Phase II Site Assessment
Brunswick Street,
Manchester,
M13 9SU

REC Reference: LA102867P2R1

Report Prepared For: Brunswick Living Ltd
September 2017

National Consultancy, Locally Delivered

A CONCEPT LIFE SCIENCES COMPANY

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Interim	Completion of additional site works		
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EXECUTIVE SUMMARY	
Site Address	Brunswick Street, Manchester, M13 9SU
Grid Reference	E: 385243 N: 397072
Site Area	0.36 ha
Current Site Use	The subject site is rectangular in shape with plan dimensions of approximately 30m by 15m, and is currently a disused parcel of land, devoid of any building, with an advertising hoarding located in the south east corner.
Adjacent Site Uses	The site is immediately adjacent to a small supermarket and petrol station to the north, with a local school and its associated facilities to the north west and Ardwick Green Park located to the north east. Immediately to the west of the site area is a car park and directly adjacent associated residential apartments with a medical centre beyond. The south of the site is bordered by Brunswick Street.
Environmental Setting	**Geology:** Superficial deposits of Glacial Till Diamicton overlying solid deposits of the Chester Pebble Beds Formation **Hydrogeology:** The site is underlain by a Secondary undifferentiated aquifer (superficial deposits), overlying a Principal aquifer (solid deposits). There are no potable and seven groundwater abstractions within 2km of the site, the closest located at around 450m from the site. **Hydrology:** No surface water features are located within 250m of the site. No surface water abstraction licenses are located within 1km of the site. **Sensitive Land Uses:** Residential properties, a local primary school, health care facilities and a local park are within close proximity.
Site History	There is relatively little recorded on-site historical development; circa 1851 the subject site comprised part of 2 No. courtyards / area of gardens for local large residential houses. From the period of circa. 1889 to 1908 the site area appears to be undeveloped land subsequent to the demolition of the initial associated residences. Circa. 1908 to 2002 the site was occupied by a single building used as a Sunday School, Hope Mission Hall, which changed use circa. 1932 becoming a Club. Since its demolition circa. 2002 the land has remained undeveloped.
Landfill Sites & Ground Gases	The Environment Agency hold records of a single landfill within 1km of the site, Palmerston Street Landfill located approximately 770m to the north east of the site. The site is registered as first receiving waste on 1st September 1986 which ceased on 31st December 1987. Waste types received are inert waste which remains largely unaltered once buried such as glass, concrete, bricks, tiles, soil and stones and industrial from factory or industrial process, excluding waste from mines, quarries and agricultural wastes. Potential sources of ground gas have been identified as: ▶ Made Ground deposits; and, ▶ The adjacent off site petrol filling station (however, the history of the site is unknown and there are no recorded pollution incidents having occurred on this site).
Radon	BRE211 Radon: Guidance on protective measures for new buildings (2015 Edition), Map 13, Northern Welsh Marches and Liverpool indicates that no radon protective measures are required in the construction of new dwellings.
Coal Mining / Land Stability	The Coal Authority Report indicates that the site is in falls within a coal mining area but is confirmed but to not be affected by past mine workings and as such a Coal Mining Risk Assessment (CMRA) Report is not required for the site.
Intrusive Ground Investigation	

Ground Conditions	**Made Ground** Made Ground deposits were encountered across the site at varying depths, consisting of either brown or red sandy gravels with gravel content of brick concrete and limestone, and / or brown sandy gravelly clay with gravel content of brick and concrete. The depth of the Made Ground was between 0.00m and 3.20m. **Drift** Superficial glaciofluvial comprising gravel, sand and clay layers was encountered at depths between 2.10m and 11.15m bgl. **Solid Geology** Bedrock was encountered and recovered as cores at depths of below 11.15m bgl. It is considered that highly weathered Sandstone was recovered as very dense Sand at depths of below 6.50m within the two rotary boreholes undertaken during the second stage of the intrusive site investigation. **Groundwater** Groundwater was not encountered during the intrusive site investigative works and has not been encountered during the groundwater monitoring visits carried out to date.
Tier II Contaminated Land Risk Assessment	
Human Health	Elevated concentrations of several PAH's and Lead were found from chemical samples from within the made ground during the site investigation. One chemical sample tested positive for Asbestos (Chrysotile) fibres, however following subsequent quantification the concentration was found to be on the limit of detection. It is recommended that the vast majority of contamination found across the site within the Made Ground can be remediated through the removal of the viable exposure pathway in the proposed development. It is therefore recommended that all soft landscaped areas of the proposed development are capped with a clean inert cover system approximately 600mm thick.
Controlled Waters	A number of contaminants were found to exceed the tier II screening values for drinking water, groundwater and surface waters. The risks to controlled waters from the contaminants is not considered to be a significant risk for the following reasons: ▶ Groundwater was not encountered during the site investigation or the post monitoring period, there are no potable abstractions within 2km of the site; ▶ There are no surface water courses in close proximity to the site; the nearest is the River Medlock located 470m north of the site; ▶ With the absence of groundwater within the superficial deposits and a significant proportion of the site likely to be covered in buildings and of other hardstanding areas, it is not considered that mobilisation of the contaminants from the made ground would be significantly impeded.
Ground Gas	The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas: ▶ The adjacent petrol filling station (however, the history of the site is unknown and there are no recorded pollution incidents having occurred on this site); and,

	▶ Made Ground deposits across the site. No significantly elevated concentrations of methane or carbon dioxide were recorded during the gas monitoring period. Atmospheric pressure was recorded at 1009mbar to 1007mbar and 1018mbar to 1019mbar.
Geotechnical Assessment	
Underground Obstructions	Variable made ground deposits extending to depths of 3.20m bgl were identified. No other underground obstructions were identified during the site investigation.
Allowable Bearing Capacity	The shallow clay deposits across the site are highly variable and of a low to medium strength, with an ABC less between 53kN/m^2 and 102kN/m^2. The natural glaciofluvial clay generally shows an increase in strength with depth. The shallow granular deposits across the site are highly variable, returning densities of very loose to very dense, with an ABC between 18kN/m^2 to 428kN/m^2. The natural glaciofluvial sand and gravel does not display a distinct increase in strength with depth. Sandstone recovered from the two rotary cored boreholes returned an allowable bearing capacity of 4.3MPa at a depth of 14.20m bgl.
Foundation Options	Based on the ABCs, it is considered that the variable composition and calculated ABPs in the Made Ground and superficial drift deposits are not suitable founding stratum for the proposed apartment block. It is therefore recommended that piled foundations are used to support the structure, likely to be end bearing piles socketed into the underlying solid geology at a depth of circa 15.0m bgl.
Soak-away and Drainage	A formal drainage survey has not been conducted. The proposed development will cover the footprint of the site and include a basement structure, therefore it is considered that soakaway drainage will be unsuitable for this development. The presence of substantial depths of Made Ground and soft glaciofluvial sand, gravels and clays across 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. Further assessment would be required to determine soil infiltration rates in accordance with CIRIA C515 (2000).
Sulphate Assessment	Concrete should be designed in accordance with Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).
Developed Conceptual Site Model (CSM)	
Human Health There was several exceedances of the Tier II screening values associated with the made ground on the site; including lead and several PAH's. Chrysotile fibres were detected in one made ground sample, however following quantification the concentration was found to be on the limit of detection. The overall risk associated with on site sources is considered **low to moderate** on the basis that the superficial deposits on site and the surrounding area comprise glaciofluvial Glacial Till, which is not considered to offer protection from the potential migration of hazardous materials and or ground gases from an off-site source. **Controlled Waters**	

Groundwater

No groundwater was identified within the intrusive site investigation. The site is proven to be underlain by glaciofluvial deposits of sands and thin bands of clays. A number of contaminants exceeded the tier II screening values, however the absence of groundwater in the superficial deposits, no nearby surface water bodies or potable water abstraction points indicates a relatively low risk to potential water bodies. The underlying Chester Pebble Beds (solid geology) is considered by the Environment Agency (EA) to be a Principal Aquifer. With consideration to these points, and the potential contaminated sources previously identified, it is considered that the risk of contamination to the underlying groundwater is **low.**

Surface Waters

No surface water features are located within 250m of the site and therefore, it is considered that the risk of contamination to surface water receptors is low. The site is identified as being in close proximity to a River and Coastal Zone 2 floodplain (located 6m southwest) and a Zone 3 floodplain (located 50m southwest). It is therefore considered that the risk of contamination to surface water receptors is **low**.

