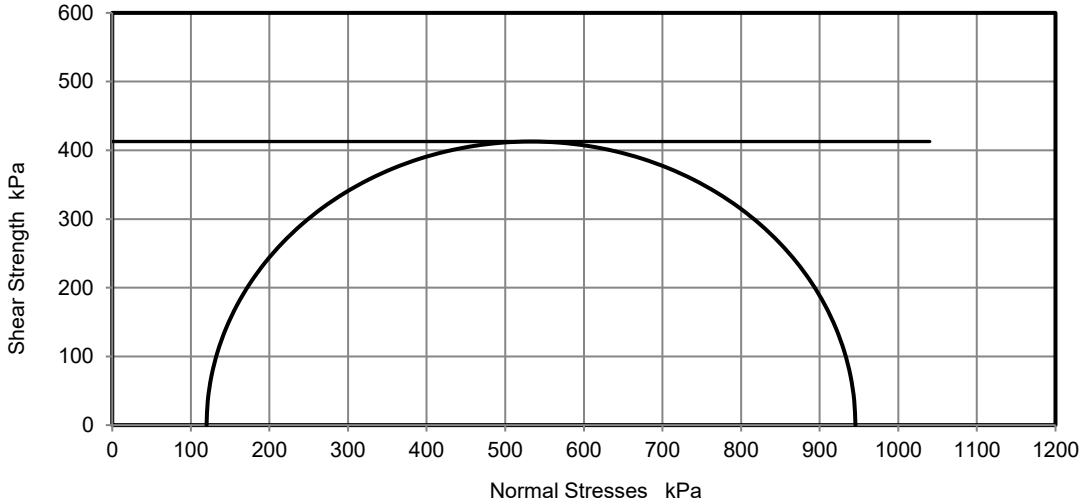
Laboratory Reference:	1229238	Depth Top [m]:	6.00
Hole No.:	BH4	Depth Base [m]:	6.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown sandy CLAY		

Test Number	1		Rate of Strain	2.00	%/min
Length	98.27	mm	Cell Pressure	120	kPa
Diameter	49.10	mm	Axial Strain at failure	17.9	%
Bulk Density	2.33	Mg/m3	Deviator Stress, (σ1 - σ3)f	825	kPa
Moisture Content	11	%	Undrained Shear Strength, cu	413	kPa ½(σ1 - σ3)f
Dry Density	2.10	Mg/m3	Mode of Failure	Compound	
Membrane Correction	1.50	kPa	Membrane thickness	0.21	mm

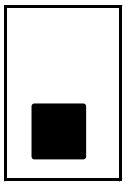
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

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PL Geotechnical Laboratory Manager
Date Reported: 06/06/2019

Signed: Darren Berrill
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for and on behalf of i2 Analytical Ltd **GF 184.7**

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Appendix F – Chemical Test Results

Mark Newton
NX Consulting
Thorpe House
11 Thorpe Close
Timperley
Altrincham
WA15 7WZ

e: marknewton@nxconsulting.org.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

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

Analytical Report Number : 19-42438

Replaces Analytical Report Number : 19-42438, issue no. 1

Project / Site name:	New Base Building, MSP	**Samples received on:**	22/05/2019
Your job number:	NX369	**Samples instructed on:**	22/05/2019
Your order number:	NX369	**Analysis completed by:**	31/05/2019
Report Issue Number:	2	**Report issued on:**	03/06/2019
Samples Analysed:	18 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.

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

Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228074	1228075	1228076	1228077	1228078
Sample Reference				RBH56	RBH56	WS3	WS3	WS4a
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.90	0.60	2.20	0.50
Date Sampled				18/05/2019	18/05/2019	18/05/2019	18/05/2019	18/05/2019
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	19	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	15	6.5	11	13	11
Total mass of sample received	kg	0.001	NONE	1.1	1.2	1.3	1.3	1.1
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
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.9	8.2	8.6	8.5	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	910	190	1200	290	810
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.37	0.019	-	0.030	-
Sulphide	mg/kg	1	MCERTS	41	1.7	10	< 1.0	1.7
Total Organic Carbon (TOC)	%	0.1	MCERTS	2.0	0.3	0.8	0.7	2.2
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.6	< 0.05	< 0.05	< 0.05	1.0
Fluorene	mg/kg	0.05	MCERTS	1.2	< 0.05	< 0.05	< 0.05	0.66
Phenanthrene	mg/kg	0.05	MCERTS	11	< 0.05	0.71	0.29	6.8
Anthracene	mg/kg	0.05	MCERTS	3.1	< 0.05	0.18	< 0.05	1.9
Fluoranthene	mg/kg	0.05	MCERTS	16	< 0.05	1.1	0.23	8.9
Pyrene	mg/kg	0.05	MCERTS	15	< 0.05	1.1	0.24	8.0
Benzo(a)anthracene	mg/kg	0.05	MCERTS	6.6	< 0.05	0.47	< 0.05	3.8
Chrysene	mg/kg	0.05	MCERTS	7.3	< 0.05	0.53	< 0.05	4.0
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	8.7	< 0.05	0.59	< 0.05	4.7
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	3.8	< 0.05	0.35	< 0.05	2.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	7.5	< 0.05	0.55	< 0.05	3.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	3.8	< 0.05	0.26	< 0.05	2.0
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.2	< 0.05	< 0.05	< 0.05	0.59
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	4.6	< 0.05	0.39	< 0.05	2.5
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	90.5	< 0.80	6.16	< 0.80	50.9
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	9.7	9.0	2.4	25
Boron (water soluble)	mg/kg	0.2	MCERTS	2.3	0.4	1.2	1.2	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	0.3	0.3	< 0.2	0.6
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	33	23	19	5.2	26
Copper (aqua regia extractable)	mg/kg	1	MCERTS	72	11	27	9.6	110
Lead (aqua regia extractable)	mg/kg	1	MCERTS	240	13	280	14	250
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	< 0.3	< 0.3	< 0.3	1.0
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	24	15	8.8	26
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.7	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	34	110	35	200

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228074	1228075	1228076	1228077	1228078
Sample Reference				RBH56	RBH56	WS3	WS3	WS4a
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	1.90	0.60	2.20	0.50
Date Sampled				18/05/2019	18/05/2019	18/05/2019	18/05/2019	18/05/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	3.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	5.5	< 2.0	7.0	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	13	< 8.0	23	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	57	< 8.0	89	-	27
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	76	< 10	120	-	31
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	11	< 2.0	4.2	-	9.9
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	94	< 10	51	-	73
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	170	< 10	170	-	160
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	270	< 10	230	-	240

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228079	1228080	1228081	1228082	1228083
Sample Reference				WS4a	WS5	WS2	RBh01	RBh01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.60	0.60	0.70	0.30	0.90
Date Sampled				18/05/2019	18/05/2019	18/05/2019	16/05/2019	16/05/2019
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	16	12	15	11	13
Total mass of sample received	kg	0.001	NONE	0.96	0.67	1.2	1.2	1.1
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
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.1	8.2	8.2	8.4	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	390	530	590	640	910
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.088	-	-	0.039	-
Sulphide	mg/kg	1	MCERTS	13	< 1.0	< 1.0	1.6	1.7
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.9	0.8	1.4	1.1	0.9
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	3.1	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.49	0.30
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.35	0.38	0.22
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.20	< 0.05	0.30
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.31	2.8	1.4	4.9
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.62	0.31	1.5
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.50	4.1	1.7	6.4
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.47	3.9	1.8	7.0
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.6	0.61	3.2
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.0	0.97	3.1
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.0	0.83	3.0
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.2	0.54	1.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.8	0.72	2.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.91	< 0.05	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.28	< 0.05	0.40
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.1	< 0.05	1.6
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	1.28	22.9	12.8	37.1
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	4.8	7.8	9.6	8.6	10
Boron (water soluble)	mg/kg	0.2	MCERTS	0.9	1.7	0.3	0.4	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.4	0.3	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	30	19	13	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	24	25	43	21	34
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	38	200	380	2200
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.4	< 0.3	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	31	31	18	12	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	55	60	99	76	42

