AtkinsRéalis

Volume 3, Appendix 11.2 – Ground Investigation

Manchester City Council

October 2024

FORMER CENTRAL RETAIL PARK – THE PARK

AtkinsRéalis - Sensitive / Sensible

Notice

This document and its contents have been prepared and are intended solely as information for Manchester City Council and use in relation to The Park Planning Application.

AtkinsRéalis assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 224 pages including the cover.

Document history

Document title: Volume 3, Appendix 11.2 – Ground Investigation

Document reference: Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	For Client Comment	AW	AV	LR	DP	31/07/2024
2.0	For submission	AW	AV	LR	DP	31/10/2024

Client signoff

Client	Manchester City Council	**Client signature/date**
Project	Former Central Retail Park – The Park	
Job number	5224911	

Contents

1. Phase I and Phase II Geo-environmental Site Assessment 4
2. Geo-environmental Data Review Technical Note 212

Tables

No table of figures entries found.

Figures

No table of figures entries found.

1. Phase I and Phase II Geo-environmental Site Assessment

PHASE I AND PHASE II GEO-ENVIRONMENTAL SITE ASSESSMENT

Central Retail Park
Great Ancoats St,
Manchester
M4 6DH

Prepared for:
UK Retail Warehouse Fund
c/o TH Real Estate

Report Ref: 11-834r1
Date Issued: July 2017



e3p | Environmental | Energy | Engineering

E3P

Heliport Business Park,
Liverpool Road,
Eccles,
Manchester,
M30 7RU

Tel : + 00 (0) 161 707 9612
http:\\www. e3p.co.uk

Registered in England
No.: 807255262

QUALITY ASSURANCE

REMARKS	Final-Rev 1
DATE	July 2017
PREPARED BY	Roy Walker
QUALIFICATIONS	BSc (Hons.), FGS
SIGNATURE	
CHECKED BY	Andrew Edgar
QUALIFICATIONS	BSc, MSc, AIEMA, MIEnvSc, CEnv
SIGNATURE	
AUTHORISED BY	Martin Dyer
QUALIFICATIONS	BSc, FGS, AIEMA, MIEncSc, CEnv
SIGNATURE	
PROJECT NUMBER	11-834

IMS Template Reference:
QR009-3

EXECUTIVE SUMMARY		
Site Address	Central Retail Park, Great Ancoats Street, Manchester, M4 6DJ, UK	
Grid Reference	E385130, N398390	
Site Area	4.02Ha	
Current Site Use	The subject site comprises an active retail park with a terrace of steel portal frame buildings in the northern sector and car parking in the southern sector. A service yard is located to the rear. Retaining walls exist to the north and east boundaries to facilitate the fall from adjacent land. The retaining wall to the north is circa 3.50m in height with the wall to the east circa 1.50m No Above Ground Storage Tanks (AST) or Underground Storage Tanks (UST) were observed at the site during the preliminary site inspection. A storm water sewer is recorded in Old Mill Street and the UU plans record the presence of several redundant sewers crossing the site including a possible culverted watercourse.	
Proposed Development	The outline masterplan for the redevelopment of Central Retail Park, Manchester currently comprises a high density residential development with buildings ranging from 6 storeys to 10 storeys with the potential for one block to be 30 storeys high. It is also considered likely that ground floor space fronting onto the Great Ancoats Street will be used for retail / commercial. There will also be some areas of landscaping on site.	
Environmental Setting	*Drift Geology*	Till (Devensian – Clay) across the site.
	Bedrock Geology	Chester Pebble Beds.
	Hydrogeology	Unproductive strata (drift) overlying a Principal Aquifer. The closest groundwater abstraction is identified at 720m to the south but this may be disused.
	Hydrology	Rochdale Canal (adjacent), Islington Wharf Marina (30m) and Ashton Canal (Islington Wharf Branch) (30m)
	Flood Risk	Unaffected by flooding from rivers.
	Ecology	No potential sensitive habitat is considered likely to be present at the site. No invasive species were identified during the ground investigation.
Site History	Historical map research has identified that the site comprised residential housing, tin works, timber yards, warehouses, saw mills, cotton mill, church, depots, engineering works and a former canal channel. Planning searches have revealed that site uses have also included vehicle repair. All the historical buildings were cleared to facilitate the development of the Central Retail Park pre 1989.	
Utility Locations	Service drawings for the site show that the gas, electricity and water supply to the site are located within the rear service yard. Redundant sewers are mapped crossing the site and a surface water culvert is recorded cross the site from northeast to southwest through the central sector of the site.	
Landfill Sites & Ground Gases	No current or historical landfill sites have been identified at the site. However, Made Ground associated with backfill canal channel or demolition of historical structures may be source of ground gas.	
Radon	Unaffected – no special precautions required.	

EXECUTIVE SUMMARY	
Coal Mining / Land Stability	The subject site is located within a Coal Authority Coal Mine Reporting Area and therefore a Coal Authority Mining Report has been obtained (Ref: 51001535078001) dated July 2017. The report identifies that the property is in a surface area that could be affected by underground mining in 3 seams of coal at 360m to 1090m depth, and last worked in 1961. Any movement in the ground due to coal mining activity should have stopped. Based on the Coal Authority information and site geological setting there is considered to be low risk associated with coal mine related subsidence.
E3P Intrusive Ground Investigation	
Site Investigation Works	E3P has completed an intrusive Ground Investigation comprising window sample boreholes, cable percussion boreholes and rotary follow-on. Shallow and deep environmental monitoring installations were also constructed.
Ground Conditions	**Made Ground** Made Ground has been recorded in all exploration locations as a variable gravelly sand and sandy gravel with numerous anthropogenic materials including clinker, brick, ash, limestone, mudstone, slate, timber and rare porcelain. No visual or olfactory evidence of hydrocarbon impact was observed. The investigation identified a notably thicker band of Made Ground that appears to trend broadly north to south through the central-eastern sector of the site. The infill in this location was proven to a maximum depth of between 5.0 and 5.1m bgl with locations corresponding with the general trend of the culverted brook and perhaps indicates backfilled channel. Similarly, thicker Made Ground was recorded in the eastern sector of site were between 1.3m and 1.8m was recorded. This is in the mapped locality of a former canal channel. Within the remaining locations at the site, Made Ground was relatively uniform and recorded to between 0.4m and 1.1m thick. **Drift** The underlying drift stratum beneath the site comprise stiff high strength gravelly and sandy gravelly CLAY with local horizons of more silty CLAY. Horizons of gravelly SAND have been recorded in the drift at depth within the deeper boreholes. The drift was proven to a maximum depth of 29m bgl in BH102 where a dense sandy GRAVEL was encountered to 29.3m bgl. The upper weathered Sandstone was recorded to full depth of BH102 but could not be penetrated. **Solid** The solid bedrock geology comprises upper weathered horizons returned as fine to medium SAND with lithorelics of Sandstone that becomes rock at depths of 24.50m bgl and 33.00m bgl. **Groundwater** Groundwater monitoring indicates the perched groundwater is deeper in the southern sector reflecting the relative thickness of the Made Ground. Monitoring of the deep monitoring wells indicates that depths vary between 19.50m bgl in the east and 24.4m bgl in the wes with a gradient of 0.017 to the west determined.

EXECUTIVE SUMMARY	
Contaminated Land Assessment	
Human Health Contamination Risk Assessment	Laboratory testing has not identified any significant site wide contamination. Loose chrysotile fibres and elevated concentration of lead have been identified within a single location. The risk to future end users will be mitigated by the proposed development that will largely encapsulate the site and remove viable exposure to impacted soil and groundwater. Consideration will need to be given to areas of landscaping and if impacted soils are present in these areas, then a clean cover system is likely to be required to mitigate all perceived risk. The pre-demolition exploratory investigation has not identified any evidence of potentially volatile / soluble hydrocarbon impact, furthermore given the historical site use and absence of bulk chemical storage the presence of such contamination is not widely anticipated. Any as yet unidentified localised hotspots can be easily delineated and remediated during site enabling works. To mitigate the risk to construction workers associated with any further asbestos and lead, it is recommended that all works are completed in line with industry best practice so that control measures to manage dust and personal exposure are carefully implemented in accordance with an agreed Remediation and Enabling Works Strategy.
Controlled Waters	Soil and groundwater analysis confirmed that there is no significant risk to controlled waters or the wider environs.
Ground Gas	Ground gas monitoring is currently on-going but initial classification indicates Characteristic Situation 1 and that no ground gas protection measures will be required.
Potable Water Infrastructure	A well designed, managed and validated programme of enabling works should render the site suitable for PE Potable Supply Infrastructure.
Geotechnical Assessment	
Underground Obstructions	Significant obstructions associated with relict foundations etc have not been encountered but given the former site use are anticipated. Existing buildings and foundation structures will require careful demolition and removal in order to facilitate the future development.
Allowable Bearing Pressure (ABP)	Based on the assessment of the relative undrained shear strength of the natural strata where is occurs close to the surface has been identified as the underlying firm to very stiff Clay to have ABP in the order of 110kN/m^2 to 166kN/m^2 at ca.1.0 to 1.5m bgl. Rock analytical results are currently awaited, however it is likely that the rock will provide a calculated ABP in excess of 1000kN/m2.
Foundation Options	Based on the assessment of ABP within the drift it would be possible to utilise shallow pad foundations to support any lighter/portal frame buildings. It is likely that for high rise structures, deeper piled foundations will be required and a summary of rock analysis will be provided once laboratory point load and UCS results are made available. However, based on field descriptions and previous experience the Sandstone will provide a suitable founding stratum for piled foundations. Rock head has been recorded at depths of between 24.50m bgl and 33.00m bgl.
Building Floor Slabs	Ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement and low to moderate plasticity clay.

EXECUTIVE SUMMARY	
Heave Precautions	The clay is deemed to be of low to moderate volume change potential, therefore moderate used for design purposes. If a shallow foundation, ground bearing floor slab or pile ground beam is to be constructed within the conjectured zone of existing or proposed trees, appropriate heave precautions will be required to the internal face of a foundation and the underside of a groundbeam.
Soakaway Drainage	The site is predominantly underlain by circa 1-2m of likely low permeability gravelly CLAY. Therefore, the use of soak-away drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured it is not recommended that soakaways utilised for disposal of surface water runoff.
Sulphate Assessment	Chemical analyses for pH and soluble sulphate content shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005). Elevated sulphate concentrations meeting Class DS-2, AC-2 and DS2-AC3 were noted within the Made Ground deposits in WS125 and WS109 respectively.
CBR Design %	It is considered that the Made Ground material can be re-engineered to a method to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions. Natural clay soils will provide a CBR in the order of 3-5% during drier climatic periods, however If water is allowed to shed onto the formation, the CBR will reduce to <2% which will require specialist engineering of the sub-grade.
Cut / Fill	Development levels unknown at this time.
Waste Characterisation	Stable Non-Reactive (non-hazardous / inert). Within one location, the Made Ground may be classified as Hazardous due to the presence of asbestos and elevated lead.
Recommendations	Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course: - Post demolition Ground Investigation & Supplementary Contamination Risk Assessment; - Geotechnical Earthworks Strategy (Infrastructure); and, - Enabling Works strategy.

Table of Contents

1. INTRODUCTION 8
1.1 Background 8
1.2 Proposed Development 8
1.3 Objectives 9
1.4 Limitations 9
1.5 Confidentiality 9

2. SITE SETTING 10
2.1 Site Details 10
2.2 Current Site Use 10
2.3 Surrounding Area 11

3. SITE HISTORY 12
3.1 On-Site Historical Development 12
3.2 Off-Site Historical Development 14
3.3 Planning History 15
3.4 Anecdotal Information 15

4. ENVIRONMENTAL SETTING 16
4.1 Geology and Hydrogeology 16
4.2 Geotechnical Data 16
4.3 Coal Mining 17
4.4 Brine Workings 17
4.5 Hydrology 18
4.6 Radon Risk Potential 18
4.7 Industrial Land Uses 19
4.8 Sensitive Land Uses 19
4.9 Site Sensitivity Assessment 19
4.10 Preliminary Geotechnical Assessment 20
4.11 Unexploded Ordnance 20

5. CONSULTATIONS 21
5.1 Landfill Sites and Waste Treatment Sites 21
5.2 Regulatory Database 21

6. INITIAL CONCEPTUAL SITE MODEL 22
6.1 Initial CSM 22

7. E3P INTRUSIVE GROUND INVESTIGATION 24
7.1 General Overview 24
7.2 In-Situ Standard Penetration Testing (SPT) 25
7.3 Laboratory Analysis 25

8. GROUND AND GROUNDWATER CONDITIONS 26
8.1 Ground and Groundwater Conditions 26
8.1.1 Summary of Ground Conditions 26
8.1.2 Made Ground 26
8.1.3 Drift Deposits 27
8.1.4 Solid Geology 27
8.1.5 Soil Consistency 27
8.1.6 Side Stability and Ease of Excavation 27

8.1.7 Soil Infiltration 36
8.1.8 Soil Plasticity 36
8.1.9 pH and Sulphate 37
8.2 Groundwater Conditions 37
8.3 Ground Gas 38
8.3.1 Investigation Rationale 38
8.3.2 Monitoring Methodology 39

9. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT 42
9.1 Human Health Risk Assessment 42
9.2 Controlled Waters Risk Assessment 46
9.3 Ground Gas 50
9.3.1 Sources of Ground Gas 50
9.3.2 Groundwater 50
9.3.3 Gas Flow 50
9.3.4 Gas Concentrations 50
9.3.5 Gas Assessment 50
9.4 Conceptual Site Model 51

10. GEOTECHNICAL ASSESSMENT 53
10.1 Proposed Development 53
10.2 Summary of Ground Conditions 53
10.3 Site Preparation 53
10.4 Foundation Conditions & Assessment of Potential Bearing Capacities 54
10.5 Ground Floor Slabs 55
10.6 Heave Precautions 56
10.7 Drainage 56
10.8 Concrete Durability 56
10.9 Excavations 56
10.10 Coal Mining 57
10.11 Further Works 57
10.12 Construction Activity and Inspection 57

11. CONCLUSIONS AND RECOMMENDATIONS 58

APPENDICES

Appendix I Limitations
Appendix II Glossary
Appendix III Drawings
Drawing No 11-834-001 – Site Location Plan
Drawing No 11-834-002 – Historical Features
Drawing No 11-834-003 – Exploration Location Plan
Drawing No 11-834-004 – Depth of Made Ground Plan
Drawing No 11-834-005 – Depth of Bedrock Plan
Drawing No 11-834-006 – Depth to Shallow Groundwater Plan (Drift/Made Ground)
Drawing No 11-834-007 – Depth to Deep Groundwater (Sandstone)
Drawing No 11-834-008 – Conceptual Site Model
Appendix IV Photographs
Appendix V Historical Maps
Appendix VI E3P Exploratory Hole Logs
Appendix VII Chemical Testing Results
Appendix VIII Origin of Tier I Generic Assessment Criteria
Appendix IX Geotechnical Testing Results
Appendix XII Coal Authority Report

1. INTRODUCTION

1.1 Background

E3P has been commissioned by GVA on behalf of Henderson Global Investors to undertake a detailed Phase I and II Geo-Environmental Site Investigation of the Central Retail Park, Great Ancoats Street, Manchester, UK.

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed development of high rise student accommodation.

The scope of work the following elements:

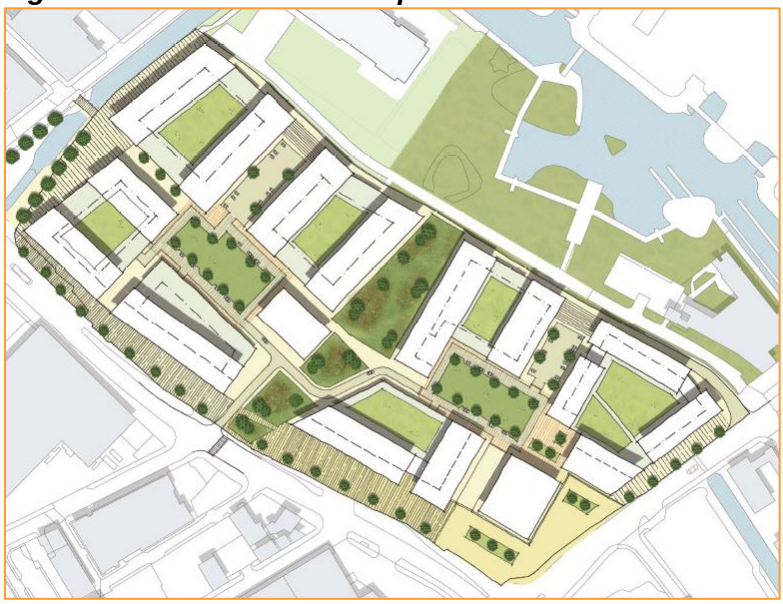
- *Desk study;*
- *Intrusive ground investigation consisting of window sample probeholes and deep cable percussive boreholes with rotary core boring follow on;*
- *Installation of shallow and deep groundwater monitoring installations;*
- *In-situ geotechnical testing;*
- *Chemical & geotechnical laboratory analysis;*
- *Groundwater monitoring and sampling;*
- *Ground gas monitoring;*
- *Contamination risk assessment & conceptual site model;*
- *Geotechnical assessment & interpretation; and,*
- *Factual and interpretive reporting.*

1.2 Proposed Development

The outline masterplan for the redevelopment of Central Retail Park, Manchester currently comprises a high density residential development with buildings ranging from 6 storeys to 10 storeys with the potential for one block to be 30 storeys high. It is also considered likely that ground floor space fronting onto the Great Ancoats Street will be used for retail / commercial. There will also be some areas of landscaping on site.

A snapshot of the proposed development layout is indicated in Figure 1.1.

Figure 1.1 Outline Masterplan



1.3 Objectives

The objectives of the Geo-Environmental Investigation are to:

- Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));
- Undertake a preliminary stage of sampling and analysis to provide an overview of environmental issues identified;
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;
- Assess the geotechnical information and provide preliminary recommendations in relation to foundations, pavement construction and floor slabs; and,
- Provide recommendations regarding future works required.

1.4 Limitations

The limitations of this report are presented in Appendix I.

1.5 Confidentiality

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

2. SITE SETTING

2.1 Site Details

Site Address	Central Retail Park, Great Ancoats Street, Manchester, M4 6DJ, UK
National Grid Reference	E385130, N398390
Site Area	4.02Ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.
A site location map is presented in Appendix III as Drawing 11-834-001.

2.2 Current Site Use

E3P has undertaken a site walkover of the entire site and a description of the key findings is summarised in Table 2.1.

Table 2.1 Site Description

Occupancy/use	The subject site currently comprises 7No commercial units of steel portal frame construction with metal cladding façade. Currently all but two units towards the centre of the park are vacant. Their individual uses have been mainly for clothing and electrical goods. The remainder of the site features brick surfaced car parking to the front and concrete hardstanding to the rear.	
Structures	The site is occupied by 7No commercial units of steel portal frame construction with metal cladding façade. There is also a small brick built security cabin to the south and a brick built substation to the rear of the buildings.	
Access	Vehicle access can be gained along the eastern boundary from Great Ancoats Street (A665) or alternatively to the north east of the building via Old Mill Street. Pedestrian access can also be gained along the southern boundary through the car park and to the north west from the Canal.	
Slope	From the eastern corner of the site the surface walls away gradually giving a ramp to the rear and east of the buildings. However, there is a second slope falling from the west to east. The buildings step down but each unit has been built on a level platform. To the rear of the building a number of loading bays currently exist with ramps to facilitate wagons.	
Retaining structures	Retaining walls exist to the north and east boundaries to facilitate the fall from adjacent land. The retaining wall to the north is circa 3.50m in height with the wall to the east circa 1.50m	
Surface Cover (%)	Buildings:	50%
	Hardstand:	49%
	Soft cover:	<1%
Vegetation/Ecology	The brick wall that surrounds the site to the south and east has been planted with hedgerow and sporadic semi-mature trees. To the north a run of vegetated land runs from the substation to the west. No observations of invasive species were noted during the site works.	

Hazardous Material Storage	No Above Ground Storage Tanks (AST) or Underground Storage Tanks (UST) were observed at the site during the preliminary site inspection. Due to the previously undeveloped nature of the site it is unlikely hazardous materials storage will have occurred on the site.
Asbestos Containing Material (ACM)	No evidence of ACM was noted a during the site walkover and given the age of the retail park, ACM is not considered likely to present though this should be confirmed prior to any demolition works. The retail park is located on previously development land and the presence of ACM within the sub-surface is considered likely.
Polychlorinated Biphenyls (PCBs)	There is a sub-station located to the rear (north) of the retail of the units. However, the substation appears to be been constructed at the time of the retail park and therefore unlikely to be a source of PCB.
Waste Storage	Potentially hazardous waste streams are unlikely to be generated at the site and none were observed during the site inspection.
Utilities	A formal drainage survey has not been completed, however a review of online records held by United Utilities (UU) indicates the presence of foul sewers with Great Ancoats Street and Old Mill Street in addition to running along the northern boundary and site access road. A storm water sewer is recorded in Old Mill Street and the UU plans record the presence of several redundant sewers crossing the site including a possible culverted watercourse.

2.3 Surrounding Area

The surrounding area land uses are summarised in Table 2.2.

Table 2.2 Surrounding Land Uses

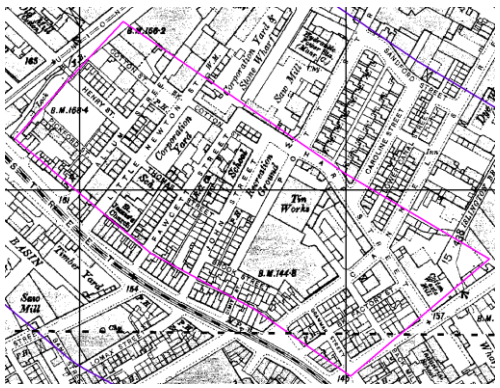
DIRECTION	LAND USE
North	New Islington School, Medical Practice and Marina
East	Old Mill Road with residential apartments and car park beyond
South	Great Ancoats Street with residential apartments and retail.
West	Retail and commercial properties.

3. SITE HISTORY

3.1 On-Site Historical Development

A review of historical mapping pertinent to the site is summarised in Table 3.1 below. In addition, historical site features are presented on Drawing No 11-834-002 in Appendix III.

Table 3.1 Historical Development

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1851	The site is recorded as predominantly residential housing with schools, public houses, hotels and churches located through the centre. A Timber Yard and the Shooters Brook Iron Works No1 (Mechanical Engineering) are recorded in the centre Coal Wharfs are recorded in the east. A Islington Branch of the Manchester and Ashton Under Lyne Canal is recorded crossing the western tip of the site in a northerly direction . The Allum Street Foundry and Mill are recorded in the north and an Oil Cloth Factory, Machine Manufactory and Iron Foundry are recorded in the west.	
1893	The Oil Cloth Works are recorded as a Saw Mill. The Shooter Brook Iron Works no longer have a specificed use.	
1908	The Saw Mill is no longer recorded as such. The former Iron Works is as a Tin Works and a Cotton Waste Works is recorded at the eastern boundary. A Corporation Yard is recorded in the centre of the site with a larger Corporation Yard & Stone Wharf encroaching on the norther boundary.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1922	A Timber Shed is recorded in the central-eastern sector of the site and the Cotton Waste Works is recorded as Sun Mills (Rags etc). No other significant changes are recorded when compared with the previous map.	
1951	The Timber Shed has expanded north and now occupies the former Tin Works. A Cabinet Works is recorded to the east of the Timber Shed. A ruin is marked at the southern edge of the Timber Shed. The former Saw Mill in the west is recorded as a Timber Yard and the land in the northwest is recorded as a Saw Mill and Cardboard Box Mill.	
1955	A Garage, Clothing Works and Engineering Works (Automobile) are recorded in the northwest. Timber Warehouses are recorded in the east and southeast of the site and the Timber Shed in the central-eastern sector is recorded as a Saw Mill. An Engineering Works in recorded in the southeast. Many of the residential properties have been cleared.	
1981	All of the residential properties have been cleared leaving much of the site as vacant land. Unspecified Works, Timber Yards and a Depot are recorded in the west. Unspecified works are also recorded in the central and western sectors. Sun Mill is still recorded in the east but the Islington Brach is no longer recorded.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1989	The site is recorded as Central Retail Park.	

3.2 Off-Site Historical Development

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 100m radius of the site is summarised below in Table 3.2.

Table 3.2 Surrounding Historical Development

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Corporation Yard Then undeveloped land/car park	Adjacent	Pre 1893 to Pre 1978 Pre 1978 to Present	North
John Street Coal Wharf Then Saw Mill & Hydraulic Power Station Then marked as undeveloped land and works Then undeveloped land	Adjacent	Pre 1893 to Pre 1908 Pre 1908 Pre 1981 Pre 1985 to Present	North
Wire Works Then unspecified Then Engineering Works (lift equipment) Then residential properties	Adjacent	Pre 1893 to 1908 Pre 1908 Pre 1951 Pre 1951 to Pre 1981 Pre 1981 to Pre 2017	East
Long Mill (Cotton) Then car park	Adjacent	Pre 1893 to Pre 1965 Pre 1965 to Present	West
Sedgewick Mill (Cotton) Then unspecified works Then Clothing Factory Then area marked as Royal Mill	Adjacent	Pre 1893 to Pre 1981 Pre 1981 to Pre 1983 Pre 1983 to 1992 Pre 1992 to Present	West
Old Mill (Cotton) Then Royal Mill Then unspecified works	Adjacent	Pre 1893 to 1922 Pre 1922 to Pre 1981 Pre 1981 to Present	West
Foundry (Disused) Then Iron & Steel Warehouse Then Warehouse	20m	Pre 1893 to Pre 1908 Pre 1908 to Pre 1978 Pre 1978 to Pre 1992	South
Saw Mill Then Garage, Depot and Atlas Works Then Garage and Depot	80m	Pre 1893 to Pre 1971 Pre 1971 to Pre 1990 Pre 1990 to Pre 1996	Southwest
Dye Works Then unspecified Then residential properties	90m	Pre 1893 to Pre 1922 Pre 1922 to Pre 1981 Pre 1981 to Pre 2017	Northeast
Bedstead & Safe Works Then Engineering Works, Clothing Manufacture, Corporation Cleansing Depot	70m	Pre 1908 to Pre 1951 Pre 1951 to Pre 1981	East

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Then residential properties and estate roads		Pre 1981 to Pre 2017	

3.3 Planning History

EP3 has undertaken a review of on-line planning records held by Manchester City Council in order to provide additional historical information on site uses. The results of this on-line search are provide in Table 3.3

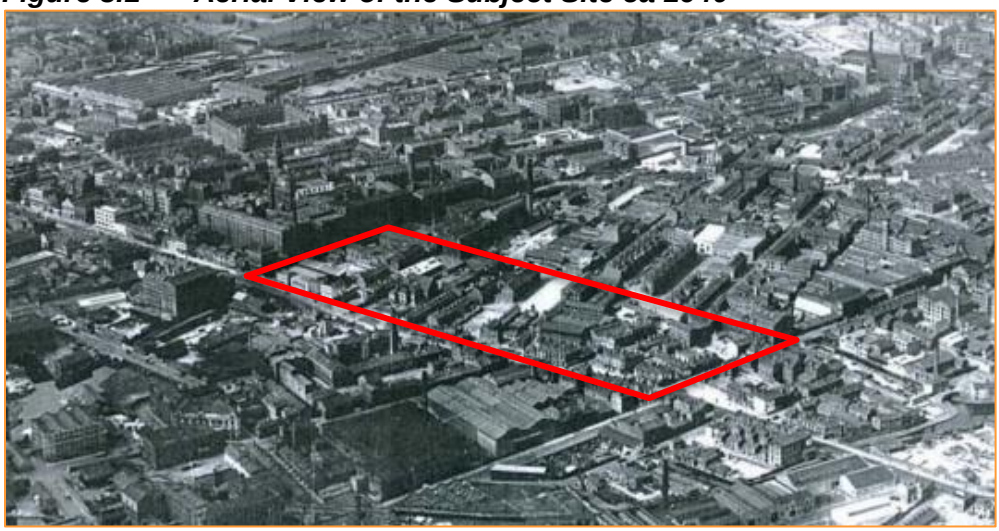
Table 3.3 Planning Application Search

APPLOCATION REF	ADDRESS	LOCATION ON SITE	DESCRIPTION
F04075	97, 99, 101 Dawn Street & Covered yard area on Courtney Street, Ancoats.	North	Erection of a single-storey ice-cream workshop and garage (Phase I) and a 2-storey warehouse and garage (Phase II) following demolition of existing buildings.
F00830	Dawn Street/23-27 Allum Street, Ancoats.	Centre	Retention of extension to repair garage used for light industry.
F03010	173/181 Great Ancoats Street, Ancoats.	Centre South	Continuation of existing temporary planning permission for use of premises as offices and workshops for the repair, maintenance and service of radios and TV sets.
F03636	Cannel Street, Ancoats.	Centre South	Erection of a single-storey building for the maintenance of vehicles.

3.4 Anecdotal Information

The following image of the subject site has been obtained from Britain from above

Figure 3.1 Aerial View of the Subject Site ca 1940



4. ENVIRONMENTAL SETTING

4.1 Geology and Hydrogeology

The British Geological Survey (BGS) map for the site, (Sheet 85, 1:50,000, Solid & Drift edition) and online records indicates the site is underlain by the geological sequence presented in Table 4.1.

Table 4.1 Summary of Underlying Geology

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	Glacial Till	Silty, sandy, gravelly CLAY with cobbles	Secondary Undifferentiated
Solid	Chester Pebble Beds	Sandstone	Principal Aquifer

British Geological Survey records for the area indicate that the Glacial Till is approximately 21m thick and consists of Silty, gravelly Clay with the lower horizons comprising sandy Gravel.

The Envirocheck Report indicates that the site is not located within a Groundwater Source Protection Zone. The closest identified groundwater abstraction is listed at approximately 720m to the south of the site at Moseley Rubber Co Ltd. The permit start date is listed as being 1966 and it is likely that this abstraction is no longer in use.

Shallow groundwater is likely to occur as perched water within any granular Made Ground or sand horizons within the Glacial Till with flow direction dictated by below ground structures and presence of adjacent managed watercourses. Groundwater flow within the underlying Sandstone is likely to be to the southwest following topographic gradient towards the River Irwell.

4.2 Geotechnical Data

Geotechnical Data presented within a commercially available environmental database is summarised within Table 4.2.

Table 4.2 Summary of Geotechnical Data

HAZARD	DESIGNATION
Shrink-Swell Clay	Very Low
Landslides	Very Low
Ground Dissolution	No Hazard
Compressible Ground	No Hazard
Collapsible Deposits	Very Low
Running Sand	Very Low

4.3 Coal Mining

The subject site is located within a Coal Authority Coal Mine Reporting Area and therefore a Coal Authority Mining Report has been obtained (Ref: 51001535078001) dated July 2017. The report provides the following information:

- The property is in a surface area that could be affected by underground mining in 3 seams of coal at 360m to 1090m depth, and last worked in 1961. Any movement in the ground due to coal mining activity should have stopped.
- The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.
- The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.
- The property is not in an area likely to be affected from any planned future underground coal
- mining. However, reserves of coal exist in the local area which could be worked at some time in the future.
- No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.
- There are no known coal mine entries within, or within 20 metres of, the boundary of the property.
- The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.
- The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994.
- There is no current Stop Notice delaying the start of remedial works or repairs to the property.
- The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
- The Coal Authority has no record of a mine gas emission requiring action.

Based on the above information and site geological setting there is considered to be **low risk** associated with coal mine related subsidence. No further investigation of coal mine related issues is considered to be necessary.

4.4 Brine Workings

The site is not situated within the Cheshire salt field and is therefore not considered to be at risk from brine excavation related subsidence.

4.5 Hydrology

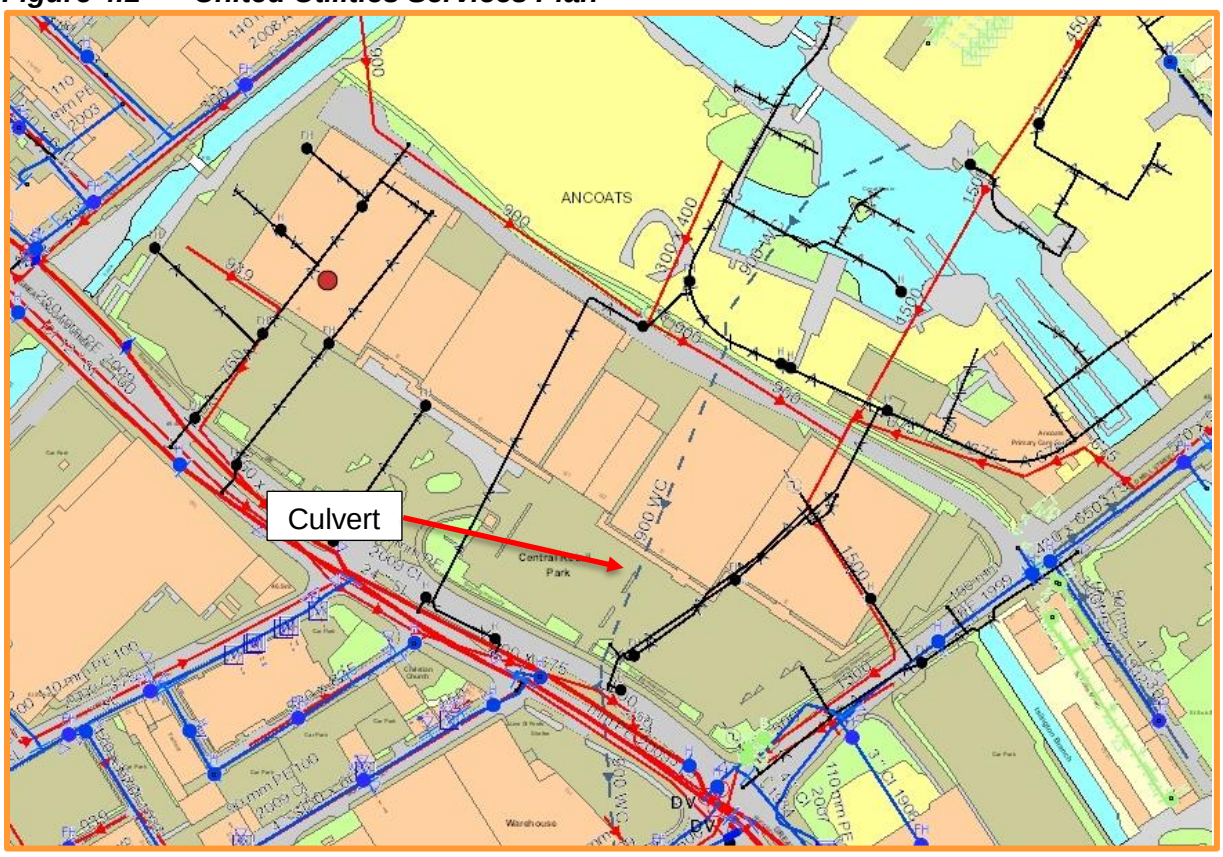
Surface water features within 250m of the subject site are summarised in Table 4.5.