Ground Gas

No significantly elevated concentrations of methane or carbon dioxide were recorded during the monitoring period (4 rounds spread over a period of 4 weeks) therefore subject to the agreement of Regulatory Authorities, the site falls into this CIRIA C665 Characteristic Situation 1 / Green in line with the NHBC Traffic Light System bracket and does not require any gas protection measures.

Recommendations

Based on the findings of this report, REC considers the site is suitable for the proposed development subject to the observations and findings of this report.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **II**

1.0 INTRODUCTION **1**

1.1 Background 1
1.2 Proposed Development 1
1.3 Previous Reports 1
1.4 Objectives 1
1.5 Risk Classification 1
1.6 Limitations of the Study 2
1.7 Confidentiality 2

2.0 SITE SETTING **3**

2.1 Site Details 3
2.2 Current Site Use 3
2.3 Surrounding Area 4

3.0 SITE INVESTIGATION **5**

3.1 Desk Study Information 5
3.2 Site Investigation Rationale 5
3.3 In-Situ Testing 6
3.3.1 Standard Penetration Tests 6
3.4 Laboratory Analysis 6
3.4.1 Soil Chemical Analysis 6
3.4.2 Geotechnical Laboratory Analysis 6
3.5 Gas and Groundwater Monitoring 6

4.0 GROUND AND GROUNDWATER CONDITION **8**

4.1 Ground Conditions 8
4.1.1 Summary of Ground Conditions 8
4.1.2 Made Ground 8
4.1.3 Drift Deposits 9
4.1.4 Solid Geology 9
4.1.5 Soil Consistency 9
4.1.6 pH and Sulphate 9
4.2 Ground Gas 9

5.0 TIER II GENERIC QUANTITATIVE CONTAMINATED LAND RISK ASSESSMENT **12**

5.1 Human Health Risk Assessment 12
5.2 Controlled Waters 14
5.3 Ground Gas 16
5.4 Revised Conceptual Site Model 17

6.0 WASTE ASSESSMENT 19

6.1 Waste Acceptance Criteria 19
6.2 Hazardous Waste Assessment 20

7.0 GEOTECHNICAL ASSESSMENT 21

7.1 Proposed Development 21
7.2 Summary of Ground and Groundwater Conditions 21
7.3 Site Preparation 21
7.4 Foundation Conditions and Bearing Capacity 21
7.5 Drainage 23
7.6 Concrete Durability 23
7.7 Excavations 23
7.8 Coal Mining 24

8.0 CONCLUSIONS & RECOMMENDATIONS 25

APPENDICES

Appendix I Limitations
Appendix II Glossary
Appendix III Drawings
Drawing No 102867-001 – Site Location Plan
Drawing No 102867-002 – Exploratory Hole Location Plan
Drawings Titled – The Proposals – Proposed Development Plan
Appendix VI REC Exploratory Hole Logs
Appendix V Chemical Testing Results
Appendix VI Geotechnical Testing Results

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd has been commissioned by Brunswick Living Ltd to undertake a Phase I and II Site Investigation at the Site on Brunswick Street, Manchester, M13 9SU. A site location plan is presented as Drawing No. 102867-001 in Appendix III.

The scope of the Phase II Ground Investigation comprised five window sample probeholes. Three window samples were completed as environmental monitoring installations. The scope of works also comprised targeted chemical and geotechnical laboratory analysis and a factual and interpretive report.

A second phase of site works was undertaken which involved the advancing of two rotary open hole and cored boreholes and the advancing of 6 machine excavated trial pits.

1.2 Proposed Development

REC has been provided with a preliminary layout plan comprising 1 No. high-rise 5 storey residential apartment building comprising of 16 private residences, private and communal ground level gardens and a roof terrace with communal gardens.

The proposed development plan Drawings titled 'The Proposals' is contained in Appendix III.

1.3 Previous Reports

The following reports have been previously provided by REC:

- Phase I Site Assessment, dated December 2016. Reference No. 102678p1r0.

This report has been designed to supplement the previous reports and therefore, this report should be read in conjunction with the reports

1.4 Objectives

The objectives of the geo-environmental investigation are to:

- 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; and,
- Provide recommendations regarding future works required.

1.5 Risk Classification

REC Ltd has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the property development. The risk classification definitions are summarised overleaf:

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

1.6 Limitations of the Study

The limitations of this report are presented in Appendix I.

1.7 Confidentiality

REC 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 REC; a charge may be levied against such approval.

2.0 SITE SETTING

2.1 Site Details

Site Address	Brunswick Street, Manchester, M13 9SU (nearest postcode)
National Grid Reference	385243, 397072
Site Area	0.36 Ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location plan (Drawing No 102867-001) is presented in Appendix III.

2.2 Current Site Use

Site Description

The subject site is regular in shape with maximum plan dimensions of approximately 30m by 12m, and is currently an unused parcel of land. There is advertising hoarding across the south east corner of the site; no other structures such as buildings are present.

The perimeter of the site is fully enclosed, only allowing vehicular access and pedestrian access upon removal of slats of the approximately 3m tall wooden fence along the south east facing boundary. The North West facing boundary comprises a wooden fence, supported by concrete posts, standing approximately 2m in height. The boundary to the north east is delineated by a brick wall, approximately 3m high with barbed wire running along the top. The south west boundary is defined by iron railings set into a small brick wall, standing at approximately 2m combined height.

Ground cover is gravel overlain by leaf litter with both being found across the full extent of the site area. Dense woody vegetation is found throughout the majority of the site area, consisting of various types of vegetation including some small trees, poplar (found throughout the site area), and rowan. Large established trees of pine, sycamore and beach were also found located towards and along the North West boundary fence.

Dead canes of Japanese Knotweed, an invasive plant species, were observed along the north east and west facing boundaries of the site and sporadically around the centre during the visit (please note this walkover did not comprise a full invasive plant species survey or an ecology survey). Live Japanese Knotweed was also observed during the site walkover on the 29th June 2017.

The site slopes gently down towards the south west with additional localised variations and depressions resulting in generally undulating uneven ground.

Fly-tipped materials and litter are present across the site area, with the bulk of the materials being confined to the outer edges along the boundary fence lines of the adjacent properties. Items identified include bricks, plastic pipes, wooden beams, traffic cones, child's pushchair, and general litter such as metal cans, plastic bags.

Hazardous Materials Storage

No above ground storage tanks (AST) or Underground Storage Tanks (USTs) were observed at the site.

Asbestos Containing Material (ACM)

No potential ACMs were observed at the site.

Polychlorinated Biphenyls (PCBs)

No equipment that may potentially contain PCBs was observed at the site; however, an electricity control box was found to be located at the base of the wall in the south west corner of the site. The box is external to the site and acts to control the security gate for the adjacent car park of the associated residential apartment block.

Waste Storage

No potentially hazardous waste streams are currently generated at the property.

The site is considered to represent a low risk in its current unused state.

Drainage Issues

A formal drainage survey has not been completed.

2.3 Surrounding Area

The surrounding land uses are summarised below:

Direction	Land Use
North	Directly adjacent a small Tesco store and associated small car park, with a petrol station beyond. A local school and associated facilities such as playing fields is located to the north west, with Ardwick Green Park located to the north east.
East	Car park for the adjacent supermarket and petrol station.
South	Brunswick Street with a site currently under development beyond (suspected residential development).
West	Car park directly adjacent and associated residential apartments, with The Vallance medical centre beyond.

3.0 SITE INVESTIGATION

3.1 Desk Study Information

Potential contamination sources have been identified from the desk study and these are listed in Table 3.1 below:

Table 3.1 Summary of Potential Contaminant Sources

Potential Source	Potential Contaminants	Potential Impact
Adjacent petrol station/ garage	Hydrocarbons, phenols, volatile organic compounds and semi-volatile organic compounds	Human health and controlled waters and buildings
Made Ground across the site	Metals, asbestos, PAHs, hydrocarbons, methane and carbon dioxide	Human health, controlled waters and buildings

3.2 Site Investigation Rationale

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 3.1 above. In addition, exploratory holes have also been advanced to provide information on baseline conditions across the site. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed on the 29th June 2017 and between 9th and 11th August 2017. The works are summarised in Table 3.2, below.