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228079	1228080	1228081	1228082	1228083
Sample Reference				WS4a	WS5	WS2	RBh01	RBh01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				3.60	0.60	0.70	0.30	0.90
Date Sampled				18/05/2019	18/05/2019	18/05/2019	16/05/2019	16/05/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	4.2	-	3.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	11	-	8.5
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	27	37	-	30
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	35	53	-	42

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	8.0	-	5.9
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	< 10	55	-	55
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	< 10	100	-	75
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	12	160	-	140

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228084	1228085	1228086	1228087	1228088
Sample Reference				RBh01	BH2D	Bh04	Bh04	Bh03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.70	2.50	1.00	3.10	0.60
Date Sampled				16/05/2019	17/05/2019	19/05/2019	19/05/2019	18/05/2019
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	11	12	14	12	11
Total mass of sample received	kg	0.001	NONE	1.3	0.98	1.2	1.0	1.2

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	0.534
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	0.534

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	8.5	8.1	8.1	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	400	450	1400	510	1200
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.091	-	0.12	-
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	37	12	2.2
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.4	0.8	1.5	1.0	0.9

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.53	< 0.05	0.28
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.6	0.26	5.4
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.73	< 0.05	1.2
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.6	0.28	6.6
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.5	0.32	6.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.3	< 0.05	3.0
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.7	< 0.05	3.0
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.7	< 0.05	3.0
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.1	< 0.05	1.5
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.5	< 0.05	2.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.79	< 0.05	1.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.0	< 0.05	1.6

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	20.0	0.86	35.9

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.4	5.3	14	8.0	39
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.3	2.5	0.5	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.4	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	21	18	26	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	16	22	120	28	29
Lead (aqua regia extractable)	mg/kg	1	MCERTS	340	11	390	17	520
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.4	< 0.3	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	24	20	28	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	33	38	210	52	79

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228084	1228085	1228086	1228087	1228088
Sample Reference				RBh01	BH2D	Bh04	Bh04	Bh03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.70	2.50	1.00	3.10	0.60
Date Sampled				16/05/2019	17/05/2019	19/05/2019	19/05/2019	18/05/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	< 2.0	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	< 8.0	49	-	28
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	59	-	34

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	4.2	-	4.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	< 10	28	-	48
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	< 10	71	-	75
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	100	-	130

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228089	1228090	1228091		
Sample Reference				Bh03	RBn01	RBn05		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				2.60	8.00	6.90		
Date Sampled				18/05/2019	16/05/2019	18/05/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	35		
Moisture Content	%	N/A	NONE	14	15	3.5		
Total mass of sample received	kg	0.001	NONE	1.5	0.48	0.80		
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-		
Asbestos in Soil	Type	N/A	ISO 17025	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	8.7	8.8	8.7		
Total Cyanide	mg/kg	1	MCERTS	< 1	-	-		
Total Sulphate as SO_4	mg/kg	50	MCERTS	390	-	-		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.064	0.035	0.033		
Sulphide	mg/kg	1	MCERTS	< 1.0	-	-		
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.5	-	-		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Phenanthrene	mg/kg	0.05	MCERTS	0.30	-	-		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Fluoranthene	mg/kg	0.05	MCERTS	0.30	-	-		
Pyrene	mg/kg	0.05	MCERTS	0.33	-	-		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	-		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	-		
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	0.93	-	-		
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.9	-	-		
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	-	-		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	-		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	-	-		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	-	-		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	-	-		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6	-	-		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	-	-		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	-	-		

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Analytical Report Number: 19-42438

Project / Site name: New Base Building, MSP
Your Order No: NX369

Lab Sample Number				1228089	1228090	1228091		
Sample Reference				Bh03	RBn01	RBn05		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				2.60	8.00	6.90		
Date Sampled				18/05/2019	16/05/2019	18/05/2019		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
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	< 2.0	-	-		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	-	-		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	-	-		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	-		

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	< 1.0	-	-		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	-		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	-	-		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	-	-		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	-		

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Analytical Report Number: 19-42438
Project / Site name: New Base Building, MSP
Your Order No: NX369

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
1228088	Bh03	0.60	127	Hard/Cement Type Material	**Chrysotile**	0.534	**0.534**

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

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Analytical Report Number : 19-42438

Project / Site name: New Base Building, MSP

* 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 *
1228074	RBH56	None Supplied	0.60	Brown clay and sand with gravel.
1228075	RBH56	None Supplied	1.90	Brown sand with stones and gravel
1228076	WS3	None Supplied	0.60	Brown sand with brick and gravel
1228077	WS3	None Supplied	2.20	Brown sand with gravel.
1228078	WS4a	None Supplied	0.50	Brown loam and sand with vegetation and gravel.
1228079	WS4a	None Supplied	3.60	Brown clay with vegetation.
1228080	WS5	None Supplied	0.60	Brown clay and sand with gravel.
1228081	WS2	None Supplied	0.70	Brown clay and sand with gravel.
1228082	RBh01	None Supplied	0.30	Brown sandy clay with gravel and tar.
1228083	RBh01	None Supplied	0.90	Brown sandy clay with gravel.
1228084	RBh01	None Supplied	1.70	Brown sandy clay with gravel.
1228085	BH2D	None Supplied	2.50	Brown clay with gravel.
1228086	Bh04	None Supplied	1.00	Brown clay and sand with gravel.
1228087	Bh04	None Supplied	3.10	Brown clay.
1228088	Bh03	None Supplied	0.60	Brown loam and sand with brick and vegetation.
1228089	Bh03	None Supplied	2.60	Brown sandy clay with gravel.
1228090	RBn01	None Supplied	8.00	Brown sand with gravel.
1228091	RBn05	None Supplied	6.90	Brown clay and sand with gravel and stones.

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Analytical Report Number : 19-42438

Project / Site name: New Base Building, MSP

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
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
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
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.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical 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
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
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

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 : 19-42444

Project / Site name:	New Base Building, MSP	**Samples received on:**	22/05/2019
Your job number:	NX369	**Samples instructed on:**	22/05/2019
Your order number:	NX369	**Analysis completed by:**	04/06/2019
Report Issue Number:	1	**Report issued on:**	04/06/2019
Samples Analysed:	4 10:1 WAC samples		

Signed: CCStone

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

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Waste Acceptance Criteria Analytical Results

Report No:	**19-42444**						
					Client:	**NXCONSULTI**	
Location	**New Base Building, MSP**						
Lab Reference (Sample Number)	1228102 / 1228103				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	18/05/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	RBU56						
Depth (m)	0.60						
Solid Waste Analysis							
TOC (%)**	1.3				3%	5%	6%
Loss on Ignition (%) **	3.8				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	61				500	--	--
Total PAH (WAC-17) (mg/kg)	55				100	--	--
pH (units)**	7.8				--	>6	--
Acid Neutralisation Capacity (mol / kg)	5.7				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg			
Arsenic *	0.0060			0.0510	0.5	2	25
Barium *	0.0960			0.814	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0009			0.0080	0.5	10	70
Copper *	0.0080			0.068	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0288			0.244	0.5	10	30
Nickel *	0.0024			0.020	0.4	10	40
Lead *	0.0062			0.053	0.5	10	50
Antimony *	0.030			0.26	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0052			0.045	4	50	200
Chloride *	1.5			12	800	4000	25000
Fluoride	0.87			7.3	10	150	500
Sulphate *	41			350	1000	20000	50000
TDS*	140			1200	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	8.89			75.4	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.1						
Dry Matter (%)	85						
Moisture (%)	15						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

*= UKAS accredited (liquid eluate analysis only)
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**19-42444**						
					Client:	**NXCONSULTI**	
Location	**New Base Building, MSP**						
Lab Reference (Sample Number)	1228104 / 1228105				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	18/05/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS3						
Depth (m)	2.20						
Solid Waste Analysis							
TOC (%)**	0.7				3%	5%	6%
Loss on Ignition (%) **	1.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	8.1				--	>6	--
Acid Neutralisation Capacity (mol / kg)	10				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0014			0.0125	0.5	2	25
Barium *	0.0104			0.0900	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0011			0.0093	0.5	10	70
Copper *	0.011			0.093	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0023			0.0202	0.5	10	30
Nickel *	0.0014			0.012	0.4	10	40
Lead *	0.0014			0.012	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0034			0.030	4	50	200
Chloride *	0.81			7.1	800	4000	25000
Fluoride	0.44			3.8	10	150	500
Sulphate *	7.4			64	1000	20000	50000
TDS*	53			460	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	2.65			23.0	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.3						
Dry Matter (%)	87						
Moisture (%)	13						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