Table 4.5 Surface Water Features

SURFACE WATER FEATURE	DISTANCE (m)	DIRECTION
Rochdale Canal	Adjacent	Northwest
Islington Wharf Marina	30m	Northeast
Ashton Canal (Islington Wharf Branch)	30m	Southeast

United Utilities plans indicate that a surface watercourse passes beneath the subject site through a 900mm diameter pipe. Information obtained from Hidden Manchester Map indicates that this is the culverted Newton Brook. A excerpt of the United Utilities services plan is presented as Figure 4.1.

Figure 4.1 United Utilities Services Plan



The site is predominantly located within a currently defined Flood Risk Zone 1; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (<0.1%), and as such is considered to be unaffected by river flooding.

4.6 Radon Risk Potential

The Envirocheck Report indicates the site is situated in an area where less than 1% of homes are above the Action Level and that the BGS reports that full radon protective measures are not necessary in the construction of new dwellings or extensions.

4.7 Industrial Land Uses

The site is located within a predominantly commercial area though some smaller light industrial activities are identified within 250m of the site including an aluminium and scrap metal processing activity approximately 110m to the south.

4.8 Sensitive Land Uses

The closest residential properties are located approximately 170m to the northeast.

No other environmentally sensitive land uses have been identified within close proximity to the site.

4.9 Site Sensitivity Assessment

The site is assessed to be located within a low to moderate sensitivity setting as discussed within Table 4.5.

Table 4.5 Site Sensitivity Assessment

SESITIVITY PROFILE	DISCUSSION	RATING
Sensitive land uses within close proximity (e.g. residential, school, nursery, local nature reserves etc.)	A school is located adjacent to the northern boundary and residential apartments are present to the east of the subject site beyong Old Mill Street	**Moderate**
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	None	**Low**
Distance to the closest groundwater abstraction point.	The closest identified abstraction is 720m from the subject site. This abstraction may have ceased and is likely to be from the confined Chester Pebble Bed Aquifer.	**Low**
Aquifer Classification in Superficial Drift Deposits.	Secondary Undifferentiated	**Low**
Aquifer classification in Bedrock.	Principal Aquifer	**High**
Is the site underlain by low permeability Drift to depths in excess of 10.0m?	BGS boreholes records confirm that there is in excess of 20m low permeability Clay drift beneath the site.	**Low**
Is the site located within 50m of a surface watercourse?	Branches of the Ashton and Rochdale Canals are located in close proximity of the subject site. These watercourses are managed and not considered likely to be in continuity with shallow groundwater due to the nature of the underlying drift and likely presence of engineered channel structures. Canals in this area are known to contribute shallow groundwater through leakage. A surface water culvert is recorded cross the site NE to SW through the central sector of the site.	**Low/Moderate**
Overall Site Environmental Sensitivity		**Low/Moderate**

4.10 Preliminary Geotechnical Assessment

Based on the desk study information, the following geotechnical assessment has been made:

- Historical development has been identified at the site and the presence of below ground structures and areas of deep Made Ground cannot be entirely discounted;
- A culverted watercourse is reported to be present beneath the subject site;
- The underlying clay stratum may be susceptible to changes in natural moisture content and result in heave and/or desiccation.

4.11 Unexploded Ordnance

The regional unexploded bomb risk map from Zetica indicates that the site is in an area at moderate risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. (Zetica, 2014). However, it should be noted that the site has underground significant redevelopment in the construction of current retail park and it is therefore considered unlikely that any existing UXO will be present.

5. CONSULTATIONS

5.1 Landfill Sites and Waste Treatment Sites

No current or historical landfill sites have been identified within a 250m radius of the subject site.

5.2 Regulatory Database

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250m of the subject site and not otherwise detailed in the report.

Table 5.1 Summary of Environmental Data

RECORD	ENTRIES WITHIN 250m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified (N/A).
Authorised industrial processes (IPC/IPPC/LAPPC).	1	Presbar Diecasting Ltd operate a PG2/1 and PG2/6 Part B Authorisation for approximately 110m to the south.
Fuel Stations Entries	0	N/A
Licensed radioactive substances	0	N/A
Enforcements, prohibitions or prosecutions	0	N/A
Discharge Consents	0	There are no currently active discharge consents within 250m of the subject site.
Pollution Incidents	8	Eight Category 3 Minor Pollution Incidents are identified within a 250m radius. All the incidents are to the Aston and Rochdale Canals including two immediately adjacent.
Consents issued under the Planning (Hazardous Substances) Act 1990	0	N/A
Control of Major Accident Hazard (COMAH) sites	0	N/A

6. INITIAL CONCEPTUAL SITE MODEL

6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P Ltd has developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

Table 6.1 Initial Conceptual Site Model

SOURCE	PATHWAY	RECEPTOR
Human Health		
Heavy metals, non volatile petroleum hydrocarbons and Polycyclic Aromatic Hydrocarbon (PAH) within Made Ground	Dermal Contact and Ingestion	Construction Workers Residential End Users
Discussion: Historical map research indicates that the site has had a variety of uses including saw mills, timber yard, mills, engineering works and depots in addition to wider areas of residential development. Made Ground associated with these uses may be a potential source of heavy metals and PAH. These compounds may pose a risk to future construction workers who may come into direct contact with any impacted Made Ground during enabling works and to future end users who may be exposed to impacted Made Ground in landscaped areas.		
Volatile hydrocarbon compounds associated within vehicle repair facilities and various works	Volatilisation / Accumulation, Vapour Inhalation	Construction Workers, Residential End Users
Discussion: As discussed above, historical uses may have resulted in impact to the sub surface and these may also include volatile petroleum hydrocarbons. Impacts associated with hydrocarbons tend to be localised to former storage facilities and if present may pose a risk to construction workers and future end users through inhalation of vapour either within confined spaces (excavations) or within indoor air.		
Asbestos Containing Materials (ACM) within Made Ground	Fibre / Dust Inhalation	Construction Workers Residential End Users Third Party Property
Discussion: Former buildings at the site may have been constructed with asbestos and their subsequent demolition may have resulted in impact within on-site Made Ground. If ACM is present within Made Ground then this could be released during enabling works and pose a risk to construction workers and adjacent properties. End users may be exposed to fibres should impacted Made Ground be present in landscaped areas.		
Hazardous Ground Gases		
Methane and Carbon Dioxide associated with possible on-site fill material	Inhalation Accumulation	Construction Workers Residential End Users
Discussion: Demolition material can contain timber and other potentially degradable material that can result in the generation of ground gases such as methane and carbon dioxide. Additionally, should there be any localised hydrocarbon impact this may also result in the generation of ground gas. Ground gas can accumulate within excavations and within confined spaces such as service ducts and pose a risk to construction workers and end users through inhalation or accumulation to explosive levels.		

SOURCE	PATHWAY	RECEPTOR
Controlled Waters		
Hydrocarbon compounds associated within historical vehicle repair and works facilities	Vertical / Lateral Migration	Principal Aquifer Adjacent Canals
Discussion: As discussed above, potentially mobile contaminants may be present at the site but the site is located within an area that is mapped as being underlain by a significant thickness of likely low permeability Glacial Till. The till will restrict lateral and vertical migration of mobile contaminants and under existing conditions the risk to controlled waters is low. Additional consideration of pathways may be needed, particularly if deep piled foundations are utilised as these may penetrate the till and set within the underlying sandstone Principal Aquifer.		
Buildings and Infrastructure		
pH & Sulphate	Corrosion of Concrete	Foundations / Concrete
Discussion: Presence of elevated pH and sulphate within Made Ground deposits may result in corrosion of buried concrete within the proposed development. Assessment must be undertaken to confirm the levels of pH and sulphate within Made Ground deposits and thus determine the concrete classification.		
Ecology		
None Identified	N/A	N/A
Discussion: The site is an operating, modern retail park and no potentially sensitive ecological receptors are considered likely to be present at the site or within the surrounding area.		

7. E3P INTRUSIVE GROUND INVESTIGATION

7.1 General Overview

A Ground Investigation has been designed based on the findings of the desk study with exploratory holes advanced to target specific potential contaminant sources summarised in Table 6.1. Some features could not be targeted as they are located beneath existing buildings or services. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed between the 7th June 2017 and the 13th July 2017. The works are summarised in Table 7.1 below.

Table 7.1 Summary of Fieldwork

POTENTIAL SOURCE/ RATIONALE	LOCATION HOLE	TYPE	MAX DEPTH (mbgl)	MONITORING WELLS RESPONSE ZONE (mbgl)
Timber Yard	WS101	Window Sample	3.45	1.0-2.0
Backfilled Canal	WS102	Window Sample	1.80	0.5-1.8
Southern Boundary	WS103	Window Sample	5.45	1.0-4.0
Church/basements	WS104	Window Sample	5.45	-
Church/basements	WS105	Window Sample	5.45	1.0-5.0
Timber shed/warehouse	WS106	Window Sample	5.45	1.0-5.0
Central sector	WS107	Window Sample	5.45	1.0-5.0
Central sector	WS108	Window Sample	5.45	-
Timber Shed/Tin Works	WS109	Window Sample	5.45	1.0-3.0
Southern boundary	WS110	Window Sample	5.45	-
Engineering works	WS111	Window Sample	5.45	1.0-5.0
Timber shed/Tin Works	WS112	Window Sample	4.45	-
Southern boundary	WS113	Window Sample	5.45	-
Timber shed/Tin Works	WS114	Window Sample	6.45	-
Backfilled canal	WS115	Window Sample	1.30	-
Timber shed/Tin Works/Cabinet works	WS116	Window Sample	5.45	-
Northern boundary	WS117	Window Sample	5.00	-
Timber shed/Tin Works/Cabinet works	WS118	Window Sample	0.70	-
Clothing works	WS119	Window Sample	5.45	-
Sun Mill	WS120	Window Sample	5.45	0.5-2.5
Central northern sector	WS121	Window Sample	5.45	1.0-5.0
Abandoned due to services	WS122	Window Sample	-	-
	WS123	Window Sample	-	-
	WS124	Window Sample	-	-
Clothing works	WS125	Window Sample	5.45	-
Assess depth to rock head and obtain core samples for rock strength analysis.	BH101	Shell & Auger (Rotary Follow-on)	39.00	
	BH102	Shell & Auger (Rotary Follow-on)	39.00	
	BH103	Shell & Auger (Rotary Follow-on)	39.00	
	BH104	Shell & Auger	17.00	
	BH105	Shell & Auger (Rotary Follow-on)	34.50	
	BH106	Shell & Auger (Rotary Follow-on)	26.30	

The sampling locations are illustrated in Drawing 11-834-003 (Appendix III). The ground conditions encountered are indicated on the logs which are provided in Appendix VI.

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

7.2 In-Situ Standard Penetration Testing (SPT)

In-situ geotechnical testing was conducted using the Standard Penetration Test (SPT) and where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in Appendix VI and presented in Table 9.4 and discussed in Section 10.0.

7.3 Laboratory Analysis

Soils

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

- Metals, pH, total sulphate, water soluble sulphate (2:1 extract), sulphide, cyanide, phenols, total and speciated poly-aromatic hydrocarbons (PAHs), SVOCs, VOCs, asbestos and total and speciated petroleum hydrocarbon (TPH).

Additionally, selected samples of Made Ground also had leachate testing completed for metal, TPH and PAH.

Groundwater

Groundwater samples were obtained from within shallow wells and deeper monitoring that were constructed into the underlying Principal Aquifer. The groundwater samples were tested for the following:

- Metals, pH, cyanide, total and speciated poly-aromatic hydrocarbons (PAHs), SVOCs, VOCs, total and speciated petroleum hydrocarbon (TPH).

Shallow groundwater samples were obtained using a low flow sampling method. Deeper groundwater samples were obtained using disposable bailers. I2 Analytical undertook the analytical work and the testing results are included in Appendix VII and discussed in Section 9.0.

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

- Atterberg Limits Determinations;
- Single Stage Triaxial Tests;
- Point Load Analysis;
- Unconfined Compressive Strength (UCS).

Laboratory analysis sheets are included in Appendix IX and are summarised in Section 10.0:

8. GROUND AND GROUNDWATER CONDITIONS

8.1 Ground and Groundwater Conditions

8.1.1 Summary of Ground Conditions

The Ground Investigation generally confirms the published geology and identifies the strata set out in Table 8.1 below:

Table 8.1 Summary of Strata

STRATA	GENERAL DESCRIPTION	TYPICAL DEPTH (mbgl):				LOCATION
		TOP:		BASE:		
		MIN:	MAX:	MIN:	MAX:	
Surface Cover	Generally surface cover comprises decorative brick or concrete that is underlain by a variably thick granular sub-base of limestone.	-	-	0.15	0.70	All
MADE GROUND	Loose to dense, locally grey and brown, clayey, sandy gravel and gravelly sand. Gravel is fine to coarse sub-angular to sub-rounded of clinker, brick, ash, limestone, mudstone, slate, timber and rare porcelain.	0.15	0.70	0.40	5.00	All
CLAY	Firm to very stiff, brown and grey silty, locally sandy and gravelly CLAY. Gravel is fine, sub-angular of coal and sandstone.	0.40	5.00	3.45	28.5	All
SAND	Medium dense, brown, slightly gravelly clayey fine to medium SAND. Gravel is fine, sub-angular to sub-rounded of mudstone and coal.	4.40	4.70	3.45	33.0	WS102, WS121, BH101, BH102, BH103, BH104, BH105, BH106
SANDSTONE	Red Sandstone. Upper horizons highly weathered and returned as gravelly SAND with lithorelics of SANDSTONE.	24.50	28.50	24.50	33.00	BH101, BH103, BH104, BH105, BH106

8.1.2 Made Ground

Made Ground has been recorded in all exploration locations as a variable gravelly sand and sandy gravel with various anthropogenic materials as summarised in Table 8.1. No visual or olfactory evidence of hydrocarbon impact was observed.

The investigation has identified a notably thicker band of Made Ground that appears to trend broadly north to south through the central-eastern sector of the site. The fill in this location was proven to a maximum depth of between 5.0 and 5.1m bgl (WS114 and WS115) and these locations corresponds with the general trend of the culverted brook and perhaps indicates backfilled channel. Similarly, thicker Made Ground was recorded in the eastern sector of site (WS102 and WS115) were between 1.3m and 1.8m was recorded. This is in the mapped locality of a former canal channel. Within the remaining locations at the site, Made Ground was relatively uniform and recorded to between 0.4m and 1.1m thick.

A Depth of Made Ground Plan is presented as Drawing 11-834-004 in Appendix III.

8.1.3 Drift Deposits

The underlying drift stratum beneath the site comprise of bands of gravelly and sandy gravelly CLAY with local horizons of more silty CLAY. Horizons of gravelly SAND have been recorded in the drift at depth within the deeper boreholes.

The drift was proven to a maximum depth of 29m bgl in BH102 where a dense sandy GRAVEL was encountered to 29.3m bgl. The upper weathered Sandstone was recorded to full depth of BH102 but could not be penetrated.

8.1.4 Solid Geology

The solid bedrock geology comprises upper weathered horizons returned as fine to medium SAND with lithorelics of Sandstone that becomes rock at depths of 24.50m bgl and 33.00m bgl.

A Depth to Bedrock Plan is presented as Drawing 11-834-005 in Appendix III.

8.1.5 Soil Consistency

Undrained shear strength values were measured using both field hand shear vane tests and laboratory undrained triaxial tests. Results of the tests are presented in Table 8.2 and 8.3 below which indicate the clay soils to vary between stiff and very stiff. Strength test data is generally consistent with the field descriptions of the soils given above.

Table 8.2 Summary of Undrained Shear Strength Test Results

LOCATION	SAMPLE DEPTH (m)	LAB DESCRIPTION	UNDRAINED SHEAR STRENGTH (kN/m^2)	CONSISTENCY
WS105	0.5-1.0	Stiff brown slightly gravelly sandy CLAY	107	Stiff
WS117	2.5-3.0	Very stiff brown slightly gravelly sandy CLAY	170	Very Stiff

Results of the Standard Penetration Tests, including undrained shear strengths derived from SPTs are included on Table 8.3.

8.1.6 Side Stability and Ease of Excavation

The window sample probeholes were generally able to penetrate the Made Ground but refused in three locations (WS102, WS115 and WS118). In three other locations, the positions were abandoned due to the presence of services.

Table 8.3 Standard/Cone Penetration Test Results

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS101	1	MG: clayey gravel	15	15.12	Medium Dense	N/A	N/A	N/A
WS101	2	slightly sandy CLAY	15	13.70	N/A	Medium strength	Stiff	68.52
WS101	3	slightly sandy CLAY	19	16.52	N/A	High strength	Very Stiff	82.62
WS102	1	MG: gravelly sand	38	38.31	Dense	N/A	N/A	N/A
WS102	1.8	MG: gravelly sand	50	46.32	Dense	N/A	N/A	N/A
WS103	1	slightly sandy CLAY	16	16.13	N/A	High strength	Very Stiff	80.65
WS103	2	slightly sandy CLAY	24	21.92	N/A	High strength	Very Stiff	109.62
WS103	3	slightly sandy CLAY	26	22.61	N/A	High strength	Very Stiff	113.05
WS103	5	slightly sandy CLAY	31	25.72	N/A	High strength	Very Stiff	128.59
WS104	1	slightly sandy CLAY	12	12.10	N/A	Medium strength	Stiff	60.49
WS104	2	slightly sandy CLAY	19	17.36	N/A	High strength	Very Stiff	86.79
WS104	3	slightly sandy CLAY	16	13.91	N/A	Medium strength	Stiff	69.57
WS104	4	slightly sandy CLAY	18	15.21	N/A	High strength	Very Stiff	76.04
WS105	1	slightly silty CLAY	12	12.10	N/A	Medium strength	Stiff	60.49
WS105	2	slightly silty CLAY	18	16.44	N/A	High strength	Very Stiff	82.22
WS105	3	slightly silty CLAY	19	16.52	N/A	High strength	Very Stiff	82.62
WS105	4	slightly silty CLAY	18	15.21	N/A	High strength	Very Stiff	76.04
WS105	5	very gravelly CLAY	14	11.61	N/A	Medium strength	Stiff	58.07
WS106	1	slightly silty CLAY	13	13.11	N/A	Medium strength	Stiff	65.53
WS106	2	slightly silty CLAY	16	14.62	N/A	Medium strength	Stiff	73.08
WS106	3	slightly silty CLAY	14	12.18	N/A	Medium strength	Stiff	60.88
WS106	4	slightly silty CLAY	22	18.59	N/A	High strength	Very Stiff	92.93
WS106	5	slightly silty CLAY	29	24.06	N/A	High strength	Very Stiff	120.30
WS107	1	slightly sandy CLAY	6	6.05	N/A	Low strength	Firm	30.24
WS107	2	slightly sandy CLAY	14	12.79	N/A	Medium strength	Stiff	63.95
WS107	3	slightly sandy CLAY	12	10.44	N/A	Medium strength	Stiff	52.18
WS107	4	slightly sandy CLAY	21	17.74	N/A	High strength	Very Stiff	88.71
WS107	5	slightly sandy CLAY	27	22.40	N/A	High strength	Very Stiff	112.00

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS108	1	MG: slightly sandy very clayey gravel	6	6.05	Loose	N/A	N/A	N/A
WS108	2	MG: slightly sandy very clayey gravel	10	9.14	Loose	N/A	N/A	N/A
WS108	3	MG: slightly sandy very clayey gravel	6	5.22	Loose	N/A	N/A	N/A
WS108	4	slightly sandy CLAY	21	17.74	N/A	High strength	Very Stiff	88.71
WS108	5	slightly sandy CLAY	23	19.08	N/A	High strength	Very Stiff	95.41
WS109	1	MG: slightly sandy clayey gravel	22	22.18	Medium Dense	N/A	N/A	N/A
WS109	2	MG: slightly sandy clayey gravel	8	7.31	Loose	N/A	N/A	N/A
WS109	3	MG:slightly sandy clayey gravel	11	9.57	Loose	N/A	N/A	N/A
WS109	4	slightly sandy CLAY	22	18.59	N/A	High strength	Very Stiff	92.93
WS109	5	slightly sandy CLAY	20	16.59	N/A	High strength	Very Stiff	82.96
WS110	1	MG: Slightly sandy very gravelly clay	16	16.13	N/A	High strength	Very Stiff	80.65
WS110	2	MG: gravel	10	9.14	Loose	N/A	N/A	N/A
WS110	3	MG: gravel	16	13.91	Medium Dense	N/A	N/A	N/A
WS110	4	CLAY	33	27.88	N/A	High strength	Very Stiff	139.40
WS110	5	CLAY	24	19.91	N/A	High strength	Very Stiff	99.55
WS111	1	slightly silty CLAY	12	12.10	N/A	Medium strength	Stiff	60.49
WS111	2	slightly silty CLAY	23	21.01	N/A	High strength	Very Stiff	105.06
WS111	3	slightly silty CLAY	24	20.87	N/A	High strength	Very Stiff	104.36
WS111	4	slightly silty CLAY	23	42.24	N/A	Very high strength	Very Stiff	211.21
WS111	5	slightly silty CLAY	23	19.08	N/A	High strength	Very Stiff	95.41
WS112	1	MG: slightly clayey slightly sandy gravel	50	50.41	Very Dense	N/A	N/A	N/A
WS112	2	MG: sandy gravel	11	10.05	Medium Dense	N/A	N/A	N/A
WS112	3	MG: Sandy Gravel	20	17.39	Medium Dense	N/A	N/A	N/A
WS112	4	Slightly Silty CLAY	50	42.24	N/A	Very high strength	Very Stiff	211.21
WS113	5	Slightly Silty CLAY	28	23.23	N/A	High strength	WS113	5

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS113	1	MG: Very Sandy Gravel	24	24.20	Medium Dense	N/A	WS113	1
WS113	2	MG:Sandy Gravel	7	6.39	Loose	N/A	ws113	2
WS113	1	MG: Very Sandy Gravel	24	24.20	Medium Dense	N/A	N/A	N/A
WS113	2	MG:Sandy Gravel	7	6.39	Loose	N/A	N/A	N/A
WS113	3	MG: Sandy Gravel	0	0.00	FALSE	N/A	ws113	3
WS113	4	Silty CLAY	23	19.43	N/A	High strength	Very Stiff	97.16
WS113	5	Slightly Silty CLAY	28	23.23	N/A	High strength	Very Stiff	116.15
WS114	1	MG: Slightly Clayey Slightly Sandy Gravel	4	4.03	Loose	N/A	N/A	N/A
WS114	2	MG: Slightly Clayey Gravel	16	14.62	Medium Dense	N/A	N/A	N/A
WS114	3	MG: Slightly Clayey Gravel	5	4.35	Loose	N/A	N/A	N/A
WS114	4	MG: Slightly Clayey Gravel	0	0.00	FALSE	N/A	N/A	N/A
WS114	5	Clay	26	21.57	N/A	High strength	Very Stiff	107.85
WS115	1	MG: Very Clayey Gravelly Sand	50	50.41	Very Dense	N/A	N/A	N/A
WS116	1	MG: Sandy Gravel	12	12.10	Medium Dense	N/A	N/A	N/A
WS116	2	MG: Gravel	4	3.65	Very Loose	N/A	N/A	N/A
WS116	3	MG: Gravelly Sandy Clay	4	3.48	N/A	Very low strength	Soft	17.39
WS116	4	MG: Gravelly Sandy Clay	8	6.76	N/A	Low strength	Firm	33.79
WS116	5	MG: Gravelly Silty Sand	13	10.79	Medium Dense	N/A	N/A	N/A
WS117	1	Slightly Gravelly CLAY	17	17.14	N/A	High strength	Very Stiff	85.69
WS117	2	Slightly Gravelly CLAY	17	15.53	N/A	High strength	Very Stiff	77.65
WS117	3	Slightly Gravelly CLAY	16	13.91	N/A	Medium strength	Stiff	69.57
WS117	4	Clay	24	20.28	N/A	High strength	Very Stiff	101.38
WS117	5	Clay	27	22.40	N/A	High strength	Very Stiff	112.00
WS118	0.5	MG: Slightly Clayey Sandy Gravel	50	56.02	Very Dense	N/A	N/A	N/A
WS119	1	Slightly Sandy CLAY	16	16.13	N/A	High strength	Very Stiff	80.65
WS119	2	Slightly Sandy CLAY	16	14.62	N/A	Medium strength	Stiff	73.08
WS119	3	Slightly Sandy CLAY	15	13.04	N/A	Medium strength	Stiff	65.22
WS119	4	Slightly Sandy CLAY	24	20.28	N/A	High strength	Very Stiff	101.38

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
WS119	5	Slightly Sandy CLAY	24	19.91	N/A	High strength	Very Stiff	99.55
WS120	1	MG: Gravelly Sand	39	39.32	Dense	N/A	N/A	N/A
WS120	2	MG: Gravelly Sand	11	10.05	Medium Dense	N/A	N/A	N/A
WS120	3	Slightly Gravelly CLAY	15	13.04	N/A	Medium strength	Stiff	65.22
WS120	4	Slightly Gravelly CLAY	27	22.81	N/A	High strength	Very Stiff	114.05
WS120	5	Slightly Gravelly CLAY	26	21.57	N/A	High strength	Very Stiff	107.85
WS121	1	Slightly Gravelly CLAY	16	16.13	N/A	High strength	Very Stiff	80.65
WS121	2	Slightly Gravelly CLAY	20	18.27	N/A	High strength	Very Stiff	91.35
WS121	3	Slightly Gravelly CLAY	18	15.65	N/A	High strength	Very Stiff	78.27
WS121	4	Slightly Gravelly CLAY	19	16.05	N/A	High strength	Very Stiff	80.26
WS121	5	Slightly Gravelly Clayey SAND	29	24.06	Medium Dense	N/A	N/A	N/A
WS125	1	Slightly Sandy CLAY	15	15.12	N/A	High strength	Very Stiff	75.61
WS125	2	Slightly Sandy CLAY	20	18.27	N/A	High strength	Very Stiff	91.35
WS125	3	Slightly Sandy CLAY	18	15.65	N/A	High strength	Very Stiff	78.27
WS125	4	Slightly Sandy CLAY	15	12.67	N/A	Medium strength	Stiff	63.36
WS125	5	Slightly Sandy CLAY	13	10.79	N/A	Medium strength	Stiff	53.93
BH101	1.2	Clay	12	11.77	N/A	Medium strength	Stiff	58.87
BH101	2	Clay	17	15.53	N/A	High strength	Very Stiff	77.65
BH101	3	Clay	23	20.00	N/A	High strength	Very Stiff	100.01
BH101	4	Clay	23	19.43	N/A	High strength	Very Stiff	97.16
BH101	5	Clay	27	22.40	N/A	High strength	Very Stiff	112.00
BH101	8	Clay	26	21.05	N/A	High strength	Very Stiff	105.23
BH101	11	Clay	24	18.56	N/A	High strength	Very Stiff	92.80
BH101	12.5	Clay	26	19.00	N/A	High strength	Very Stiff	94.98
BH101	14	Clay	23	15.93	N/A	High strength	Very Stiff	79.66
BH101	15.5	Clay	31	20.42	N/A	High strength	Very Stiff	102.10
BH101	18.5	Clay	35	20.98	N/A	High strength	Very Stiff	104.91

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH101	20	Clay	13	7.45	N/A	Low strength	Firm	37.27
BH101	21.5	Clay	13	7.14	N/A	Low strength	Firm	35.70
BH101	23	Clay	41	21.59	N/A	High strength	Very Stiff	107.97
BH101	1.2	Clay	12	11.77	N/A	Medium strength	Stiff	58.87
BH101	2	Clay	17	15.53	N/A	High strength	Very Stiff	77.65
BH101	3	Clay	23	20.00	N/A	High strength	Very Stiff	100.01
BH101	4	Clay	23	19.43	N/A	High strength	Very Stiff	97.16
BH101	5	Clay	27	22.40	N/A	High strength	Very Stiff	112.00
BH102	1.5	Clay	17	16.15	N/A	High strength	Very Stiff	80.76
BH102	2.5	Clay	31	27.53	N/A	High strength	Very Stiff	137.67
BH102	3	Clay	50	43.48	N/A	Very high strength	Very Stiff	217.41
BH102	3.5	Clayey sand	4	3.42	Very Loose	N/A	N/A	N/A
BH102	4.5	Sand and Gravel	15	12.55	Medium Dense	N/A	N/A	N/A
BH102	7.5	Sand and gravel	15	12.17	Medium Dense	N/A	N/A	N/A
BH102	9	Sand and gravel	15	12.10	Medium Dense	N/A	N/A	N/A
BH102	10.5	Sand And Gravel	21	16.57	Medium Dense	N/A	N/A	N/A
BH102	12	Clayey Sand	44	32.75	Dense	N/A	N/A	N/A
BH102	13.5	Clay	50	35.24	N/A	Very high strength	Very Stiff	176.22
BH102	15	Clay	30	20.09	N/A	High strength	Very Stiff	100.45
BH102	18	Clay	31	18.87	N/A	High strength	Very Stiff	94.34
BH102	19.5	Sand And Gravel	22	12.80	Medium Dense	N/A	N/A	N/A
BH102	21	Clay	50	27.86	N/A	High strength	Very Stiff	139.28
BH102	22.5	Clay	50	26.70	N/A	High strength	Very Stiff	133.51
BH102	24	Clay	49	25.11	N/A	High strength	Very Stiff	125.56
BH102	25	Clay	33	16.46	N/A	High strength	Very Stiff	82.31
BH102	27	Clay	29	13.72	N/A	Medium strength	Stiff	68.60
BH102	28.5	Sand And Gravel	56	25.48	Medium Dense	N/A	N/A	N/A
BH102	31.5	Sand And Gravel	50	21.08	Medium Dense	N/A	N/A	N/A
BH102	33	Sand And Gravel	50	20.30	Medium Dense	N/A	N/A	N/A

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH103	1.2	Clay	11	10.79	N/A	Medium strength	Stiff	53.97
BH103	2	Clay	18	16.44	N/A	High strength	Very Stiff	82.22
BH103	3	Clay	24	20.87	N/A	High strength	Very Stiff	104.36
BH103	4	Clay	25	21.12	N/A	High strength	Very Stiff	105.61
BH103	5	Clay	29	24.06	N/A	High strength	Very Stiff	120.30
BH103	8	Clay	25	20.24	N/A	High strength	Very Stiff	101.18
BH103	11	Clay	43	33.25	N/A	Very high strength	Very Stiff	166.27
BH103	12.5	Clay	46	33.61	N/A	Very high strength	Very Stiff	168.04
BH103	14	Clay	22	15.24	N/A	High strength	Very Stiff	76.20
BH103	15.5	Clay	45	29.64	N/A	High strength	Very Stiff	148.20
BH103	16.8	Clay	50	31.59	N/A	Very high strength	Very Stiff	157.94
BH103	18.5	Clay	23	13.79	N/A	Medium strength	Stiff	68.94
BH103	20	Clay	22	12.62	N/A	Medium strength	Stiff	63.08
BH103	23	Clay	50	26.34	N/A	High strength	Very Stiff	131.68
BH103	21.5	Sand And Gravel	32	17.58	Medium Dense	N/A	N/A	N/A
BH103	24.5	Sand And Gravel	50	25.28	Medium Dense	N/A	N/A	N/A
BH103	26	Sand And Gravel	50	24.29	Medium Dense	N/A	N/A	N/A
BH103	27.5	Sand And Gravel	49	22.88	Medium Dense	N/A	N/A	N/A
BH103	28.5	Weathered Sandstone	50	22.75	Medium Dense	N/A	N/A	N/A
BH104	3	sandy clay	26	22.61	N/A	High strength	Very Stiff	113.05
BH104	4	sandy clay	29	24.50	N/A	High strength	Very Stiff	122.50
BH104	5	sandy clay	14	11.61	N/A	Medium strength	Stiff	58.07
BH104	8	sandy clay	15	12.14	N/A	Medium strength	Stiff	60.71
BH104	11	sandy clay	26	20.11	N/A	High strength	Very Stiff	100.54
BH104	14	sandy clay	30	20.78	N/A	High strength	Very Stiff	103.91
BH104	12.5	sand	37	27.03	Medium Dense	N/A	N/A	N/A
BH104	15.5	sandy clay	37	24.37	N/A	High strength	Very Stiff	121.86
BH104	17	sandy clay	36	22.60	N/A	High strength	Very Stiff	113.00
BH105	4.5	Gravelly Clay	20	16.73	N/A	High strength	Very Stiff	83.64

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH105	6	Gravelly Clay	18	14.76	N/A	Medium strength	Stiff	73.79
BH105	9	Gravelly Clay	19	15.33	N/A	High strength	Very Stiff	76.65
BH105	12	Gravelly Clay	46	34.24	N/A	Very high strength	Very Stiff	171.18
BH105	13.5	Gravelly Clay	40	28.20	N/A	High strength	Very Stiff	140.98
BH105	2.5	Made Ground	50	44.41	Dense	N/A	N/A	N/A
BH105	3.5	Made Ground	50	42.78	Dense	N/A	N/A	N/A
BH105	15	Sand And Gravel	44	29.46	Medium Dense	N/A	N/A	N/A
BH105	16.5	Sand And Gravel	40	25.51	Medium Dense	N/A	N/A	N/A
BH105	18	Clayey Sand	46	28.00	Medium Dense	N/A	N/A	N/A
BH105	19.5	Sand And Gravel	50	29.10	Medium Dense	N/A	N/A	N/A
BH105	21	Sand And Gravel	39	21.73	Medium Dense	N/A	N/A	N/A
BH105	22.5	Sand And Gravel	37	19.76	Medium Dense	N/A	N/A	N/A
BH105	24	Sand And Gravel	50	25.62	Medium Dense	N/A	N/A	N/A
BH105	25	Sand And Gravel	46	22.95	Medium Dense	N/A	N/A	N/A
BH105	27	Sand And Gravel	43	20.34	Medium Dense	N/A	N/A	N/A
BH105	28.5	Sand And Gravel	55	25.03	Medium Dense	N/A	N/A	N/A
BH105	29.5	Weathered Sandstone	50	22.17	Medium Dense	N/A	N/A	N/A
BH106	2	Gravelly Clay	4	3.65	N/A	Very low strength	Soft	18.27
BH106	3	Gravelly Clay	3	2.61	N/A	Very low strength	Soft	13.04
BH106	4	Gravelly Clay	11	9.29	N/A	Medium strength	Stiff	46.47
BH106	5	Gravelly Clay	12	9.96	N/A	Medium strength	Stiff	49.78
BH106	8	Gravelly Clay	20	16.19	N/A	High strength	Very Stiff	80.95
BH106	9.5	Gravelly Clay	23	18.54	N/A	High strength	Very Stiff	92.68
BH106	11	Gravelly Clay	92	71.15	N/A	Extremely high strength	Very Stiff	355.75
BH106	12.5	Gravelly Clay	32	23.38	N/A	High strength	Very Stiff	116.90
BH106	14	Gravelly Clay	50	34.64	N/A	Very high strength	Very Stiff	173.18
BH106	18.5	Sandy Clay	37	22.18	N/A	High strength	Very Stiff	110.91
BH106	20	Sandy Clay	35	20.07	N/A	High strength	Very Stiff	100.35
BH106	23	Gravelly Clay	42	22.12	N/A	High strength	Very Stiff	110.61

BOREHOLES	DEPTH (mbgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m^2)
BH106	1.2	Made Ground	14	13.74	Medium Dense	N/A	N/A	N/A
BH106	15.5	Sand And Gravel	50	32.93	Dense	N/A	N/A	N/A
BH106	17	Sand And Gravel	50	31.39	Dense	N/A	N/A	N/A
BH106	21.5	Sand And Gravel	19	10.44	Medium Dense	N/A	N/A	N/A
BH106	24.5	Weathered Sandstone	50	25.28	Medium Dense	N/A	N/A	N/A
BH106	26.3	Weathered Sandstone	50	24.09	Medium Dense	N/A	N/A	N/A

8.1.7 Soil Infiltration

Considering the significant thickness of low permeability clay on the site, it is considered that soakaway drainage may not be suitable for the proposed development. However, the application of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365 – *Soakaway Design*.