Table 3.2 Summary of Fieldwork

Location Hole	Potential Source/Rationale	Type	Maximum Depth (m bgl)	Monitoring Wells Response Zone (m bgl)
WS101	Baseline conditions / Made Ground	Window Sample	4.19	1.00-2.10
WS102	Baseline conditions / Made Ground	Window Sample	4.12	N/A
WS103	Baseline conditions / Made Ground	Window Sample	3.66	1.00-3.20
WS104	Baseline conditions / Made Ground	Window Sample	5.00	N/A
WS105	Baseline conditions / Made Ground	Window Sample	5.00	2.70-4.80
BH201 & BH202	Establish depth to competent rock	Rotary	18.00	5.00-10.00
TP201 to TP206	Baseline conditions, establish footing depth of boundary wall	Machine Excavated	3.00	N/A

The window sample probeholes were designed to provide geotechnical information, and to retrieve environmental samples for chemical testing in order to develop the findings of the Initial Conceptual Site Model (ICSM).

The rotary boreholes were designed to establish depth to rock head and to retrieve samples for subsequent laboratory testing to establish the strength of the sandstone.

The trial pits were designed to provide baseline conditions across the site and to establish the depth of boundary wall foundation.

All samples were collected using appropriate PPE and sampling equipment that was cleaned at each sampling location. A detailed copy of REC Ltd sampling methodology, QA procedures and laboratory chain of custody forms can be provided upon request.

3.3 In-Situ Testing

3.3.1 Standard Penetration Tests

Standard Penetration Tests (SPT) were carried out in all locations (WS107) at 1m intervals with the first test carried out at the bottom of the hand dug inspection pits; 1.20m. The testing was carried out to provide validation of ground consistency and strength observations. The results of the in-situ testing are presented in table 4.2, Section 4.1.

3.4 Laboratory Analysis

3.4.1 Soil Chemical Analysis

Selected soil samples were submitted for a range of chemical analysis comprising, metals, pH, total sulphate, water soluble sulphate (2:1 extract), sulphide, cyanide, phenols, total and speciated poly-aromatic hydrocarbons (PAHs), asbestos, benzene, toluene, ethylbenzene and xylenes (BTEX) and speciated banded total petroleum hydrocarbons (TPH).

Concept Life Sciences Ltd (formerly Scientific Analysis Laboratories Ltd / SAL) of Manchester undertook the analytical work. These results are discussed in section 5 and presented in Appendix V.

3.4.2 Geotechnical Laboratory Analysis

Selected soil samples were submitted to Professional Soil Laboratories (PSL) Ltd of Doncaster, where the following geotechnical tests were undertaken:

- 1 No. Undrained Triaxial Test;
- 3 No. Determination of Undrained Shear Strength; and,
- 10 No. Point Load Tests.

Chemical analysis on soil samples included pH and sulphate (2:1 extraction) analysis to aid concrete design.

3.5 Gas and Groundwater Monitoring

Following the intrusive phase of site works, gas and groundwater monitoring was undertaken on four occasions between the 6th and 9th August 2017.

Concentrations of methane (CH_4), carbon dioxide (CO_2) and Oxygen (O_2) were measured using an infra-red gas analyser (GFM 436), calibrated to a reference standard (before and after each survey) and gas flow rates were measured. 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.

Groundwater 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.

Ground gas results and the recorded groundwater levels are summarised in Section 4.2.

4.0 GROUND AND GROUNDWATER CONDITIONS

4.1 Ground Conditions

4.1.1 Summary of Ground Conditions

The ground investigation generally confirms the published geology and identifies the strata set out in Table 4.1 below.

Table 4.1 Summary of Strata

Strata	Typical Description	Min Depth to Top of Strata (m)	Max Depth to Top of Strata (m)	Max Thickness (m)
MG Brown sandy GRAVEL	Light brown very sandy fine to coarse angular to sub-angular GRAVEL of brick, concrete, limestone with a low cobble content. Cobbles are angular to sub-angular of brick and concrete.	0.00	0.00	3.20
MG Medium dense red sandy GRAVEL	Medium dense red sandy fine to coarse angular to sub-angular GRAVEL of brick with high cobble content. Cobbles are angular to sub-angular of brick.	1.20	1.20	1.50
MG Very soft to soft brown Sandy gravelly CLAY	Very soft to soft brown sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular of brick and concrete.	1.70	2.60	0.60
MG Cobbles	Red angular to sub-angular COBBLES of brick with a low boulder content of concrete	0.80	1.50	>2.20
Brown sandy GRAVEL	Medium dense light brown very sandy fine to coarse sub-rounded to rounded GRAVEL of sandstone.	2.10	2.10	1.10
Orangey brown gravelly SAND	Dense light orangey brown gravelly fine to medium SAND. Gravel is fine sub-rounded to rounded of sandstone.	3.20	3.20	0.99
Brown sandy gravelly CLAY	Soft to firm brown sandy to very sandy gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded of sandstone.	2.70	3.20	2.20
Red brown gravelly SAND	Red to reddish brown gravelly fine to medium SAND. Gravel is fine to medium sub-angular to rounded of sandstone.	3.40	4.90	9.50
Reddish brown SANDSTONE	Highly weathered reddish brown medium grained SANDSTONE (Chester Pebble Beds).	11.15	14.00	Not proven

4.1.2 Made Ground

Made Ground deposits were encountered across the site at varying depths, consisting of either brown or red sandy gravels with gravel content of brick concrete and limestone, and / or brown sandy gravelly

clay with gravel content of brick and concrete. Occasional cobble horizons are also noted within the trial pits at depths of between circa 0.80m and 3.00m bgl. The depth of the Made Ground was between ground surface and 3.20m. Exploratory hole logs are presented in Appendix IV.

4.1.3 Drift Deposits

Superficial glaciofluvial deposits comprising gravel, sand and clay layers was encountered at depths between 2.10m and 11.15m bgl.

4.1.4 Solid Geology

Very dense Sand which may be representative of highly weathered bedrock was encountered from depths of 3.40m during the site investigation. Rotary coring returned Sandstone cores from 11.15m on wards. Results of Unconfined Compressive Strength (UCS) testing return values of this material as between 4.3 MPa and 5.3 MPa which corresponds to published presumed safe bearing capacities for sandstone (based on BS 8004:1986).

4.1.5 Soil Consistency

The granular Made Ground deposits (up to 3.20m bgl) were found to be variable between very loose to medium dense in consistency and the cohesive Made Ground was of a low strength (very soft to firm). The underlying natural glaciofluvial gravel and sand was found to be generally medium dense in consistency and the natural glaciofluvial clay was found to be variable between low strength to medium strength.

Results of the Standard Penetration Tests, including undrained shear strengths derived from SPTs are included on Table 4.3 overleaf.

4.1.6 pH and Sulphate

Chemical analyses for pH and soluble sulphate content contained in Appendix V (summarised below in Table 4.2), 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).

Table 4.2 Summary of pH and Sulphate Data

Location	Depth (m)	SO_4 in 2:1 water / soil (g/l)	pH Value
WS101	0.50	<0.1	7.7
WS102	0.70	<0.1	7.6
WS103	0.50	<0.1	7.6
WS104	1.00	<0.1	7.5
WS105	0.60	<0.1	7.4
	Design Value	<0.1	7.4

4.1.7 Evidence of Contamination

No visual or olfactory evidence of contamination was observed during the intrusive investigation.

4.2 Ground Gas

The results of the ground gas monitoring are presented in Table 4.4.