*= UKAS accredited (liquid eluate analysis only)
** = MCERTS accrediited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**19-42444**						
					Client:	**NXCONSULTI**	
Location	**New Base Building, MSP**						
Lab Reference (Sample Number)	1228106 / 1228107				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	18/05/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS2						
Depth (m)	0.70						
Solid Waste Analysis							
TOC (%)**	1.4				3%	5%	6%
Loss on Ignition (%) **	4.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	63				500	--	--
Total PAH (WAC-17) (mg/kg)	23				100	--	--
pH (units)**	8.2				--	>6	--
Acid Neutralisation Capacity (mol / kg)	14				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg			
Arsenic *	0.0055			0.0466	0.5	2	25
Barium *	0.0564			0.477	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0037			0.032	0.5	10	70
Copper *	0.0072			0.061	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0049			0.0417	0.5	10	30
Nickel *	0.0004			0.0034	0.4	10	40
Lead *	0.0089			0.075	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0030			0.026	4	50	200
Chloride *	0.58			4.9	800	4000	25000
Fluoride	0.90			7.6	10	150	500
Sulphate *	8.0			67	1000	20000	50000
TDS*	64			540	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	4.40			37.2	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.2						
Dry Matter (%)	85						
Moisture (%)	15						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accrediited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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

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Waste Acceptance Criteria Analytical Results

Report No:	**19-42444**						
					Client:	**NXCONSULTI**	
Location	**New Base Building, MSP**						
Lab Reference (Sample Number)	1228108 / 1228109				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	16/05/2019				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	RBh01						
Depth (m)	0.90						
Solid Waste Analysis							
TOC (%)**	0.9				3%	5%	6%
Loss on Ignition (%) **	2.4				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	49				500	--	--
Total PAH (WAC-17) (mg/kg)	37				100	--	--
pH (units)**	8.7				--	>6	--
Acid Neutralisation Capacity (mol / kg)	7.9				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1			10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
	mg/l			mg/kg			
Arsenic *	0.0054			0.0461	0.5	2	25
Barium *	0.0299			0.257	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0021			0.018	0.5	10	70
Copper *	0.0050			0.043	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0094			0.0808	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	0.059			0.51	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	< 0.0004			< 0.0040	4	50	200
Chloride *	0.71			6.1	800	4000	25000
Fluoride	1.3			11	10	150	500
Sulphate *	6.4			55	1000	20000	50000
TDS*	72			620	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	3.21			27.6	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.1						
Dry Matter (%)	87						
Moisture (%)	13						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation
** = MCERTS accrediited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 19-42444

Project / Site name: New Base Building, MSP

* 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 *
1228102	RBU56	None Supplied	0.60	Brown clay and sand with gravel.
1228104	WS3	None Supplied	2.20	Brown sand with gravel.
1228106	WS2	None Supplied	0.70	Brown clay and sand with gravel.
1228108	RBh01	None Supplied	0.90	Brown sandy clay with gravel.

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Analytical Report Number : 19-42444

Project / Site name: New Base Building, MSP

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
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in leachate by ICP-OES	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
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols 10:1 WAC	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	L080-PL	W	ISO 17025
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated WAC-17 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. MCERTS accredited except Coronene.	L064-PL	D	NONE
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 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	NONE

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Analytical Report Number : 19-42444

Project / Site name: New Base Building, MSP

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
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

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

Appendix G – Gas monitoring Record Sheet

Job No:	NX369
Date:	13/06/2019
Engineer:	TDS

Site:	New Base Building Manchester
Client:	Bruntwood
Equipment:	GA2000

Next Generation Engineering Consultancy Services

WS2	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base		Barometric Pressure		Barometric Pressure
05/06/2019	0	0	0.0	0.8	19.2	0.0	0.0	0.0	0.8	19.2	0.0	0.0	2.63	2.78		999		999
13/06/2019	0	0.01	0.0	0.6	19.6	0.0	0.0	0.0	0.6	19.4	0.0	0.0	2.60	2.78		1002		1002
19/05/2019	0	0	0.0	0.2	19.8	0.0	0.0	0.0	0.2	19.8	0.0	0.0	2.61	2.78		1010		1010
21/06/2019	0	0.01	0.1	0.1	21.4	0.0	0.0	0.1	0.0	21.4	0.0	0.0	2.52	2.78		1015		1015

WS3	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base		Barometric Pressure		Barometric Pressure
05/06/2019	0	0	0.0	0.8	19.7	0.0	0.0	0.0	0.8	19.7	0.0	0.0	2.33	2.55		999		999
13/06/2019	0	0.02	0.0	0.7	19.8	0.0	0.0	0.0	0.7	19.8	0.0	0.0	2.30	2.56		1002		1002
19/05/2019			0.0	0.7	19.8	0.0	0.0	0.0	0.7	19.8	0.0	0.0	2.32	2.56		1010		1010
21/06/2019	0	0.01	0.1	0.1	21.4	0.0	0.0	0.1	0.0	21.2	0.0	0.0	2.16	2.56		1015		1015

WS4A	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base (m)	Time	Barometric Pressure	Time	Barometric Pressure
05/06/2019	0	0	0.0	1.7	19.0	0.0	0.0	0.0	1.7	19.0	0.0	0.0	dry	3.07		999		999
13/06/2019	0	0	0.0	1.5	19.4	0.0	0.0	0.0	1.5	19.4	0.0	0.0	dry	3.06		1002		1002
19/05/2019	0	0.01	0.0	1.3	19.5	0.0	0.0	0.0	1.3	19.5	0.0	0.0	dry	3.06		1010		1010
21/06/2019	0	0.01	0.1	2.6	18.9	0.0	0.0	0.1	2.6	18.9	0.0	0.0	dry	3.06		1015		1015

WS5	Flow Rate (l/h)	Pressure Differential	Gas Concentration										Water		Start		Finish	
			Peak					Steady										
Date			CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	CH_4 %	CO_2 %	O_2 %	LEL %	H2S/ CO (ppm)	Depth to Water	Depth to Base	Time	Barometric Pressure	Time	Barometric Pressure
05/06/2019	0	0	0.0	0.1	20.1	0.0	0.0	0.0	0.1	20.1	0.0	0.0	dry	2.82		999		999
13/06/2019	0	0	0.0	0.1	20.2	0.0	0.0	0.0	0.1	20.1	0.0	0.0	dry	2.81		1002		1002
19/05/2019	0	0.02	0.0	0.1	20.1	0.0	0.0	0.0	0.1	20.1	0.0	0.0	dry	2.80		1010		1010
21/06/2019	0	0.01	0.1	0.0	21.3	0.0	0.0	0.1	0.0	21.3	0.0	0.0	2.47	2.8		1015		1015

CH_4 Above the **1.0%** v/v guideline value in Waste Management Paper no 27 (WMP27).

CO_2 Above the **1.5%** v/v guideline value given in WMP27.

Date	Weather	Pressure Trend	Ground Conditions
05/06/2019	Dry	Low & falling	Damp
13/06/2019	overcast	High and falling	wet
19/05/219	Overcast	High and steady	damp
21/06/2019	sunny light drizzle	High and steady	damp

Appendix H – Conceptual Models & Risk Assessments

PRINCIPLES OF RISK ASSESSMENT

MONITORING AND ASSESSMENT CRITERIA

C 1.0 GENERAL

C 1.1 The purpose of this appendix is to describe in detail the concepts underlying the risk-based approach to assessing potentially contaminated land, introduce the roles of key legislation and describe the qualitative methodology adopted for evaluating and characterising risk.

C 1.2 Current best practice in the UK promotes a risk-based approach to dealing with both soil and groundwater contamination. The principal aim of the approach is to ensure protection of human health and the environment in a thorough, transparent and cost-effective manner.