8.1.8 Soil Plasticity

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each "type" of clay, although judgement is applied where variable results are reported.

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

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

PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised January 2014), which advocates the use of modified Plasticity Index (I'p), defined as:

I'p = Ip * (%< 425µm/100)

ie if PI is 30%, but the soil contains 80% < 425µm, then: I'p = 30 * 80/100 = 24%.

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

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

The Atterberg Limits determinations, summarised in Table 8.4 below, show the clay to be of predominantly low to moderate plasticity clay.

Table 8.4 Summary of Plasticity Index Test Results

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PERCENTAGE PASSING 425µm SIEVE (%)	MODIFIED PLASTICITY INDEX
WS111	2.0	15	18	35	17	96	16.32
WS113	4.0	14	17	34	17	94	15.98
WS114	6.0	17	20	39	20	92	18.40
WS108	3.0	18	18	36	18	94	16.92
WS106	2.0	20	34	59	34	97	32.98
WS104	3.0	18	20	40	20	95	19.00
WS103	3.0	19	21	41	21	96	20.16
WS101	3.0	22	24	46	24	91	21.84

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PERCENTAGE PASSING 425µm SIEVE (%)	MODIFIED PLASTICITY INDEX
WS119	2.0	17	19	38	19	97	18.43
WS116	5.0	17	21	40	21	69	14.49
WS120	3.0	15	37	17	20	93	18.60
WS121	2.0	15	38	18	20	94	18.80

8.1.9 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix VII (summarised below in Table 8.5), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).

Elevated sulphate concentrations meeting Class DS-2, AC-2 and DS2-AC3 were noted within the Made Ground deposits in WS125 and WS109 respectively.

Table 8.5 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER / SOIL (g/l)	pH VALUE	CLASSIFICATION
WS111	1.20	0.0543	8.3	DS1-AC1
WS114	2.40	0.199	8.8	DS1-AC1
WS107	0.90	0.0439	8.5	DS1-AC1
WS108	3.50	0.0601	8.4	DS1-AC1
WS109	2.90	1.61	7.2	DS3-AC3
WS125	0.40	0.585	10.7	DS2-AC2
WS106	0.55	0.0541	8.7	DS1-AC1
WS104	0.20	0.0112	9.2	DS1-AC1
WS105	1.30	0.122	8.4	DS1-AC1
WS103	4.20	0.0690	8.7	DS1-AC1
WS119	2.60	0.0597	8.6	DS1-AC1
WS116	0.40	0.0139	9.2	DS1-AC1
WS117	0.90	0.0246	8.3	DS1-AC1
WS117	3.90	0.107	8.4	DS1-AC1

8.2 Groundwater Conditions

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records and summarised in Table 8.6 overleaf. In the deeper boreholes it was necessary to add significant amounts of water to aid drilling and as such groundwater information is not included.

Table 8.6 Summary Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)	NOTES
WS101	1.90	Slow Ingress - Perched
WS106	4.00	
WS116	4.00	
WS125	5.10	
BH104	3.00	Slow Ingress - Perched

Monitoring was undertaken using an electronic dip meter and interface probe to record the depth to groundwater and the thickness of any free phase hydrocarbon product, if present.

The results of shallow groundwater monitoring are presented on Drawing 11-834-006 in Appendix III. The results indicate the shallow groundwater is deeper in the southern sector reflecting the relative thickness of the Made Ground.

Depth to groundwater within the deep monitoring wells are presented on Drawing 11-834-007 and indicate depths vary between 19.50m bgl in the east (BH104) and 24.4m bgl in the west (BH101) with a gradient of 0.017 determined.

Topographic surveying is to be completed to accurate define groundwater depths and flow and seasonal variation in groundwater depths is likely and should be considered going forward, particularly as infiltration through the low permeability Clay is likely to be limited.

8.3 Ground Gas

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

8.3.1 Investigation Rationale

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

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

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

Table 8.7 Ground Gas Monitoring Location Rationale

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS101	Made Ground	1.0-2.0
WS102	Made Ground	0.5-1.8
WS103	Glacial Till	1.0-4.0
WS105	Glacial Till	1.0-5.0
WS106	Glacial Till	1.0-5.0
WS107	Glacial Till	1.0-5.0
WS109	Made Ground	1.0-3.0
WS111	Glacial Till	1.0-5.0
WS116	Made Ground	1.0-5.0
WS120	Made Ground	0.5-2.5
WS121	Glacial Till	1.0-5.0

8.3.2 Monitoring Methodology

Concentrations of methane (CH_4), carbon dioxide (CO_2) and Oxygen (O_2) were measured using an infra-red gas analyser (GFM435) and gas flow rates were measured using an attached flow pod.

Gas measurements were recorded for a minimum of sixty seconds at each location, at which point the maximum concentration of CH_4 and CO_2 together with the lowest concentration of O_2 were recorded. The results of the ground gas monitoring are presented in Table 8.8 (overleaf).

Table 8.8 Summary of Ground Gas Monitoring Results

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS101	11/7/17	0	0	0	0	0	0	20.6	1001	Steady	-3.41	1.0-2.0	1.77	1.15
WS102	11/7/17	0	0	0	0.7	0.7	-0.01939	19.3	1001	Steady	-2.77	0.5-1.8	1.77	1.43
WS103	11/7/17	Under car										1.0-4.0		
WS105	11/7/17	0.1	0	-0.00159	0.4	0.4	-0.00636	20.4	1001	Steady	-1.59	1.0-5.0	4.97	4.20
WS106	11/7/17	Under a car										1.0-5.0		
WS107	11/7/17	0.5	0	-0.0108	0.7	0.7	-0.01512	19.7	1001	Steady	-2.16	1.0-5.0	4.61	2.02
WS109	11/7/17	Under a car										1.0-3.0		

WELL	DATE	CH_4 INITIAL %V/V	CH_4 STEADY %V/V	CH_4 GSV l/hr	CO_2 INITIAL %V/V	CO_2 STEADY %V/V	CO_2 GSV l/hr	O_2 %V/V	ATMOS(mB)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE / STRATUM (mbgl)	DEPTH TO BASE (mbgl)	DEPTH TO WATER (mbgl)
WS111	11/7/17	0	0	0	0.4	0.4	-0.00464	20.3	1001	Steady	-1.16	1.0-5.0	4.57	2.64
WS116	11/7/17	0	0	0	0.9	0.9	0	17.8	1001	Steady	0.0	1.0-5.0	4.77	2.97
WS120	11/7/17	0	0	0	0.6	0.6	-0.00078	20.1	1001	Steady	-0.13	0.5-2.5	2.5	1.72
WS121	11/7/17	0	0	0	0	0	0	20.7	1001	Steady	-2.52	1.0-5.0	4.53	0.48

9. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

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

9.1 Human Health Risk Assessment

At a Tier 1 stage the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM / CIEH S4UL (S4UL3267). In this instance as the proposed development will comprise residential appartments and as such E3P has utilised conservative Residential without Plant Uptake Tier I screening values.

The results of this comparison have been summarised within Table 9.1 (overleaf).

Table 9.1 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential (without plant uptake) Use

DETERMINAND	UNITS	GAC Resi w/o	N	MC	LOC. OF EX	PATHWAY	ASSESSMENT
Arsenic	mg/kg	40	14	29	-	1	No Further Action
Cadmium	mg/kg	85	14	0.9	-	1	No Further Action
Chromium (VI)	mg/kg	6	14	<4.0	-	1	No Further Action
Lead	mg/kg	200	14	1600	WS109 – 2.90m	1	Discussed Below
Mercury**	mg/kg	1.2	14	1.8	-	2	No Further Action
Nickel	mg/kg	180	14	40	-	1	No Further Action
Selenium	mg/kg	430	14	<1.0	-	1	No Further Action
Copper	mg/kg	7100	14	1600	-	1	No Further Action
Zinc	mg/kg	40000	14	290	-	1	No Further Action
Cyanide - Total	mg/kg	791	14	<1	-	1	No Further Action
Phenols - Total.	mg/kg	210	14	0.3	-	1	No Further Action
Asbestos	Fibres	NFD	14	<0.01	WS109-2.90m	4	Chrysotile
Naphthalene	mg/kg	2.3	14	1.7	-	2	No Further Action
Acenaphthylene	mg/kg	2900	14	0.55	-	3	No Further Action
Acenaphthene	mg/kg	3000	14	0.23	-	1	No Further Action
Fluorene	mg/kg	2800	14	1.3	-	1	No Further Action
Phenanthrene	mg/kg	1300	14	9.1	-	3	No Further Action
Anthracene	mg/kg	31000	14	1.9	-	3	No Further Action
Fluoranthene	mg/kg	1500	14	11.0	-	3	No Further Action
Pyrene	mg/kg	3700	14	11.0	-	3	No Further Action
Benzo(a)Anthracene	mg/kg	11	14	4.9	-	3	No Further Action
Chrysene	mg/kg	30	14	5.2	-	3	No Further Action
Benzo(b)Fluoranthene	mg/kg	3.9	14	5.9	-	3	No Further Action
Benzo(k)Flouranthene	mg/kg	110	14	1.8	-	3	No Further Action
Benzo(a)Pyrene	mg/kg	3.2	14	4.7	-	3	No Further Action
Indeno(123-cd)Pyrene	mg/kg	45	14	2.7	-	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.31	14	0.75	-	3	No Further Action
Benzo(ghi)Perylene	mg/kg	360	14	3.6	-	3	No Further Action
TPH C5-C6 (aliphatic)	mg/kg	42	12	<0.001	-	2	No Further Action
TPH C6-C8 (aliphatic)	mg/kg	100	12	<0.001	-	2	No Further Action
TPH C8-C10 (aliphatic)	mg/kg	27	12	<0.001	-	2	No Further Action
TPH C10-C12 (aliphatic)	mg/kg	130	12	1.1	-	2	No Further Action
TPH C12-C16 (aliphatic)	mg/kg	1100	12	5.0	-	1	No Further Action
TPH C16-C35 (aliphatic)	mg/kg	65000	12	45	-	1	No Further Action
TPH C5-C7 (aromatic)	mg/kg	370	2	<0.001	-	1	No Further Action
TPH C7-C8 (aromatic)	mg/kg	860	2	<0.001	-	2	No Further Action
TPH C8-C10 (aromatic)	mg/kg	47	2	<0.001	-	2	No Further Action
TPH C10-C12 (aromatic)	mg/kg	250	2	2.5	-	2	No Further Action
TPH C12-C16 (aromatic)	mg/kg	1800	2	18	-	2	No Further Action
TPH C16-C21 (aromatic)	mg/kg	1900	2	76	-	1	No Further Action
TPH C21-C35 (aromatic)	mg/kg	1900	2	150	-	1	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	2	<1.0	-	2	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	2	<0.1	-	2	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	2	<0.1	-	2	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	250	2	3.4	-	2	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	1800	2	14	-	2	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	1900	2	16	-	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1900	2	50	-	1	No Further Action
Polychlorinated Biphenyl***	mg/kg	8	1	<0.001	-		No Further Action

DETERMINAND	UNITS	GAC Resi w/o	N	MC	LOC. OF EX	PATHWAY	ASSESSMENT
SVOC (where detected) 2-Methylnaphthalene Dibenzofuran Carbazole	mg/kg	- - -	1	1.0 0.8 0.6	-	1	No Further Action
VOC (where detected)	mg/kg		2	<1.0	-	2	No Further Action

Notes
Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 4 = Dust Inhalation.
Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance; NFD = No Fibres Detected
* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C_5-C_{12}) and the Tier 1 values for aromatic compound for the non-volatile fractions (C_{12}-C_{35}). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.
**Based on Elemental Mercury.
***Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil Science Report SC050021 / Dioxins SGV

Referring to Table 9.1, the results of this direct comparison indicates that a single sample (WS109-2.9m) exceeded the screening criteria for a residential without plant uptake use the following contaminants:

- Chrysotile
- Lead

Asbestos in the form of loose Chrysotile fibres has been identified in the granular Made Ground in WS109. While no other ACM was recorded in the other samples tested, due to the nature of asbestos impact, its presence cannot be entirely discounted from other areas of the site.

An elevated concentration of lead was also recorded in WS109 when compared with residential POS guideline values but this did not exceed Tier I Commercial Guideline Values.

No significantly elevated concentrations of VOC or SVOC were identified in the soils submitted for chemical analysis.

No significantly elevated concentrations of PAH or TPH were recorded in the soil sample submitted for chemical analysis.

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

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

- The main exposure pathways based on the Tier I exceedances are:

1. Soil Ingestion
2. Fibre / Dust Inhalation

Risk Assessment and Mitigation

Loose chrysotile fibres and elevated concentrations of lead have been identified within a single location beneath the subject site. Given the nature of the site further impacted areas may also be present and it is more than probable that the general Made Ground will be impacted on a site wide basis by inorganic heavy metals, PAH and trace asbestos fibres which may pose a potential chronic risk to health of the critical receptor (future residents) via a direct exposure pathway.

The risk to future end users will mitigated by the proposed development that will largely encapsulate the site and remove viable exposure to impacted soil and groundwater. Consideration will need to be given to areas of landscaping and if impacted soils are present in these areas, then a clean cover system is likely to be required to mitigate all perceived risk.

The pre-demolition exploratory investigation has not identified any evidence of potentially volatile / soluble hydrocarbon impact, furthermore given the historical site use and absence of bulk chemical storage the presence of such contamination is not widely anticipated. Any as yet unidentified localised hotspots can be easily delineated and remediated during site enabling works.

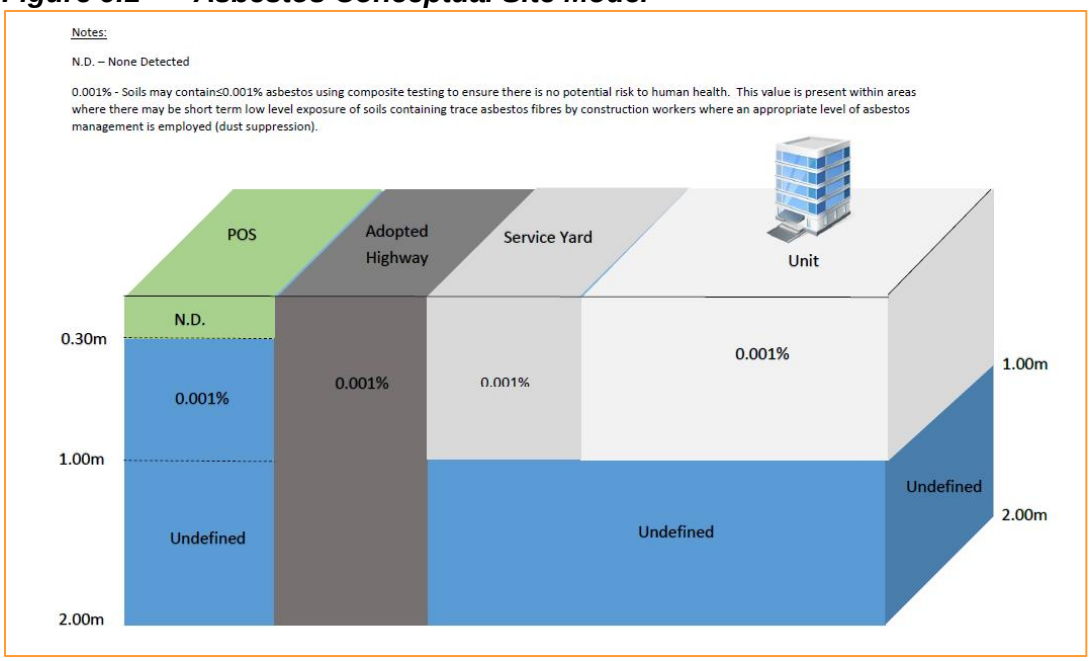
Supplementary post demolition intrusive site investigations, contamination risk assessment and addendum report to update the site Conceptual Site Model will be required to ensure the robustness of this initial assessment.

To mitigate the risk to construction workers associated with asbestos and lead, it is recommended that all works are completed in line with industry best practice so that control measures to manage dust and personal exposure are carefully implemented in accordance with an agreed Remediation and Enabling Works Strategy.

The specific design and installation process for the appropriate cover systems will require definition within the Site Remediation & Enabling Works Strategy, however industry best practice (as outlined within BRE 465 *Cover systems for land regeneration - thickness of cover systems for contaminated land)* would suggest that a 300mm clean cover within areas of POS.

With regard to the identified asbestos impact, data suggests that a 300mm cover system would also be appropriate to mitigate the risk to future end users. However, should bulk fragments of greater concentrations be identified then additional mitigation may be required. E3P has developed a development specific Asbestos Conceptual Site Model based on the principles of CIRIA 773 (*Asbestos in soil and made ground: a guide to understanding and managing risks*) to show how asbestos impacted soils may be managed on-site. This is presented in Figure 9.1.

Figure 9.1 Asbestos Conceptual Site Model



Chemical analysis and visual and olfactory observations of the natural clay and sand drift deposits have identified these soils to be acceptable for use as subsoil within the proposed

landscaped areas. However, further chemical validation samples will be required to confirm this. There are no suitable sources of topsoil available on the site.

9.2 Controlled Waters Risk Assessment

The site sensitivity with respect to controlled waters is summarised within Table 9.2

Table 9.2 Controlled Waters Sensitivity Profile

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	None	**LOW**
Distance to the closest groundwater abstraction point.	The closest identified abstraction is 720m from the subject site. This abstraction may have ceased and is likely to be from the confined Chester Pebble Bed Aquifer.	**LOW**
Aquifer Classification in Superficial Drift Deposits.	Secondary Undifferentiated	**MODERATE**
Aquifer classification in Bedrock.	Principal Aquifer	**HIGH**
Viability for Anthropogenic soil in direct contact with aquifer (drift or bedrock).	Ground investigation has identified that the underlying drift in in excess of 20m thick. This is considered likely to afford a high degree of protection to the Principal Aquifer. Foundation structures may create preferential pathways as high rise structures are likely to utilise pile foundations.	**LOW/ MODERATE**
Is the site located within 50m of a surface watercourse?	Branches of the Ashton and Rochdale Canals are located in close proximity of the subject site. These watercourses are managed and not considered likely to be in continuity with shallow groundwater due to the nature of the underlying drift and likely presence of engineered channel structures. Canals in this area are known to contribute shallow groundwater through leakage.	**LOW**
Summary The ICSM developed within the context of the site setting has only identified a single viable pollutant risk which would be the downward migration of potentially mobile phase soluble contaminants towards the underlying Principal Aquifer through the creation of preferential pathways.		

To further refine the ICSM, E3P has undertaken an initial qualitative assessment of the soil data analysis to assess the potential for a source of separate phase or dissolved phase contamination originating from either a defined on-site source or from impacted soils. This assessment is summarised in Table 9.3.

Table 9.3 Qualitative Risk to Controlled Waters from Soil Analytical Results

BTEX - >1mg/kg **Total VOC - > 1mg/kg**	The soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of VOC impact.
Total SVOC - > 1 mg/kg	PAH analysis recorded concentrations either below or only slightly elevated above the laboratory LOD.
C5-C10 - > 5mg/kg	All concentrations are below the laboratory LOD.
C10-C12 - > 10mg/kg	All concentrations are below the laboratory LOD.
C12-C16 - > 50mg/kg	All concentrations are below the laboratory LOD.
Phenols – > 2mg/kg	All concentrations are below the laboratory LOD.
Naphthalene - > 2mg/kg	The most soluble SVOC (Naphthalene) has been not identified at concentrations greater than 2mg/kg.
Total PAH - > 10mg/kg	PAH compounds greater than 10mg/kg have been recorded within Made Ground at WS107, WS114 and WS109.
PCB - > 1mg/kg	No potential sources of PCB have been identified.
Heavy metals - > 500mg/kg	Copper (1600mg/kg) and Lead (1600mg/kg) have been recorded within the Made Ground at WS109.

In due consideration of the ICSM which has identified a potential pollutant linkage associated with the migration towards the underlying Principal Aquifer, E3P has undertaken a Tier I controlled waters risk assessment. The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground and shallow and deep groundwater samples to Drinking Water Standards in the first instance and where absent Environmental Quality Standards (EQS).

Given the site setting, the assessment of controlled waters risk using these values is considered to be highly conservative.

These are presented in Table 9.3 overleaf.

Table 9.3 Comparison of Groundwater Analysis with Tier 1 Screening Levels (µg/l)

DETERMINAND	UNITS	EQS SCREENING VALUE [1, 2, 3]		DWS [3,4,5]	Leachate Number	Leachate Max Conc	Shallow GW Number	Shallow G/W Max Conc	Deep Ground Number	Deep G/W Max Conc	LOC OF EX	ASSESSMENT
		AA	MAC									
Arsenic	µg/l	50	-	10	5	9.5	5	9.4	2	**16**	BH104	Further Assessment
Cadmium	µg/l	0.08	0.45	5	5	<0.08	5	<0.08	2	<0.08	N/A	No Further Action
Chromium (VI)	µg/l	3.4	-	-	5	<5.0	5	<5.0	2	<0.08	N/A	No Further Action
Chromium (III)	µg/l	4.7	-	50	5	9.6	5	<0.4	2	<5.0	N/A	No Further Action
Copper (hardness)	µg/l	1-28		2000	5	15	5	8.4	2	1.7	N/A	No Further Action
Total Cyanide	µg/l	1	-	50	5	<10	5	<10	1	<10	N/A	No Further Action
Lead	µg/l	1.2	14	10	5	9.8	5	1.3	2	2.1	N/A	No Further Action
Mercury	µg/l	-	0.07	1.0	5	<0.5	5	<0.5	2	0.14	N/A	No Further Action
Nickel	µg/l	4	34	20	5	7.3	5	3.6	2	11	N/A	No Further Action
Selenium	µg/l		-	10	5	<4.0	5	<4.0	2	0.7	N/A	No Further Action
Zinc(hardness)	µg/l	8-125	-	-	5	13	5	9.5	2	9.9	N/A	No Further Action
pH	6-9				5	5.5-12.1	5	7.5-7.8	2	6.7	N/A	No Further Action
PAH												
Naphthalene	µg/l	2	130	10*	5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
Anthracene	µg/l	0.1	0.1		5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
Benzo[b]fluoranthene	µg/l	1.7^{-4}	0.017		5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
Benzo[k]fluoranthene	µg/l	1.7^{-4}	0.017		5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
Benzo(a)pyrene	µg/l	1.7^{-4}	0.27		5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
Fluoranthene	µg/l	0.0063	0.12		5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
Benzo(ghi)perylene	µg/l	1.7^{-4}	8.2^{-3}		5	<0.01	5	<0.01	2	<0.01	N/A	No Further Action
TPH-Aromatic												
TPH C5-C6 (benzene)	µg/l	10	50	1	5	<0.01	5	<1.0	2	<1.0	N/A	No Further Action
TPH C6-C8 (toluene)	µg/l	50	-	700	5	<0.01	5	<1.0	2	<1.0	N/A	No Further Action
TPH C8-C10 (ethyl Benzene)	µg/l	20	-	300	5	<0.01	5	<1.0	2	<1.0	N/A	No Further Action
TPH C10-C12 (xylene)	µg/l	30	-	500	5	<0.01	5	<1.0	2	<1.0	N/A	No Further Action
TPH C12-C16	µg/l	2	130	90[5]	5	<0.01	5	<10	2	<10	N/A	No Further Action
TPH C16-C35	µg/l	50#	50#	90[5]	5	<0.01	5	<10	2	<10	N/A	No Further Action

DETERMINAND	UNITS	EQS SCREENING VALUE [1, 2, 3]		DWS [3,4,5]	Leachate Number	Leachate Max Conc	Shallow GW Number	Shallow G/W Max Conc	Deep Ground Number	Deep G/W Max Conc	LOC OF EX	ASSESSMENT
		AA	MAC									
TPH Aliphatic [5]												
TPH C5-C6	µg/l	-	-	15000	5	<1.0	5	<1.0	2	<1.0	N/A	No Further Action
TPH C6-C8	µg/l	-	-	15000	5	<1.0	5	<1.0	2	<1.0	N/A	No Further Action
TPH C8-C10	µg/l	-	-	300	5	<1.0	5	<1.0	2	<1.0	N/A	No Further Action
TPH C10-C12	µg/l	-	-	300	5	<10	5	<10	2	<10	N/A	No Further Action
TPH C12-C16	µg/l	-	-	300	5	<10	5	<10	2	<10	N/A	No Further Action
TPH C16 – C21	µg/l	-	-	300**	5	<10	5	<10	2	28	N/A	No Further Action
TPH C21-C35	µg/l	-	-	300**	5	<10	5	<10	2	270	N/A	No Further Action
VOC												
Tetrachloroethylene	µg/l	0.4	-	10	-	-	5	<1.0	2	<1.0	N/A	No Further Action
Trichloroethylene	µg/l	10	-	10	-	-	5	<1.0	2	<1.0	N/A	No Further Action
Trichlorobenzene	µg/l	0.4	-	-	-	-	5	<1.0	2	<1.0	N/A	No Further Action
Trichloromethane	µg/l	2.5	-	-	-	-	5	<1.0	2	<1.0	N/A	No Further Action
Dichloromethane	µg/l	20	-	200	-	-	5	<1.0	2	<1.0	N/A	No Further Action
Carbon Tetrachloride	µg/l	12	-	3	-	-	5	<1.0	2	<1.0	N/A	No Further Action
Vinyl Chloride	µg/l	-	-	0.3	-	-	5	<1.0	2	<1.0	N/A	No Further Action

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

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

Table 9.3 indicates that none of the data obtained from leachate analysis on Made Ground or from shallow perched groundwater exceed their DWS. A slight exceedance of the arsenic DWS has been recorded within a deep borehole from within the Principal Aquifer. However, it should be noted that this sample was obtained using a disposable bailer and not slow flow due to the depth of the monitoring well.

9.3 Ground Gas

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007).

However, only one round of monitoring has been completed and it is recommended that the full ground gas assessment and any subsequent recommended protection measures are agreed with the local authority prior to their adoption on-site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

During the monitoring visit completed to data monitoring wells WS103, WS106 and WS109 were obstructed and could not be monitored. However, a further eight visits are proposed over the next three months.

9.3.1 Sources of Ground Gas

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

- Made Ground

9.3.2 Groundwater

Monitoring well WS121 was flooded during the first monitoring survey and the results should not be considered within this initial assessment.

9.3.3 Gas Flow

During the first visit all of the available wells recorded negative flows are indicative of back pressure from wind being greater than the active flow from the wells.

9.3.4 Gas Concentrations

Methane was recorded below the level of detection in all monitoring wells apart from WS105 where a concentration of 0.1% v/v .

Carbon dioxide concentrations across the site have ranged between below the level of detection to a maximum of 0.9%v/v in WS116.

9.3.5 Gas Assessment

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). Assessment of the calculated gas screening values indicates that all locations would be classified as Characteristic Situation 1 and would not require the use of gas mitigation within proposed structures.

This assessment will need to be updated upon completion of the monitoring programme.

9.4 Conceptual Site Model

Following the completion of the intrusive site investigation, chemical analysis and risk assessment the conceptual model shown in Table 9.4 has been prepared for the site.

Table 9.4 Conceptual Model

SOURCE	PATHWAY	RECEPTOR
Human Health		
Asbestos	Dust Inhalation	Commercial/Residential End Users Construction Workers
Discussion: Loose chrysotile fibres were identified within the Made Ground deposits in one location. Given the nature of diffuse asbestos fibres, other ACM within the Made Ground cannot be entirely discounted. ACM could be released during earthworks and then subsequently inhaled by construction workers and possibly third party property. Localised impacted soils will requirement placement at depth during a carefully managed and regulatory authority approved phase of enabling works, under strict construction phase health and safety controls. Upon placement of asbestos impacted soils at depth beneath hardstanding or landscaped areas, they will present no unacceptable risk to the future site users.		
Heavy Metals (lead)	Dermal Contact and Ingestion	Construction Workers Commercial/Residential End Users
Discussion: Heavy metals may pose a short-term risk to construction workers who may come into contact with impacted soils during any future earthworks. These risks can be mitigated through the use of appropriate PPE and provision of adequate welfare. Where elevated metals are identified, the provision of a cover system may be required should the area be proposed as landscaped area. The proposed development will be covered by either buildings and hardstanding, but should areas of landscaping be proposed it is likely that a cover system will be required.		
Controlled Waters		
None identified	N/A	N/A
Discussion: Analysis of soil, leachate, shallow and deep groundwater samples has not identified any potentially significant sources of contamination with respect to controlled waters. In the absence of any on-site sources, the formation of preferential pathways associated with foundation structures on high rise properties is considered to be unlikely. As no plausible source, pathway, receptor linkage has been identified, the risk to controlled waters is considered to be low.		
Ground Gas		
Methane and Carbon Dioxide	Inhalation & Accumulation	Construction Workers Site End Users
Discussion: Limited data is currently available but based on what has been collected, there does not appear to be a significant risk associated with ground gas.		
Buildings and Infrastructure		
pH & Sulphate	Corrosion of Concrete	Foundations / Concrete
Discussion: Chemical analyses for pH and soluble sulphate content shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005). Elevated sulphate concentrations meeting Class DS-2, AC-2 and DS2-AC3 were noted within the Made Ground deposits in WS125 and WS109 respectively.		

SOURCE	PATHWAY	RECEPTOR
Ecology		
None Identified	N/A	N/A
Discussion: In the absence of any potential receptors, no unacceptable risk to ecology has been identified.		

10. GEOTECHNICAL ASSESSMENT

10.1 Proposed Development

The outline masterplan for the redevelopment of Central Retail Park, Manchester currently comprises a high density residential development with buildings ranging from 6 storeys to 10 storeys with the potential for one block to be 30 storeys high. It is also considered likely that ground floor space fronting onto the Great Ancoats Street will be used for retail / commercial. There will also be some areas of landscaping on site.

10.2 Summary of Ground Conditions

Made Ground

Made Ground has been recorded in all exploration locations as a variable gravelly sand and sandy gravel with various anthropogenic materials including clinker, brick, ash, limestone, mudstone, slate, timber and rare porcelain. No visual or olfactory evidence of hydrocarbon impact was observed.

The investigation has identified a notably thicker band of Made Ground that appears to trend broadly north to south through the central-eastern sector of the site. The fill in this location was proven to a maximum depth of between 5.0 and 5.1m bgl (WS114 and WS115) and these locations corresponds with the general trend of the culverted brook and perhaps indicates backfilled channel. Similarly, thicker Made Ground was recorded in the eastern sector of site (WS102 and WS115) were between 1.3m and 1.8m was recorded. This is in the mapped locality of a former canal channel. Within the remaining locations at the site, Made Ground was relatively uniform and recorded to between 0.4m and 1.1m thick.

Drift

The underlying drift stratum beneath the site comprise gravelly and sandy gravelly CLAY with local horizons of more silty CLAY. Horizons of gravelly SAND have been recorded in the drift at depth within the deeper boreholes.

The drift was proven to a maximum depth of 29m bgl in BH102 where a dense sandy GRAVEL was encountered to 29.3m bgl. The upper weathered Sandstone was recorded to full depth of BH102 but could not be penetrated.