Table 4.3 Standard Penetration Test Results

Boreholes	Depth (m bgl) (i)	Material Field Description	CPT/SPT "N" Value	Corrected "N" Value $(N_1)_{60}$	Terzaghi & Peck Relative Density (Sands)	Eurocode Soil strength	Consistency (BS5930)	Stroud & Butler Approximate Undrained Shear Strength (kN/m²)
WS101	1.2	Made Ground Sand	19	18.64	Medium Dense	N/A	N/A	N/A
	2.0	Made Ground Clay	11	10.05	Medium Dense	N/A	N/A	N/A
	3.0	Sandy Gravel	16	13.91	Medium Dense	N/A	N/A	N/A
	4.0	Fine to Medium Sand	50	42.24	Dense	N/A	N/A	N/A
WS102	1.2	Made Ground Gravel	21	20.61	Medium Dense	N/A	N/A	N/A
	2.0	Made Ground Clay	2	1.83	Very Loose	N/A	N/A	N/A
	3.0	Gravel	32	27.83	Medium Dense	N/A	N/A	N/A
	3.8	Gravel	50	42.44	Dense	N/A	N/A	N/A
WS103	1.2	Made Ground Gravel	30	29.44	Medium Dense	N/A	N/A	N/A
	2.0	Made Ground Gravel	23	21.01	Medium Dense	N/A	N/A	N/A
	3.0	Made Ground Gravel	23	20.00	Medium Dense	N/A	N/A	N/A
	3.45	Gravelly Medium Sand	50	42.85	Dense	N/A	N/A	N/A
WS104	1.2	Made Ground Gravel	2	1.96	Very Loose	N/A	N/A	N/A
	2.0	Made Ground Gravel	4	3.65	Very Loose	N/A	N/A	N/A
	3.0	Made Ground Clay	6	5.22	N/A	Low Strength	Firm	26.09
	4.0	Sandy Gravelly Clay	11	9.29	N/A	Medium strength	Stiff	46.78
	5.0	Sandy Gravelly Clay	12	9.96	N/A	Medium strength	Stiff	30.44
WS105	1.2	Made Ground Gravel	3	2.94	Very Loose	N/A	N/A	N/A
	2.0	Made Ground Gravel	12	10.96	Medium Dense	N/A	N/A	N/A
	3.0	Sandy Gravelly Clay	7	6.09	N/A	Low Strength	Firm	30.44
	4.0	Sandy Gravelly Clay	8	6.76	N/A	Low Strength	Firm	30.79
	5.0	Gravelly Medium Sand	8	6.64	Loose	N/A	N/A	N/A
BH201	6.5	Gravelly Sand	50 for 190mm	79	Very Dense	N/A	N/A	N/A
	9.8	Gravelly Sand	100 for 45mm	667	Very Dense	N/A	N/A	N/A
BH202	9.0	Gravelly Sand	50 for 25mm	600	Very Dense	N/A	N/A	N/A

Table 4.4 Summary of ground gas and groundwater 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 (mbgl)	Depth to Base (mbgl)	Depth to Water (mbgl)
WS101	06/07/2017	0.1	0.1	0.0001	1.3	1.3	0.0013	19.3	1009	Falling	0.1	1.00 – 2.10	1.845	Dry
	14/07/2017	0.1	0.1	0.0001	1.4	1.4	0.0014	19.3	1018	Rising	0.1		1.845	Dry
	21/07/2017	0	0	0	0.9	0.9	0.0009	19.7	1003	Falling	0		1.845	Dry
	09/08/2017	0	0	0	0.9	0.9	0.0009	19.5	1019	Rising	0		1.845	Dry
WS103	06/07/2017	0.1	0.1	0.0001	0.9	0.7	0.0007	20.3	1008	Falling	0.1	1.00 – 3.20	2.750	Dry
	14/07/2017	0.1	0.1	0.0001	0.7	0.6	0.0006	20.4	1018	Rising	0.1		2.750	Dry
	21/07/2017	0	0	0	0.8	0.4	0.0004	20.4	1003	Falling	0		2.750	Dry
	09/08/2017	0	0	0	0.8	0.5	0.0005	20.3	1019	Rising	0		2.750	Dry
WS105	06/07/2017	0.1	0.1	0.0001	0.6	0.6	0.0006	20.5	1007	Falling	0.1	2.70 – 4.80	3.825	Dry
	14/07/2017	0.1	0.1	0.0001	0.6	0.6	0.0006	20.4	1019	Rising	0.1		3.825	Dry
	21/07/2017	0	0	0	0.5	0.5	0.0005	20.1	1002	Falling	0		3.825	Dry
	09/08/2017	0	0	0	0.5	0.5	0.0005	20.1	1019	Rising	0		3.825	Dry

5.0 TIER II GENERIC QUANTITATIVE CONTAMINATED LAND RISK ASSESSMENT

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

5.1 Human Health Risk Assessment

At a Tier II stage, the long term (chronic) toxicity risk to human health is assessed by utilising appropriate and conservative generic assessment criteria (GAC) to determine whether there are actual or potential unacceptable risks at the site and if any viable pollutant linkages are present.

To undertake the Tier II assessment within the context of the development proposal, REC has determined that the most appropriate GAC values available will be those based upon a residential land use with the cultivation and ingestion of home-grown produce taken into account.

The following assessment, summarised below and overleaf in Table 5.1, has primarily adopted the S4UL (Suitable for Use Levels reference values published by LQM/CIEH in 2015, the S4ULs). Currently, no published GAC value is available for cyanide and therefore REC has utilised the Environment Agency Contaminated Land Exposure Assessment Tool (CLEA v1.06) to derive the relevant GAC for this proposed land use. Due to the absence of a published lead GAC for direct use within the planning regime, the 2014 Defra C4SL (Category 4 Screening Level) has been used as this value is considered to incorporate the latest toxicological, bioaccessibility and exposure modelling research to date.

Table 5.1: Summary of Human Health Toxicity Assessment for a Residential End Use

Determinand	Units	GAC	GAC Source	n	[mc]	Location / Strata	Primary Pathways	Assessment
Inorganics								
Arsenic	mg/kg	40	(i)	5	16	N/A	1	No Further Action
Cadmium	mg/kg	85	(i)	5	1		1, 2	
Chromium (VI)	mg/kg	6	(i)	5	<1		1, 2, 3	
Lead	mg/kg	200	(iv)	5	420	WS101 at 0.50m	1, 2	**See Discussion**
Mercury [Inorganic]	mg/kg	56	(ii)	5	<1	N/A	1, 2	No Further Action
Nickel	mg/kg	180	(ii)	5	23		1	
Selenium	mg/kg	430	(ii)	5	<3		1, 2	
Copper	mg/kg	7,100	(ii)	5	91		1, 2	
Zinc	mg/kg	40,000	(ii)	5	230		1, 2	
Cyanide [Total]	mg/kg	791	(v)	5	<1		1	
Asbestos	-	D.	-	5	D	WS103 at 0.50m	3	**See Discussion**
Phenols	mg/kg	690	(ii)	6	0.1	N/A	2	No Further Action
Naphthalene	mg/kg	5.6	(ii)	6	1.2		4	
Acenaphthylene	mg/kg	4,600	(ii)	6	0.1		2	
Acenaphthene	mg/kg	4,700	(ii)	6	3.5		2	
Fluorene	mg/kg	3,800	(ii)	6	2.4		2	
Phenanthrene	mg/kg	1,500	(ii)	6	19		2	
Anthracene	mg/kg	4,700	(ii)	6	4		2	
Fluoranthene	mg/kg	1600	(ii)	6	24		1, 2	
Pyrene	mg/kg	3800	(ii)	6	22		1, 2	

Determinand	Units	GAC	GAC Source	n	[mc]	Location / Strata	Primary Pathways	Assessment
Benzo(a) Anthracene	mg/kg	14	(ii)	6	9.2		1	
Chrysene	mg/kg	31	(ii)	6	9.7		1	
Benzo(b) Fluoranthene	mg/kg	4	(ii)	6	9.4	WS103 at 0.50m	1	**See Discussion**
Benzo(k) Fluoranthene	mg/kg	110	(ii)	6	7.8	N/A	1	No Further Action
Benzo(a)Pyrene	mg/kg	3.2	(ii)	6	8.6	WS103 at 0.50m	1	**See Discussion**
Indeno (123-cd)Pyrene	mg/kg	27	(ii)	6	4.4	N/A	1	No Further Action
Dibenzo(a,h) Anthracene	mg/kg	0.32	(ii)	6	2.2	WS101 at 0.50m, WS103 at 0.50m and WS104 at 1.00m	1	**See Discussion**
Benzo(ghi) Perylene	mg/kg	320	(ii)	6	4.7	No Further Action	1	No Further Action
Organics – TPHs								
TPH C_5-C_6	mg/kg	42	(iii)	5	<0.20	N/A	4	No Further Action
TPH C_6-C_8	mg/kg	100	(iii)	5	<0.20		4	
TPH C_8-C_{10}	mg/kg	27	(iii)	5	<0.20		4	
TPH C_{10}-C_{12}	mg/kg	74	(iii)	5	2		4	
TPH C_{12}-C_{16}	mg/kg	140	(iii)	5	22		1, 4	
TPH C_{16}-C_{21}	mg/kg	260	(iii)	5	110		1	
TPH C_{21}-C_{35}	mg/kg	1,100	(iii)	5	400		1	