C 1.3 Fundamental to the risk-based approach is the concept that for 'Contaminated Land' to be designated, as a consequence of historic activities, a pathway for contamination must be shown to exist between a source of contamination and a receptor. The combined presence of a source, pathway and a receptor is described as a 'pollutant linkage'.

C 1.4 The concepts associated with a contaminant source, pathway and receptor are defined in DETR Circular 02/2000 'Contaminated Land Environmental Protection Act 1990: Part II A'. A ***source*** of contamination may be considered as a 'substance which is in, on or under land that has the potential to cause harm or to cause pollution of controlled waters'. A ***receptor*** can be considered as either 'a living organism, a group of living organisms, an ecological system or a piece of property which is being, or could be harmed, by a contaminant or controlled waters which are being, or could be, polluted by a contaminant'. A ***pathway*** may be considered as one or more routes by, or through, which a receptor is being, or could be, exposed to or affected by a contaminant. Typical pathways may include migration in groundwater, surface water run-off or infiltration, inhalation, dermal contact and ingestion.

C 1.5 The risks posed by an identified pollutant linkage can often be mitigated by removing the source of contamination, treating the source of contamination, blocking the relevant pathway(s) or by protecting the receptor.

C 2.0 PRINCIPLES OF RISK EVALUATION

C 2.1 The risk evaluation methodology presented below is qualitative in nature, and is therefore a subjective method. It is based upon guidance presented in CIRIA publication referenced C552, 'Contaminated land risk assessment ~ A guide to good practice', 2001 and involves the classification of the following.

C 2.2 The magnitude of the potential **consequence** (severity) of risk occurring (Table C 1).

C 2.3 The magnitude of the **probability** (likelihood) of the risk occurring (Table C 2).

C 2.4 These are then considered in conjunction to give a risk matrix (Table C 3)

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in 'significant harm' as defined by the Environmental Protection Act 1990, Part II A. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (Note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in the *Draft Circular on Contaminated Land,* DETR, 2000). Damage to sensitive buildings/structures/ services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table C 1: Classification of Consequence

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table C 2: Classification of Probability

		Consequence			
		Severe	*Medium*	*Mild*	*Minor*
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table C 3: Comparison of Consequence Against Probability

Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Table C 4: Description of the classified risks and likely action required

Conceptual Site Model (CSM) and Refined Risk Assessment
Table 2.0 (Phase 2)

Table and Summary of Potential Risks, Sheet 1

SOURCE – PATHWAY -RECEPTOR LINKAGE				QUANTITATIVE RISK ASSESSMENT		
Contaminant	**Location**	**Receptors**	**Pathways to Receptors**	**Associated Hazard (Potential Severity)**	**Likelihood of Occurrence**	**Risk***
On site contaminants from; past and present land use; lead & chrysotile asbestos in shallow soils	Possibly within sub surface strata.	Ground water (Primary Aquifer)	Vertical percolation to groundwater	Groundwater (Low to Moderate –sensitive water resource)	Unlikely due to concentrations in soil samples retrieved within Made Ground.	**Low/moderate reassessed as Low**
		Surface Water (No adjacent surface water features)	Lateral percolation to surface water	Surface Water (Low – sensitive water resource)	Unlikely due to concentrations in soil samples retrieved within Made Ground.	**Low/moderate reassessed as Low**
		End user of site (Staff and patrons)	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Medium)	Unlikely due to concentrations in soil samples retrieved within Made Ground. 300mm cover system required in new landscaped areas.	**Low/Moderate reassessed as low post construction**
		Construction workers if applicable	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Minor – providing suitable PPE equipment is worn)	Possible in soil samples retrieved within Made Ground. Appropriate PPE required & asbestos control measures	**Low/Moderate reassessed as low post construction**

** Where risk is evaluated as **moderate** or greater) either; a) remedial action is recommended to address this residual risk (Section 8.0 in the main body of the report) or, b) further investigation is recommended to better inform the risk classification and/or to enable a more detailed, quantitative risk assessment to be undertaken.*

Table and Summary of Potential Risks, Sheet 2

SOURCE – PATHWAY -RECEPTOR LINKAGE				QUANTITATIVE RISK ASSESSMENT		
Contaminant	**Location**	**Receptors**	**Pathways to Receptors**	**Associated Hazard (Potential Severity)**	**Likelihood of Occurrence**	**Risk***
Off site contaminants from surrounding land use	Possibly within made-ground surrounding site.	End user of site (Staff and patrons)	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Medium)	Unlikely (Due to no specific evidence of off-site sources impacting site)	**Low/Moderate reassessed as low post construction**
		Construction workers if applicable	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Minor – Providing suitable PPE equipment is worn)	Unlikely (Due to no specific evidence of off-site sources impacting site)	**Low/Moderate reassessed as low post construction**
Gas associated with Made Ground	Possibly within strata beneath the site.	End user of site (Staff and patrons)	Migration through strata and accumulation under buildings of explosive and asphyxiating gases.	Human Health (Severe)	Unlikely - No nearby landfills. Also low recorded concentrations/flows during gas monitoring)	**Low/Moderate reassessed as low post construction**

** Where risk is evaluated as **moderate** or greater) either; a) remedial action is recommended to address this residual risk (Section 8.0 in the main body of the report) or, b) further investigation is recommended to better inform the risk classification and/or to enable a more detailed, quantitative risk assessment to be undertaken.*

Appendix C – NX Consulting Protocol for Validation of Soil Cover Systems

NX Consulting Limited Protocol for Validation of Soil Cover

Isolation of potentially contaminated or unsuitable materials in garden and landscaped areas beneath a cover of "clean" subsoil, and topsoil is often recommended on developments to allow safe use and/or occupation of the land; most notably when it contains inorganic contaminants at concentrations above guidance threshold values.

A cover is only required in proposed garden and/or landscaped areas (i.e. not beneath drives, garages or houses). The soil cover, hard standing breaks direct contact pollutant linkages between the potentially contaminated soils and future residents or end users.

The CML initiative requires house builders to submit to the NHBC (or other warranty providers) a validation report confirming the thickness and chemical suitability of the soil cover.

Validation reports are normally prepared by independent geoenvironmental consultants such as NX Consulting. Soil cover validation requires independent assessment of the chemical suitability of the soil and the thickness of the placed subsoil and topsoil.

Inspection and Sampling of cover soil at source

Soil quality is best determined by sampling at the **source** at least 7 working days before importation to the development site. If this is achieved, further, on-site (post-placement) quality testing should not usually be necessary providing that confirmation can be given that the material arriving at site is the same soil as that tested.

Inspection and Sampling of cover soil following import to site

In some cases, soil is often delivered to site prior to sampling and chemical testing. Such soils should be stockpiled in a secure location on site and NX Consulting should be contacted to arrange for visual inspection, sampling and chemical testing. It is strongly recommended that soils should not be placed in garden and landscaped areas, prior to confirmation of the suitability of the soil by NX Consulting. This normally takes two weeks from initial notification.

Suitable soil material should:

- be clean and free of foreign debris, building waste materials or contaminants;
- not have a stone content of greater than 20% by visual estimation
- have a maximum stone size of 150mm in any one direction.
- not have been sourced from an area within 7m laterally, or 3m vertically, of Japanese Knotweed plants, and not contain any Japanese Knotweed fragments (rhizomes, leaves, stems etc).

The number of samples taken will be dependant on the nature of the source and the quantity of material to be imported and the testing ratio should be agreed with the Local Authority (EHO) before testing is undertaken. However, as a guide, a **minimum** of 6 samples of each soil type should be tested, with a further sample for each 250m3 of subsoil, where the quantity exceeds 1,500m3; and a further sample for each 50m3 topsoil, where the quantity exceeds 300m3.