Solid

The solid bedrock geology comprises upper weathered horizons returned as fine to medium SAND with lithorelics of Sandstone that becomes rock at depths of 24.50m bgl and 33.00m bgl.

Groundwater

Shallow groundwater has been recorded between 0.48m bgl and 4.20m with deeper groundwater recorded with the thicker Made Ground deposits and in the south of the site.

10.3 Site Preparation

The site should be cleared in accordance with Series 200 of the Specification for Highway Works. This should include:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill;
- Demolition of all existing buildings and removal of all concrete hardstanding;
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,
- Buried structures and old foundations have not been encountered on site during the site investigation, though their presence cannot be entirely discounted. Should any obstructions be encountered, these should be excavated from below the proposed development foot print with the resulting void backfilled.

10.4 Foundation Conditions & Assessment of Potential Bearing Capacities

Based on in-situ and laboratory geotechnical testing of the drift strata and upper weathered horizons of the underlying bedrock, E3P has undertaken an assessment of the net safe Allowable Bearing Pressure (ABP) to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 10.1.

Table 10.1 Summary of ABPs

GRANULAR SOILS			
Description	**Depth (range bgl)**	**Relative Density**	**Allowable Bearing Pressure (kN/m²)**
Gravelly SAND	1.0-5.0	Very Loose to Medium Dense	34-240
Gravelly SAND	5.0-10.0	Medium Dense	121-240
Gravelly SAND	10.0-15.00	Medium Dense to Dense	121-327
Gravelly SAND	15.0-20.0	Medium Dense to Dense	255-329
Gravelly SAND	20.0-25.00	Medium Dense	104-256
Gravelly SAND	26.0-33.0	Medium Dense	145-254
COHESIVE SOILS			
Description	**Depth (range m bgl)**	**Undrained Shear Strength (Cu) kN/m²**	**Allowable Bearing Pressure (kN/m²)**
Gravelly, sandy CLAY	1.0-5.0	13-211	26-434
Gravelly, sandy CLAY	5.0-10.0	49-120	102-247
Gravelly, sandy CLAY	10.0-15.00	79-176	163-326
Gravelly, sandy CLAY	15.0-20.00	37-157	76-324
Gravelly, sandy CLAY	20.0-25.0	35-139	73-286
Gravelly, sandy CLAY	26.0-33.0	68	141

Based on the assessment of the relative undrained shear strength of the natural strata where is occurs close to the surface has been identified as the underlying firm to very stiff Clay to have ABP of approximately 110kN/m^2 to 166kN/m^2 at ca.1.0 to 1.5m bgl. Based on the assessment and without any detailed designs it is considered that it would be possible to utilise shallow pad foundations to support any lighter/portal frame buildings.

Notable soft Clay and loose Sand horizons have been recorded in the following areas where ABPs are reduced:

- WS116-3.0m (soft Clay)
- BH101-20.0-21.0m (soft Clay)
- BH102-3.5m (very loose Sand)
- BH106 – 3.0m (soft Clay)

Given the current and historical uses of the site, prior to the detailed design of suitable foundations solutions, a programme of remediation and enabling works will be required to remove the buried obstructions such as existing slabs and foundations and any oversize material associated with historical land uses.

Upon completion of enabling works, it may be feasible to be re-engineer the Made Ground using Vibro Stone Columns (VSC) to support a shallow strip or spread foundation. However, this will depend of the required loadings and existing services, retaining walls and culvert may preclude its use.

It is likely that for high rise structures deeper piled foundations will be required and a summary of rock analysis will be provided once laboratory point load and UCS results are made available. However, based on field descriptions and previous experience the Sandstone will provide a suitable founding stratum for piled foundations and this has been recorded at depths of between 24.50m bgl and 33.00m bgl.

10.5 Ground Floor Slabs

Ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement and low to moderate plasticity clay.

Ground bearing slabs will need to be constructed utilising a sub-base with the thickness designed by a structural engineer to ensure that settlement tolerances are taken into consideration. Particular attention may need to be given the design in order to resist the influence of clay heave to take account of any trees used within landscaped areas. Mitigation of heave may include using exaggerated sub-base and additional re-enforcement within the slab to be designed by the Structural Engineer.

Where it is necessary to undertake cut / fill works utilising site derived cohesive soils, careful consideration must be given to seasonal climatic conditions which will have a significant impact of Moisture Conditions and the ability to compact clay soils in the wetter winter months. It may be necessary to undertake an element of stabilisation works through the addition of lime to ensure the soils can be engineered to the required performance standards.

It would be possible to utilise soil stabilisation techniques that incorporate the addition of lime and OPC to construct a stiffened soil horizon with a CBR >15% to constitute a sub-base replacement layer that could then be capped with Type 1 MOT. The use of soil stabilisation could be extended within the conjectured zone of tree influence to modify the structure of clay soils and negate the potential for volumetric instability.

10.6 Heave Precautions

The clay is deemed to be of low to moderate volume change potential, therefore moderate classification is used for design purposes.

A programme of remediation and enabling works will be required to remediate the proposed road sub-grade in accordance with the requirements of the highways design manual (series 600) for a Method Compaction.

It is considered that the Made Ground material can be re-engineered to a method to achieve a CBR in excess of 5% if works are completed in favourable climatic conditions. Natural clay soils will provide a CBR in the order of 3-5% during drier climatic periods, however If water is allowed to shed onto the formation, the CBR will reduce to <2% which will require specialist engineering of the sub-grade.

10.7 Drainage

The presence of substantial depths of Made Ground across some areas of the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

Furthermore, the site is predominantly underlain by circa 1-2m of likely low permeability gravelly CLAY. Therefore, the use of soak-away drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured it is not recommended that soakaways utilised for disposal of surface water runoff.

If soak-away drainage is to be considered, full BRE365 Testing must be completed to inform the detailed design.

10.8 Concrete Durability

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

Elevated sulphate concentrations meeting Class DS-2, AC-2 and DS2-AC3 were noted within the Made Ground deposits in WS125 and WS109 respectively.

10.9 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, however obstructions may be present in the near surface including former foundations and former floor slabs. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works.

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

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations. Consideration should be given for the potential for dewatering gravels in the surrounding areas to the subject site that may cause structural damage to buildings sub-structures in close proximity to the site.

Table 10.2 Civil Engineering Excavation Risk Matrix

RISK ITEM	PRESENT	COMMENT
Running Sands	No	Dense sand and gravel has been recorded in the deeper drift horizons which made drilling slow.
Minor Water ingress	No	Minor water ingress will require localised dewatering / sump pumping during the construction of site drainage infrastructure.
Shallow Bedrock	No	Bedrock has been recorded between 24.50m bgl and 33.00m bgl.

10.10 Coal Mining

No significant risks have been identified.

10.11 Further Works

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

- Geotechnical Earthworks Strategy (Infrastructure); and
- Remediation & Enabling Works strategy.

10.12 Construction Activity and Inspection

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

- Due to the variability of the soils at the site it is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction;
- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 utilised;
- It is considered that de-watering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond;
- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results; and,
- The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

11. CONCLUSIONS AND RECOMMENDATIONS

Contaminated Land	
Human Health	Laboratory testing has not identified any significant site wide contamination. Loose chrysotile fibres and elevated concentration of lead have been identified within a single location. Given the nature of the site, other impacted areas may be also be present. To mitigate the risk to construction workers associated with asbestos and lead, it is recommended that all works are completed in line with industry best practice so that control measures to manage dust and personal exposure are carefully implemented in accordance with an agreed Enabling Works Strategy. The risk to future end users are mitigate to a large extent by the likely hardcover development. Consideration will need to be given to areas of landscaping and if impacted soils are present in these areas, then a clean cover system is likely to be required.
Controlled Waters	Soil and groundwater analysis identifies that there is no significant risk to controlled waters.
Ground Gas	Characteristic Situation 1 (pending completion of gas monitoring).
Potable Water	Poly-Ethylene Pipe

Geotechnical Issues

Significant obstructions associated with relict foundations etc have not been encountered but cannot be entirely discounted. Existing buildings and foundation structures will require careful demolition and removal in order to facilitate the future development.

Based on the assessment of the relative undrained shear strength of the natural strata where is occurs close to the surface has been identified as the underlying firm to very stiff Clay to have ABP of approximately 110kN/m^2 to 166kN/m^2 at ca.1.0 to 1.5m bgl. Based on the assessment and within any detailed designs it is considered that it would be possible to utilise shallow pad foundations to support any lighter/portal frame buildings.

It is likely that for high rise structures, deeper piled foundations may be required and a summary of rock analysis will be provided once laboratory point load and UCS results are made available. However, based on field descriptions and previous experience the Sandstone will provide a suitable founding stratum for piled foundations and rock head has been recorded at depths of between 24.50m bgl and 33.00m bgl.

Ground bearing floor slabs, whilst viable, will require detailed design to accommodate variability of the formation and account for differential settlement and low to moderate plasticity clay.

The site is predominantly underlain by circa 1-2m of likely low permeability gravelly CLAY. Therefore, the use of soak-away drainage will be limited, and as the lateral continuity of the Made Ground cannot be assured it is not recommended that soakaways utilised for disposal of surface water runoff.

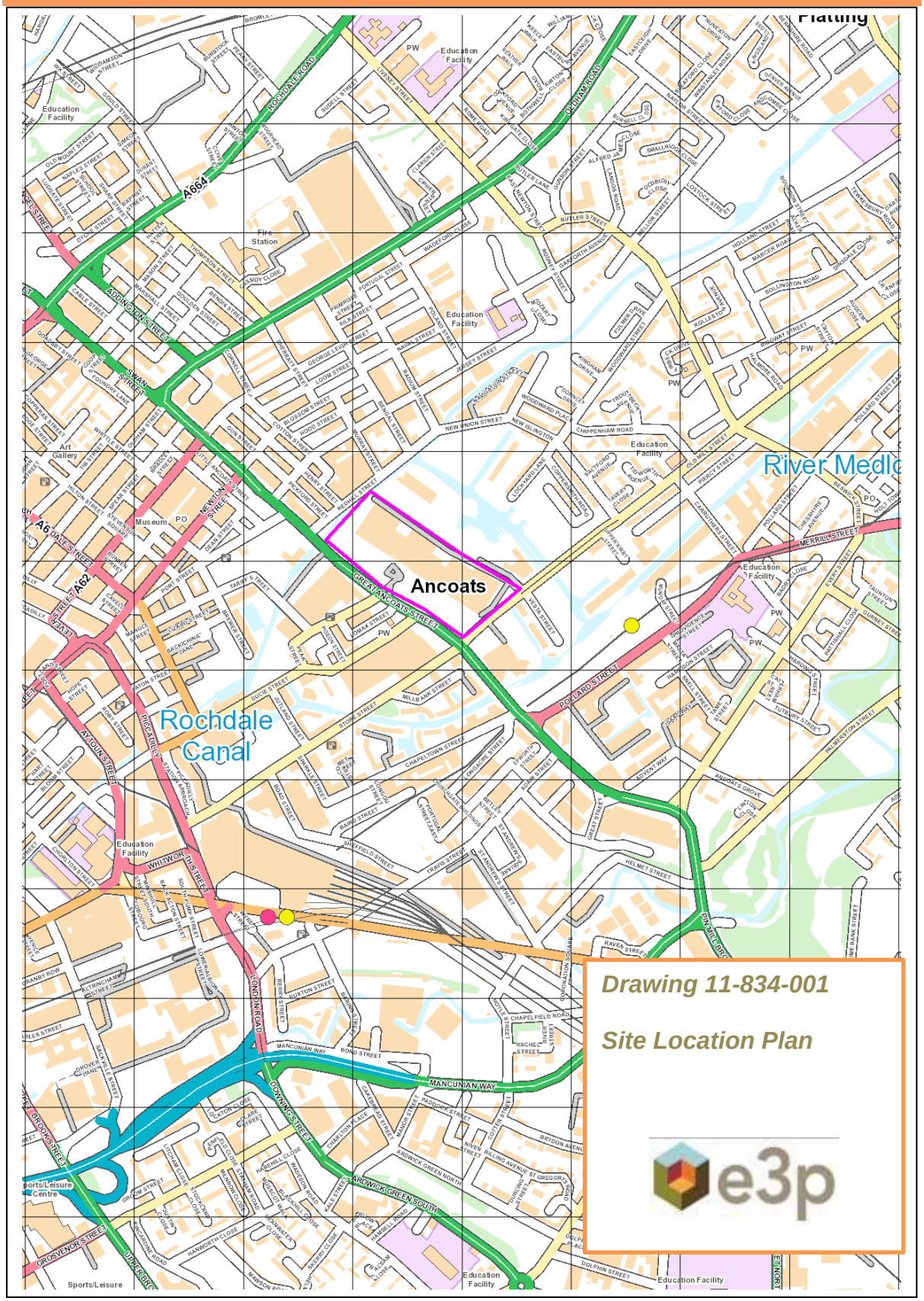
The underlying natural clay drift deposits have been assessed as being very stiff high strength with a net ABP in the order of 100kN/m^2 at circa 1.00m bgl increasing to 150-200kN/m^2 at circa 2.00m bgl.

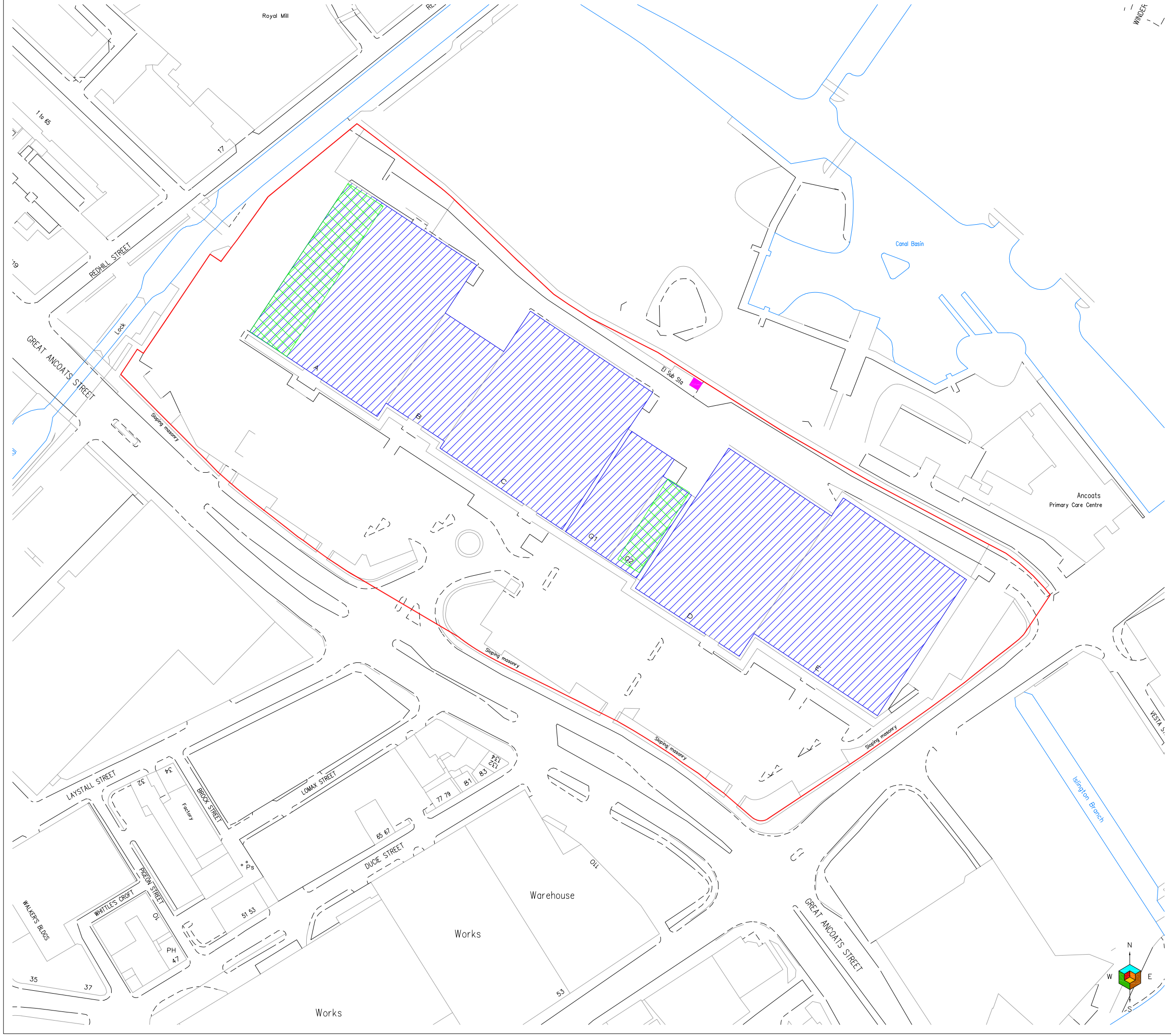
Chemical analyses for pH and soluble sulphate content shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005). Elevated sulphate concentrations meeting Class DS-2, AC-2 and DS2-AC3 were noted within the Made Ground deposits in WS125 and WS109 respectively.

END OF REPORT

APPENDIX III
DRAWINGS




Ancoats
Rochdale Canal
River Medlo
Education Facility
Fire Station
Art Gallery
Museum
PO
Sports/Leisure Centre
ROCHDALE ROAD
OLDHAM ROAD
ADDINGTON STREET
SWAN STREET
NEWTON STREET
OLDHAM STREET
A664
A6
A62
GREAT ANCOATS STREET
POLLARD STREET
MERRIMAN STREET
WHITWORTH STREET
LONDON ROAD
MANCUNIAN WAY
DOWNING STREET
HARDWICK GREEN SOUTH
GROSVENOR STREET
PICCADILLY
AYTOUN STREET
Drawing 11-834-001
Site Location Plan



Key:

Site Features

- Electrical Substation
- Existing Buildings
- Possible Lateral Probeholes to be reviewed

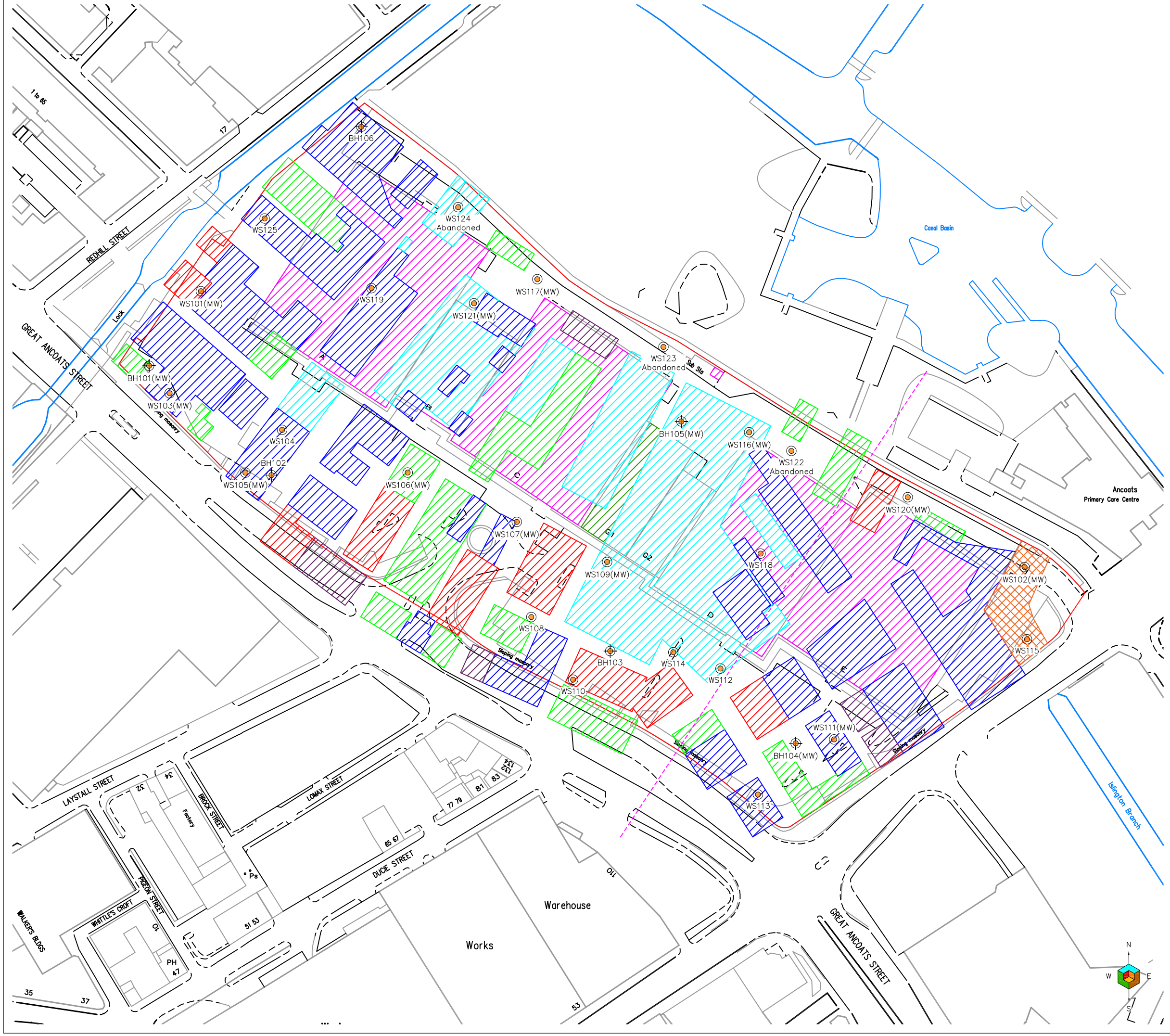
Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	20.07.2017	DRAFT	RW	MD

Client: GVA	Job No: 11-834	Date: 20.07.2017
	Drawing No: 002	Scale: N.T.S
Job Title: Central Retail Park, Manchester	Drawing Title: Site Features Plan	

Environmental Energy Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: Info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other Intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

WS101(MW) — Approximate Window Sample Probehole Location with Install

BH101 — Approximate Cable Percussive Borehole Location

Historical Features

- Former Buildings (Pre 1893 - Pre 1981)
- Former Buildings (Pre 1893 - Pre 1981)
- Former Buildings (Pre 1893 - Pre 1965)
- Former Buildings (Pre 1922 - Pre 1981)
- Former Buildings (Pre 1965 - Pre 1981)
- Former Buildings (Pre 1981 - Pre 2017)
- Former Buildings (Pre 1992 - Pre 2017)
- Backfilled Canal (Pre 1893 - Pre 1963)
- Former Shockers Brook Culvert (Pre 1893 - Pre 1922)

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	20.07.2017	DRAFT	RW	MD

Client: GVA

Job No: 11-834

Date: 20.07.2017

Drawing No: 003

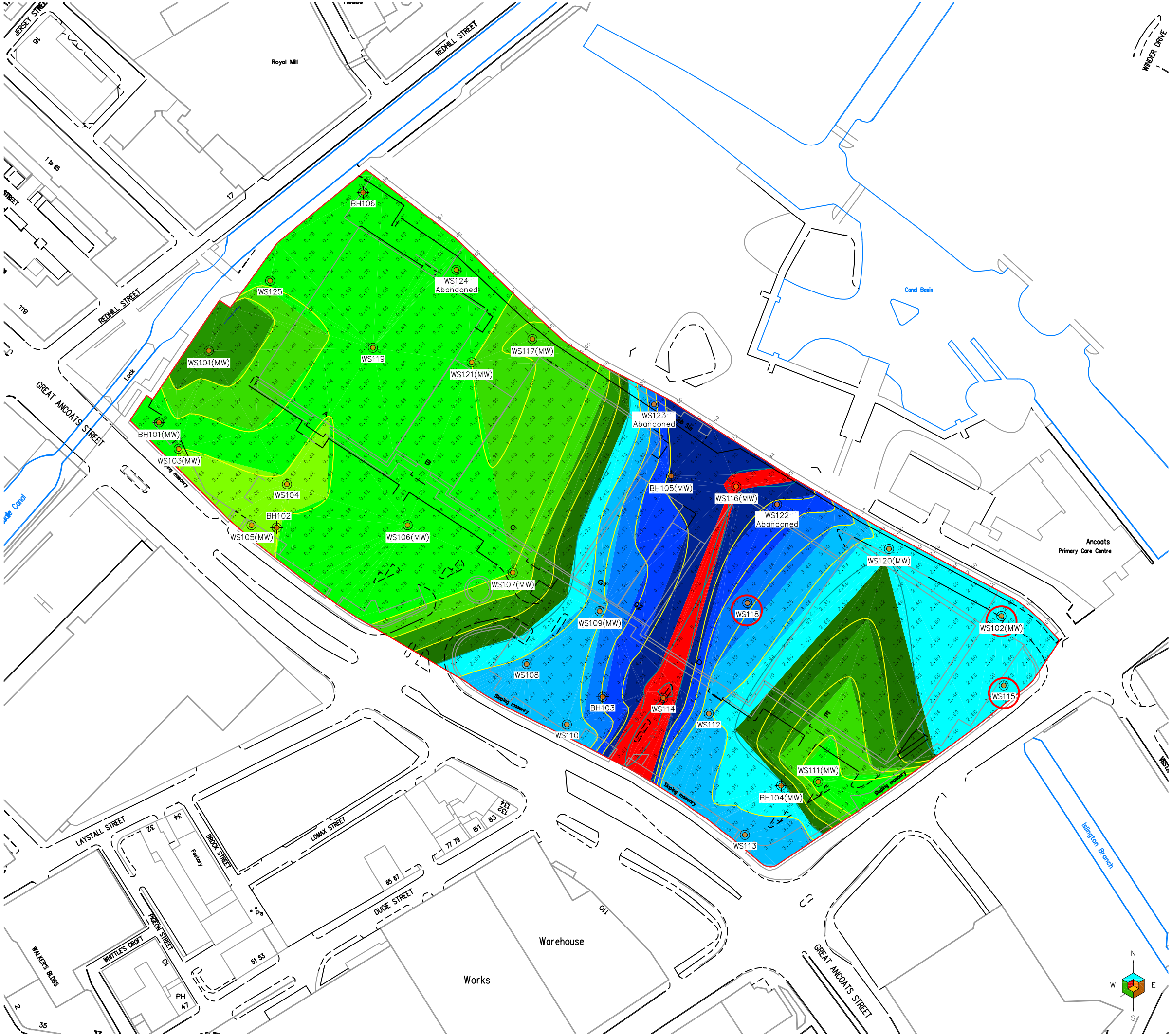
Scale: N.T.S

Job Title: Central Retail Park, Manchester

Drawing Title: Historical Features Plan

Environmental Energy Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: Info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other Intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or Intellectual property.



Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- BH101 — Approximate Cable Percussive Borehole Location

Made Ground Depth (m)

- Depth of Made Ground in Excess of 5.00m
- Depth of Made Ground Between 4.50 - 4.99m
- Depth of Made Ground Between 4.00 - 4.49m
- Depth of Made Ground Between 3.50 - 3.99m
- Depth of Made Ground Between 3.00 - 3.49m
- Depth of Made Ground Between 2.50 - 2.99m
- Depth of Made Ground Between 2.00 - 2.49m
- Depth of Made Ground Between 1.50 - 1.99m
- Depth of Made Ground Between 1.00 - 1.49m
- Depth of Made Ground Between 0.50 - 0.99m
- Depth of Made Ground Between 0.00 - 0.49m
- Base of Made Ground not Encountered - Depth has been Inferred

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	26-07-2017	DRAFT	CB	MD

Client: GVA

Job No: 11-834

Date: 26-07-2017

Drawing No: 004

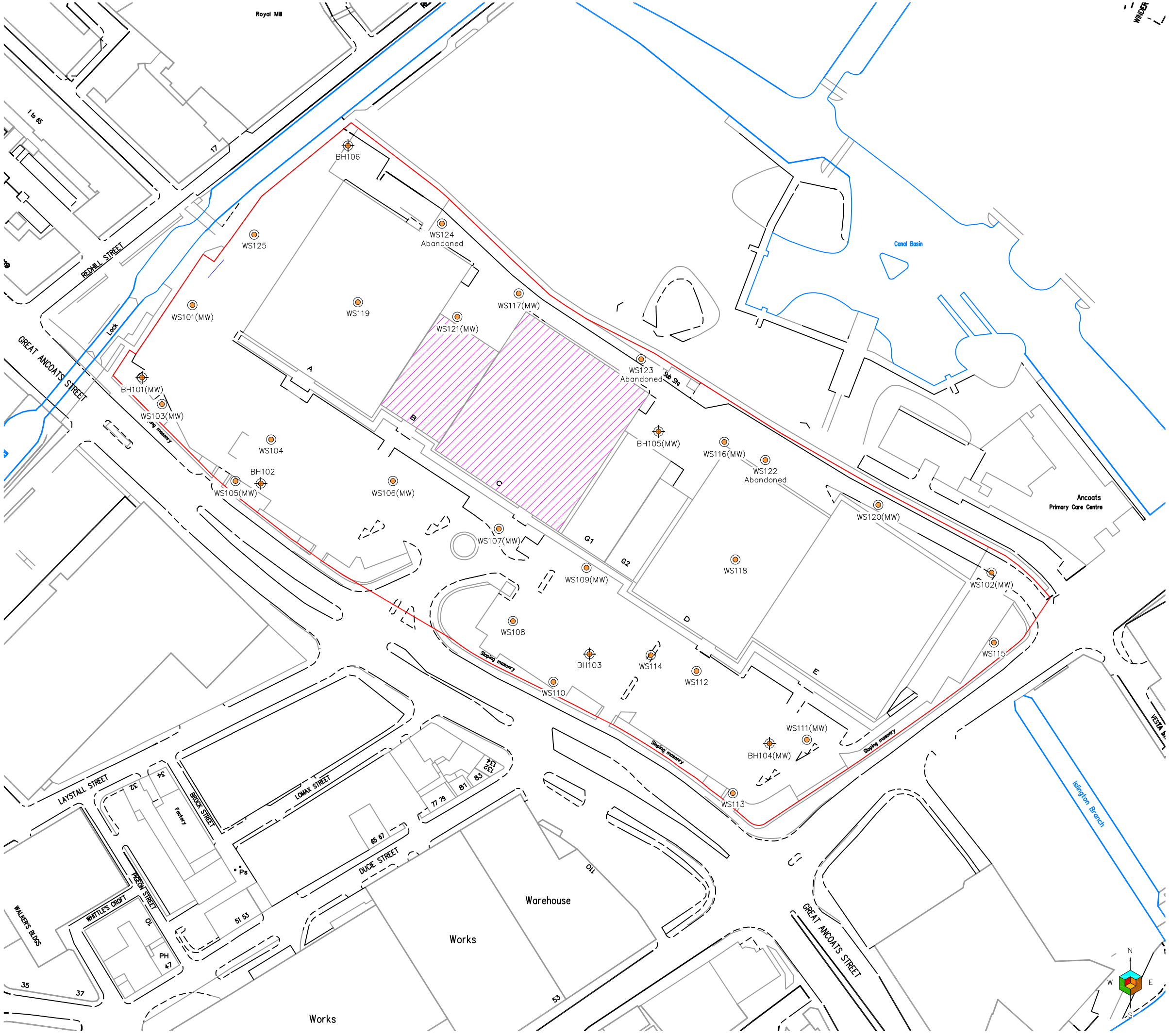
Scale: NTS @ A3

Job Title: Central Retail Park, Manchester

Drawing Title: Depth of Made Ground Plan

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

WS101(MW) — Approximate Window Sample Probehole Location with Install

BH101 — Approximate Cable Percussive Borehole Location

Constraints

Occupied Buildings

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	20.07.2017	DRAFT	RW	MD

Client: GVA

Job No: 11-834

Date: 20.07.2017

Drawing No: 004

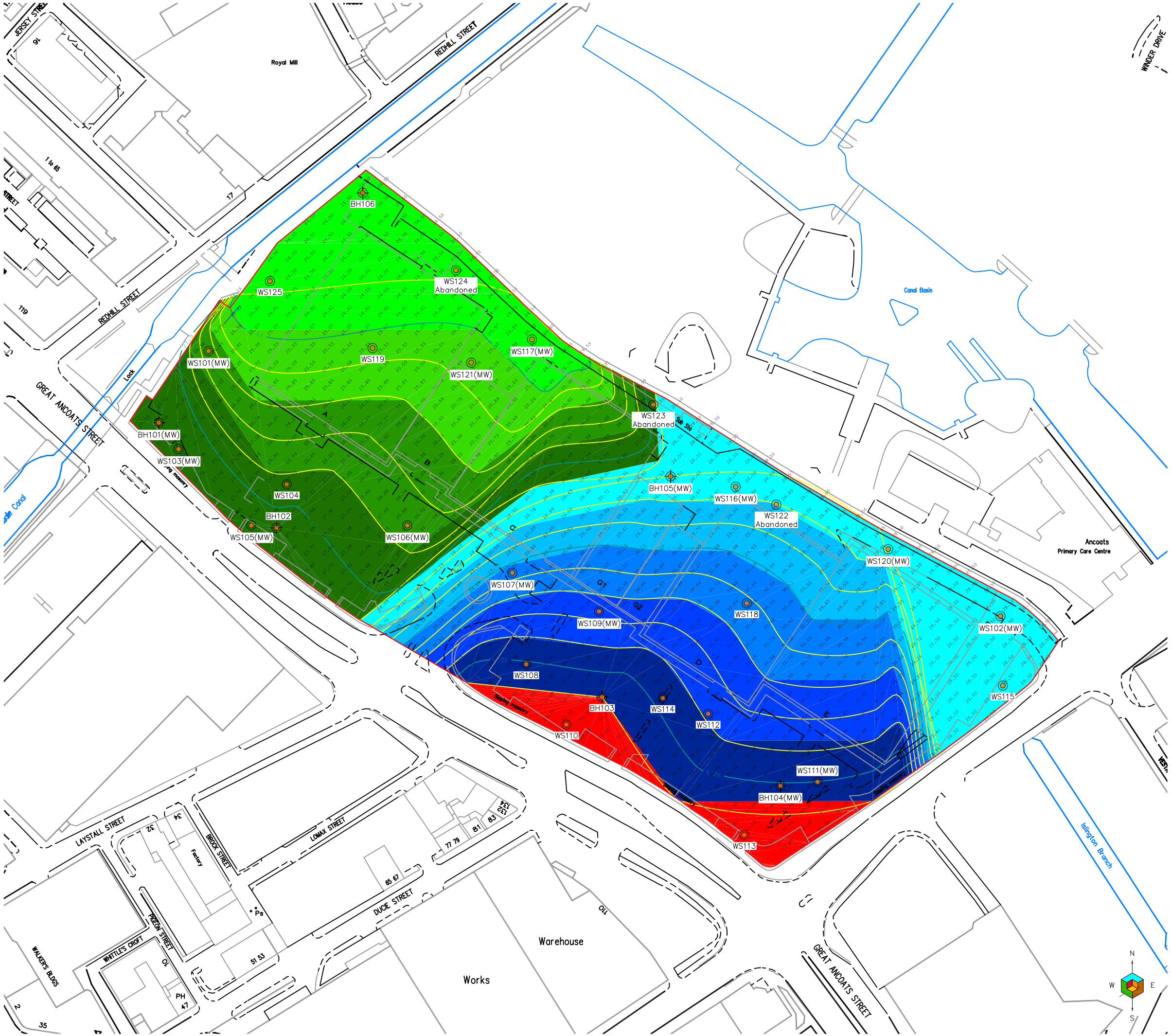
Scale: N.T.S

Job Title: Central Retail Park, Manchester

Drawing Title: Exploratory Hole Location Plan

Environmental Energy Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: Info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