Key
[mc] Maximum Concentration Recorded
D. Detected
N.D. None Detected (Limit of Detection = <0.0001%)

Primary Pathways
1 Ingestion of soil and indoor dust and / or oral background exposure;
2 Consumption of home-grown produce and attached soil;
3 Inhalation of dust (background and indoor);
4 Inhalation of vapour (background and indoor);

Generic Assessment Criteria (GAC) Source
(i) LQM/CIEH Suitable For Use Level (S4UL) (2015);
(ii) S4UL – Conservative Assessment Approach of 1% SOM within natural ground and 2.5% in made ground;
(iii) S4UL –1% SOM and assumed worst case aliphatic / aromatic compound;
(iv) Defra Category 4 Screening Level (2014);
(v) CLEA 1.06 Derived Value.

Referring to Table 5.1, the results of this direct comparison indicates that the screening values have been exceeded for the following determinands:

- **Lead** (WS101 at 0.50m)

- **Benzo(b) Fluoranthene** (WS103 at 0.50m)
- **Benzo(a)Pyrene** (WS103 at 0.50m)
- **Dibenzo(a,h) Anthracene** (WS101 at 0.50m, WS103 at 0.50m and WS104 at 1.00m)

In the case of the above derminands the main exposure pathway are through soil ingestion and dermal contact.

Chrysotile fibres were also detected in the made ground at one location; WS103 at 0.50m. The quantification results showed the concentration was on the limit of detection (<0.001%) and therefore any associated risk to construction workers or future site uses through the inhalation exposure pathway is considered negligible.

No visual or olfactory evidence of contamination was observed during the intrusive investigations.

It is recommended that the vast majority of contamination found across the site within the Made Ground can be remediated through the removal of the viable exposure pathway in the proposed development. It is therefore recommended that all soft landscaped areas of the proposed development are capped with a clean inert cover system approximately 600mm thick.

5.2 Controlled Waters

The groundwater vulnerability map shows the site to be located over a Principal Aquifers with a high leaching potential. The Chester Pebble Beds Formation (sandstone) bedrock is overlain by permeable glaciofluvial deposits comprising sand, silt, and clay.

No groundwater was observed during the ground investigations and in any of the monitoring installations during monitoring visits therefore leachate analysis (2.1 BSEN 12457 single stage methodology) was undertaken on soil samples.

A Tier II risk assessment has been undertaken with concentrations of determinants compared with the relevant thresholds. These are presented in Table 5.2 below

Table 5.2 Summary of Controlled Waters Risk Assessment

Determinand	Units	Hardness Banding (mg/l $CaCO_3$)	Ground Water Screening Values	Surface Water Screening Values	Drinking Water Screening Values	WS101 0.50	WS103 3.10	WS105 1.00
Inorganic								
Arsenic	µg/l	-	5(6)	50 (1)	10 (3)	3.7	3	3
Cadmium	**µg/l**	50-100*		0.09 (2)	5 (3)	0.21	0.05	0.1
Chromium VI	µg/l	-	1(6)	3.4	50 (3)	<0.003	<0.003	<0.003
Copper	**µg/l**	-		1 (1)	2000 (3)	15	7.5	5.3
Cyanide	µg/l	-		50 (1)	50 (3)	<0.05	<0.05	<0.05
Lead	µg/l	-	5(6)	1.2 (2)	10 (3)	68	11	14
Mercury	µg/l	-	0.5(6)	0.07 (2)	1 (3)	<0.05	<0.05	<0.05
Nickel	µg/l	-		4 (2)	20 (3)	4	2	2
Selenium	µg/l	-		-	10 (3)	<0.05	0.6	<0.05
Sulphate (SO_4)	mg/l	-		400 (1)	250 (3)	6	32	3.2
Zinc	µg/l	-		10.9 (1)	5000 (3)	120	9	18
pH	µg/l	-		6-9 (1)	-	7.7	7.8	7.8
Organics								
Phenol	µg/l	-		7.7 (1)	0.5 (3)	<0.5	<0.5	<0.5
Benzo(a)Pyrene	µg/l	-	0.005(6)	0.27 (2)	0.03 (3)	0.21	<0.01	0.08
Benzo[b&k] flouranthene	µg/l	-	0.05(6)	0.03 (2)	-	0.18	0.01	0.08
Benzo(ghi)perylene & Indeno(123-cd) pyrene	µg/l	-	0.05(6)	0.0082 (2)	-	0.16	<0.02	0.06
Anthracene	µg/l	-	0.05(6)	0.1 (2)	-	0.61	0.81	0.78
Fluoranthene	µg/l	-		0.12 (2)	-	0.42	0.14	0.29
Naphthalene	µg/l	-		2.0 (2)	-	0.28	<0.10	<0.20
PAHs (Sum of Four)[11]	µg/l	-		-	0.1(9)	0.34	<0.03	0.14

Key
(1) Water Framework Directive – EQS Specific Pollutant
(2) Water Framework Directive – EQS for priority Hazardous Substances. Annual Average concentration unless otherwise stated. MAC = Maximum admissible concentration unless otherwise stated.
(3) Drinking Water Screening Values – The Water Supply (Water Quality) Regulations 2016
(4) WHO DWS for TPH (2008)
(5) Sum of Four PAHs (benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene and indeno[1,2,3-c,d]pyrene)
(6) UKTAG definition for hazardous substances, UK Technical Advisory Group on the Water Framework Directive Technical report on Groundwater Hazardous Substances, 11b(iii) v12 , Final version for website. Annual mean value.
(7) WHO Drinking Water Guideline
(8) EA/SNIFFER (2001) – non statutory
*Water hardness not measured but assumed based on known water hardness within the surrounding area.

Referring to Table 5.2, the results of this direct comparison indicates that the **drinking water** screening values have been exceeded for the following determinands:

- **Lead** (WS101 at 0.50m, WS103 at 3.10m and WS105 at 1.00m)
- **Benzo(a)Pyrene** (WS101 at 0.50m and WS105 at 1.00m)

There were a number of exceedances for **surface water** screening values (as environmental quality standards – EQS) for the following determinands:

- **Cadmium** (WS101 at 0.50m and WS105 at 1.00m)
- **Copper** (WS101 at 0.50m, WS103 at 3.10m and WS105 at 1.00m)
- **Lead** (WS101 at 0.50m, WS103 at 3.10m and WS105 at 1.00m)
- **Zinc** (WS101 at 0.50m and WS105 at 1.00m)
- **Benzo[b&k] flouranthene** (WS101 at 0.50m and WS105 at 1.00m)
- **Benzo(ghi)perylene & Indeno(123-cd) pyrene** (WS101 at 0.50m, WS103 at 3.10m and WS105 at 1.00m)
- **Anthracene** (WS101 at 0.50m, WS103 at 3.10m and WS105 at 1.00m)
- **Fluoranthene** (WS101 at 0.50m, WS103 at 3.10m and WS105 at 1.00m)

Lead, Benzo[b&k], fluoranthene, Benzo(ghi)perylene & Indeno(123-cd) pyrene and Anthracene also exceeded the **groundwater** Tier II screening value based on the UKTAG definition for hazardous substances, UK Technical Advisory Group on the Water Framework Directive .