A less frequent sampling rate may be appropriate for soils from a greenfield source or where large volumes (say > 5,000m3) of soil are imported from a single, relatively homogenous source.
Each sample taken should be forwarded to an analytical laboratory for testing in accordance with the following schedule:

Soils from a bona fine **Greenfield s**ource:

- PH and metals (*Cu, Ni, Zn, Cr, As, Hg, Se, Cd & Pb)*

Where soils are from a **Brownfield** source chemical analysis should ideally be determined by appropriate level of desk study to determine likely contaminants. However, as a minimum the following testing should be undertaken:

- PH, metals (*Cu, Ni, Zn, Cr, As, Hg, Se, Cd & Pb), speciated PAH, banded TPH and BTEX.*

Cover layers can often include a "difficult to dig" or capillary break layer of coarse natural or recycled aggregate. Where this aggregate is sourced from recycled materials (such as crushed demolition arisings) asbestos screening tests should also be undertaken.

The Client\Contractor will be notified of the soil's suitability (or otherwise) immediately following receipt of the results (typically taking 7 working days). Chemical assessment (Tier 1) criteria for imported soils are presented below.

On receipt of written confirmation from NX Consulting, the Client should instruct his Contractor to commence importation. It will probably be necessary to stockpile the cover prior to placement in garden\landscaped areas. NX Consulting should inspect the stockpiled material prior to placement, to confirm that it is the same material as previously tested, **and** the Contractor should provide the Client with appropriate haulage notes.

Cover Thickness Validation

Soil **thickness** can only be checked after placement, but should be done before turfing, fencing etc. Thickness could be checked via the excavation of an appropriate number of inspection trial pits. Typically one trial pit for every two gardens will be required.

The thickness of cover is dependant on the nature and degree of contamination (and often the Local Authority whose area the site lies within), but typically between 600mm and 1,000mm is required. Where underlying materials do not contain contaminants above critical concentrations but contains materials generally considered undesirable as a near-surface material in garden areas (colliery spoil, construction\demolition rubble etc) then a 450mm thick cover, in accordance with NHBC Standards, Chapter 9.2, should be adequate.

Soil cover is usually placed many weeks after completion of the preparatory\remedial works, and issue of the associated Verification Report. Consequently, site visits, to generate supplementary

letter reports, are typically required after soil cover has been placed in the gardens of each plot, or set of plots.

Cover material can sometimes be sourced on-site from foundation\drainage excavations in natural in-situ strata, but import is often necessary.

Issue of Soil Cover Validation Reports

Validation reports will be issued by NX Consulting following the confirmation of the placed thickness within each plot, or set of plots. Each report will contain the following information;

- details of the provenance of the subsoil and topsoil,
- chemical test data,
- an interpretation of the chemical data indicating whether the soils are suitable for use in a clean cover layer,
- a drawing indicating the location of cover thickness validation trial pits,
- photographs of the excavated trial pits confirming the thickness of placed soils,
- a data table indicating the thickness of cover soils within each trial pit excavated.

Soil Cover Validation Reports will be issued to the Local Authority and to the NHBC by email.

NX Consulting Tier 1 Values Version 1 - CLEA 2009 (Software Version 1.06)

	Residential with Homegrown Produce.	**Residential without Homegrown Produce.**	**Commercial Industrial with Landscaping**
Active Pathways	• Direct Ingestion • Dermal Contact • Consumption of Vegetables and Attached Soil • Inhalation of Indoor Vapour and Dust • Inhalation of Outdoor Vapours and Dust	• Direct Ingestion • Dermal Contact • Inhalation of Indoor Vapour and Dust • Inhalation of Outdoor Vapours and Dust	• Direct Ingestion • Dermal Contact • Inhalation of Indoor Vapour and Dust • Inhalation of Outdoor Vapours and Dust
Critical Receptors	Female Child 0-6yrs Old	Female Child 0-6yrs Old	Female Adult Worker >17 years old.

Determinand/Units	mg/kg	Source	mg/kg	Source	mg/kg	Source
Arsenic	37	LQM / CIEH S4ULs	40	LQM / CIEH S4ULs	640	LQM / CIEH S4ULs
Cadmium	11	LQM / CIEH S4ULs	85	LQM / CIEH S4ULs	190	LQM / CIEH S4ULs
Mercury (inorganic)	40	LQM / CIEH S4ULs	56	LQM / CIEH S4ULs	1,100	LQM / CIEH S4ULs
Nickel	180	LQM / CIEH S4ULs	180	LQM / CIEH S4ULs	980	LQM / CIEH S4ULs
Selenium	250	LQM / CIEH S4ULs	430	LQM / CIEH S4ULs	1,200	LQM / CIEH S4ULs
Chromium III	910	LQM / CIEH S4ULs	910	LQM / CIEH S4ULs	8,600	LQM / CIEH S4ULs
Chromium VI	6	LQM / CIEH S4ULs	6	LQM / CIEH S4ULs	33	LQM / CIEH S4ULs
Lead	450	C4SLs	450	C4SLs	750	C4SLs
Copper	2,400	LQM / CIEH S4ULs	7,100	LQM / CIEH S4ULs	68,000	LQM / CIEH S4ULs
Zinc	3,700	LQM / CIEH S4ULs	40,000	LQM / CIEH S4ULs	730,000	LQM / CIEH S4ULs
Boron	290	LQM / CIEH S4ULs	1100	LQM / CIEH S4ULs	240,000	LQM / CIEH S4ULs

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Standard Land Use Scenario	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Source
Determinand/SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM	
Naphthalene	*2.3*	*5.6*	*13*	*2.3*	*5.6*	*13*	*190*	*460*	*1100*	LQM / CIEH S4ULs
Acenaphthylene	170	420	920	2900	4600	6000	83000	97000	10000	LQM / CIEH S4ULs
Acenaphthene	210	510	1100	3000	4700	6000	84000	97000	10000	LQM / CIEH S4ULs
Fluorene	170	400	860	2800	3800	4500	63000	68000	71000	LQM / CIEH S4ULs
Phenanthrene	95	220	440	1300	1500	1500	22000	22000	23000	LQM / CIEH S4ULs
Anthracene	2400	5400	1100	31000	35000	37000	520000	540000	540000	LQM / CIEH S4ULs
Fluoranthene	280	560	890	1500	1600	1600	23000	23000	23000	LQM / CIEH S4ULs
Pyrene	620	1200	2000	3700	3800	3800	54000	54000	54000	LQM / CIEH S4ULs
Benzo(a)anthracene	7.2	11	13	11	14	15	170	170	180	LQM / CIEH S4ULs
Chrysene	15	22	27	30	31	32	350	350	350	LQM / CIEH S4ULs
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	44	44	LQM / CIEH S4ULs
Benzo(k)fluoranthene	77	93	100	110	110	110	1200	1200	1200	LQM / CIEH S4ULs
Benzo(a)pyrene	*2.2*	*2.7*	*3*	*3.2*	*3.2*	*3.2*	*35*	*35*	*35*	LQM / CIEH S4ULs
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	LQM / CIEH S4ULs
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	3.5	3.6	3.6	LQM / CIEH S4ULs
Benzo(ghi)perylene	320	340	350	360	360	360	3900	4000	4000	LQM / CIEH S4ULs
Benzene	*0.087*	*0.17*	*0.37*	*0.38*	*0.7*	*1.4*	*27*	*47*	*90*	LQM / CIEH S4ULs
Toluene	*130*	*290*	*660*	*880*	*1900*	*3900*	*55,600*	*11000*	*18000*	LQM / CIEH S4ULs
Ethylbenzene	*47*	*110*	*260*	*83*	*190*	*440*	*5,700*	*13000*	*27000*	LQM / CIEH S4ULs
Xylenes	*56*	*130*	*310*	*79*	*180*	*430*	*5,900*	*14000*	*30000*	LQM / CIEH S4ULs
Aliphatic C5-C6	*42*	*78*	*160*	*42*	*78*	*160*	*3200*	*5900*	*12000*	LQM / CIEH S4ULs