WS101(MW) — Approximate Window Sample Probehole Location with Install

BH101 — Approximate Cable Percussive Borehole Location

Made Ground Depth (m)

- Depth to Bedrock in Excess of 34.00m
- Depth to Bedrock Between 33.00 - 33.99m
- Depth to Bedrock Between 32.00 - 32.99m
- Depth to Bedrock Between 31.00 - 31.99m
- Depth to Bedrock Between 30.00 - 30.99m
- Depth to Bedrock Between 29.00 - 29.99m
- Depth to Bedrock Between 28.00 - 28.99m
- Depth to Bedrock Between 27.00 - 27.99m
- Depth to Bedrock Between 26.00 - 26.99m
- Depth to Bedrock Between 25.00 - 25.99m
- Depth to Bedrock Between 24.00 - 24.99m
- Depth to Bedrock Between 23.00 - 23.99m

Notes:

P1	-	26-07-2017	DRAFT	CB	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: GVA

Job No: 11-834

Date: 26-07-2017

Drawing No: 005

Scale: NTS @ A3

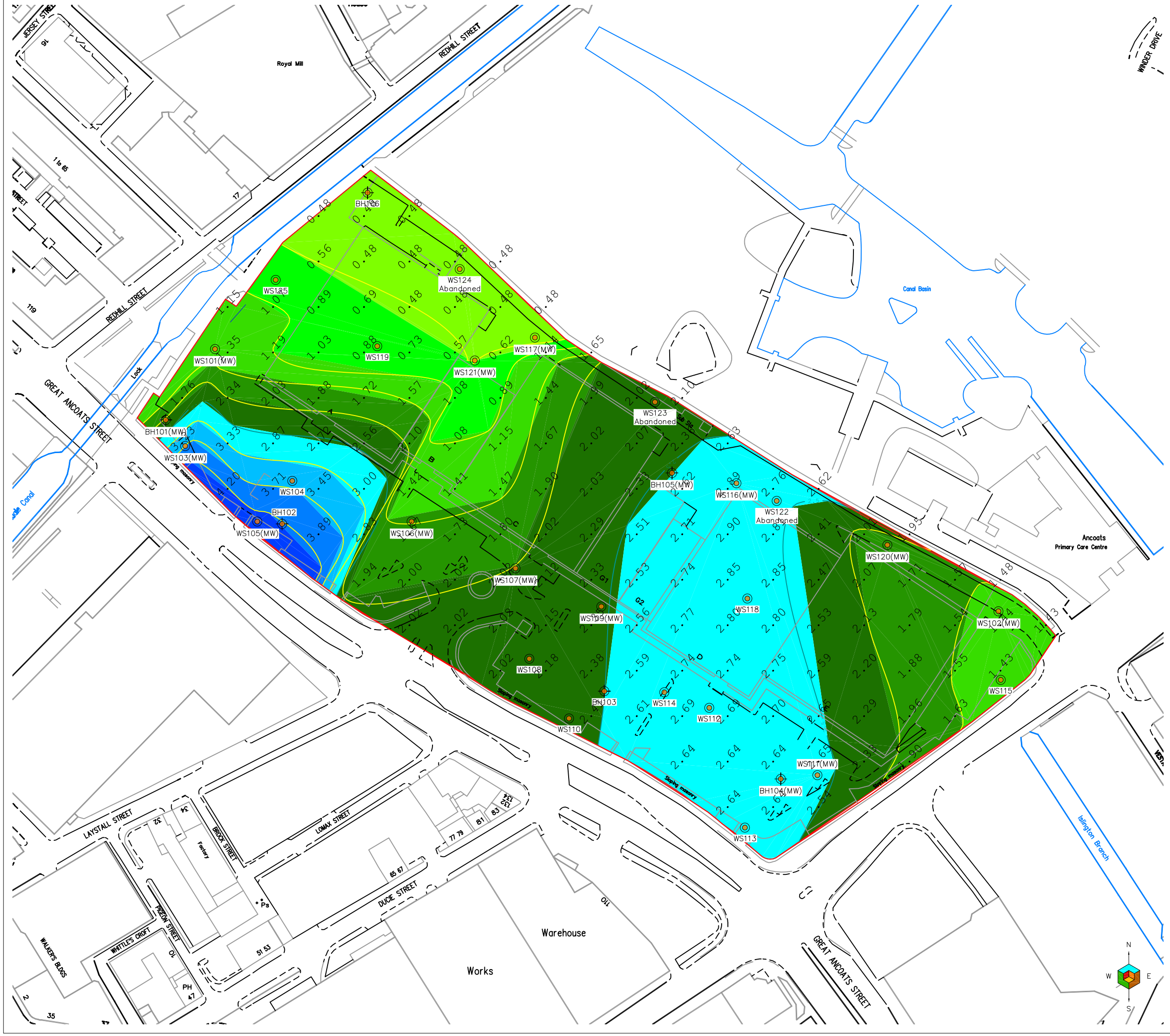
Job Title: Central Retail Park, Manchester

Drawing Title: Depth to Bedrock Plan

e3p

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install
- BH101 — Approximate Cable Percussive Borehole Location

Groundwater Depth (m)

- Depth to Groundwater in Excess of 5.00m
- Depth to Groundwater Between 4.50 - 4.99m
- Depth to Groundwater Between 4.00 - 4.49m
- Depth to Groundwater Between 3.50 - 3.99m
- Depth to Groundwater Between 3.00 - 3.49m
- Depth to Groundwater Between 2.50 - 2.99m
- Depth to Groundwater Between 2.00 - 2.49m
- Depth to Groundwater Between 1.50 - 1.99m
- Depth to Groundwater Between 1.00 - 1.49m
- Depth to Groundwater Between 0.50 - 0.99m
- Depth to Groundwater Between 0.00 - 0.49m

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	25-07-2017	DRAFT	CB	MD

Client: GVA

Job No: 11-834

Date: 25-07-2017

Drawing No: 006

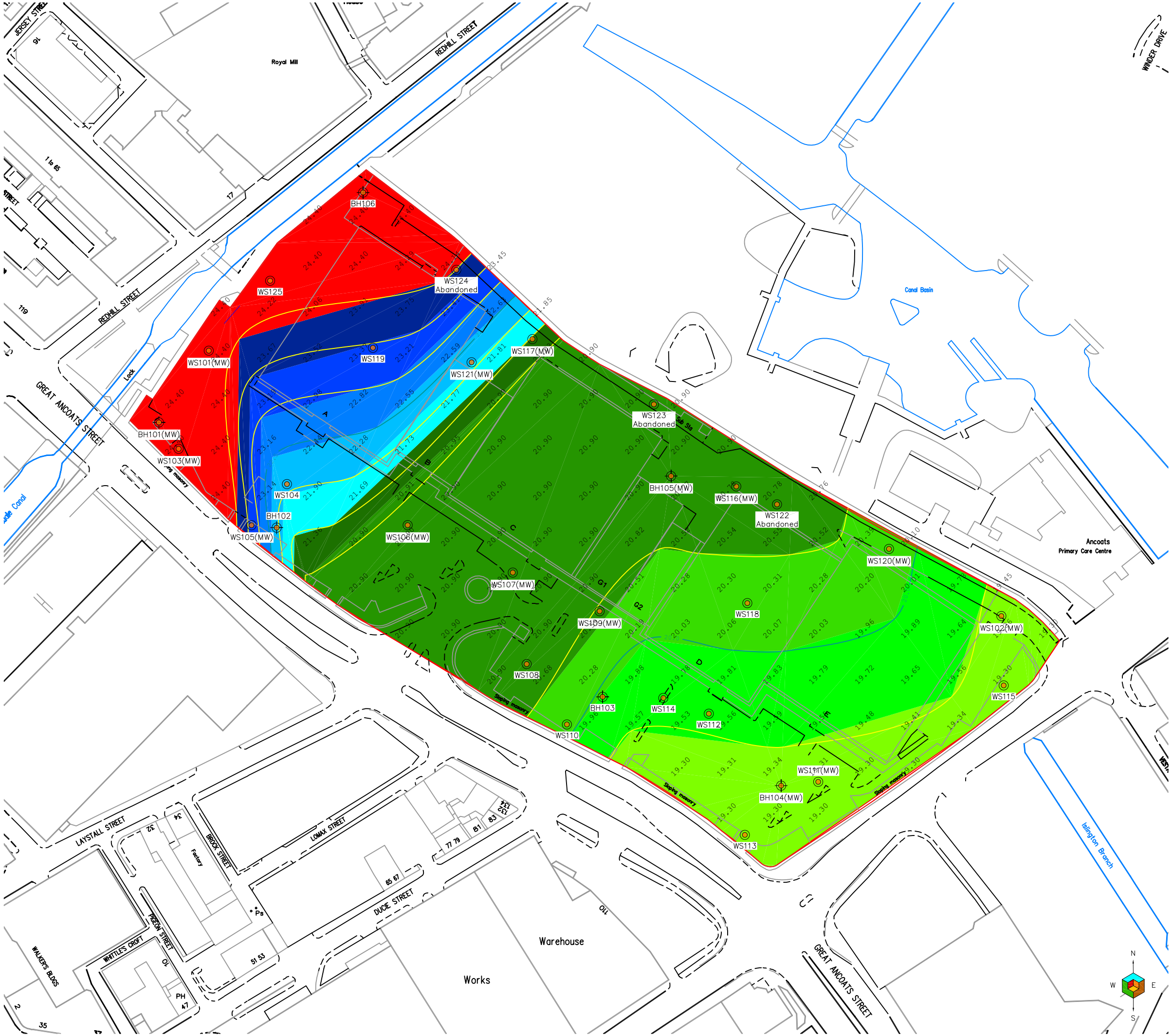
Scale: NTS @ A3

Job Title: Central Retail Park, Manchester

Drawing Title: Depth to Shallow Groundwater Plan

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Key:

Location Symbols

WS101 — Approximate Window Sample Probehole Location

WS101(MW) — Approximate Window Sample Probehole Location with Install

BH101 — Approximate Cable Percussive Borehole Location

Groundwater Depth (m)

- Depth to Groundwater in Excess of 24.50m
- Depth to Groundwater Between 24.00 - 24.49m
- Depth to Groundwater Between 23.50 - 23.99m
- Depth to Groundwater Between 23.00 - 23.49m
- Depth to Groundwater Between 22.50 - 22.99m
- Depth to Groundwater Between 22.00 - 22.49m
- Depth to Groundwater Between 21.50 - 21.99m
- Depth to Groundwater Between 21.00 - 21.49m
- Depth to Groundwater Between 20.50 - 20.99m
- Depth to Groundwater Between 20.00 - 20.49m
- Depth to Groundwater Between 19.50 - 19.99m
- Depth to Groundwater Between 19.00 - 19.49m

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	25-07-2017	DRAFT	CB	MD

Client: GVA

Job No: 11-834

Date: 25-07-2017

Drawing No: 007

Scale: NTS @ A3

Job Title: Central Retail Park, Manchester

Drawing Title: Depth to Deep Groundwater Plan

Environmental Engineering Partnerships Ltd
City Heliport & Business Centre
Eccles, Manchester, M30 7RU
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.

APPENDIX IV
PHOTOGRAPHS





PLATE 1 –



PLATE 2 –



PLATE 3 –



PLATE 4 –



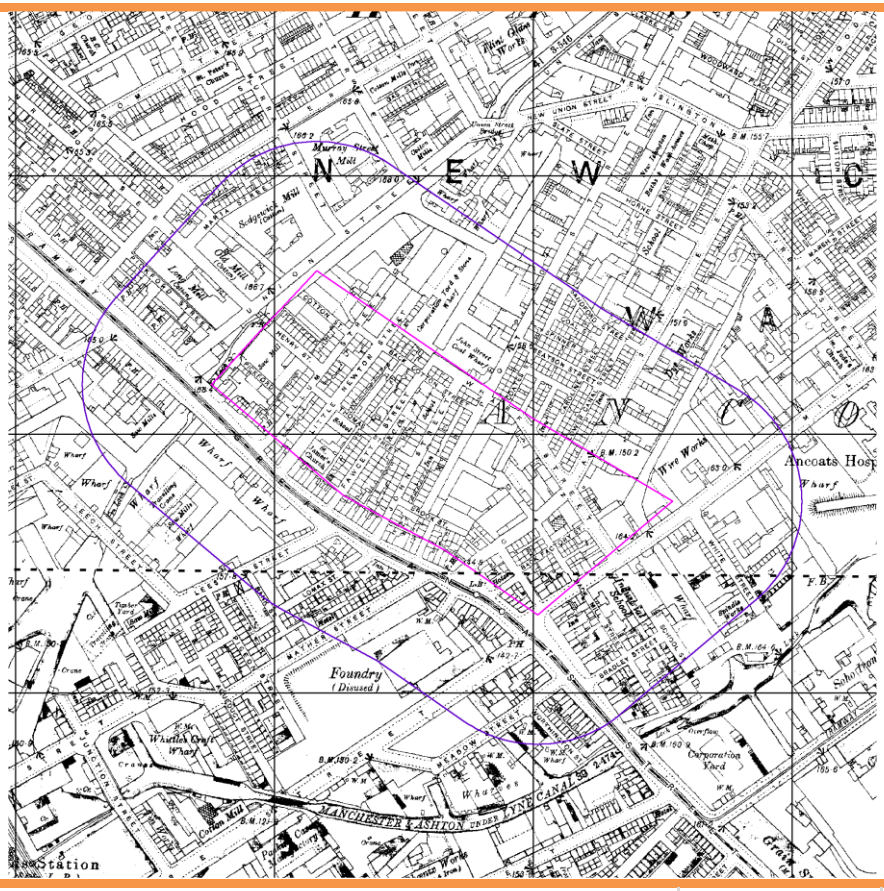
PLATE 5 -

APPENDIX V
HISTORICAL MAPS



APPENDIX V
HISTORICAL MAPS



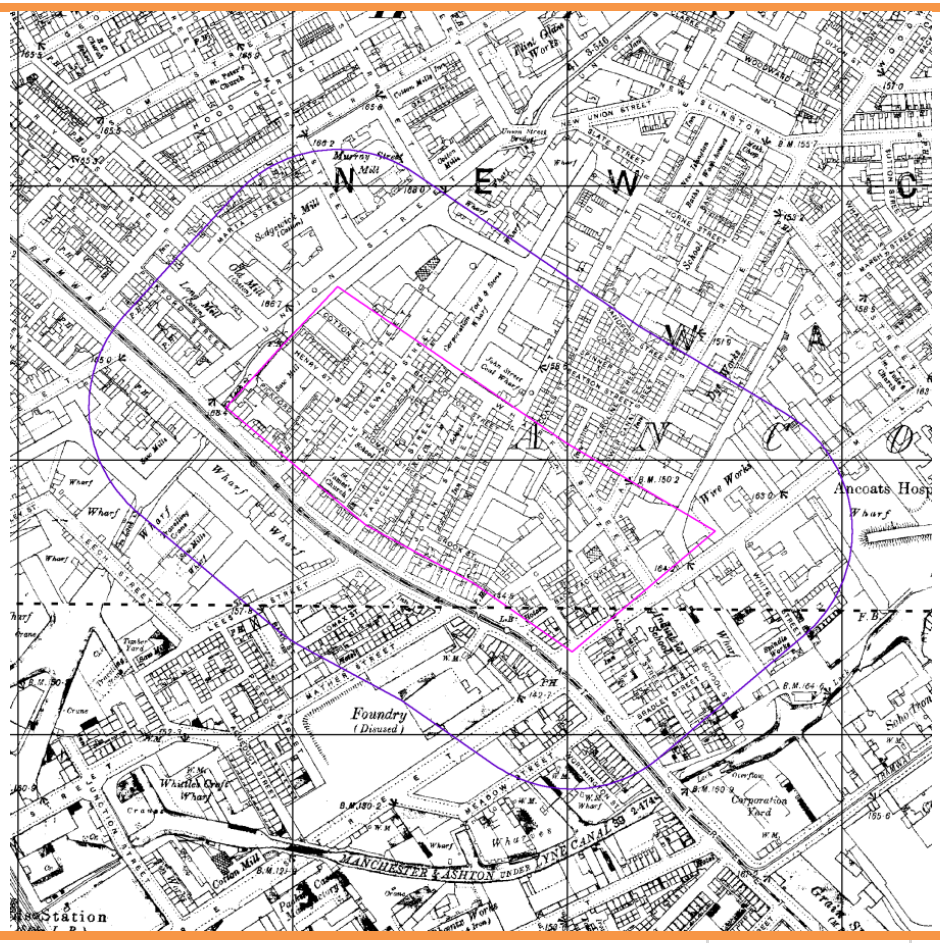


Historical Map

Dated: 1893

Original Scale: 1:2,500

North

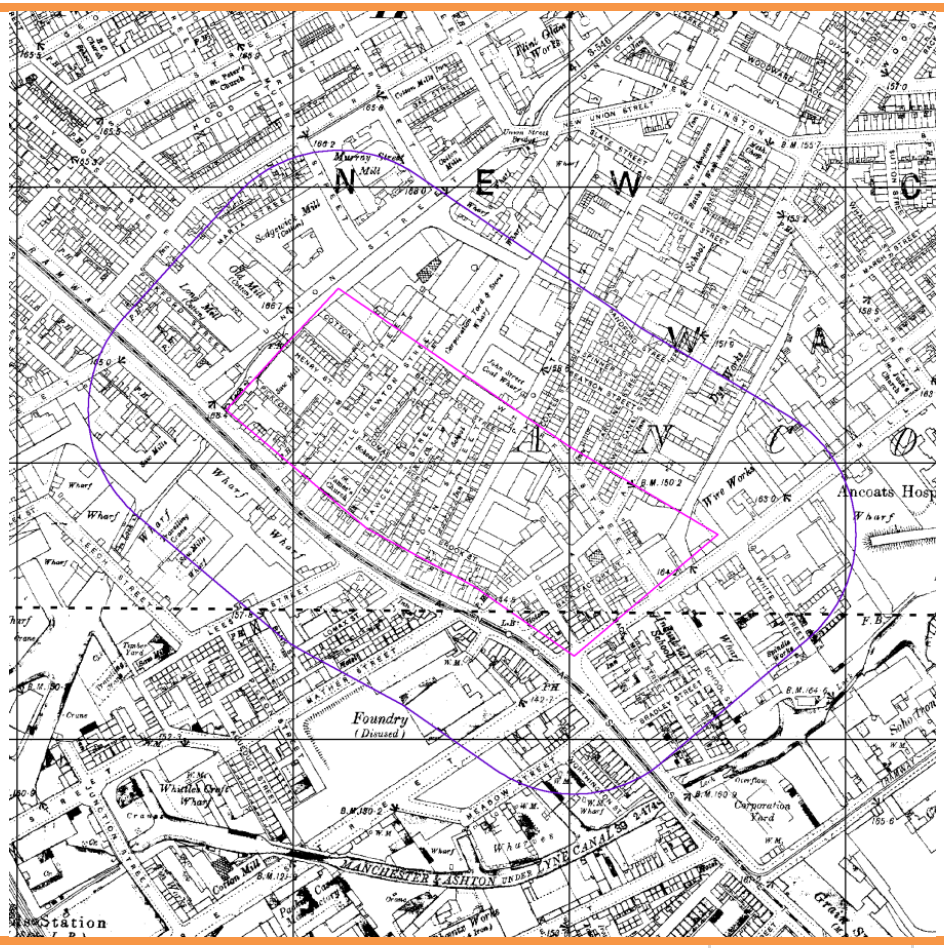


Historical Map

Dated: 1908

Original Scale: 1:2,500

North

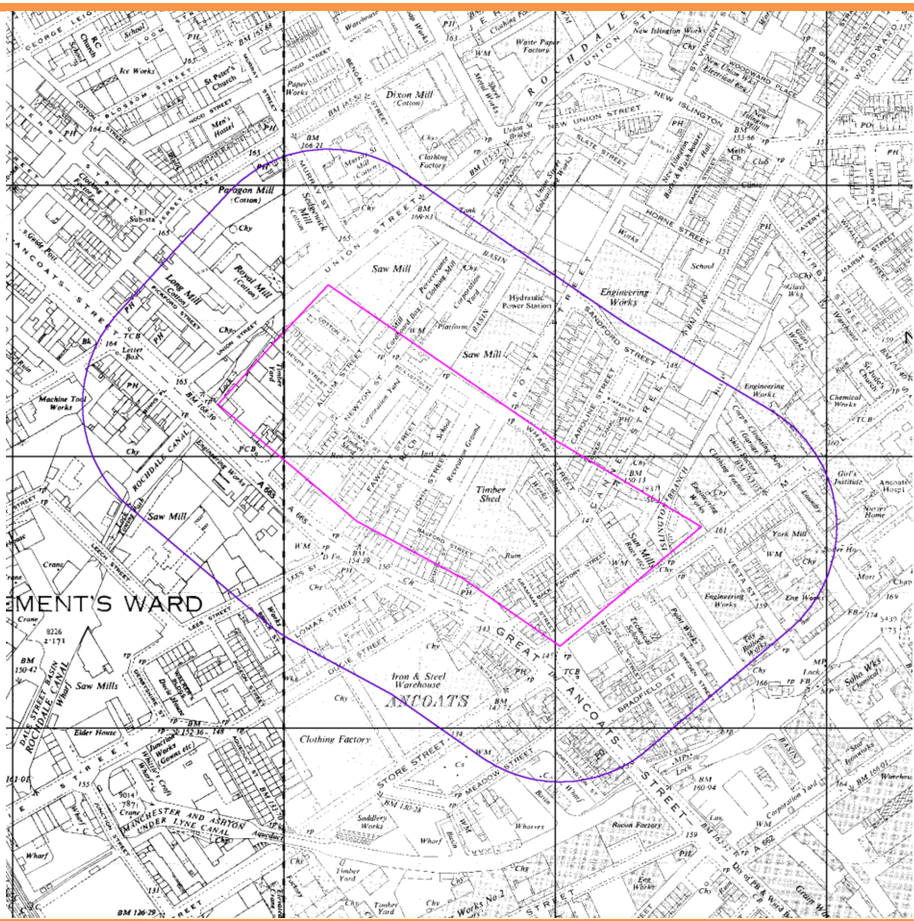


Historical Map

Dated: 1922

Original Scale: 1:2,500

North

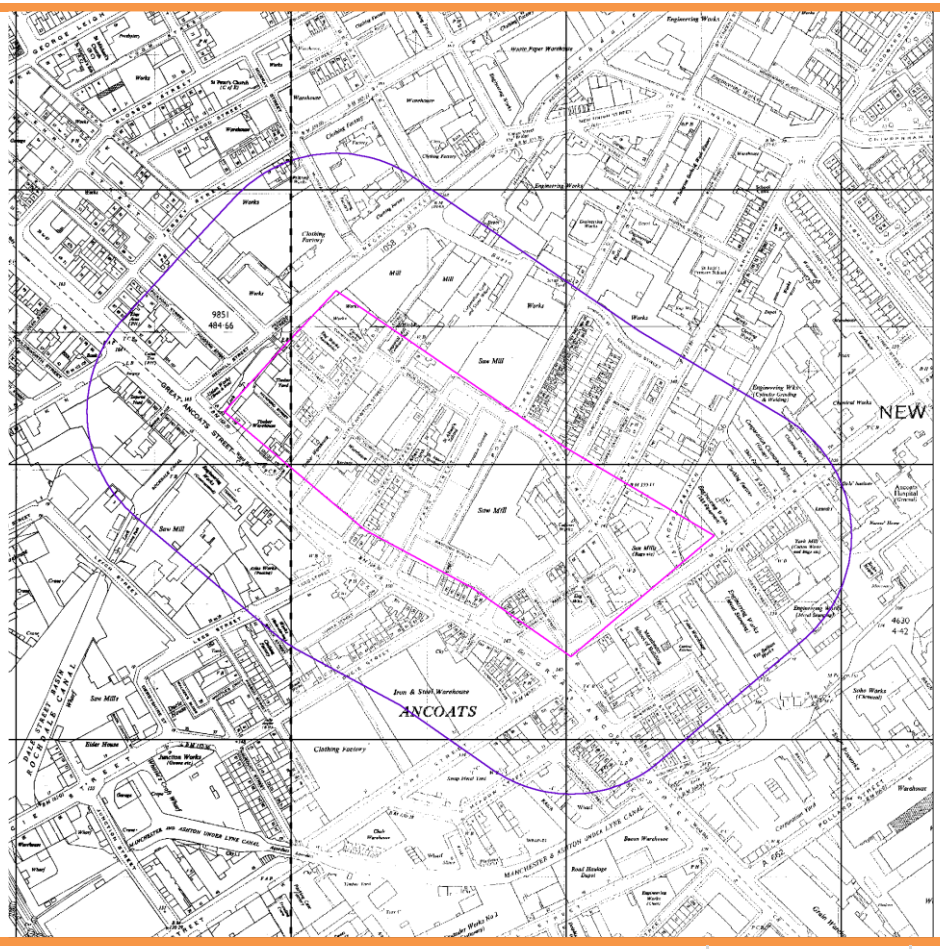


Historical Map

Dated: 1951

Original Scale: 1:2,500

North



Historical Map

Dated: 1965

Original Scale: 1:2,500

North



Historical Map

Dated: 1981

Original Scale: 1:2,500

North



Historical Map

Dated: 1981

Original Scale: 1:10,000

North

APPENDIX VI
E3P EXPLORATORY HOLE LOGS



Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
					0.30			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.70			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
				N=15 (3,5/4,5,3,3)				
	▼	1.90	ES		1.90			MADE GROUND: Medium dense red brown clayey gravel. Gravel is fine to coarse sub-angular to sub-rounded of brick.
		2.00	D	N=15 (2,2/3,4,4,4)				
		2.30	ES					Stiff medium strength to very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		3.00	D	N=19 (3,4/4,4,5,6)				
					3.45			End of borehole at 3.45 m

Remarks

1. Terminated at 3.45m bgl. 2. Water strike encountered at 1.90m bgl. 3. Monitoring well installed.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 19/06/2017 -	Logged By: G. Hirst

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.40	ES		0.10			MADE GROUND: Concrete.
					0.20			MADE GROUND: Brown medium to coarse sand.
				N=38 (5,6/7,8,9,14)				MADE GROUND: Dense light brown gravelly medium to coarse sand with cobbles. Gravel is medium to coarse angular to sub-rounded of sandstone.
				50 (25 for 30mm/50 for 15mm)	1.80			End of borehole at 1.80 m

Remarks

1. Refused at 1.80m bgl. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
		0.30	ES		0.15			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.50			MADE GROUND: Grey brown sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of brick and concrete.
		1.00	D	N=16 (2,3/4,4,4,4)				Very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		1.50	PP	221				
		2.00	D	N=24 (2,4/5,6,6,7)				
		2.80	PP	221				
		3.00	D	N=26 (3,4/5,6,7,8)				
		3.50	PP	103	3.40			Brown medium SAND.
					3.45			Firm to stiff brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		4.00	D	N=22 (2,3/3,5,6,8)	4.00			Medium dense brown medium SAND.
		4.20	ES		4.30			Very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		4.70	PP	128				
		5.00	D	N=31 (3,8/7,8,7,9)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.06			MADE GROUND: Brick.
					0.25			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		1.00	D	N=12 (2,2/3,3,3,3)	0.40			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.50	PP	221				Stiff medium strength to very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		2.00	D	N=19 (2,4/3,5,5,6)				
		2.50	PP	194				
		3.00	D	N=16 (2,2/3,4,4,5)				
		3.50	PP	186				
		4.00	D	N=18 (6,3/4,4,5,5)				
		4.50	PP	103				
		5.00	D	N=24 (2,4/5,5,7,7)				
					5.45			End of borehole at 5.45 m

Remarks

Complete.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
		0.30	ES		0.15			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		0.50	U		0.40			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.00	D	N=15 (2,3/3,4,4,4)				Stiff stiff medium strength to very stiff high strength brown mottled grey slightly silty CLAY.
		1.30	ES					
		1.50	PP	211				
		2.00	D	N=18 (2,3/4,4,5,5)				
		2.50	PP	177				
		3.00	D	N=19 (2,2/3,5,5,6)				
		3.50	PP	98				
		4.00	D	N=18 (2,4/4,4,5,5)				
		4.50	PP	221				
		5.00	D	N=14 (3,4/3,4,3,4)	4.90			Stiff medium strength brown very gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone and sandstone.
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
					0.25			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		0.55	ES		0.50			
					0.51			Membrane.
					0.70			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.00	D	N=13 (2,2/3,3,3,4)				
		1.34	ES					
		1.50	U					
		2.00	D	N=16 (2,2/3,4,4,5)				MADE GROUND: Firm red brown gravelly clay. Gravel is fine to coarse sub-rounded of brick, coal and mudstone.
								Stiff medium strength brown mottled grey slightly silty CLAY.
		2.60	PP	211				
		3.00	D	N=14 (3,4/3,4,3,4)				
	▼	4.00	D	N=22 (4,4/4,6,6,6)				
		4.60	PP	98				
		5.00	D	N=29 (4,5/6,7,8,8)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Perched water encountered at 4.00m bgl. 3. Monitoring well installed.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
					0.20			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.40			
		0.90	ES		0.80			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.00	D	N=6 (1,2/1,2,1,2)	1.00			
		1.80	PP	172				MADE GROUND: Light brown slightly clayey gravelly medium sand. Gravel is fine sub-angular to sub-rounded of limestone and sandstone.
		2.00	D	N=14 (2,3/3,3,4,4)				
		2.80	PP	177				MADE GROUND: Stiff red black brown very gravelly clay. Gravel is fine to coarse sub-angular of brick and clinker.
		3.00	D	N=12 (2,2/3,3,3,3)				Firm low strength to stiff medium strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		3.60	PP	221				
				N=21 (3,3/4,5,6,6)				
		4.70	PP	231				
				N=27 (3,5/5,6,6,10)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS108**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
					0.30			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		0.55	ES		0.70			
		1.00	D	N=6 (2,2/2,1,1,2)				MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.40	ES					MADE GROUND: Loose red black slightly sandy very clayey gravel. Gravel is fine to coarse sub-angular to sub-rounded of clinker, ash, coal and brick.
				N=10 (2,2/2,2,3,3)				
		3.00	D	N=6 (2,2/1,1,1,3)				
					3.30			Very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		3.70	PP	201				
		4.00	D	N=21 (3,3/4,5,6,6)				
				N=23 (3,5/5,6,6,6)				
					5.45			End of borehole at 5.45 m

Remarks

Complete.

Borehole Log

Borehole No. **WS109**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
					0.25			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.60			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
				N=22 (3,4/5,7,5,5)				
				N=8 (1,1/1,2,2,3)				MADE GROUND: Medium dense red grey brown slightly sandy clayey gravel. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone and sandstone.
					2.80			MADE GROUND: Black gravel. Gravel is fine to coarse sub-angular to sub-rounded of coal and timber.
		2.90	ES	N=11 (5,3/4,2,2,3)	3.00			
					3.40			MADE GROUND: Loose red grey brown slightly sandy clayey gravel. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone and sandstone.
		3.70	PP	221				Very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
				N=22 (5,4/4,4,6,8)				
		4.70	PP	221				
				N=20 (2,4/3,6,5,6)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS110**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.04			MADE GROUND: Red brown brick.
		0.40	ES		0.20			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		1.00	D	N=16 (2,2/3,3,4,6)	0.50			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.30	ES					MADE GROUND: Very stiff high strength dark grey slightly sandy very gravelly clay. Gravel is fine to coarse sub-angular to sub-rounded of brick, mudstone and coal.
				N=10 (2,2/2,2,4,2)	1.80 2.00			MADE GROUND: Black brown sandy gravel. Gravel is fine to medium sub-rounded of sandstone.
		3.00	D	N=16 (1,2/3,5,4,4)				MADE GROUND: Loose to medium dense red gravel. Gravel is fine to coarse sub-angular to sub-rounded of brick.
					3.10			Very stiff high strength brown CLAY.
		3.80	PP	221				
		4.00	D	N=33 (6,6/7,8,9,9)				
		4.80	PP	221				
				N=24 (4,5/5,6,6,7)				
					5.45			End of borehole at 5.45 m

Remarks

Complete.