Discussion

The risks to controlled waters from the contaminants presented is not considered to be a significant risk for the following reasons:

- Groundwater was not encountered during the site investigation or the post monitoring period, there are no potable abstractions within 2km of the site;

- There are no surface water courses in close proximity to the site; the nearest is the River Medlock located 470m north of the site;

- With the absence of groundwater within the superficial deposits and a significant proportion of the site likely to be covered in buildings and of other hardstanding areas, it is not considered that mobilisation of the contaminants from the made ground would be significantly impeded.

5.3 Ground Gas

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on-site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

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

- The adjacent petrol filling station (however, the history of the site is unknown and there are no recorded pollution incidents having occurred on this site); and,
- Made Ground deposits across the site.

No significantly elevated concentrations of methane or carbon dioxide were recorded during the four monitoring visits. Atmospheric pressure was recorded at 1002mbar to 1019mbar.

In accordance with the methodology outlined with the CIRIA publication C665, REC have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.0001l/hr (WS101, WS103 and WS105) and for carbon dioxide was 0.0014l/hr (WS101).

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area. CIRIA C665 states that the maximum GSV for carbon dioxide and methane is <0.07l/hr for Characteristic Situation 1 / Green in line with the NHBC Traffic Light System and therefore the site would fall into this bracket and not require any gas protection measures.

Please note the Local Authority may request further ground gas monitoring is completed.

5.4 Revised Conceptual Site Model

A review of the initial conceptual site model will be revised in light of the ground investigation and the chemical analysis results presented the previous sections. The revised conceptual site model is developed for the proposed future land use based upon the recommended remedial measures. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors.

Table 5.3 Revised Conceptual Site Model

Receptor	Potential Risk	Current Residual Risk	Mitigation
Human Health *	*Uptake of contaminants by food plants grown in contaminated soil*	YES	**A minimum provision of 600mm clean cover in all garden areas will break pathway to residual low level contamination. Remediation of lead, asbestos and PAH contamination contamination.**
	Ingestion	YES	**A minimum provision of 600mm clean cover in all garden areas will break pathway to residual low level contamination. Remediation of hydrocarbon contamination.**
	Inhalation	NO	Quantification of Chrysotile fibres found within made ground was found to be on the limit of detection, therefore the risk to human health is negligible.
	Skin contact	YES	**A minimum provision of 600mm clean cover in all garden areas will break pathway to residual low level contamination. Remediation of hydrocarbon contamination.**
	Irradiation	NO	Site is not within an area where radon gas is present in any significant quantities.

Receptor	Potential Risk	Current Residual Risk	Mitigation
	Fire and explosion	NO	Made ground materials are not considered to be combustible. No elevated concentrations of gases were recorded during the gas monitoring period.
Buildings	*Fire and explosion*	NO	Made ground materials are not considered to be combustible. No elevated concentrations of gases were recorded during the gas monitoring period.
	Chemical attack on building materials and services	YES	**Soils present at the site are consistent with design sulphate class DS-1 and ACEC AC-1s.**
Natural Environment	*Phytotoxicity*	A phytotoxicity assessment has not been completed	**600mm cover system should be suitable for plant growth**
	Contamination of Controlled waters	NO	Absence of groundwater pathway and no receptors in close proximity to the site.

6.0 WASTE ASSESSMENT

Two samples of soil were collected from the made ground during the intrusive investigation performed at the Brunswick St site on 9th August 2017. These included:

- TP101 collected at 0.4m bgl comprising of Made ground of light brown, very sandy gravel of limestone with gravel and cobbles of brick and concrete; and,
- TP104 taken at 1.0m bgl comprising of made ground of dark brown, very sandy gravel of brick, concrete, limestone and timber.

6.1 Waste Acceptance Criteria

The chemical results have been compared against landfill waste acceptance criteria parameters to classify the soils into inert, stable non-reactive and hazardous waste accordingly. These defining parameters were created by the EU landfill directive and the directive is transposed into UK law through 'the landfill regulations 2002' active throughout England and Wales and "the landfill (Scotland) regulations 2003" active throughout Scotland. The samples tested were compared to these parameters and are presented within Tables 6.1 & 6.2 below and overleaf.

Table 6.1 Summary of Waste Acceptance Criteria Parameters

Determinant	Units	Inert Waste	Stable non-reactive Hazardous Waste	Hazardous Waste	TP101 @ 0.4mbgl	TP104 @ 1.0m bgl	Waste Criteria
BTEX (sum)	mg/kg	6			<0.04	<0.04	**Inert**
Loss on Ignition	%			10%	4.5	5.6	**Not hazardous**
PAH Sum	mg/kg	100			5.0	5.0	**Inert**
PCB EC7 Sum	mg/kg	1.0			<0.07	<0.07	**Inert**
pH			Min 6.0		7.9	7.8	**Inert**
Total Organic Carbon*	%	3%	5%	6%	5.2	6.5	**Unlikely to be inert but depends upon specific landfill operator**
TPH C10-C40 Sum	mg/kg	500			100	190	**Inert**

*In the case of soils, a higher TOC limit value may be permitted by the Environment Agency at an inert waste landfill, provided the DOC value of 500mg/kg is achieved at L/S 10 l/kg, either at the soil's own pH or at a pH value between 7.5 and 8.0.

Table 6.2 Leachate BS EN 12457-2 (10:1)

Determinand	Units	Inert Waste	Stable non-reactive Hazardous Waste	Hazardous Waste	TP101	TP104	Waste Criteria
Antimony	mg/kg	0.06	0.7	5.0	0.013	0.02	**Inert**
Arsenic	mg/kg	0.5	2.0	25	0.018	0.038	**Inert**
Barium	mg/kg	20	100	300	0.13	0.11	**Inert**
Cadmium	mg/kg	0.04	1.0	5.0	<0.0002	0.00022	**Inert**
Chloride	mg/kg	800	15000	25000	10	<10	**Inert**
Chromium	mg/kg	0.5	10	70	0.013	0.014	**Inert**
Copper	mg/kg	2	50	100	0.042	0.029	**Inert**
Dissolved Organic Carbon	mg/kg	500	800	10000	140	120	**Inert**
Fluoride	mg/kg	10	150	500	3.8	8.7	**Inert**
Lead	mg/kg	0.5	10	50	0.042	0.013	**Inert**
Mercury	mg/kg	0.01	0.2	2.0	<0.0005	<0.0005	**Inert**
Molybdenum	mg/kg	0.5	10.0	30.0	0.012	0.13	**Inert**
Nickel	mg/kg	0.4	10.0	40.0	<0.01	<0.01	**Inert**
Phenols (total Mono)	mg/kg	1.0			<1.0	<1.0	**Inert**
Selenium	mg/kg	0.1	0.5	7.0	<0.005	0.0064	**Inert**
Sulphate		1000	20000	50000	77	54	**Inert**
Total Dissolved Solids		4000	60000	100000	<1000	<1000	**Inert**
Zinc		4.0	50.0	200	0.03	<0.02	**Inert**

If an inert waste does not meet the SO_4 L/S10 limit, alternative limit values of 1500 mg/l SO_4 at C_0 (initial eluate from the percolation test (prCEN/TS 14405:2003)) AND 6000 mg/kg SO_4 at L/S10 (either from the percolation test or batch test BS EN 12457), can be used to demonstrate compliance with the acceptance criteria for inert wastes. In this instance, the leaching test using prCEN/TS 14405:2003 has not been performed. It is recommended that discussions are held with the landfill operator to confirm the sulphate limit that is acceptable.

The results of the WAC assessment shows that for all but total organic carbon (TOC), concentrations recorded within soils are classified as inert waste. The acceptance of elevated TOC within an inert landfill is dependent upon the landfill operator – who will take into account other factors such as Loss on Ignition (LOI). If the waste soil is not acceptable within an inert landfill then it is likely to be classed as non-hazardous waste.

6.2 Hazardous Waste Assessment

The available results of soil samples analysed were compared against the WM3[1] using an online hazardous waste assessment tool 'HazWaste online'[2] and from this, it is considered that soils from both sampled locations would not be classified as hazardous waste.

Please note that this assessment does not assess whether the waste would be classified as inert as opposed to non-hazardous as this assessment is made using the WAC analysis, as detailed in the section above. The output of the hazardous waste assessment is contained within Appendix VII.