Standard Land Use Scenario	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Source
Aliphatic C6-C8	*100*	*230*	*530*	*100*	*230*	*530*	*7800*	*17000*	*40000*	LQM / CIEH S4ULs
Aliphatic C8-C10	*27*	*65*	*150*	*27*	*65*	*150*	*2000*	*4800*	*11000*	LQM / CIEH S4ULs
Aliphatic C10-C12	*130*	*330*	*760*	*130*	*330*	*770*	*9700*	*23000*	*47000*	LQM / CIEH S4ULs
Aliphatic C12-C16	*1100*	*2400*	*4300*	*1100*	*2400*	*4400*	*59000*	*82000*	*90000*	LQM / CIEH S4ULs
Aliphatic C16-C35	*65000*	*92000*	*110000*	*65000*	*92000*	*110000*	*1600000*	*1700000*	*1800000*	LQM / CIEH S4ULs
Aliphatic C35-44	*65000*	*92000*	*110000*	*65000*	*92000*	*110000*	*1600000*	*1700000*	*1800000*	LQM / CIEH S4ULs
Aromatic C5-C7	*70*	*140*	*300*	*370*	*690*	*1400*	*26000*	*46000*	*860000*	LQM / CIEH S4ULs
Aromatic C7-C8	*130*	*290*	*660*	*860*	*1800*	*3900*	*56000*	*110000*	*180000*	LQM / CIEH S4ULs
Aromatic C8-C10	*34*	*83*	*190*	*47*	*110*	*270*	*3500*	*8100*	*17000*	LQM / CIEH S4ULs
Aromatic C10-C12	*74*	*180*	*380*	*250*	*590*	*1200*	*16000*	*28000*	*34000*	LQM / CIEH S4ULs
Aromatic C12-C16	*140*	*330*	*660*	*1800*	*2300*	*2500*	*36000*	*37000*	*38000*	LQM / CIEH S4ULs
Aromatic C16-C21	*260*	*540*	*930*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Aromatic C21-C35	*1100*	*1500*	*1700*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Aromatic C35-C44	*1100*	*1500*	*1700*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Aromatic+aromatic EC>44-70	*1600*	*1800*	*1900*	*1900*	*1900*	*1900*	*28000*	*28000*	*28000*	LQM / CIEH S4ULs
Phenol	280	550	1100	750	1300	2300	760	1500	3200	LQM / CIEH S4ULs
Cyanide	527			527			1400			*CLEA 2009*

Standard Land Use Scenario	Residential with Homegrown Produce	Residential without Homegrown Produce	Commercial	Source
PCBs	1.7	1.8	1.8	*CLEA 2009*

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Appendix D – UU Potable Water Risk Assessment

Supplementary guidance for the selection of water pipes in land potentially affected by contamination

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Introduction

In January 2011, UK Water Industry Research (UKWIR) published "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21; the 'UKWIR Guidance'). Its aim is to ensure that the correct materials are selected for water pipes and components to be used below ground in brownfield sites to protect the quality of drinking water whilst taking into account the service life of the water distribution system. It supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03 "Laying Pipes in Contaminated Land" which has been withdrawn.

The UKWIR Guidance is for use by developers, self-lay organisations, water companies and consultants when planning, designing and constructing water mains and/or services in brownfield sites. It defines brownfield sites as "land or premises that have previously been used or developed. They may also be vacant or derelict. However, they are not necessarily contaminated." The UKWIR Guidance states that it does not apply to greenfield sites; however, we consider this supplementary guidance and the relevant sections of the UKWIR guidance as being equally suitable for application to those greenfield sites considered to be potentially affected by contamination. Where greenfield sites are not affected by contamination a preliminary risk assessment (see below) will suffice.

The UKWIR Guidance also states that there should be no departure from its provisions "except where formally approved by the Water Company, such departure being technically justifiable or representing advances in knowledge or product development".

We have adopted the UKWIR Guidance in principle and produced this company specific supplementary guidance (the 'UUW Guidance') which includes the Risk Assessment for Water Pipes (the 'RA').

This guidance does not cover operative safety, health exposure modelling or accidental pipe damage.

Risk Assessment for Water Pipes in Land Potentially Affected by Contamination

Any application for new water supplies to a development (construction of new properties, or renovation or conversion of existing buildings) in land potentially affected by contamination shall include a completed RA.

As a minimum a desk study (preliminary risk assessment) shall be provided with the RA in accordance with the framework in Environment Agency publication "Model Procedures for the Management of Land Contamination" (ref: CLR11) that sets out whether the land through which the pipes are to be laid may be affected by contamination. The application of the source, pathway, receptor concept will be an integral part of any pipeline risk assessment. For each potential source (the contamination) and each potential receptor (the water pipe), consideration shall be given to whether a potential pathway between source and receptor exists, or may exist in the future, linking the two. There are normally only three pathways by which contamination may come into contact with water pipes. These are direct contact with the soil or backfill, an excessive vapour phase or a contaminated groundwater regime. If none of these conditions exist on site (adopting the source, pathway, receptor concept) then it is likely that extended and/or targeted soil testing will not be required and a simple risk assessment will suffice. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. The testing requirements are as described in the following section.

The signatories of the Water Supply Application Form and the RA must ensure that all assessments of land condition have been carried out in accordance with applicable current standards and guidelines by or under the direction of a suitably qualified competent person.

We require the competent person to be a) a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or b) a Specialist in Land Condition (SiLC) with appropriate geo-environmental experience.

Testing Requirements

How to contact us about the information in this leaflet

DeveloperServicesWater@uuplc.co.uk'

0345 072 6067
Opening hours:
8am-5pm Mon to Thurs
8am-4.30pm Fri

The soil, rock and if appropriate groundwater tests that are required on all sites where the potential for organic contamination has been identified in the desk study and where water pipes are proposed to be laid must be accredited by United Kingdom Accreditation Service (UKAS) as a minimum and where commercially available the Environment Agency's Monitoring Certification Service (MCERTS). These accredited tests should be undertaken for:

Banded hydrocarbons EC5-EC10, EC10-EC16, EC16-EC40 (Total aliphatic and aromatic hydrocarbons for each banding may be summed). Aliphatic/aromatic fractionation and subsequent banding may be required should a more detailed site specific risk assessment be undertaken. The bandings have been amended to take into account readily available laboratory tests. The equivalent carbon number (EC) is used to assess petroleum hydrocarbon mixtures rather than the actual number of carbon atoms in the molecule in line with guidance issued by the Environment Agency (2005).

Volatile organic compounds (VOCs) (method by head space or purge & trap GCMS) with tentative identification of compounds greater than 20µg/kg. The method used should be capable of detecting a wide range of compounds listed in US EPA Method 8260C or similar. The method should include analysis of naphthalene.

BTEX (Benzene, toluene, ethyl benzene and xylenes) plus MTBE (Methyl-tertiary butyl ether) (by head space GCMS)

Semi-Volatile Organic Compounds (SVOCs) (method by GCMS) with tentative identification of compounds greater than 20µg/kg The method used should be capable of detecting the compounds listed in US EPA Method 8270D or similar. The total concentration of SVOCs excludes polycyclic aromatic hydrocarbons, ethers, nitrobenzene, ketones, aldehydes, phenols, cresols and chlorinated phenols. Phenols, cresols and chlorinated phenols which are detected by the SVOC analysis are given their own assessment criteria.

We do not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in the RA below replaces Table 3.1 of the UKWIR Guidance.

Where previous site uses include the use, storage, treatment, disposal or manufacture of any of the following, appropriate testing for these substances will be required:

- Ethers, nitrobenzene, ketones, aldehydes and amines. Note that the presence of amines on any site at the proposed pipe depth +/- 1.0m precludes the use of polyethylene. The methods of analysis and method of calculation of total concentrations of these compounds will need to be agreed with UUW.

To comply with the testing requirements, the suites of tests that are required on all brownfield sites where wrapped steel, wrapped ductile iron or copper pipes are to be laid as minimum must include:

- pH, Conductivity and redox potential

Sufficiency of Testing

Water pipes are normally laid at between 0.75 and 1.35m from finished ground level to crown of pipe. Samples taken and tested must represent both a) the soil in which the water pipes are to be laid and b) the soil down to at least 500mm below the underside of the proposed pipe. Where the proposed depth of the pipes is unknown at the time of application, soil samples representative of the ground condition between surface level and 1.5m below finished ground level shall be taken as a minimum. Where appropriate (see UKWIR Guidance) groundwater sampling and groundwater monitoring will also be necessary. Photo-ionisation detection (PID) monitoring along the proposed route of the pipeline may be employed, though this does not provide a definitive guide to the suitability of water pipe materials.