Borehole Log

Borehole No. **WS111**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.04			MADE GROUND: Red brown brick.
					0.40			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		0.80	PP	186	0.60			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.00	D	N=12 (2,2/2,3,3,4)				STiff medium strength to very stiff high strength brown mottled grey slightly silty CLAY with occasional gravel. Gravel is fine sub-angular to sub-rounded of sandstone.
		1.30	ES					
		1.80	PP	221				
		2.00	D	N=23 (4,4/5,6,6,6)				
		3.00	D	N=24 (4,5/6,6,6,6)				
		4.00	D	N=23 (4,5/5,6,6,6)				
		5.00	D	N=23 (6,5/5,6,6,6)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS112**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.04			MADE GROUND: Red brown brick.
					0.20			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.60			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		0.80	ES	50 (3,4/50 for 15mm)				
					1.20			MADE GROUND: Very dense grey brown slightly clayey slightly sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone and sandstone.
		1.40	ES					
					1.60			MADE GROUND: Black grey sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of slate, ash and mudstone.
				N=11 (2,1/2,3,3,3)				MADE GROUND: Medium dense red grey sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of brick.
				N=20 (25 for 70mm/11,3,3,3)	3.10			Firm to stiff brown grey slightly silty CLAY.
		4.00	D	50 (7,8/50 for 70mm)				
					4.45			End of borehole at 4.45 m

Remarks

Refused at 4.45m bgl.

Borehole Log

Borehole No. **WS113**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.04			MADE GROUND: Red brown brick.
					0.30			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.50			
					0.80			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
				N=24 (5,7/4,4,7,9)				
		1.80	PP	196				MADE GROUND: Firm brown grey slightly silty gravelly clay. Gravel is fine to coarse sub-angular to sub-rounded of mudstone and brick.
				N=7 (2,2/2,2,1,2)	2.00			MADE GROUND: Medium dense brown very sandy gravel. Gravel is fine to coarse sub-angular of sandstone.
		2.20	ES					
					2.70			MADE GROUND: Loose red brown sandy gravel. Gravel is fine to coarse sub-angular of brick.
				N=0 (2,0/0,0,0,0)	3.00			MADE GROUND: Black grey sandy gravel. Gravel is fine sub-angular of clinker and sandstone.
					3.30			MADE GROUND: Red brown sandy gravel. Gravel is fine to medium of brick.
		3.80	PP	221				Firm to stiff brown grey slightly silty CLAY.
		3.90	ES	N=23 (6,4/5,5,6,7)				
		4.00	D					
		5.00	D	N=28 (5,6/7,7,7,7)				
					5.45			End of borehole at 5.45 m

Remarks

Complete.

Borehole Log

Borehole No. **WS114**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.04			MADE GROUND: Red brown brick.
					0.20			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
				N=4 (1,1/1,1,1,1)	0.80			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
					1.40			MADE GROUND: Loose grey slightly clayey slightly sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of mudstone and slate.
				N=16 (3,4/7,2,4,3)	1.80			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		2.40	ES					MADE GROUND: Medium dense black red slightly clayey gravel. Gravel is fine to coarse sub-angular to sub-rounded of clinker, brick, ash and mudstone.
				N=5 (2,1/1,1,1,2)				
				N=0 (1,1/0,0,0,0)				
				N=26 (5,5/6,6,7,7)	5.00			Very stiff high strength brown CLAY.
		6.00	D					
					6.45			End of borehole at 6.45 m

Remarks

Complete.

Borehole Log

Borehole No. **WS115**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.06			MADE GROUND: Brick.
					0.15			MADE GROUND: Red brown brick.
					0.30			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
		0.60	ES					
				50 (7,13/50 for 30mm)				MADE GROUND: Very dense red brown very clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
					1.30			End of borehole at 1.30 m

Remarks

Refused at 1.30m bgl.

Borehole Log

Borehole No. **WS116**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 09/06/2017 - 09/06/2017	Logged By: G. Hirst

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Concrete.
		0.40	ES		0.45			MADE GROUND: Brown gravelly medium to coarse sand with cobbles. Gravel is medium to coarse angula to sub-angular of sandstone and rare brick.
				N=12 (3,4/5,2,3,2)	1.10			MADE GROUND: Medium dense brown sandy gravel with frequent cobbles. Gravel is fine to coarse angular to sub-angular of sandstone, limestone, rare coal and rare brick.
		1.30	ES					
				N=4 (2,1/1,1,1,1)	2.00			MADE GROUND: Black brown gravelly clayey fine to medium sand with cobbles. Gravel is fine to coarse angular to sub-angular of limestone, sandstone and brick.
					2.10			MADE GROUND: Very loose light grey gravel. Gravel is fine to medium angular to sub-angular of limestone.
		2.50	ES					
				N=4 (1,1/1,1,1,1)				MADE GROUND: Dark brown gravelly sandy clay. Gravel is fine to coarse angular to sub-rounded of brick, ash, rare slag and rare porcelain.
	▼			N=8 (2,3/2,2,2,2)				
					4.50			MADE GROUND: Black gravelly silty fine to coarse sand. Gravel is fine to medium angular to sub-angular of brick, ash and limestone.
				N=13 (1,4/3,3,3,4)	5.10			Firm to stiff brown CLAY.
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Water strike encountered at 4.00m bgl.

Borehole Log

Borehole No. **WS117**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 09/06/2017 - 09/06/2017	Logged By: G. Hirst

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.09			MADE GROUND: Concrete.
					0.50			MADE GROUND: Light grey sandy gravel. Gravel is fine to medium angular to sub-angular of limestone.
		0.90	ES	N=17 (2,2/4,4,4,5)	0.70 0.85 1.00			MADE GROUND: Brown gravelly medium to coarse sand . Gravel is fine to medium angular to sub-angular of sandstone and coal.
		1.60	PP	245				MADE GROUND: Red brown fine to medium sand.
				N=17 (1,2/5,4,4,4)				MADE GROUND: Dark brown slightly gravelly medium to coarse sand with organic content. Gravel is fine to medium angular to sub-angular of sandstone and rare coal.
		2.50 2.50	PP U	110				Very stiff high strength brown slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone and rare coal.
				N=16 (2,4/4,4,4,4)	3.10			Very stiff high strength brown CLAY.
		3.50	PP	129				
		3.90	ES	N=24 (4,4/5,4,7,8)				
		4.50	PP	219				
				N=27 (4,5/5,7,7,8)	5.00			End of borehole at 5.00 m

Remarks

Complete.

Borehole Log

Borehole No. **WS118**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES	50 (25 for 50mm/50 for 30mm)	0.15			MADE GROUND: Concrete.
					0.15			MADE GROUND: Blue membrane.
					0.70			MADE GROUND: Very dense brown slightly clayey sandy gravel. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.
								End of borehole at 0.70 m

Remarks

Refused at 0.70m bgl.

Borehole Log

Borehole No. **WS119**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 07/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			MADE GROUND: Concrete.
		0.40	ES		0.15			MADE GROUND: Blue membrane.
					0.20			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		0.70	PP	211	0.60			
		1.00	D	N=16 (2,2/4,4,4,4)				MADE GROUND: Blue grey slightly clayey gravel. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.
		1.70	PP	206				Very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		2.00	D	N=16 (2,4/4,4,4,4)				
		2.60	ES					
		2.70	PP	162				
				N=15 (2,3/3,4,4,4)				
		3.70	PP	113				
				N=24 (4,4/5,6,6,7)				
				N=24 (3,5/5,6,6,7)				
					5.45			End of borehole at 5.45 m

Remarks

Complete.

Borehole Log

Borehole No. **WS120**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 19/06/2017 -	Logged By: G. Hirst

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			MADE GROUND: Concrete.
		0.30	ES		0.30			MADE GROUND: Grey brown sandy gravel. Gravel is fine to medium angular to sub-rounded of limestone.
				N=39 (7,8/8,8,9,14)				MADE GROUND: Dens elight brown gravelly fine to medium sand with cobbles. Gravel is medium to coarse angular to sub-rounded of sandstone, limestone and rare coal.
		1.60	ES					
				N=11 (3,2/2,3,3,3)	2.10			MADE GROUND: Firm black brown slightly sandy slightly gravelly clay. Gravel is fine to medium angular to sub-rounded of brick, sandstone and rare coal.
		2.50	PP	45	2.60			Stiff medium strength to very stiff high strength brown slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of coal and mudstone.
		2.50	ES					
		2.80	PP	169				
				N=15 (2,2/3,3,4,5)				
		3.60	PP	210				
				N=27 (4,5/5,7,7,8)				
		4.70	PP	226				
		4.80	ES					
				N=26 (4,6/5,7,6,8)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS121**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 19/06/2017 -	Logged By: G. Hirst

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.20			MADE GROUND: Concrete.
					0.50			MADE GROUND: Brown gravelly medium to coarse sand. Gravel is fine to coarse angular to sub-rounded of sandstone, mudstone, limestone and brick.
		0.70	ES		0.70			MADE GROUND: Grey sandy gravel with cobbles. Gravel is fine to coarse angular to sub-angular of limestone, sandstone and coal.
				N=16 (2,3/3,4,4,5)	1.00			MADE GROUND: Light brown gravelly medium to coarse sand with cobbles. Gravel is fine to coarse angular to sub-rounded of sandstone and limestone.
		1.40	PP	207				Very stiff high strength brown slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of mudstone, sandstone and coal/
				N=20 (3,3/4,5,5,6)				
		2.20	ES					
		2.60	PP	187				
				N=18 (3,4/4,4,5,5)				
		3.50	PP	97				
				N=19 (3,4/4,5,4,6)				
		4.40	PP	60				
		4.80	ES		4.70			Medium dense brown slightly gravelly clayey fine to medium SAND. Gravel is fine sub-angular to sub-rounded of mudstone and coal.
				N=29 (4,6/5,6,8,10)	5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Monitoring well installed.

Borehole Log

Borehole No. **WS125**

Sheet 1 of 1

Project Name: Central Retail Park	Project No.: 11834	Co-ords: -	Hole Type: WS
Location: Manchester		Level:	Scale: 1:50
Client:		Dates: 06/06/2017 -	Logged By: R. Walker

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.06			MADE GROUND: Brick.
		0.40	ES		0.15			MADE GROUND: Yellow grey slightly gravelly coarse sand. Gravel is fine to medium sub-angular to sub-rounded of limestone.
					0.50			MADE GROUND: White slightly sandy gravel. Gravel is fine to medium sub-angular to sub-rounded of brick and concrete.
				N=15 (2,3/3,4,4,4)	0.80			MADE GROUND: Red brown slightly clayey gravelly medium sand. Gravel is fine to coarse sub-angular to sub-rounded of limestone.
		1.70	PP	221				Very stiff high strength brown mottled grey slightly sandy CLAY with occasional gravel. Gravel is fine sub-angular of coal and sandstone.
		2.00	D	N=20 (2,3/3,5,5,7)				
		2.60	PP	221				
		3.00	D	N=18 (3,3/3,5,4,6)				
		3.70	PP	123				
		4.00	D	N=15 (2,2/3,4,4,4)				
		4.60	PP	88				
	▼	5.00	D	N=13 (1,3/3,2,4,4)				
					5.45			End of borehole at 5.45 m

Remarks

1. Complete. 2. Water strike encountered at 5.10m bgl.

Borehole Log

Borehole No. **BH101**

Sheet 1 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05			MADE GROUND: Concrete.
					0.10			SAND.
		0.40	D		0.40			GRAVEL.
								Firm becoming very stiff brown CLAY.
		1.20		N=11 (1,1/2,2,3,4)				
		1.20	D					
		2.00		N=18 (2,2/3,4,5,6)				
		3.00		N=24 (3,3/4,6,7,7)				
		4.00		N=25 (3,4/5,7,6,7)				
		5.00		N=29 (4,4/6,6,8,9)				
		8.00		N=25 (3,5/5,6,6,8)				

1 2 3 4 5 6 7 8 9 10

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH101**
Sheet 2 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		11.00		N=43 (5,5/8,11,12,12)				
		12.50		N=46 (5,6/9,10,13,14)				
		14.00		N=22 (3,5/5,6,6,5)				
		15.20	D					
		15.50		N=45 (6,7/8,11,12,14)				
		16.80	D		16.80			Red MARL.
		17.00		50 (9,14/50 for 10mm)				
		18.50		N=23 (2,4/4,6,6,7)	18.50			Firm brown sandy CLAY.
		19.50	D		19.50			Firm grey silty CLAY.
		20.00		N=22 (2,3/4,5,6,7)				

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH101**

Sheet 3 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.50	D		20.50			Brown SAND and GRAVEL.
		21.50		N=32 (3,6/7,8,7,10)				
		22.20	D		22.20			Brown sandy CLAY.
		23.00		50 (25 for 30mm/50 for 46mm)				
					24.00			Brown sandy CLAY.
		24.30	D		24.30			Dense brown SAND.
		24.50		50 (8,12/50 for 58mm)				
		26.00		50 (9,14/50 for 38mm)				
					26.20			Dense brown SAND and GRAVEL.
		26.70	D					
		27.50		49 (10,11/49 for 2mm)				
		27.70	D		27.70			Red SANDSTONE.
		28.50		50 (25 for 75mm/50 for 34mm)	28.50			Weak to medium strength thinly bedded red brown medium to coarse grained SANDSTONE.

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH101**

Sheet 4 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					39.00			End of borehole at 39.00 m

31 32 33 34 35 36 37 38 39 40

Remarks

Borehole Log

Borehole No. **BH102**

Sheet 1 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05			MADE GROUND: Concrete.
					0.10			SAND.
					0.40			GRAVEL.
								Stiff brown CLAY.
		1.20		N=12 (1,1/2,3,3,4)				
		2.00		N=17 (2,3/3,3,5,6)				
		3.00		N=23 (1,3/3,5,7,8)				
		4.00		N=23 (3,3/5,5,6,7)				
		5.00		N=27 (3,4/5,7,7,8)				
		8.00		N=26 (4,5/5,6,7,8)				
					9.50			Stiff brown CLAY.
								Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Borehole Log

Borehole No. **BH102**

Sheet 2 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		11.00		N=24 (3,5/5,5,7,7)				
		12.50		N=26 (4,4/6,7,7,6)				
					13.10			Stiff brown laminated CLAY.
		14.00		N=23 (3,3/5,5,6,7)	13.90			Brown SAND and GRAVEL.
					14.10			Stiff brown sandy CLAY.
		15.50		N=31 (4,5/7,7,8,9)				
					16.80			Brown clayey SAND.
		17.00		N=35 (3,5/7,9,9,10)	17.00			Brown clayey SAND.
					17.70			Firm brown sandy CLAY.
		18.50		N=16 (2,3/3,4,4,5)				
					19.30			Stiff brown silty laminated CLAY.
		20.00		N=13 (2,2/3,3,4,3)				

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH102**

Sheet 3 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		21.50		N=13 (2,2/2,3,4,4)				
		23.00		N=41 (7,9/10,10,10,11)	22.90			Stiff brown sandy gravelly CLAY.
					23.80			Stiff brown sandy gravelly CLAY.
					24.00			Brown SAND and GRAVEL.
		24.50		N=27 (4,5/5,6,7,9)				
					25.10			Brown SAND and GRAVEL.
		26.00		N=30 (5,6/8,8,6,8)				
		27.50		50 (5,6/50 for 50mm)				
					27.80			Red SANDSTONE.
					28.50			Weak to medium strength thinly bedded red brown medium to coarse grained SANDSTONE.
								Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

Borehole Log

Borehole No. **BH102**

Sheet 4 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					39.00			End of borehole at 39.00 m

Remarks

Borehole Log

Borehole No. **BH103**

Sheet 1 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D		0.10			MADE GROUND: Concrete.
		0.40	D		0.20			SAND.
								SAND and GRAVEL.
					0.70			Dark sandy CLAY.
		1.00	D					
		1.20	D		1.10			CLAY.
		1.50		N=17 (3,4/4,3,5,5)				
		2.20	D					
		2.50		N=31 (2,11/17,4,4,6)				
		3.20	D					
		3.50		N=4 (2,1/1,1,1,1)	3.60			Grey slightly clayey SAND.
		4.20	D		4.10			Light brown SAND.
		4.50		N=15 (1,2/3,4,4,4)				
		5.50	D					
		6.50	D					
		7.00	D					
		7.50		N=15 (1,2/2,4,4,5)				
		8.50	D					
		9.00		N=15 (1,2/3,3,4,5)				
		9.00	U					
		10.00	D					

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH103**

Sheet 2 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.35		N=21 (2,2/4,4,4,9)	10.50			
					10.60			Light brown SAND.
								Firm to sitff brown CLAY with occasional sand lesnes.
		11.50	D					
		11.80	D		11.80			
		12.00		N=44 (4,6/9,11,12,12)	12.10			Firm to sitff brown CLAY with red brown silty sand lenses.
								Red slightly clayey SAND.
		13.00	D					
		13.50		50 (8,9/50 for 70mm)	13.50			Firm brown CLAY with fine gravel.
		14.50	D					
		14.80	D		14.80			Light brown clayey SILT.
		15.00		N=30 (3,5/5,8,8,9)	15.10			Brown CLAY.
		16.00	D					
		16.50	U		16.50			Brown sandy CLAY with frequent gravel.
		17.00	D		17.00			Brown sandy CLAY with frequent gravel.
		17.50	D					
		18.00		N=31 (4,7/7,7,8,9)				
		19.10	D		19.10			Slightly silty clayey SAND and GRAVEL.
		19.50		N=22 (2,3/5,5,7,5)				
					20.00			

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH103**
Sheet 3 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.50	D					Brown very fine sandy CLAY.
		21.00		50 (7,9/50 for 33mm)				
		22.50		50 (5,9/50 for 0mm)				
		22.50	D					
		23.00	D		23.00			Brown silty clayey SAND with occasional gravel.
		23.50	D					
		24.00		N=49 (7,9/11,11,12,15)	24.00			Very sandy CLAY with occasional gravel.
		25.00	D					
		25.10		N=33 (4,6/7,7,9,10)	25.10			SAND.
					25.20			Very sandy CLAY with occasional gravel.
					26.00			Very sandy CLAY with gravel.
		26.50	D					
		27.00		N=29 (3,5/2,7,7,13)				
		28.00	D		28.00			Dense SAND and GRAVEL.
		28.50		56 (7,8/56 for 25mm)				
					29.30			Dense red SAND with fine gravel.
					30.00			

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH103**

Sheet 4 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dense red SAND.
					33.00			Weak to medium strength thinly bedded red brown medium to coarse grained SANDSTONE.
					39.00			End of borehole at 39.00 m

31 32 33 34 35 36 37 38 39 40

Remarks

Borehole Log

Borehole No. **BH104**

Sheet 1 of 2

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Concrete.
					0.40			MADE GROUND: Sand and gravel.
								MADE GROUND: Loose black sandy brick fill.
		1.20		N=7 (3,3/3,1,1,2)				
		2.00		N=11 (3,2/3,1,4,3)				
		2.70	D		2.70			Very stiff brown sandy CLAY. (Becoming firm at 8.00m bgl).
		3.00		N=26 (2,3/4,7,7,8)				
		4.00		N=29 (4,4/5,7,8,9)				
		5.00		N=14 (2,2/3,3,4,4)				
		6.50	D					
		8.00		N=15 (2,3/3,3,4,5)				
		9.50	D					

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH104**
Sheet 2 of 2

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					10.70			Very soft to firm brown sandy CLAY.
		11.00		N=26 (5,5/6,7,7,6)				
					12.30			Dense brown SAND.
		12.50		N=37 (5,7/7,8,10,12)				
					13.10			Very stiff brown sandy CLAY.
		14.00		N=30 (5,6/7,7,8,8)				
		15.50		N=37 (5,7/7,9,10,11)				
		17.00		N=36 (4,5/8,9,9,10)	17.00			End of borehole at 17.00 m

Remarks

Borehole Log

Borehole No. **BH105**

Sheet 1 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			MADE GROUND: Concrete.
		0.50	D					MADE GROUND: Medium dense to very dense brick and concrete.
		1.50		N=15 (3,7/2,3,4,6)				
		2.50		50 (25 for 10mm/50 for 30mm)				
		3.50		50 (25 for 0mm/50 for 40mm)				
		4.50		N=20 (3,4/4,5,5,6)	4.60			Stiff brown CLAY with occasional gravel.
		5.50	D					
		6.00		N=18 (1,2/4,4,4,6)				
		7.00	D					
		7.50	U		7.50			Very stiff brown CLAY.
		8.00	D					
		9.00		N=19 (1,2/4,4,5,6)				
		10.00	D					

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH105**

Sheet 2 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	U					
		11.00	D					
		11.50	D		11.50			Brown silty SAND.
		12.00		N=46 (2,6/9,12,12,13)	12.20			Very stiff brown sandy CLAY.
		13.00	D					
		13.50		N=40 (4,6/9,10,10,11)	13.60			Dense light brown silty SAND.
					14.00			Soft brown CLAY with occasional gravel.
		14.50	D					
		15.00		N=44 (8,7/10,10,11,13)	15.00			Dense SAND and GRAVEL.
		16.50		N=40 (3,6/7,9,10,14)				
		16.50	D					
		17.00	D					
					17.50			Dense SAND and GRAVEL.
		18.00		N=46 (4,7/9,11,12,14)	18.00			Dense clayey SAND.
		18.30	D		18.30			Dense red brown slightly silty clayey SAND.
		18.50	D					
					19.20			Very dense SAND and GRAVEL.
		19.50		50 (5,11/50 for 10mm)				

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH105**

Sheet 3 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		21.00		N=39 (3,4/9,8,11,11)				
		22.50		N=37 (1,3/6,9,9,13)				
		24.00		50 (25 for 50mm/50 for 35mm)				
		25.00	D					
		25.50		N=46 (4,5/13,14,9,10)	25.50			Very dense red brown SAND with gravel.
		26.00	D					
		27.00		N=43 (3,8/10,10,11,12)				
		28.00	D		28.00			Red brown SAND and GRAVEL.
		28.50		55 (8,13/55 for 65mm)	28.50			Weak to medium strength thinly bedded red brown medium to coarse grained SANDSTONE.
		29.50		50 (15,9/50 for 45mm)				

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH105**

Sheet 4 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					34.50			End of borehole at 34.50 m

31
32
33
34
35
36
37
38
39
40

Remarks

Borehole Log

Borehole No. **BH106**

Sheet 1 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05			MADE GROUND: Concrete.
					0.10			SAND.
								Dense brown sandy GRAVEL.
		1.20		N=14 (2,2/3,5,3,3)				
					1.50			Firm grey CLAY.
		2.00		N=4 (1,1/1,1,1,1)				
					2.30			Soft grey silty CLAY.
		3.00		N=3 (1,0/1,0,1,1)				
		3.70	D		3.70			Soft becoming stiff brown CLAY.
		4.00		N=11 (2,2/2,3,3,3)				
		5.00		N=12 (2,2/3,3,3,3)				
					6.70			Firm becoming very stiff brown CLAY.
		8.00		N=20 (3,4/4,5,5,6)				
		9.50		N=23 (4,5/5,6,6,6)				
								Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Borehole Log

Borehole No. **BH106**

Sheet 2 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		11.00		N=92 (4,4/5,6,6,75)	11.00			Very stiff brown CLAY.	11
		11.90	D		11.90			Very stiff brown sandy CLAY.	12
		12.50		N=32 (5,5/6,8,9,9)					13
		14.00		50 (3,5/50 for 5mm)					14
					14.30			Dense brown SAND.	
		15.50		50 (8,10/50 for 6mm)					15
		17.00		38 (12,12/38 for 36mm)					16
									17
					18.00			Dense brown SAND.	18
		18.30	D		18.30			Dense brown sandy CLAY.	
		18.50		N=37 (6,7/8,9,10,10)					19
		19.20	D		19.20			Very stiff grey silty CLAY.	
		20.00		N=35 (5,6/8,8,9,10)					20

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH106**

Sheet 3 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.40	D		20.40			Dense brown silty SAND.
		21.50		N=19 (3,3/4,5,4,6)				
		23.00		N=42 (6,8/8,11,10,13)	22.90			Very stiff brown sandy gravelly CLAY.
		24.50		50 (25 for 50mm/50 for 42mm)	24.50			Red SANDSTONE.
		26.30		50 (25 for 53mm/50 for 26mm)	26.30			Weak to medium strength thinly bedded red brown medium to coarse grained SANDSTONE.

Continued on next sheet

Remarks

Borehole Log

Borehole No. **BH106**

Sheet 4 of 4

Project Name: Central Retail Park	Project No. 11834	Co-ords: -	Hole Type BH
Location: Manchester		Level:	Scale 1:50
Client:		Dates: -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					34.50			End of borehole at 34.50 m

31
32
33
34
35
36
37
38
39
40

Remarks

APPENDIX VII
CHEMICAL TESTING RESULTS



Roy Walker
e3p
Office 4
Heliport Business Park
Eccles
Liverpool Road
Manchester
M30 7RU

t: 0161 707 9612

e: rwalker@e3p.co.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 : 17-51311

Project / Site name:	Central Retail Park, Manchester	**Samples received on:**	12/06/2017
Your job number:	11-834	**Samples instructed on:**	13/06/2017
Your order number:		**Analysis completed by:**	20/06/2017
Report Issue Number:	1	**Report issued on:**	20/06/2017
Samples Analysed:	6 leachate samples - 14 soil samples		

Signed:

Dr Irma Doyle
Senior Account 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.

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
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	18	13	12	25
Total mass of sample received	kg	0.001	NONE	0.46	1.5	0.53	0.51	0.41
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Chrysotile- Loose fibres
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.3	8.8	8.5	8.4	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	320	2000	430	290	23000
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	110	400	88	120	3200
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	54.3	199	43.9	60.1	1610
Water Soluble SO4 as SO4 (2:1) Gallery 16h extraction	g/l	0.00125	MCERTS	0.0543	0.199	0.0439	0.0601	1.61
Sulphide	mg/kg	1	MCERTS	< 1.0	1.6	1.5	< 1.0	8.2
Total Sulphur	mg/kg	50	MCERTS	250	920	260	260	10000
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.7	-	-	0.7	-
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	-	0.27	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	0.23	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	0.22	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	0.20	-	2.0	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.32	< 0.05	-
Fluoranthene	mg/kg	0.05	MCERTS	0.20	-	2.5	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	0.18	-	2.6	< 0.05	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.12	-	1.0	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	0.10	-	1.2	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	1.3	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.58	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	1.1	< 0.05	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.57	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.11	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	0.80	< 0.05	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	0.80	-	14.8	< 0.80	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.6	37	11	8.8	29
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.3	< 0.2	0.9
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	24	27	26	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	150	43	26	1600
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19	270	46	12	1600
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.6	0.6	< 0.3	1.8
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	29	26	30	19
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	62	270	80	58	290
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	1.1	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	5.0	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	45	-	-	33
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	59	-	-	36
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	2.5	-	-	1.3
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	18	-	-	8.7
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	76	-	-	50
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	150	-	-	150
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	250	-	-	210
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
TPH (C6 - C8)	mg/kg	0.1	NONE	< 0.1	-	< 0.1	< 0.1	-
TPH (C8 - C10)	mg/kg	0.1	NONE	< 0.1	-	< 0.1	< 0.1	-
TPH (C10 - C12)	mg/kg	2	MCERTS	3.4	-	< 2.0	< 2.0	-
TPH (C12 - C16)	mg/kg	4	MCERTS	11	-	< 4.0	< 4.0	-
TPH (C16 - C21)	mg/kg	1	MCERTS	9.5	-	11	< 1.0	-
TPH (C21 - C35)	mg/kg	1	MCERTS	7.4	-	50	< 1.0	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	< 0.1
Phenol	mg/kg	0.2	ISO 17025	-	0.3	-	-	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	< 0.2
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	-	1.7	-	-	0.32
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	-	1.0	-	-	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.55	-	-	0.23
Acenaphthene	mg/kg	0.05	MCERTS	-	0.80	-	-	0.60
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	-	0.8	-	-	0.4
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Fluorene	mg/kg	0.05	MCERTS	-	1.3	-	-	0.74
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	-	9.1	-	-	6.4
Anthracene	mg/kg	0.05	MCERTS	-	1.9	-	-	1.3
Carbazole	mg/kg	0.3	MCERTS	-	0.6	-	-	0.6
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	-	11	-	-	9.2
Pyrene	mg/kg	0.05	MCERTS	-	11	-	-	9.5
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	4.9	-	-	4.5
Chrysene	mg/kg	0.05	MCERTS	-	5.2	-	-	4.5
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	5.9	-	-	5.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	1.8	-	-	2.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	4.7	-	-	4.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	2.2	-	-	2.7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.45	-	-	0.75
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	2.7	-	-	3.6

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
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	5.7	14	7.8	14	14
Total mass of sample received	kg	0.001	NONE	0.51	0.56	0.56	0.47	0.60
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	10.7	8.7	9.2	8.4	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	4500	290	59	400	190
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1200	110	22	240	140
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	585	54.1	11.3	122	69.1
Water Soluble SO4 as SO4 (2:1) Gallery 16h extraction	g/l	0.00125	MCERTS	0.585	0.0541	0.0112	0.122	0.0690
Sulphide	mg/kg	1	MCERTS	2.3	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	1800	160	< 50	240	200
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	1.1	-
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
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	< 0.80	< 0.80	< 0.80

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	9.8	1.3	7.1	6.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	9.4	26	6.6	32	14
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13	25	8.1	28	17
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	27	8.7	12	9.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.9	28	8.5	33	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	28	60	25	110	40
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	4.8	< 4.0	< 4.0	14	7.1
TPH (C16 - C21)	mg/kg	1	MCERTS	8.0	2.6	< 1.0	16	12
TPH (C21 - C35)	mg/kg	1	MCERTS	33	11	< 1.0	28	40

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	0.32	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	0.17	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	0.18	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	0.17	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
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	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-	-	-

Total PCBs by GC-MS

Total PCBs	mg/kg	0.007	MCERTS	-	-	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				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	
Moisture Content	%	N/A	NONE	13	6.5	11	20	
Total mass of sample received	kg	0.001	NONE	0.52	0.48	0.55	0.50	
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	
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.6	9.2	8.3	8.4	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	
Total Sulphate as SO_4	mg/kg	50	MCERTS	370	58	200	410	
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	120	28	49	210	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	59.7	13.9	24.6	107	
Water Soluble SO4 as SO4 (2:1) Gallery 16h extraction	g/l	0.00125	MCERTS	0.0597	0.0139	0.0246	0.107	
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Total Sulphur	mg/kg	50	MCERTS	150	< 50	140	180	
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	1.3	
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.34	-	0.25	0.36	
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.14	
Phenanthrene	mg/kg	0.05	MCERTS	0.15	-	0.36	0.82	
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.17	
Fluoranthene	mg/kg	0.05	MCERTS	0.10	-	0.15	0.87	
Pyrene	mg/kg	0.05	MCERTS	0.10	-	0.14	0.75	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.10	0.37	
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	0.10	0.34	
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.32	
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.21	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.27	
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.14	
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.22	
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	1.10	4.98	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	4.7	2.2	5.4	11	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	5.2	7.2	34	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23	8.3	22	32	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	9.4	5.5	25	17	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	5.6	8.3	40	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	52	15	36	76	
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	-	-	-	
Toluene	µg/kg	1	MCERTS	-	-	-	-	
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	
o-xylene	µg/kg	1	MCERTS	-	-	-	-	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
TPH (C6 - C8)	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
TPH (C8 - C10)	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	
TPH (C12 - C16)	mg/kg	4	MCERTS	8.8	< 4.0	4.9	6.3	
TPH (C16 - C21)	mg/kg	1	MCERTS	9.6	< 1.0	8.9	14	
TPH (C21 - C35)	mg/kg	1	MCERTS	19	< 1.0	27	39	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Naphthalene	mg/kg	0.05	MCERTS	-	0.14	-	-	
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Phenanthrene	mg/kg	0.05	MCERTS	-	0.22	-	-	
Anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Fluoranthene	mg/kg	0.05	MCERTS	-	0.15	-	-	
Pyrene	mg/kg	0.05	MCERTS	-	0.12	-	-	
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	
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	-	-	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 52	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 101	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 118	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 138	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 153	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 180	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	< 0.007	-	-	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765591	765592	765593	765594	765595
Sample Reference				WS113	WS103	WS101	WS115	WS118
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	0.30	1.90	0.60	0.50
Date Sampled				06/06/2017	08/06/2017	08/06/2017	09/06/2017	09/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	9.3	12.1	8.2	7.0	5.5
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	7.2	< 1.1	9.5	< 1.1	< 1.1
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	9.6	8.1	0.7	2.2	2.2
Copper (dissolved)	µg/l	0.7	ISO 17025	15	13	8.5	8.7	9.2
Lead (dissolved)	µg/l	1	ISO 17025	3.5	< 1.0	9.8	1.2	1.9
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	4.4	1.9	1.1	1.6	7.3
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	6.1	4.3	3.7	3.5	13

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765591	765592	765593	765594	765595
Sample Reference				WS113	WS103	WS101	WS115	WS118
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	0.30	1.90	0.60	0.50
Date Sampled				06/06/2017	08/06/2017	08/06/2017	09/06/2017	09/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765596				
Sample Reference				WS116				
Sample Number				None Supplied				
Depth (m)				2.50				
Date Sampled				09/06/2017				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.5				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10				
Speciated PAHs								
Naphthalene	µg/l	0.01	NONE	< 0.01				
Acenaphthylene	µg/l	0.01	NONE	< 0.01				
Acenaphthene	µg/l	0.01	NONE	< 0.01				
Fluorene	µg/l	0.01	NONE	< 0.01				
Phenanthrene	µg/l	0.01	NONE	< 0.01				
Anthracene	µg/l	0.01	NONE	< 0.01				
Fluoranthene	µg/l	0.01	NONE	< 0.01				
Pyrene	µg/l	0.01	NONE	< 0.01				
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01				
Chrysene	µg/l	0.01	NONE	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01				
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01				
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2				
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	NONE	< 5.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.2				
Copper (dissolved)	µg/l	0.7	ISO 17025	12				
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.2				
Selenium (dissolved)	µg/l	4	ISO 17025	7.9				
Zinc (dissolved)	µg/l	0.4	ISO 17025	8.8				

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765596				
Sample Reference				WS116				
Sample Number				None Supplied				
Depth (m)				2.50				
Date Sampled				09/06/2017				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10				
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	NONE	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	NONE	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	NONE	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C5 - C7	µg/l	1	NONE	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	NONE	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	NONE	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10				

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 : 17-51311

Project / Site name: Central Retail Park, Manchester

* 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 *
765577	WS111	None Supplied	1.20	Brown clay and gravel.
765578	WS114	None Supplied	2.40	Brown clay and gravel with brick.
765579	WS107	None Supplied	0.90	Brown clay and gravel.
765580	WS108	None Supplied	3.50	Brown clay with gravel.
765581	WS109	None Supplied	2.90	Black loam and sand with vegetation and rubble.
765582	WS125	None Supplied	0.40	Grey sand with rubble.
765583	WS106	None Supplied	0.55	Brown clay and sand.
765584	WS104	None Supplied	0.20	Light brown sand with gravel.
765585	WS105	None Supplied	1.30	Brown clay and sand with gravel.
765586	WS103	None Supplied	4.20	Brown sand.
765587	WS119	None Supplied	2.60	Brown clay.
765588	WS116	None Supplied	0.40	Brown sandy clay with gravel.
765589	WS117	None Supplied	0.90	Brown sandy clay with vegetation.
765590	WS117	None Supplied	3.90	Brown clay.