[1] WM3 -1st Edition, 2015 "Guidance on the classification and assessment of waste - Technical Guidance"
[2] https://www.hazwasteonline.com

7.0 GEOTECHNICAL ASSESSMENT

7.1 Proposed Development

Brunswick Living Ltd intends to construct a 5 storey residential building with 16 private residences, private and communal ground level gardens and a roof terrace with communal gardens, 1 No. ground level commercial unit and related infrastructure.

The proposed development plan Drawings titled 'The Proposals' is contained in Appendix III.

REC has assessed the foundation options for the proposed apartment block. Details of the proposed loadings for the apartment block are not known at this stage and therefore the following assessment is for preliminary assessment purposes only.

7.2 Summary of Ground and Groundwater Conditions

Ground conditions identified at the site are summarised in Table 4.1, Section 4 and essentially comprises Made Ground over natural Glaciofluvial deposits (sand, gravel and clay layers). Very dense Sands were encountered below3.60 m which may be representative of highly weathered Sandstone (Chester Pebble Beds). Sandstone cores were recovered from below 11.15 was not encountered during the site investigation.

During the Ground Investigation and subsequent gas and groundwater monitoring, no groundwater has been encountered.

7.3 Site Preparation

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the Specification for Highway Works. This should include:

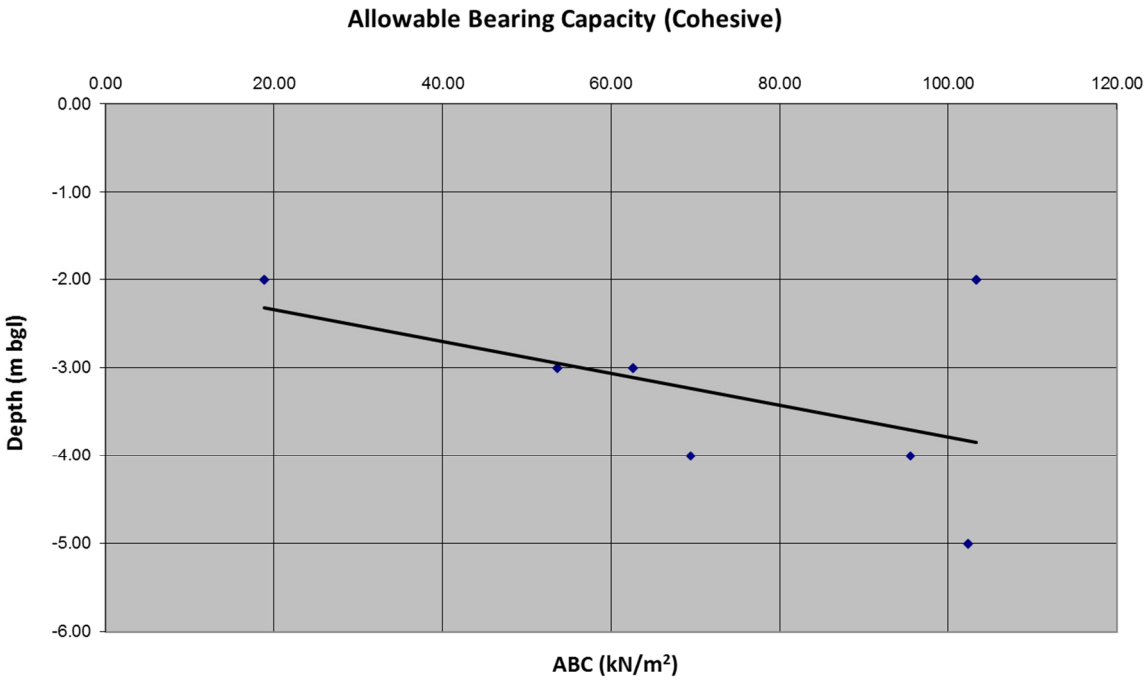
- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill;
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill;
- Buried structures and relict foundations are anticipated on the site and should be excavated from below the proposed development footprint with the resulting void backfilled; and,
- Any Japanese knotweed encountered on-site or adjacent to the site should be treated by a specialist contractor.

7.4 Foundation Conditions and Bearing Capacity

General Ground Conditions

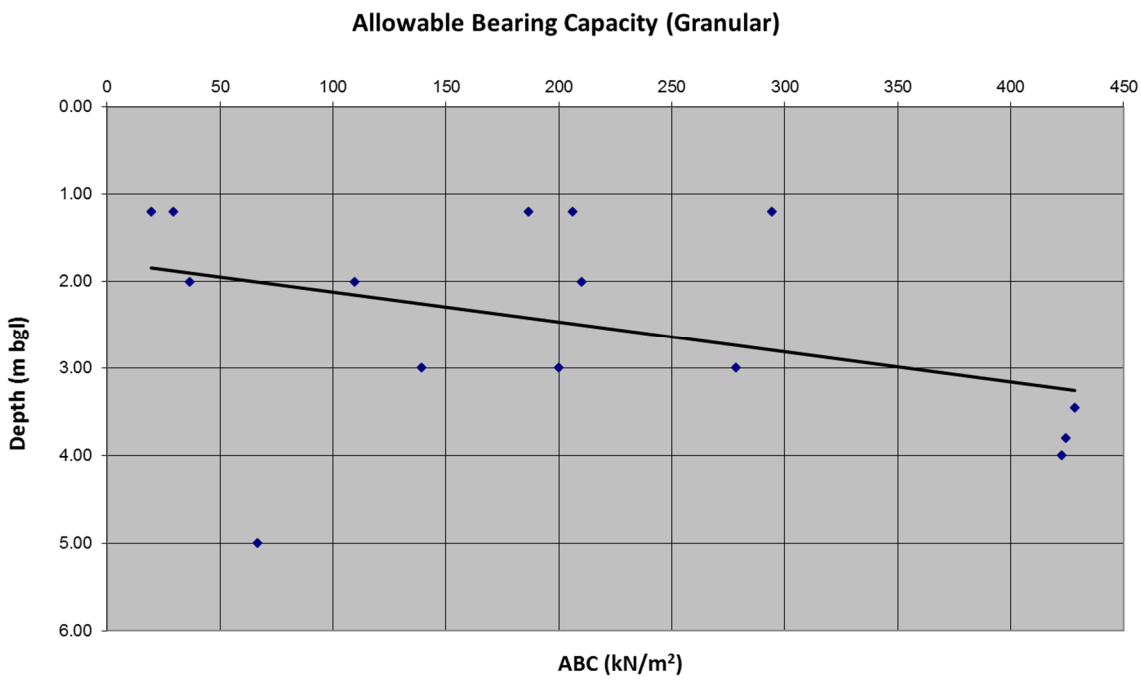
An assessment of the Allowable Bearing Capacity (ABC) for both granular and cohesive superficial deposits has been undertaken using data obtained from in-situ SPT tests.

Graph 7.1 ABC Cohesive



Graph 7.1 shows that the shallow clay deposits across the site are highly variable of a low to medium strength, with an ABC between 53kN/m^2 and 102kN/m^2. The natural glaciofluvial clay generally shows an increase in strength with depth.

Graph 7.2 ABC Granular



Graph 7.2 shows that the shallow granular deposits across the site are highly variable of a very loose to very dense density, with an ABC between 18kN/m^2 to 428kN/m^2. The natural glaciofluvial sand and

gravel does not display a distinct increase in strength with depth. Results of the SPTs taken deeper within Boreholes BH201 and BH202 have been omitted as these were taken in suspected sandstone bedrock

Apartment Block Foundation Options

Based on the ABC above, it is considered that the variable composition and calculated ABPs in the underlying superficial drift deposits are not suitable founding stratum for the proposed apartment block.

Although the proposed loadings are currently unknown the variable composition of the strata encountered means that we cannot be certain that softer lower strength deposits lie beneath the medium dense and dense gravels encountered on site. Furthermore, cohesive deposits have only demonstrated an ABC of a maximum of approximately 100kN/m^2, which is not considered sufficient for a five storey structure.

It is therefore recommended that piled foundations are used to support the structure. End bearing piles socketed into the underlying solid geology at depths of circa 15.0m bgl. This intimate contact would also partially address the Environment Agency concern with regards to the creation of preferential contaminant migration pathways. REC can produce a piled foundation risk assessment when required. Pile design should be undertaken by a specialist contractor to allow them to reduce the factor of safety based on their extensive pile testing data.