Where required a sufficient number of test results should be obtained from the material in which the pipes are to be laid. CLAIRE/CIEH 2008 "Guidance on comparing soil contamination data with a critical concentration" may be used, where appropriate, to justify the number of soil samples tested; however, this statistical model should not be used on heterogeneous materials or used to average test results from different types of materials.

Further guidance on representative sampling is contained within BS10175:2011 Code of Practice for the Investigation of Potentially Contaminated Sites, the Department of the Environment's Contaminated Land Research Report "Sampling strategies for contaminated land" prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4; 1994) and the Environment Agency's "Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination" (ref: R&D Technical Report P5-066/TR; 2000).

Where remediation has been carried out on the site, the test results obtained from validation samples will be used in the assessment. Where a horizontal capping system has been or will be employed using materials spread across a site, sufficient samples will need to be taken to characterise the capping material used and the results presented to UUW. However, the sufficiency of sampling on the horizontal capping system, in which the pipeline will be placed, may be assessed on the basis of the source, quantity and type of materials used.

Detection Limits

Only positive concentrations, ie those above the limit of detection should be used in summation of VOC and SVOC (or other test groups of compounds ie phenols, cresols and chlorinated phenols). Laboratory methods shall provide a minimum limit of detection of 10µg/kg for each individual VOC or SVOC (or other test groups of compounds) quantitatively detected in accordance with the methods described above. For tentatively identified compounds (TICs), only those compounds with a concentration of 20µg/kg or greater shall be used in the summation of VOC and SVOC (or other test groups of compounds).

Protective Measures

Where polyethylene, ductile iron, steel or copper pipes are to be laid on a brownfield site or other land potentially affected by contamination (whether or not it has been remediated) and where the concentrations exceed the generic guideline values set out in Table 1 of the RA, the developer shall provide either:

a) a robust risk assessment to show how any contaminants will not significantly impact on proposed water supplies or buried assets over the lifetime of the assets; or

b) more suitable pipe materials; or

c) an engineering solution to protect the pipe work backed up by an adequate assessment of the risk.

Liquid free phase product (e.g. oil or free solvent layers) shall not remain in the ground or groundwater in the vicinity of water pipes, whether barrier pipe or any other pipe materials are used.

When designing pipe routes on land potentially affected by contamination, new preferential contamination pathways along the route of new water pipes shall not be created. Particular measures may be required to prevent the possible migration of contamination through pipe bedding and into controlled waters.

References

BS10175: 2011
"Investigation of Potentially Contaminated Sites Code of Practice"

CLAIRE/CIEH
"Guidance on comparing soil contamination data with a critical concentration" 2008

Department of the Environment Contaminated Land Research Report
"Sampling strategies for contaminated land" prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4) 1994

Environment Agency
"Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination"
(ref: R&D Technical Report P5-066/TR) 2000

Environment Agency
"Model Procedures for the Management of Land Contamination" (ref: CLR11), 2004

Environment Agency P5-080/TR3
"The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils", 2005

UK Water Industry Research (UKWIR)
"Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21) January 2011

Water Regulations Advisory Scheme (WRAS)
Information and Guidance Note 9-04-03
"Laying Pipes in Contaminated Land" 2002

Frequently asked questions

Why has UUW published supplementary guidance to the 'UKWIR Guidance for the Selection of Water Pipes to be used in Brownfield Sites'?

UUW agrees with the UKWIR Guidance in principle; we have published supplementary guidance to clarify some of the areas in which it will operate.

Does the UKWIR Guidance only apply to 'brownfield sites'?

Yes, the UKWIR Guidance does apply to brownfield sites; in addition United Utilities Water will apply this guidance and the UUW supplementary guidance to any greenfield sites which are potentially affected by contamination.

Who is responsible for completing/ signing the Risk Assessment for Water Pipes (RA)?

This may be the Developer, the Developers representative, or the competent person directing the land assessment. The signatory of the Risk Assessment for Water Pipes (RA) must ensure that all land assessments have been carried out in accordance with current standards and guidelines by or under the direction of a suitably qualified competent person. For water supply applications on land potentially affected by contamination, UUW requires the competent person to be either a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or a Specialist in Land Condition (SiLC). This level of competency is intended to promote good practice and high professional standards and is no greater than that required for planning purposes by Local Authorities under Planning Policy Statement 23, see link below: www.communities.gov.uk/publications/planningandbuilding/planningpolicystatement23

Do we need to agree the number and location of soil samples with the Water Company as indicated by the UKWIR guidance following the Preliminary Risk Assessment (PRA)?

Where a preliminary risk assessment (PRA) highlights the need for a site investigation UUW considers it is a responsibility of the qualified competent person directing the land assessment to determine the location and frequency of sampling. UUW's role would be to confirm that the appropriate choice of pipe material has been made on the basis of the information provided.

What do we do if the pipe route is not known when the Site Investigation report is commissioned?

Where the route of the pipe is not known at the site investigation stage, then any resultant pipe selection needs to take account of any contamination found on the site. Consideration should be given to identifying the route and depth of the pipeline at the site investigation stage to avoid unnecessary testing.

Is it acceptable not to undertake a site investigation and specify the use of barrier pipe which seems to be suitable for all conditions?

Not all brownfield land is contaminated, and because of that a default to barrier pipe is not an acceptable approach to UUW, due to the possibility of higher installation and future maintenance costs. The approach as to whether a site investigation is needed should be risk based. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the ground materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials.

Examples where defaulting to barrier pipe would not be acceptable: -

- Where a capping layer (non-contaminated) is introduced within which the pipes will be installed.
- Sites with a potential low risk for contamination.
- Where liquid free phase product (e.g. oil or free solvent layers) is in the ground or groundwater in the vicinity of water pipes.
- Where the route of the pipe could be diverted to another suitable location free from contamination.

Are UUW employees who will assess the Design Proposals for contaminated sites suitably qualified?

It is the role of the Developer's suitably qualified competent person to deal with or direct the assessment of land. UUW's role is to assess the Risk Assessment for Water Pipes and supporting Site Assessment Report (SAR) which is provided with any new water supply application (ie. it has been provided in the correct format, proposals for pipe selection are included, the methodology is in line with the UKWIR Guidance and UUW Supplementary Guidance, it has been directed by a suitably qualified competent person etc.). If UUW do need to provide assistance or information in deciding pipe materials then the assessment would be carried out under the direction of a suitably qualified competent person.

What happens to existing PE that is in the ground under the "old" guidelines?

The latest UKWIR guidance and UUW's supplementary guidance are intended to be used to decide what pipe materials will be used for new water mains and services. It will have no effect for developers with regard to any parts of UUW's existing network.

Will the Developer be required to submit a fully completed Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, for both the option of a mains requisition application and the option of a self-lay application?

Yes, UUW expect the 'Developer', as defined in UUW Supplementary Guidance, to submit a Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, in respect of any water pipes being installed on the development irrespective of who is to install them.

Does Table 1 in UUW's Risk Assessment for Water Pipes (RA) replace any of the tables to be completed in the Site Assessment Report (SAR) as required in the UKWIR Guidance?

UUW does not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in UUW's RA replaces Table 3.1 of the UKWIR Guidance.

Have any other Water Companies adopted the UKWIR Guidance yet?

You will need to contact the water company concerned if you are intending to install water pipes outside UUW's licensed area.

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About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

United Utilities Water Limited, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Warrington WA5 3LP.
Registered in England and Wales. Registered Number 2366678.

03/15/SD/E445e

Risk assessment for water pipes (RA)

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The risk assessment for water pipes will help you choose appropriate materials for your development. We are happy to deal with a risk assessment for water pipes in advance of any formal application for a new water supply.

If you need any help completing the form please call us on 0345 072 6067.

Section 1: Development details	
Development Name (if it has one)	New Base Building
Development Address	Manchester Science Park, Lloyd St North, Manchester M15 6SE.
OS Grid Reference (mid point)	384440E; 396280N
Developers Name	Manchester Science Park Limited
UUW reference number (for UU use only)	

Please provide details below of the current and historical use of the site and adjacent sites.
If your supporting information has details of the current and historical site use, please reference below the relevant sections of your report.