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 : 17-51311

Project / Site name: Central Retail Park, Manchester

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
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
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 at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE

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 : 17-51311

Project / Site name: Central Retail Park, Manchester

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil by Gallery 16hr	Determination of water soluble Sulphate by discrete analyser (precipitation method).	In house method based on BS1377-3: 1990.	L082B-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in leachate	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	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	NONE
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

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

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.

Roy Walker
e3p
Office 4
Heliport Business Park
Eccles
Liverpool Road
Manchester
M30 7RU

t: 0161 707 9612

e: rwalker@e3p.co.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 : 17-51311

Replaces Analytical Report Number : 17-51311, issue no. 1

Project / Site name:	Central Retail Park, Manchester	**Samples received on:**	12/06/2017
Your job number:	11-834	**Samples instructed on:**	13/06/2017
Your order number:		**Analysis completed by:**	18/07/2017
Report Issue Number:	2	**Report issued on:**	18/07/2017
Samples Analysed:	6 leachate samples - 14 soil samples		

Signed:

Dr Irma Doyle
Senior Account 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.

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
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	18	13	12	25
Total mass of sample received	kg	0.001	NONE	0.46	1.5	0.53	0.51	0.41
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	< 0.001
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.3	8.8	8.5	8.4	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	320	2000	430	290	23000
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	110	400	88	120	3200
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	54.3	199	43.9	60.1	1610
Water Soluble SO4 as SO4 (2:1) Gallery 16h extraction	g/l	0.00125	MCERTS	0.0543	0.199	0.0439	0.0601	1.61
Sulphide	mg/kg	1	MCERTS	< 1.0	1.6	1.5	< 1.0	8.2
Total Sulphur	mg/kg	50	MCERTS	250	920	260	260	10000
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.7	-	-	0.7	-
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	-	0.27	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	0.23	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	0.22	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	0.20	-	2.0	< 0.05	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.32	< 0.05	-
Fluoranthene	mg/kg	0.05	MCERTS	0.20	-	2.5	< 0.05	-
Pyrene	mg/kg	0.05	MCERTS	0.18	-	2.6	< 0.05	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.12	-	1.0	< 0.05	-
Chrysene	mg/kg	0.05	MCERTS	0.10	-	1.2	< 0.05	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	1.3	< 0.05	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.58	< 0.05	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	1.1	< 0.05	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.57	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.11	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	0.80	< 0.05	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	0.80	-	14.8	< 0.80	-
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.6	37	11	8.8	29
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.3	< 0.2	0.9
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	24	27	26	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	150	43	26	1600
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19	270	46	12	1600
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.6	0.6	< 0.3	1.8
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	29	26	30	19
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	62	270	80	58	290

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	1.1	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	5.0	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	45	-	-	33
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	59	-	-	36
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	2.5	-	-	1.3
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	18	-	-	8.7
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	76	-	-	50
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	150	-	-	150
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	250	-	-	210
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	-
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	-
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	< 0.1	-
TPH (C10 - C12)	mg/kg	2	MCERTS	3.4	-	< 2.0	< 2.0	-
TPH (C12 - C16)	mg/kg	4	MCERTS	11	-	< 4.0	< 4.0	-
TPH (C16 - C21)	mg/kg	1	MCERTS	9.5	-	11	< 1.0	-
TPH (C21 - C35)	mg/kg	1	MCERTS	7.4	-	50	< 1.0	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	< 1.0

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	< 0.1
Phenol	mg/kg	0.2	ISO 17025	-	0.3	-	-	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	< 0.2
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	-	1.7	-	-	0.32
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	-	1.0	-	-	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	-	0.55	-	-	0.23
Acenaphthene	mg/kg	0.05	MCERTS	-	0.80	-	-	0.60
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	-	0.8	-	-	0.4
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Fluorene	mg/kg	0.05	MCERTS	-	1.3	-	-	0.74
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	-	9.1	-	-	6.4
Anthracene	mg/kg	0.05	MCERTS	-	1.9	-	-	1.3
Carbazole	mg/kg	0.3	MCERTS	-	0.6	-	-	0.6
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	-	11	-	-	9.2
Pyrene	mg/kg	0.05	MCERTS	-	11	-	-	9.5
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	4.9	-	-	4.5
Chrysene	mg/kg	0.05	MCERTS	-	5.2	-	-	4.5
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	5.9	-	-	5.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	1.8	-	-	2.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	4.7	-	-	4.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	2.2	-	-	2.7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.45	-	-	0.75
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	2.7	-	-	3.6

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765577	765578	765579	765580	765581
Sample Reference				WS111	WS114	WS107	WS108	WS109
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.20	2.40	0.90	3.50	2.90
Date Sampled				06/06/2017	06/06/2017	07/06/2017	07/06/2017	07/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
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	5.7	14	7.8	14	14
Total mass of sample received	kg	0.001	NONE	0.51	0.56	0.56	0.47	0.60
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	10.7	8.7	9.2	8.4	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	4500	290	59	400	190
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1200	110	22	240	140
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	585	54.1	11.3	122	69.1
Water Soluble SO4 as SO4 (2:1) Gallery 16h extraction	g/l	0.00125	MCERTS	0.585	0.0541	0.0112	0.122	0.0690
Sulphide	mg/kg	1	MCERTS	2.3	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	1800	160	< 50	240	200
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	1.1	-
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
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	< 0.80	< 0.80	< 0.80
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	9.8	1.3	7.1	6.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	9.4	26	6.6	32	14
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13	25	8.1	28	17
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	27	8.7	12	9.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.9	28	8.5	33	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	28	60	25	110	40

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	4.8	< 4.0	< 4.0	14	7.1
TPH (C16 - C21)	mg/kg	1	MCERTS	8.0	2.6	< 1.0	16	12
TPH (C21 - C35)	mg/kg	1	MCERTS	33	11	< 1.0	28	40

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	0.32	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	0.17	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	0.18	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	0.17	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
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	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765582	765583	765584	765585	765586
Sample Reference				WS125	WS106	WS104	WS105	WS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.55	0.20	1.30	4.20
Date Sampled				07/06/2017	08/06/2017	08/06/2017	08/06/2017	08/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	-	-	-

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				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	
Moisture Content	%	N/A	NONE	13	6.5	11	20	
Total mass of sample received	kg	0.001	NONE	0.52	0.48	0.55	0.50	
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	8.6	9.2	8.3	8.4	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	
Total Sulphate as SO_4	mg/kg	50	MCERTS	370	58	200	410	
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	120	28	49	210	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	59.7	13.9	24.6	107	
Water Soluble SO4 as SO4 (2:1) Gallery 16h extraction	g/l	0.00125	MCERTS	0.0597	0.0139	0.0246	0.107	
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Total Sulphur	mg/kg	50	MCERTS	150	< 50	140	180	
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	1.3	
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.34	-	0.25	0.36	
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.14	
Phenanthrene	mg/kg	0.05	MCERTS	0.15	-	0.36	0.82	
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.17	
Fluoranthene	mg/kg	0.05	MCERTS	0.10	-	0.15	0.87	
Pyrene	mg/kg	0.05	MCERTS	0.10	-	0.14	0.75	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.10	0.37	
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	0.10	0.34	
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.32	
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.21	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.27	
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.14	
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.22	
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	1.10	4.98	
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	4.7	2.2	5.4	11	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	5.2	7.2	34	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23	8.3	22	32	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	9.4	5.5	25	17	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	5.6	8.3	40	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	52	15	36	76	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	ug/kg	1	MCERTS	-	-	-	-	
Toluene	µg/kg	1	MCERTS	-	-	-	-	
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	
o-xylene	µg/kg	1	MCERTS	-	-	-	-	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	
TPH (C12 - C16)	mg/kg	4	MCERTS	8.8	< 4.0	4.9	6.3	
TPH (C16 - C21)	mg/kg	1	MCERTS	9.6	< 1.0	8.9	14	
TPH (C21 - C35)	mg/kg	1	MCERTS	19	< 1.0	27	39	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Naphthalene	mg/kg	0.05	MCERTS	-	0.14	-	-	
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Phenanthrene	mg/kg	0.05	MCERTS	-	0.22	-	-	
Anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	
Fluoranthene	mg/kg	0.05	MCERTS	-	0.15	-	-	
Pyrene	mg/kg	0.05	MCERTS	-	0.12	-	-	
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	
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	-	-	

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765587	765588	765589	765590	
Sample Reference				WS119	WS116	WS117	WS117	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				2.60	0.40	0.90	3.90	
Date Sampled				09/06/2017	09/06/2017	09/06/2017	09/06/2017	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 52	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 101	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 118	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 138	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 153	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
PCB Congener 180	mg/kg	0.001	MCERTS	-	< 0.001	-	-	
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	< 0.007	-	-	

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: 17-51311
Project / Site name: Central Retail Park, Manchester
Your Order No:

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
765581	WS109	2.90	152	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

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

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765591	765592	765593	765594	765595
Sample Reference				WS113	WS103	WS101	WS115	WS118
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	0.30	1.90	0.60	0.50
Date Sampled				06/06/2017	08/06/2017	08/06/2017	09/06/2017	09/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	9.3	12.1	8.2	7.0	5.5
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	7.2	< 1.1	9.5	< 1.1	< 1.1
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	9.6	8.1	0.7	2.2	2.2
Copper (dissolved)	µg/l	0.7	ISO 17025	15	13	8.5	8.7	9.2
Lead (dissolved)	µg/l	1	ISO 17025	3.5	< 1.0	9.8	1.2	1.9
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	4.4	1.9	1.1	1.6	7.3
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	6.1	4.3	3.7	3.5	13

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765591	765592	765593	765594	765595
Sample Reference				WS113	WS103	WS101	WS115	WS118
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	0.30	1.90	0.60	0.50
Date Sampled				06/06/2017	08/06/2017	08/06/2017	09/06/2017	09/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765591	765592	765593	765594	765595
Sample Reference				WS113	WS103	WS101	WS115	WS118
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	0.30	1.90	0.60	0.50
Date Sampled				06/06/2017	08/06/2017	08/06/2017	09/06/2017	09/06/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765596				
Sample Reference				WS116				
Sample Number				None Supplied				
Depth (m)				2.50				
Date Sampled				09/06/2017				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.5				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10				
Speciated PAHs								
Naphthalene	µg/l	0.01	NONE	< 0.01				
Acenaphthylene	µg/l	0.01	NONE	< 0.01				
Acenaphthene	µg/l	0.01	NONE	< 0.01				
Fluorene	µg/l	0.01	NONE	< 0.01				
Phenanthrene	µg/l	0.01	NONE	< 0.01				
Anthracene	µg/l	0.01	NONE	< 0.01				
Fluoranthene	µg/l	0.01	NONE	< 0.01				
Pyrene	µg/l	0.01	NONE	< 0.01				
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01				
Chrysene	µg/l	0.01	NONE	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01				
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01				
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2				
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	NONE	< 5.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.2				
Copper (dissolved)	µg/l	0.7	ISO 17025	12				
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.2				
Selenium (dissolved)	µg/l	4	ISO 17025	7.9				
Zinc (dissolved)	µg/l	0.4	ISO 17025	8.8				

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765596				
Sample Reference				WS116				
Sample Number				None Supplied				
Depth (m)				2.50				
Date Sampled				09/06/2017				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10				
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10				

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: 17-51311

Project / Site name: Central Retail Park, Manchester

Lab Sample Number				765596				
Sample Reference				WS116				
Sample Number				None Supplied				
Depth (m)				2.50				
Date Sampled				09/06/2017				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

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 : 17-51311

Project / Site name: Central Retail Park, Manchester

* 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 *
765577	WS111	None Supplied	1.20	Brown clay and gravel.
765578	WS114	None Supplied	2.40	Brown clay and gravel with brick.
765579	WS107	None Supplied	0.90	Brown clay and gravel.
765580	WS108	None Supplied	3.50	Brown clay with gravel.
765581	WS109	None Supplied	2.90	Black loam and sand with vegetation and rubble.
765582	WS125	None Supplied	0.40	Grey sand with rubble.
765583	WS106	None Supplied	0.55	Brown clay and sand.
765584	WS104	None Supplied	0.20	Light brown sand with gravel.
765585	WS105	None Supplied	1.30	Brown clay and sand with gravel.
765586	WS103	None Supplied	4.20	Brown sand.
765587	WS119	None Supplied	2.60	Brown clay.
765588	WS116	None Supplied	0.40	Brown sandy clay with gravel.
765589	WS117	None Supplied	0.90	Brown sandy clay with vegetation.
765590	WS117	None Supplied	3.90	Brown clay.

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 : 17-51311

Project / Site name: Central Retail Park, Manchester

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 ouse method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
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 at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE

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 : 17-51311

Project / Site name: Central Retail Park, Manchester

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil by Gallery 16hr	Determination of water soluble Sulphate by discrete analyser (precipitation method).	In house method based on BS1377-3: 1990.	L082B-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in leachate	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	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	NONE
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

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

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.

Roy Walker
e3p
Office 4
Heliport Business Park
Eccles
Liverpool Road
Manchester
M30 7RU

t: 0161 707 9612

e: rwalker@e3p.co.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 : 17-54257

Project / Site name:	Central Retail Park	**Samples received on:**	12/07/2017
Your job number:	11834	**Samples instructed on:**	12/07/2017
Your order number:		**Analysis completed by:**	19/07/2017
Report Issue Number:	1	**Report issued on:**	19/07/2017
Samples Analysed:	6 water samples		

Signed:

Dr Irma Doyle
Senior Account 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.

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: 17-54257

Project / Site name: Central Retail Park

Lab Sample Number				781793	781794	781795	781796	781797
Sample Reference				WS107	WS115	WS101	WS105	WS121
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				10/07/2017	10/07/2017	10/07/2017	10/07/2017	10/07/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.4	7.4	7.8	7.1	7.5
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1	ISO 17025	6.9	6.9	2.9	9.4	4.4
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4	1.5	< 0.4	< 0.4	< 0.4
Copper (dissolved)	µg/l	0.7	ISO 17025	8.4	4.7	4.8	4.7	4.1
Lead (dissolved)	µg/l	1	ISO 17025	1.2	1.3	< 1.0	1.3	< 1.0
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.6	1.3	2.5	3.6	2.8
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	8.0	4.9	6.9	9.5	4.8
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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: 17-54257

Project / Site name: Central Retail Park

Lab Sample Number				781793	781794	781795	781796	781797
Sample Reference				WS107	WS115	WS101	WS105	WS121
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				10/07/2017	10/07/2017	10/07/2017	10/07/2017	10/07/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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: 17-54257

Project / Site name: Central Retail Park

Lab Sample Number				781793	781794	781795	781796	781797
Sample Reference				WS107	WS115	WS101	WS105	WS121
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				10/07/2017	10/07/2017	10/07/2017	10/07/2017	10/07/2017
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	0.51
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	0.30
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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

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

Analytical Report Number: 17-54257

Project / Site name: Central Retail Park

Lab Sample Number				781798				
Sample Reference				CP104				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				10/07/2017				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	6.7				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10				
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1	ISO 17025	16				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Copper (dissolved)	µg/l	0.7	ISO 17025	3.1				
Lead (dissolved)	µg/l	1	ISO 17025	2.1				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Nickel (dissolved)	µg/l	0.3	ISO 17025	11				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Zinc (dissolved)	µg/l	0.4	ISO 17025	9.9				
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
Petroleum Hydrocarbons								
TPH1 (C10 - C40)	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	NONE	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	NONE	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	NONE	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10				

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: 17-54257

Project / Site name: Central Retail Park

Lab Sample Number				781798				
Sample Reference				CP104				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				10/07/2017				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

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: 17-54257

Project / Site name: Central Retail Park

Lab Sample Number				781798				
Sample Reference				CP104				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				10/07/2017				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05				
Phenol	µg/l	0.05	NONE	< 0.05				
2-Chlorophenol	µg/l	0.05	NONE	< 0.05				
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05				
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05				
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05				
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05				
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05				
2-Methylphenol	µg/l	0.05	NONE	< 0.05				
Hexachloroethane	µg/l	0.05	NONE	< 0.05				
Nitrobenzene	µg/l	0.05	NONE	< 0.05				
4-Methylphenol	µg/l	0.05	NONE	< 0.05				
Isophorone	µg/l	0.05	NONE	< 0.05				
2-Nitrophenol	µg/l	0.05	NONE	< 0.05				
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05				
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05				
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05				
Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05				
4-Chloroaniline	µg/l	0.05	NONE	< 0.05				
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05				
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05				
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05				
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05				
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05				
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05				
Dimethylphthalate	µg/l	0.05	NONE	< 0.05				
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05				
Dibenzofuran	µg/l	0.05	NONE	< 0.05				
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05				
Diethyl phthalate	µg/l	0.05	NONE	< 0.05				
4-Nitroaniline	µg/l	0.05	NONE	< 0.05				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Azobenzene	µg/l	0.05	NONE	< 0.05				
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05				
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Carbazole	µg/l	0.05	NONE	< 0.05				
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05				
Anthraquinone	µg/l	0.05	NONE	< 0.05				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01				

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

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

Analytical Report Number : 17-54257

Project / Site name: Central Retail Park

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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

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.

APPENDIX VIII
ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA



Constituent	Origin of Risk Assessment Value
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs - methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide - Total	2014 LQM/CIEH S4ULs
Phenols - Total.	2014 LQM/CIEH S4ULs
Naphthalene	General Assessment Criteria (GAC) developed by CIEH / LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene[	
Chrysene	
Benzo(b/k)Fluoranthene [iii]	
Benzo(a)Pyrene	P4CSL - DEFRA
Indeno(123-cd)Pyrene	General Assessment Criteria (GAC) developed by CIEH / LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C_5-C_6 (aliphatic)	
TPH C_6-C_8 (aliphatic)	
TPH C_8-C_{10} (aliphatic)	
TPH C_{10}-C_{12} (aliphatic)	
TPH C_{12}-C_{16} (aromatic)	
TPH C_{16}-C_{21} (aromatic)	
TPH C_{21}-C_{35} (aromatic)	

APPENDIX IX
GEOTECHNICAL TESTING RESULTS



LABORATORY REPORT

4043

Contract Number: PSL17/2873

Report Date: 04 July 2017

Client's Reference: 11-834

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

For the attention of: Roy Walker

Contract Title: Central Retail Park, Manchester

Date Received: 15/6/2017
Date Commenced: 15/6/2017
Date Completed: 4/7/2017

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

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

L Knight (Senior Technician)
S Eyre (Senior Technician)
A Fry (Senior Technician)

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

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS111		D	2.00	2.45	Brown slightly gravelly very sandy CLAY.
WS113		D	4.00	4.45	Brown slightly gravelly very sandy CLAY.
WS114		D	6.00	6.45	Brown slightly gravelly sandy CLAY.
WS108		D	3.00	3.45	Brown slightly gravelly sandy CLAY.
WS106		D	2.00	2.45	Brown slightly gravelly slightly sandy CLAY.
WS106		U	1.50	2.00	Brown slightly gravelly sandy CLAY.
WS104		D	3.00	3.45	Brown slightly gravelly sandy CLAY.
WS105		U	0.50	1.00	Stiff brown slightly gravelly sandy CLAY.
WS103		D	3.00	3.45	Brown slightly gravelly sandy CLAY.
WS101		D	3.00	3.45	Brown slightly gravelly sandy CLAY.
WS119		D	2.00	2.45	Brown slightly gravelly sandy CLAY.
WS117		U	2.50	3.00	Very stiff brown slightly gravelly sandy CLAY.
WS116		D	5.00	5.45	Brown slightly gravelly sandy CLAY.

UKAS TESTING 4043	PSL Professional Soils Laboratory	Central Retail Park, Manchester	Contract No: PSL17/2873 Client Ref: 11-834

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS111		D	2.00	2.45	15			35	18	17	96	Intermediate plasticity CI.
WS113		D	4.00	4.45	14			34	17	17	94	Low plasticity CL.
WS114		D	6.00	6.45	17			39	19	20	92	Intermediate plasticity CI.
WS108		D	3.00	3.45	18			36	18	18	94	Intermediate plasticity CI.
WS106		D	2.00	2.45	20			59	25	34	97	High plasticity CH.
WS104		D	3.00	3.45	18			40	20	20	95	Intermediate plasticity CI.
WS103		D	3.00	3.45	19			41	20	21	96	Intermediate plasticity CI.
WS101		D	3.00	3.45	22			46	22	24	91	Intermediate plasticity CI.
WS119		D	2.00	2.45	17			38	19	19	97	Intermediate plasticity CI.
WS116		D	5.00	5.45	17			40	19	21	96	Intermediate plasticity CI.

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

UKAS TESTING 4043

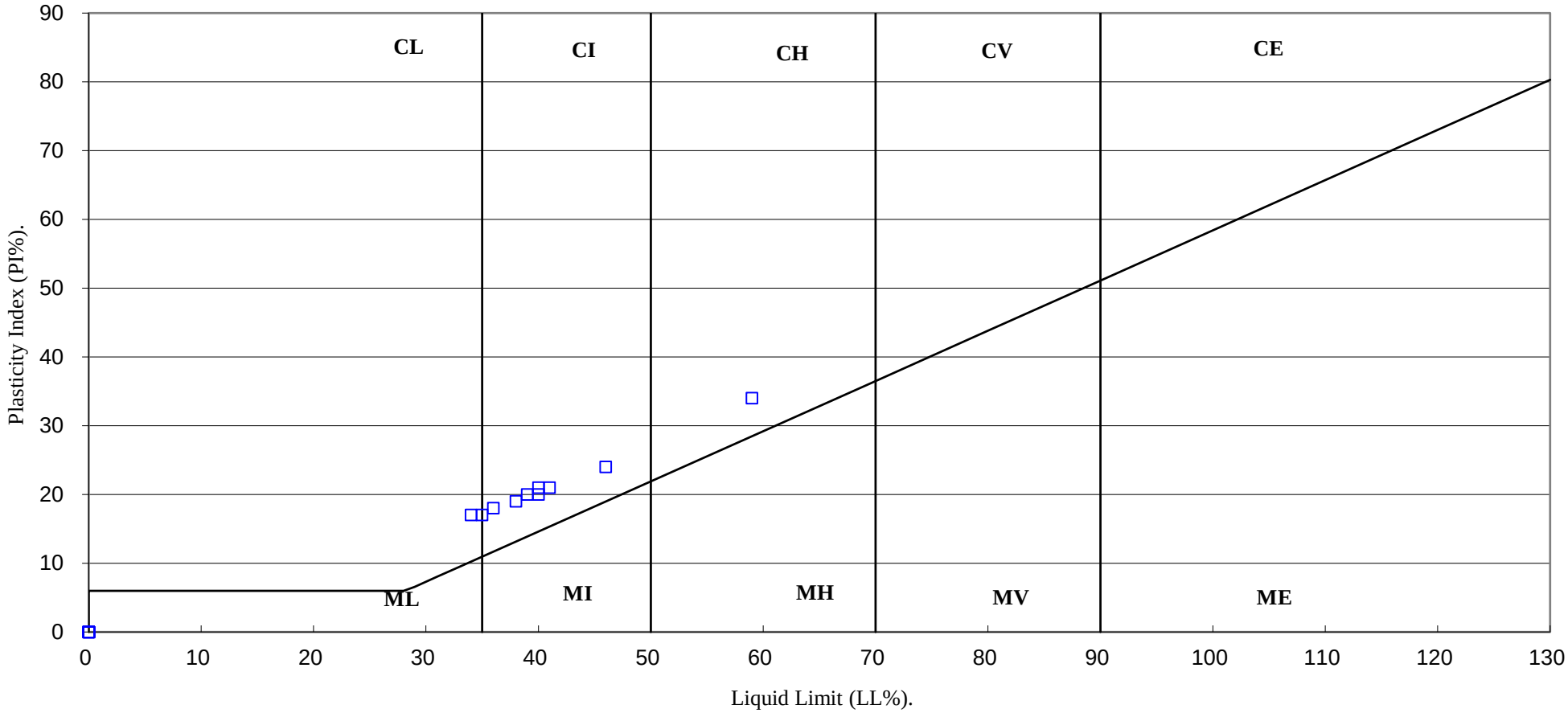
PSL Professional Soils Laboratory

Central Retail Park, Manchester

Contract No:
PSL17/2873
Client Ref:
11-834

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Central Retail Park, Manchester**	**Contract No:**
			PSL17/2873
			Client Ref:
			11-834

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

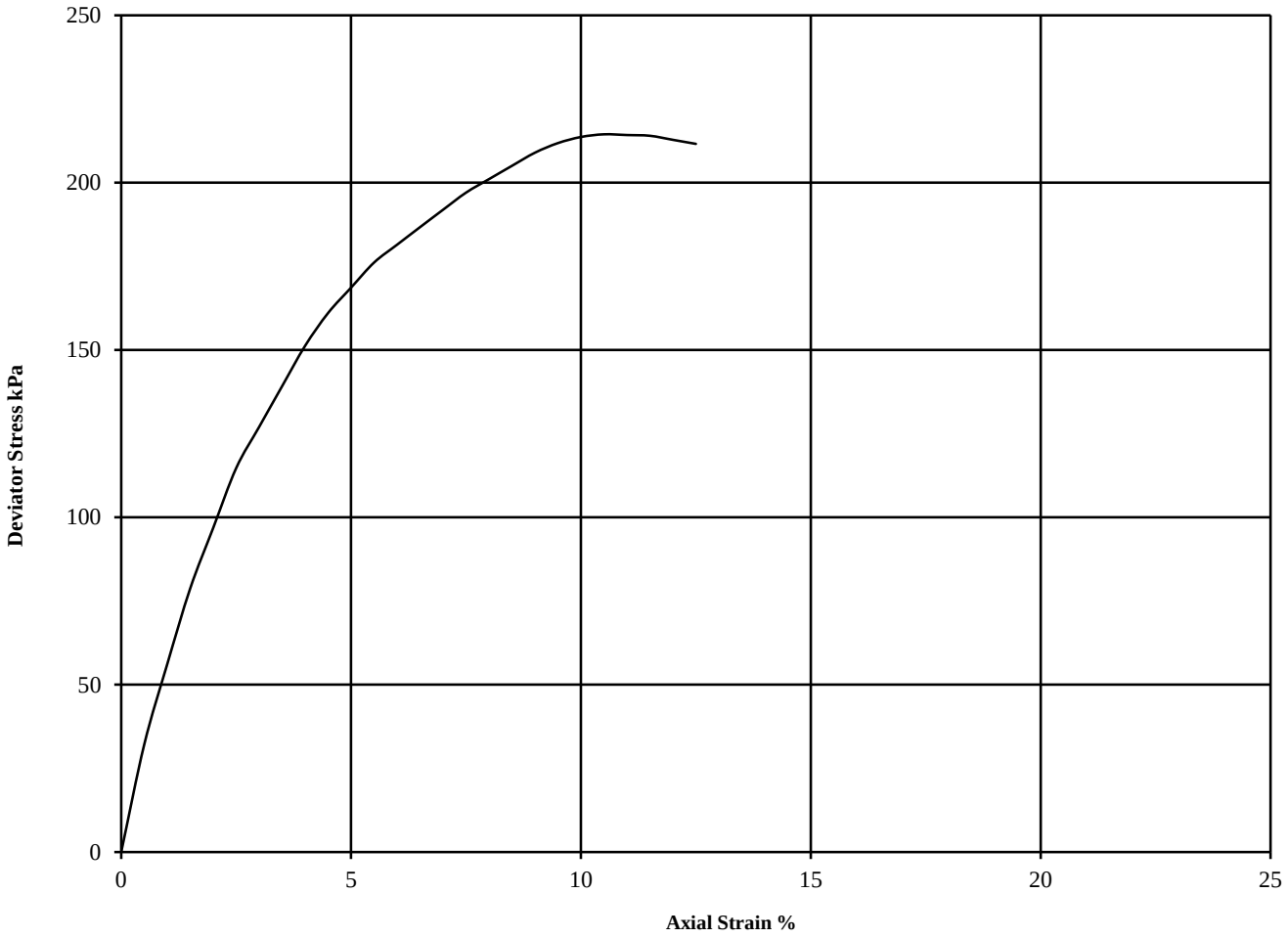
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WS105** **Top Depth (m):** **0.50**

Sample Number: **Base Depth (m):** **1.00**

Sample Type **U**



Diameter (mm):		85.0	Height (mm):		170.0	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.42
1	22	1.96	1.61	15	214	107	10.5	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Central Retail Park, Manchester

Contract No: **PSL17/2873**

Client Ref: **11-834**

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

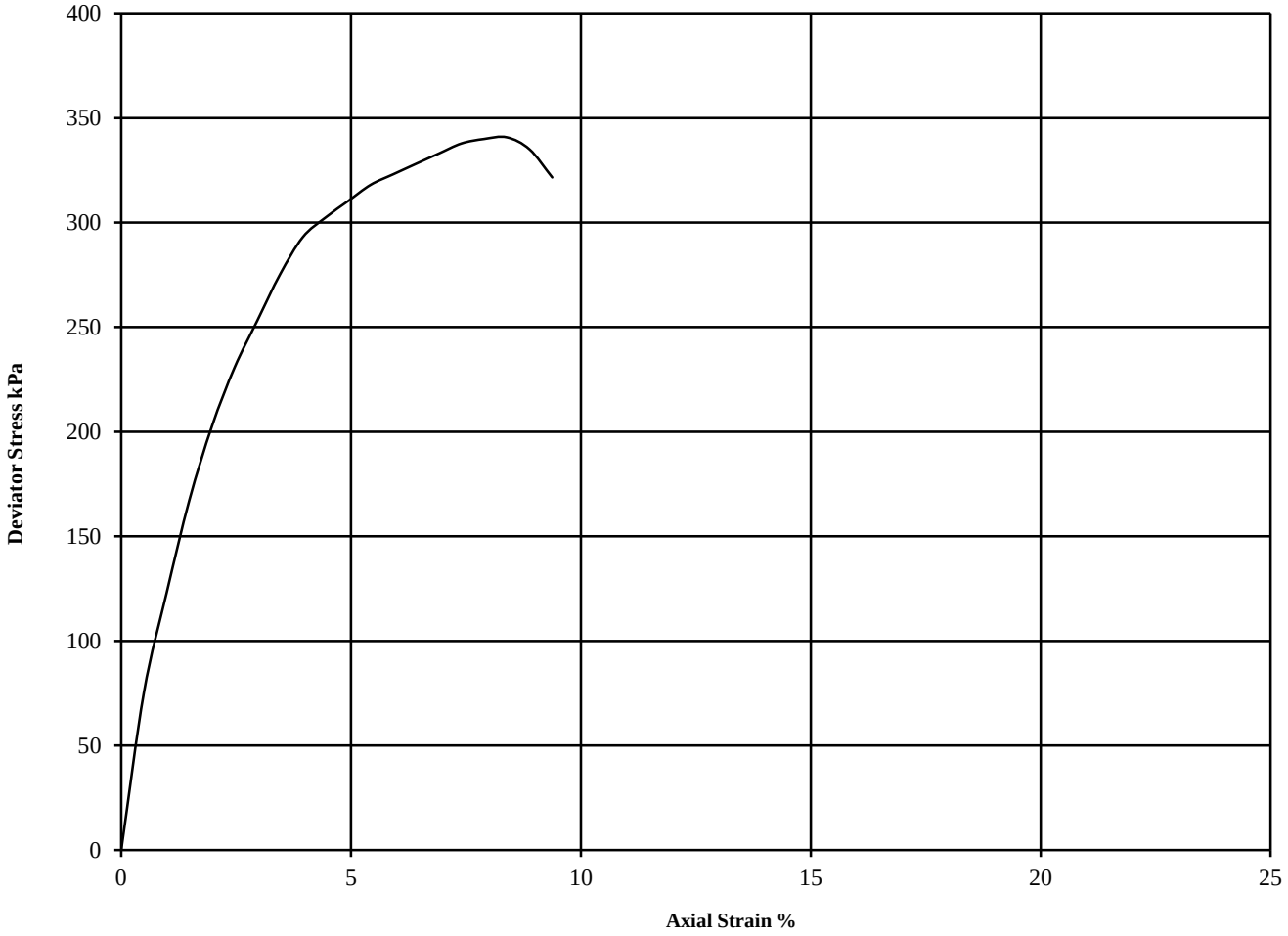
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **WS117** **Top Depth (m):** **2.50**

Sample Number: **Base Depth (m):** **3.00**

Sample Type **U**



Diameter (mm):		75.0	Height (mm):		152.0	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.48
1	22	2.11	1.72	55	341	170	8.4	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Central Retail Park, Manchester

Contract No: **PSL17/2873**

Client Ref: **11-834**

ONE DIMENSIONAL CONSOLIDATION TEST

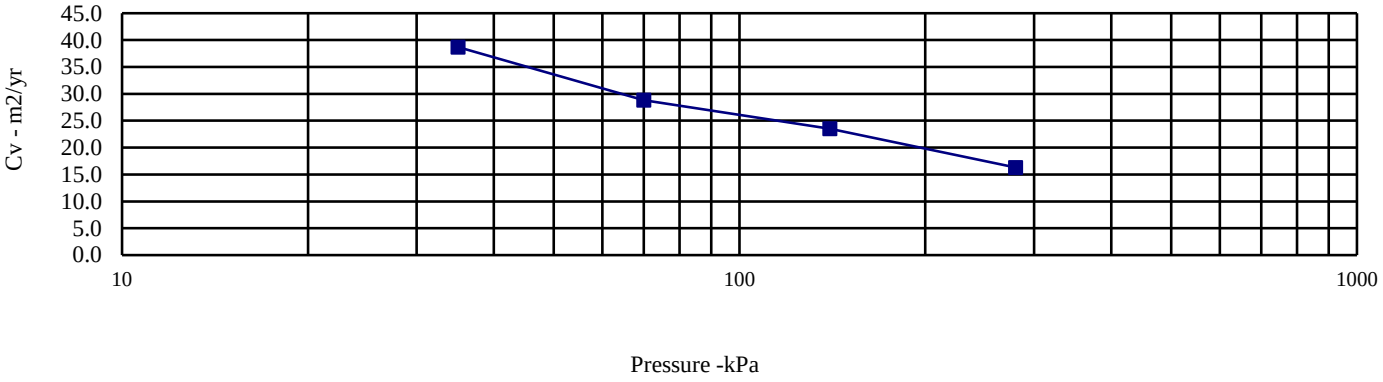
BS 1377: Part 5: 1990: Clause 3

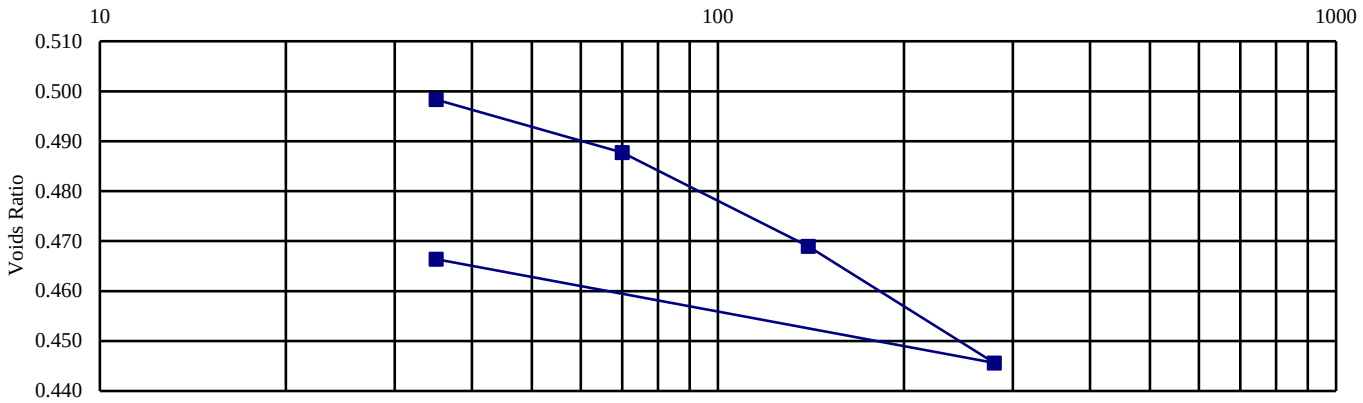
Hole Number: **WS106** **Top Depth (m):** **1.50**

Sample Number: **Base Depth (m) :** **2.00**

Sample Type: **Liner**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	20						
Bulk Density (Mg/m3):	2.11	0	35	0.239	38.706	Method used to	
Dry Density (Mg/m3):	1.75	35	70	0.202	28.812	determine CV:	T90
Voids Ratio:	0.511	70	140	0.180	23.507	Nominal temperature	
Degree of saturation:	104.6	140	280	0.113	16.302	during test ' C:	20
Height (mm):	20.214	280	35	0.059		Remarks:	
Diameter (mm)	75.088					Brown slightly gravelly sandy CLAY.	
Particle Density (Mg/m3): Assumed	2.65						





UKAS TESTING 4043	PSL Professional Soils Laboratory	**Central Retail Park, Manchester**	**Contract No: PSL17/2873** **Client Ref: 11-834**

LABORATORY REPORT

4043

Contract Number: PSL17/3068

Report Date: 03 July 2017

Client's Reference: 11-834

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

For the attention of: Gregor Hirst

Contract Title: Central Retail Park

Date Received: 26/6/2017
Date Commenced: 26/6/2017
Date Completed: 3/7/2017

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

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

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS120			3.00	3.45	Brown mottled grey slightly gravelly sandy CLAY.
WS121			2.00	2.45	Brown slightly gravelly sandy CLAY.

UKAS TESTING 4043

PSL Professional Soils Laboratory

Central Retail Park

Contract No: PSL17/3068

Client Ref: 11-834

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS120			3.00	3.45	15			37	17	20	93	Intermediate plasticity CI.
WS121			2.00	2.45	15			38	18	20	94	Intermediate plasticity CI.

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

UKAS TESTING 4043

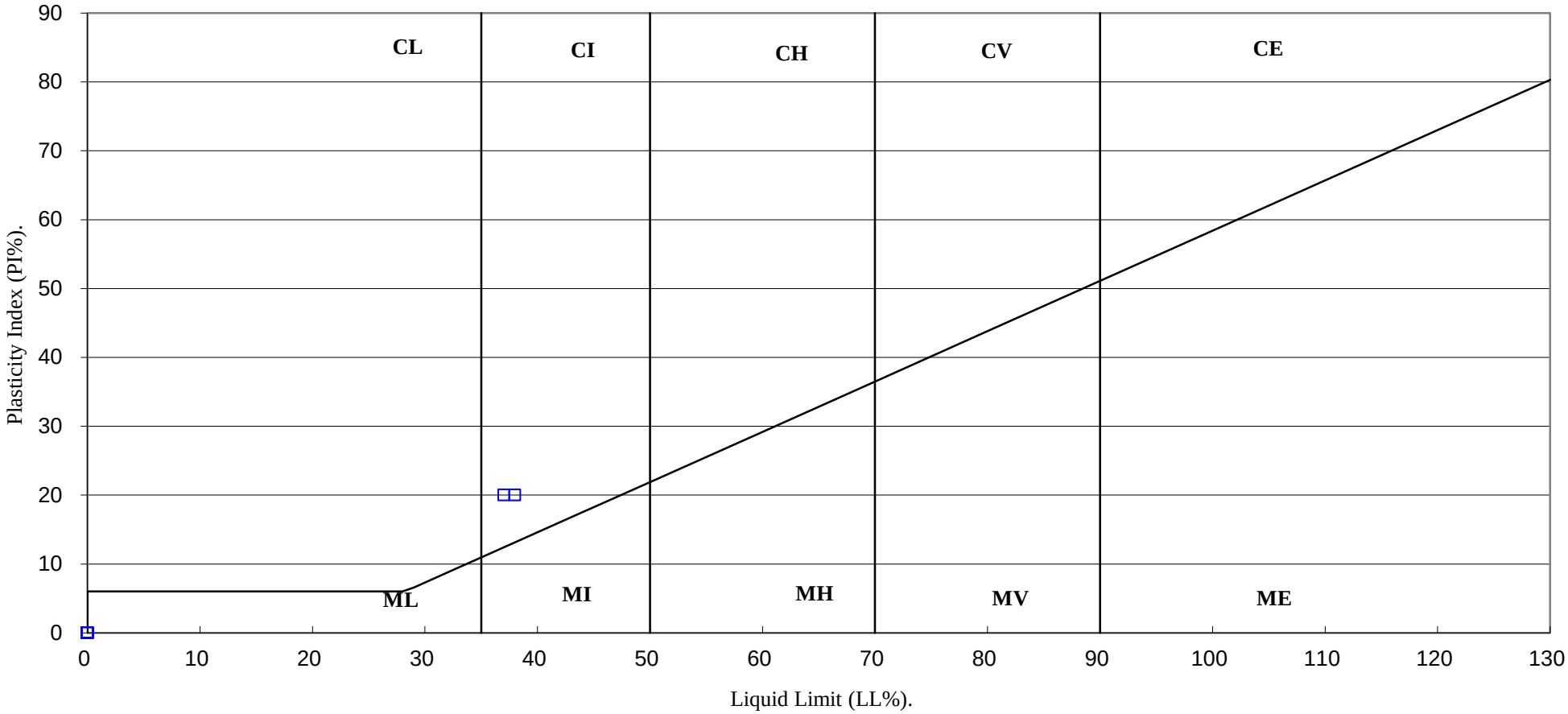
PSL Professional Soils Laboratory

Central Retail Park

Contract No:
PSL17/3068
Client Ref:
11-834

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Central Retail Park**	**Contract No:** PSL17/3068 **Client Ref:** 11-834

APPENDIX X
COAL AUTHORITY REPORT



The Coal Authority

Resolving the impacts of mining

CON29M Non-Residential Mining Report







UNIT A1, CENTRAL RETAIL PARK
GREAT ANCOATS STREET
GREATER MANCHESTER

Date of enquiry:	20 July 2017
Date enquiry received:	20 July 2017
Issue date:	20 July 2017
Our reference:	51001535078001
Your reference:	133021332_1 |

CON29M Non-Residential Mining Report

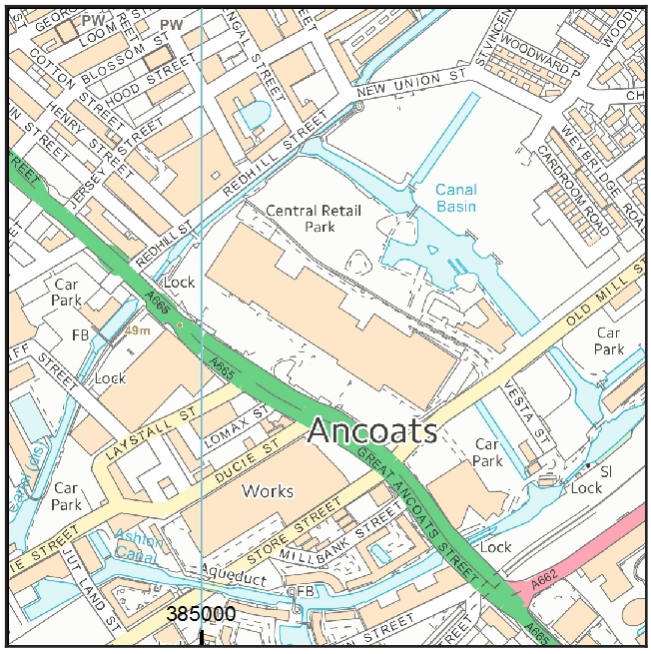
This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

LANDMARK INFORMATION GROUP LIMITED

Enquiry address

UNIT A1, CENTRAL RETAIL PARK, GREAT ANCOATS STREET, GREATER MANCHESTER



Approximate position of property

Map data

Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2017. All rights reserved.

Ordnance Survey Licence number: 100020315

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

/company/the-coal-authority
/thecoalauthority
/coalauthority

Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	No
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	Yes
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is in a surface area that could be affected by underground mining in 3 seams of coal at 360m to 1090m depth, and last worked in 1961.

Any movement in the ground due to coal mining activity should have stopped.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is in an area where a notice to withdraw support was given in 1955.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions applicable at the time the report was produced.

Disclaimer

The Coal Authority owns the copyright in this report and the information used to produce this report is protected by our database rights. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

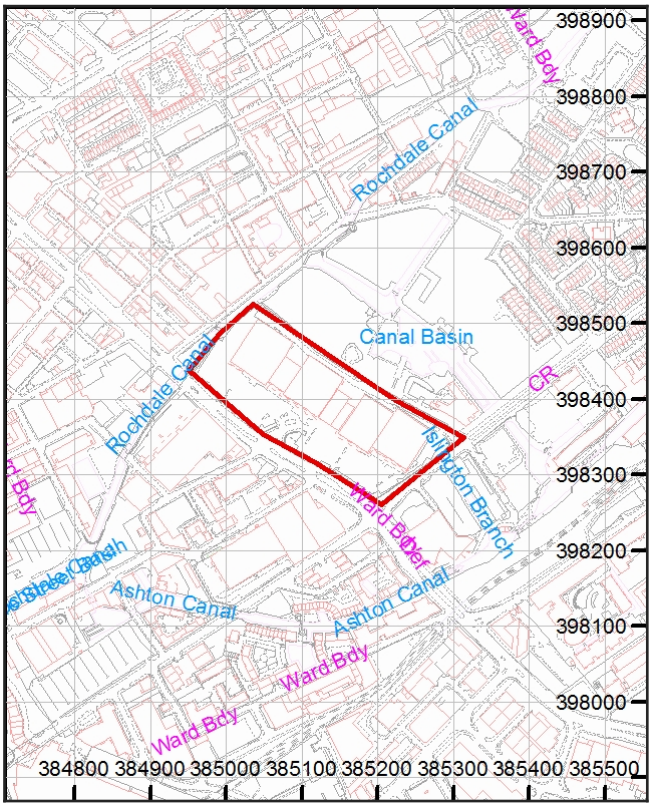
Alternative formats

If you would like this report in an alternative format, please contact our communications team.

Enquiry boundary

Key

Approximate position of enquiry boundary shown



Map data

Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2017. All rights reserved.

Ordnance Survey Licence number: 100020315

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

/company/the-coal-authority
/thecoalauthority
/coalauthority

2. Geo-environmental Data Review Technical Note

TECHNICAL NOTE

Former Central Retail Park – The Parklands, Ancoats Manchester

SUBJECT	PROJECT NO.	DATE
Geo-environmental Data Review	5224911	2 April 2024

AUTHOR	DISTRIBUTION	REPRESENTING
Charlotte Hidson	-	-

ICEPAC NO.	ATKINSRÉALIS NO.
-	-

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft for Information	C Hidson	E Cooke	A Waite	AW	May 2024

Client signoff

Client	Manchester City Council		
Project	Former Central Retail Park – The Parklands, Ancoats Manchester	**Project No.**	5224911
Client signature / date			

1. Introduction

1.1 Background

AtkinsRéalis have been commissioned by Manchester City Council (MCC) to undertake a review of existing data to assess geo environmental risks, identify potential constraints and requirements for further work associated with the former Central Retail Park, Great Ancoats Street, Manchester (the site). It is understood that the proposed development comprises public amenity parkland comprising a mixture of hard and soft landscaping areas.

1.2 Data Sources

The following data sources have been reviewed in preparation of the Technical Note:

- British Geological Survey (BGS) GeoIndex (Onshore), 2024, [1];
- Department for Environment, Food & Rural Affairs (DEFRA) Multi-Agency Geographic Information for the Countryside (MAGIC) Map Application [2];
- Environment Agency, Flood Map for Planning, 2021 [3];
- Groundsure io Environmental Data Viewer, 2024 [4];
- UK Health Security Agency (UKHSA), UK Maps of Radon, 2022 [5]; and
- Central Retail Park, Phase 1 and Phase 2 Geo-Environmental Site Assessment. E3p, Ref: 11-834r1. July 2017 [6].

1.3 Limitations

Data from previous reports undertaken by third parties have been incorporated into this report. These data have been assumed to be correct for the purposes of this assessment. AtkinsRéalis does not accept liability for the validity of reports by or on behalf of third parties.

2. Site Setting

2.1 Site Location & Current Condition

The site comprises approximately 1.0 hectare (Ha) located on Great Ancoats Street, Manchester, M4 6EY, centred at approximate National Grid Reference 385155, 398403. The site is located at a former retail park (Central Retail Park) and also includes a small parcel of land located within Cotton Field Park.

The north of the site comprises parkland comprising landscaped grass, trees and an access track which forms part of the wider Cotton Field Park. The central area of the site comprises concrete foundations associated with the former retail park. Hoarding surrounds the area of concrete foundations. The southern area of the site comprises a disused brick-paved former car park. The site location is shown on Figure 1 provided within Appendix A.

A summary of the adjacent land uses is presented below:

- North: wider Cotton Field Park with New Islington Marina Community and commercial / residential properties beyond;
- East: Former Central Park with Old Mill Street and commercial properties beyond;
- South: Great Ancoats Street (A665 Ring Road) with commercial properties beyond; and
- West: Former Central Park with the Rochdale Canal and commercial properties beyond.

2.2 Geology

The BGS GeoIndex [1] records that there is no Made Ground underlying the site, however Made Ground is anticipated to be present on-site associated with the construction of the former retail park. The superficial deposits underlying the site comprises Diamicton Devensian Till [1]. The bedrock geology underlying the site comprise sandstone of the Chester Formation [1].

2.3 Hydrogeology

The DEFRA MAGIC Map [2] records that the superficial Till is classified as a secondary undifferentiated aquifer. A secondary undifferentiated aquifer is described as 'has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has been previously designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'.

The bedrock Chester Formation is classified as a principal aquifer [2]. A principal aquifer is described as 'layers of rock or drift deposits that have high intergranular and/or fracture permeability. They may support water supply and/or river base flow on a strategic scale.

The site is not located within a Source Protection Zone (SPZ) **[2]**.

There are no known active groundwater abstractions located within 500 m of the site [6].

2.4 Hydrology

The nearest surface water feature to the site is a culverted watercourse (Newton Brook) which crosses the site in a 900 mm diameter pipe, oriented approximately north – south. It is believed that the culvert was constructed before the date of the earliest available historical mapping (1851) and is likely of brick construction [6].

The DEFRA MAGIC map [2] records that the New Islington Wharf Marina is located adjacent to the north of the site. The Rochdale Canal is located approximately 115 m north west. The Ashton Canal Islington Branch is located approximately 200m south.

2.4.1 Flood Risk

The Environment Agency Flood Map for Planning [3] records that the site is located within a Flood Zone 1. The land in a Flood Zone 1 has a low probability of flooding with land having <0.1% chance of flooding from rivers or sea annually.

2.5 Sensitive Land Uses

The Groundsure io viewer [4] records that there are no historic landfills or authorised landfills within 250 m of the site.

There are no ecologically sensitive statutory designated sites within 250 m of the site [2].

2.6 Unexploded Ordnance

Zetica [7] Risk Mapping indicates that the site is located in an area of medium risk from UXO density. Which is defined as having a bomb density of 15 to 49 bombs per 1000 acre.

2.7 Radon

The UKHSA map of radon [5] records that the site is within an area where between 5% and 10% of properties are assessed as likely to exceed the radon action level. Full radon protection measures would be required in new buildings. However it is understood that the proposed development comprises parkland.

2.8 Coal Mining

The site is located within a coal mining risk area. A Coal Authority Mining Report was obtained by e3p dated 2017 (ref 51001535078001) [6]. The report indicated that the site is considered to be low risk associated with coal mine related subsidence.

2.9 Site History

A summary of the historical development of the site and the surrounding areas obtained from Ordnance Survey (OS) historical maps within the e3p 2017 ground investigation report [6] is presented in Table 2-1.

Table 2-1 - Summary of Site History

Date	On-Site Development
1851	The site is occupied by a mix of residential housing, Shooters Brook Iron Works and a coal shed.
1893	The Shooters Brook Iron Works is no longer labelled. The coal shed is labelled as a coal wharf.
1908	A tin works and saw mill are shown on-site.
1922	A timber shed is shown on-site.
1951	The tin works is no longer shown and the timber works has expanded.
1955	Demolition of many of the residential properties has taken place. The timber shed is labelled as a saw mill.
1981	All of the residential properties have been cleared leaving much of the site as vacant land.
1989	A Retail Park is present on-site (it is likely the site levels were altered and retaining walls built at this time).

The areas surrounding the site (within 250 m) have been occupied by a timber yard, coal wharfs, cotton mills, dye works, sawmills, foundries, Cotton Waste Works, garages, engineering works, depot and manufacturing works.

3. Previous Ground Investigations

An intrusive ground investigation was undertaken by e3p in June and July 2017 within the wider former Central Retail Park [6]. The investigation locations were positioned to target potential historical sources of contamination. A summary of the ground investigations works undertaken within the proposed park site is discussed in this report and presented below.

- Drilling of five window sample holes (WS108 to WS110, WS116 and WS118) to a maximum depth of 5.45 metres below ground level (m bgl).
- Drilling of two shell and auger boreholes (BH103 and BH105) to depths of 39.0 m bgl and 34.50 m bgl.
- Installation of two groundwater/gas monitoring well within WS109 and WS116.
- Collection of soil and soil-leachate and for laboratory analysis.
- One round of groundwater monitoring in WS116.
- One round of ground gas monitoring in WS116.

3.1 Ground Conditions

A summary of the ground conditions encountered within the site during the e3p 2017 ground investigation [6] is presented in Table 3-1.

Table 3-1 – Ground Conditions Encountered

Strata	Description	Typical Depth (m bgl)
Surface Cover	Brick and concrete.	0.0 – 0.30
Made Ground	Grey and brown, clayey, sandy gravel and gravelly sand. Gravel is fine to coarse subangular to sub-rounded of clinker, brick, concrete, ash, limestone, coal, mudstone, sandstone, timber, rare slag and rare porcelain.	0.25 – 5.10 The deepest Made Ground (WS116, 5.10 m bgl and BH105, 4.60 m bgl) was recorded in the vicinity of the culverted watercourse.
Clay (Glacial Till Deposits)	Brown and grey locally sandy and gravelly CLAY. Gravel is fine, sub-angular of coal and sandstone. Horizons of gravelly SAND were recorded in the drift at depth within the deeper boreholes.	0.70 – 28.0
Sand	Brown, red and grey, slightly clayey to silty clayey SAND.	3.60 – 33.0
Sandstone (Chester Formation)	Weak to medium strength thinly bedded red brown medium to coarse grained SANDSTONE.	28.5 – 39.0

3.2 Groundwater

During the e3p 2017 ground investigation [6] a groundwater strike was recorded within the Made Ground of WS116 at a depth of 4.0 m bgl. No further groundwater strikes were encountered within any of the exploratory holes located within the site.

A total of two groundwater monitoring wells were installed. One groundwater monitoring well was installed within the Made Ground of WS109 between the depths of 1.0 m and 3.0 m bgl. A second groundwater monitoring well was installed within the Made Ground of WS116 between the depths of 1.0 m and 5.0 m bgl.

One groundwater monitoring round was undertaken on the 11 July 2017 with the depth to groundwater in WS116 recorded as 2.97 m bgl. Monitoring well WS109 was unable to be accessed due to a car parked over the well.

3.3 Ground Gas

Two window sample boreholes (WS109 and WS116) were installed with a gas monitoring well with the response zone screened within the Made Ground. One round of ground gas monitoring was undertaken from WS116 on 11 July 2017. Monitoring well WS109 was unable to be accessed due to a car parked over the well.

3.4 Evidence of Contamination

Ash, clinker and rare slag was recorded within the Made Ground. No visual and olfactory evidence of hydrocarbon contamination was recorded in the borehole logs. A summary of evidence of contamination is provided in Table 3-2.

Table 3-2 – Summary of evidence of contamination

Exploratory Hole	Evidence of Contamination	Strata	Depth (m bgl)
WS108	Clinker	Made Ground	0.70 – 3.30
	Ash		
WS116	Ash	Made Ground	2.10 – 5.10
	Rare slag		2.10 – 4.50

4. Contaminated Land Assessment

An assessment of potential risks to human health, controlled waters and property was undertaken by e3p [6] in general accordance with guidance published in Environment Agency's CLR 11 [8] and BS 10175 Code of Practice for Investigation of Potentially Contaminated Land [9].

4.1 Soil

A total of three soil samples (WS108, 3.50 m, WS109, 2.90 m and WS116, 0.40 m) were collected. The soil samples were collected from the Made Ground (WS109, 2.90 m and WS116, 0.40 m) and natural strata (WS108, 3.50 m).

Laboratory analysis was undertaken for a suite of contaminants comprising metals, pH (three samples), inorganics (three samples), totals phenols (three samples), poly-aromatic hydrocarbons (PAHs) (one sample), total petroleum hydrocarbons (TPH) (two samples), speciated TPHs (one sample), benzene, toluene, xylene, ethylbenzene (BTEX) (one sample), Methyl Tertiary Butyl Ether (MTBE) (one sample), volatile organic compounds (VOCs) (two samples) and semi volatile organic compounds (SVOCs) (two samples) and Poly Chlorinated Biphenyl's (PCBs) (one sample).

The results were compared against published LQM 'Suitable 4 Use Levels' (S4UL) Generic Assessment Criteria (GAC) for a residential (no plant uptake) land use, to assess potential risks to human health from dermal contact, ingestion and inhalation of dusts from site soils.

The assessment identified two exceedances of the GAC for lead and detected asbestos in a single sample of Made Ground from WS109 at 2.90 m bgl. Concentrations of lead in WS109 (1600 mg/kg) are within the same order of magnitude as the GAC 200 mg/kg). Asbestos in WS109 was recorded as loose chrysotile fibres at a quantification of <0.001%.

4.2 Soil-leachate

A total of three soil-leachate samples (WS113, 2.20 m bgl, WS116, 2.50 m bgl and WS118, 0.50 m bgl) were collected from the Made Ground. Laboratory analysis was undertaken for a suite of contaminants comprising metals, pH, total cyanide, PAHs, metals, BTEX, MTBE and speciated TPHs.

The results were compared by e3p against published Drinking Water Standards (DWS), protective of the underlying Principal Aquifer bedrock which was identified by e3p as the primary controlled waters receptor. No exceedances of the DWS were identified.

4.3 Groundwater

Groundwater monitoring well was installed within the Made Ground of WS109 and WS116 however no groundwater samples were collected.

4.4 Ground Gas

The e3p 2017 ground investigation report [6] states that e3p assessed risks to the proposed development from ground gas in general accordance with guidelines presented in CIRIA Report 665 'Assessing risks posed by hazardous ground gases to buildings' [10].

Two window sample boreholes (WS109 and WS116) were installed with a gas monitoring well with the response zone screened within the Made Ground. Only a single round of gas monitoring was undertaken from WS116 following completion of intrusive investigation works, during which one (WS109) of the wells were inaccessible and no readings taken. The reports states that further gas monitoring rounds are planned but this data has not been seen by AtkinsRéalis and it is unclear if the additional monitoring was completed.

In WS116 the maximum methane concentration was recorded below the level of detection (<0.1%) and a maximum carbon dioxide concentration of 0.9% were recorded.

4.5 Land Contamination Summary

4.5.1 Summary Of Findings

The e3p 2017 ground investigation report assessments [6] concluded the following:

- Human health: Two exceedances of the screening criteria (for lead and asbestos). Risks to future site users are considered to be low.
- Controlled waters: On the basis of the available information risks to controlled waters from soils and groundwater beneath the site were considered to be low.
- Ground gas: Based on the limited data available e3p derived a gas screening value (GSV) for the site in accordance with CIRIA Report 665 [10]. All locations would be classified as 'Characteristic Situation 1', where no gas protection measures would be required in new structures.

4.5.2 Discussion

4.5.2.1 Human Health

Two exceedances of the screening criteria (for lead and asbestos) were recorded in Made Ground soils at the site, whilst these concentrations present a theoretical risk to future site users it is understood that due to the topography of the site import of fill soils up to 4m thick will be required across the site from the adjacent construction site works. In addition, areas not covered in hard surfacing will require import of a suitable topsoil for planting.

Therefore, no viable contaminant migration pathways between these exceedances and the future users of the park site will exist and potential pollutant linkages will be broken

4.5.2.2 Controlled Waters

No exceedances of relevant DWS were recorded in soil leachate samples from the site. Therefore risks to controlled waters receptors are considered to be low.

5. Recommendations

Material arising from construction excavations can be reused if, among other parameters, it can be demonstrated that it does not pose a potential risk to human health or the environment.

Based on the sampling and laboratory testing undertaken, there is considered to be low risks to human health and controlled waters receptors from contaminants detected in soils from the site.

Appropriate sampling of the actual material excavated will be required with concentrations compared to appropriate re-use criteria to confirm suitability for re-use or otherwise, specific to the required end use. Specific assessment should be undertaken in relation to the reuse of soils near surface waters.

Re-use of material on site should be managed via a suitable waste exemption or a Materials Management Plan (in accordance with the Definition of Waste: Code of Practice) [12].

6. References

[1] British Geolgical Survey (BGS), “GeoIndex Onshore,” 2024. [Online]. Available: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/.

[2] DEFRA, “MAGIC Map Application,” 2024. [Online]. Available: https://magic.defra.gov.uk/.

[3] Environment Agency, “Flood Map for Planning,” 2021. [Online]. Available: https://flood-map-for-planning.service.gov.uk/. [Accessed 2024].

[4] Groundsure, “Groundsure io Environmental Data Viewer,” 2024. [Online]. Available: https://groundsure.io.

[5] UK Health Security Agency, “UKradon, UK maps of radon,” 2022. [Online]. Available: https://www.ukradon.org/information/ukmaps. [Accessed 2024].

[6] E3P, “Central Retail Park, Phase 1 and Phase 2 Geo-Environmental Site Assessment. E3p, Ref: 11-834r1. July 2017”.

[7] Zetica UXO, “Risk Maps,” 2024. [Online]. Available: https://zeticauxo.com/downloads-and-resources/risk-maps/.

[8] Environment Agency, “Model Procedures for the Management of Land Contamination . Contaminated Land Report 11.,” 2001.

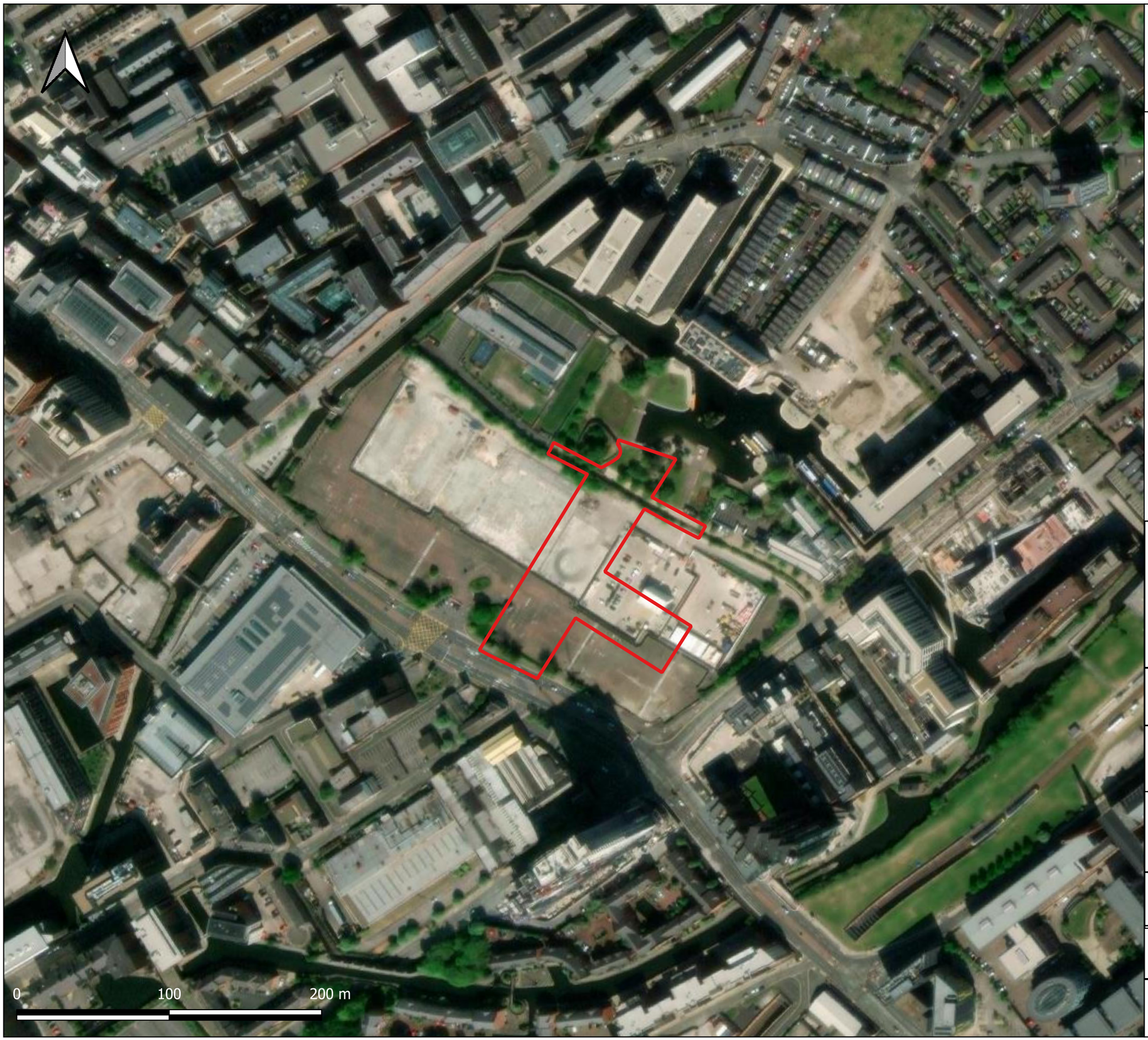
[9] BSI 2017, “Investigation of potentially contaminated sites - Code of Practice. BS 10175:2011+A2:2017, 2017,” 2017.

[10] Ciria, “Assessing risks posed by hazardous ground gases to buildings (C665D),” 2007.

[11] British Standard, “8485:2015+A1:2019 - Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings,” 2022.

[12] CL:AIRE, “CLAIRE: Definition of Waste: Code of Practice,” [Online]. Available: https://www.claire.co.uk/projects-and-initiatives/dow-cop.

Appendix A. Figures



Notes

Background mapping from ESRI Sateliete. Source https://server.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer/tile/{z}/{y}/{x}

LEGEND

Site Boundary

AtkinsRéalis

The Hub, 500 Park Avenue, Aztec West

Client

MANCHESTER CITY COUNCIL

Project Name

FORMER CENTRAL RETAIL PARK, THE PARKLANDS, ANCOATS, MANCHESTER

Drawing Title

SITE LOCATION PLAN

Scale	Designed	Drawn	Checked	Authorised
1:3,000	CH	CH	AW	AW
Original Size A3	Date 04/04/2024	Date 04/04/2024	Date 12/04/2024	Date 23/08/2023

Drawing Number

FIGURE 01

Revision

01

AtkinsRéalis
11 Bressenden Place,
London,
SW1E 5BY

© AtkinsRéalis except where stated otherwise