The site is rectangular in shape, largely level and located in the west of the wider MSP site, off Greenheys Lane.

The west of the site comprises parking and landscaped areas with Hillel House currently present in the central and eastern sectors of the site. Hillel House is a 2/3-storey modern-clad structure.

The site is open to the east and west with Palisade fencing and a structural brick wall baring access to the north and high wire fence is present to the south. An access road is present along the northern site boundary which enables vehicular access to the rear of the property.

Peripheral light landscaping is noted around the site comprising maintained grassland and public footpaths

No visual or olfactory evidence of contamination, unstable slopes, invasive knotweed or significant induced surface settlements were observed within during the site walkover.

Historical mapping shows the site to have comprised residential terraces between 1891 and c.1980. After 1980, the site appears to have been cleared and replaced by a singular structure denoted 'Hillel House' in the east of the site which is extended to its present-day arrangement c.1989.

Section 2: Preliminary risk assessment

Has your desk study and site walkover identified any land potentially affected by contamination?	☑ Yes ☐ No

If the site is potentially affected by contamination but you have not completed any intrusive site investigation please provide details below of the rationale behind the intended pipe selection.
If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.

Previous assessments have been conducted upon the site, on behalf of Manchester Science Park Limited. No elevated compounds recorded within natural and made ground soils.

The preliminary conceptual model established that risks to site receptors were deemed to be low to moderate from potential-contaminants (particularly asbestos) beneath the site associated with the history of the site and the surrounding area. Numerous phases of demolition and redevelopment potentially resulting in unknown waste disposal.

Section 3: Intrusive site investigation	
Have you completed any intrusive site investigation?	☑ Yes ☐ No
Have you completed any none intrusive site investigation?	☐ Yes ☑ No
Date(s) when the site investigation(s) undertaken	16 05 2019
At what level has groundwater been encountered?	7.20 metres below ground level or ☐ Not encountered

Table 1 (Pipeline Selection Risk Assessment Summary (PSRAS)) below classifies testing required where the preliminary risk assessment has identified land potentially affected by contamination. Please provide details below of any test groups which have not been tested and the rationale for not testing.

If your supporting information has details of the rationale behind not testing any particular test groups, please reference below the relevant sections of your report.

- **Inorganic contaminants**
- **Hydrocarbons & Organic contaminants**
- **Asbestos**
- **Phytotoxic Metals, and Cyanide**

If the intrusive site investigation has identified concentrations above the PE threshold (see PSRAS) and your intended pipe selection is PE. Please provide details below of the rationale behind the intended pipe selection.

If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.

Concentrations of concentrations marginally above C10 to C16 aliphatic/aromatic hydrocarbon and below PE threshold for testing along the line of the proposed pipework. Localised areas of hydrocarbon contamination could be present elsewhere. Either adopt PE Barrier Pipe or carry out additional testing (along the line of proposed pipework), given that the building has now been demolished and piling matt been constructed.

Section 4: Site remediation

Please provide details below of any site remediation (which may include a change in site levels) already completed.

If your supporting information has details of the site remediation already completed, please reference below the relevant sections of your report.

Enabling works to be carried out to achieve site levels suitable for development. No significant remediation proposed other than cover systems to be adopted within landscaped areas. Specialist protection measures required due to recorded asbestos within site made ground soils.

Has the PSRAS (Table 1) been completed using appropriate data after remediation?	☐ Yes ☑ No ☐ N/A

Please provide details below of any proposed site remediation and an analysis of whether this will affect your intended pipe selection.

If your supporting information has details of any proposed site remediation and whether this will affect your intended pipe selection, please reference below the relevant sections of your report.

Enabling works has been carried out to achieve site levels suitable for development. No significant remediation proposed other than cover systems to be adopted within landscaped areas. Water pipe to be laid in made ground. Depth to be confirmed.

Section 5: Final use of site

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has details of potential contamination risks which may affect your intended pipe selection, please reference below the relevant sections of your report.

No chemicals or fuel storage to be stored upon site.

What water pipe materials are intended to be used on site?	☐ PE ☑ PE Barrier Pipe Type A ☑ PE Barrier Pipe Type B Other (please specify): BUILD HARPOLD TO CONFIRM NATURE OF BARRIER PIPE

Section 6: Additional information

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has additional information to support your intended pipe selection, please reference below the relevant sections of your report.

No chemicals or fuel storage to be stored upon site.

Section 7: Risk assessor

Name and relevant qualifications of person directing the risk assessment for water pipes	Barry Williams (BEng, CEng MICE)
Name and address of risk assessor's company	NX Consulting Limited. Thorpe House, 11 Thorpe Close, Timperley, Altrincham, WA15 7WZ.
Date risk assessment performed	07 05 2020

Section 8: Declaration

I confirm I have completed this form and provided supporting information in accordance with 'UKWIR Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' and UUW's Supplementary Guidance. I also confirm that if any further site investigation is needed and carried out, I will be required to submit an additional Risk Assessment for Water Pipes with the relevant supporting information. I understand that failure to supply any of the required information may delay my application being processed.

Name	Barry Williams	Company	NX Consulting Limited
Telephone	0161 904 0187	Date	12 05 2020

Please email the completed form and supporting information to DeveloperServicesWater@uuplc.co.uk. Alternatively you can fax a paper version to 01925 677973 or post to us at United Utilities Water, Developer Services, Windermere House, Lingley Mere, Warrington WA5 3LP.

03/19/SD/9445b

Table 1 - Pipe selection risk assessment summary (PSRAS)

1. Testing must be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. Please use the appropriate testing data to complete Table 1 below.

2. If more than one pipe selection is being made, for example, for pipes in different areas of a large site, a completed PSRAS is required for each selection.

What materials have been tested to populate Table 1 below?	☑ Existing ground materials ☐ Remediated materials ☐ Imported capping materials

All concentrations in mg/kg

Test Group	Testing Required?	PE threshold	Metal Pipes/ Barrier Pipe	Laboratory Detection Limit	Testing UKAS accredited Y/N	Maximum concentration at proposed pipeline depth See Note [2]	Maximum site concentration See Note [3]	Locations and depths where concentrations exceed proposed pipeline threshold
Total VOCs	Where Preliminary Risk Assessment (PRA) has identified land potentially affected by contamination	0.5	Pass					Not in Prelim conceptual model
Total BTEX & MTBE		0.1	Pass	1mg/kg	Y	<1mg/kg	<1mg/kg	
Total SVOCs (excluding PAHs and those substances marked with an *)		2	Pass					Not in conceptual model
EC5-EC10 aliphatic and aromatic hydrocarbons		2	Pass	<0.001mg/kg	Y	<1mg/kg	<1mg/kg	Not in Prelim conceptual model
EC10-EC16 aliphatic and aromatic hydrocarbons		10	Pass	2.00	Y	16.5mg/kg	9.9mg/kg	RBH05 Away from new pipework
EC16-EC40 aliphatic and aromatic hydrocarbons		500	Pass	10.00	Y	<264mg/kg	<243mg/kg	
Phenols* (from SVOC analysis)		2	Pass					Not in Prelim conceptual model
Cresols and chlorinated phenols* (from SVOC analysis)		2	Pass					Not in Prelim conceptual model
Ethers*	Only where identified	0.5	Pass					Not in Prelim conceptual model
Nitrobenzene*		0.5	Pass					Not in Prelim conceptual model
Ketones*		0.5	Pass					Not in Prelim conceptual model
Aldehydes*		0.5	Pass					Not in Prelim conceptual model
Amines		Fail	Pass					Not in Prelim conceptual model
Corrosive	Conductivity, Redox and pH	Pass	See Note [1]					Not in Prelim conceptual model

Note [1] Threshold: For wrapped steel, corrosive if pH<7 and conductivity > 400µS/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity > 400µS/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

Note [2] Water pipes are normally laid at 0.75-1.35m below finished ground level.

Note [3] Also state if liquid free product is present in soil or groundwater.