The site has previously been developed, any new foundations should be taken onto natural undisturbed ground of adequate bearing capacity below any previously existing structures such as foundations. Likewise, foundations should be taken below a line drawn up at 45º from the base of any existing or proposed services or similar.

7.5 Drainage

The presence of substantial depths of Made Ground and soft glaciofluvial clays and variable very loose to medium dense sand and gravels across 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. It is recommended that further assessment is undertaken to determine soil infiltration rates in accordance with CIRIA C515 (2000).

7.6 Concrete Durability

It is considered that concrete structures should be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE Special Digest 1 (2005).

7.7 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works. Due to the variability of the Made Ground and Glaciofluvial deposits it is considered that all excavations should be supported or battered back in accordance with guidance contained in CIRIA RR97.

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).

7.8 Coal Mining

The subject site is indicated by the Coal Authority as being located within a coal mining area, but is confirmed to not be affected by past mine workings and no evidence of coal mining workings has been observed during the site investigation. Therefore further coal related investigation and a Coal Mining Risk Assessment (CMRA) are not required.

8.0 CONCLUSIONS & RECOMMENDATIONS

Geotechnical Assessment

It is considered that the variable composition and calculated ABPs in the underlying Made Ground and superficial glaciofluvial deposits are not suitable founding stratum for the proposed apartment block. It is therefore recommended that piled foundations are used to support the structure, likely to be end bearing piles into the underlying Sandstone of the Chester Pebble Beds where an allowable bearing capacity of between 4.3MPa can be achieved at a depth of circa 15.0m bgl. Pile design should be undertaken by a specialist contractor to allow them to reduce the factor of safety based on their extensive pile testing data.

The presence of substantial depths of Made Ground and soft glaciofluvial sand, gravels and clays across 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.

Revised Conceptual Site Model

The Tier II Human Health Risk has identified elevated Lead, PAHs within the Made Ground. Chrysotile fibres were identified within a sample from the made ground, however further quantification showed the concentration to be on the limit of detection. It is considered that the site can be successfully remediated by breaking the exposure pathway from the elevated heavy metal and PAH's by capping the made ground with a clean inert soil layer of at least 600mm in thickness in all landscaping areas.

Controlled Waters

The risks to controlled waters from a number of Inorganic and Organic contaminants is not considered to be a significant risk for the following reasons:

- Groundwater was not encountered during the site investigation or the post monitoring period, there are no potable abstractions within 2km of the site;
- There are no surface water courses in close proximity to the site; the nearest is the River Medlock located 470m north of the site;
- With the absence of groundwater within the superficial deposits and a significant proportion of the site likely to be covered in buildings and of other hardstanding areas, it is not considered that mobilisation of the contaminants from the made ground would be significantly impeded.

It is therefore considered that the risk posed to controlled waters within influencing distance of the site is **negligible**.

Ground Gas

Completion of four monitoring visits over a period of two months indicates the site is Characteristic Situation 1/ Green NHBC Traffic Light Classification and therefore no gas precautions need to be adopted for the site

Recommendations

Based on the findings of this report, REC considers the site is suitable for the proposed development subject to the observations and findings of this report.

END OF REPORT

APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Ltd and the Client as indicated in Section 1.2.

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

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

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

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

6. In addition to the above REC Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.

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

8. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.

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

10. This report presents an interpretation of the geotechnical information established by excavation, observation and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently there may be conditions present not revealed by this investigation.

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

12. Rather, this investigation has been undertaken to provide a preliminary characterisation of the existing sub-surface geotechnical characteristics and make up and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

13. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II

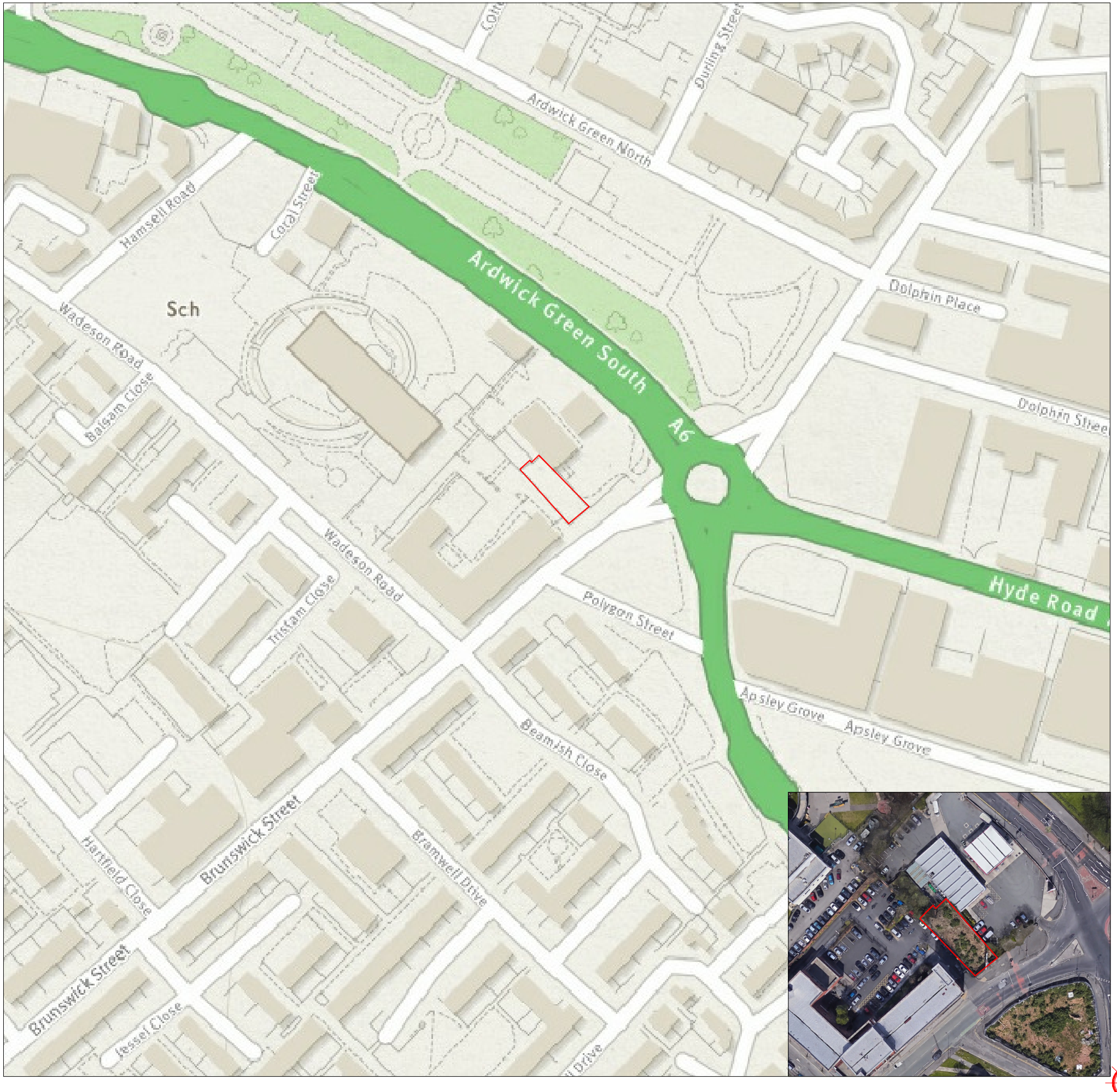
GLOSSARY

TERMS

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCs	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

APPENDIX III

DRAWINGS



Key:

Site Boundary

Notes:
© Copyright:
Google Earth 2017
Ordnance Survey 2017

P1	R0	03-07-2017	Revision	CD	CW
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Generation Ltd	Job No: 102867	Date: 03-07-2017
	Drawing No: 001	Scale: N.T.S
Job Title: Brunswick Street	Drawing Title: Site Location Plan	

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Key:

Site Boundary

WS101 Approximate Window Sample Probehole Location

WS101 Approximate Window Sample Probehole Location (with install)

Notes:
© Copyright:
Ordnance Survey 2017

Phase	Revision	Date	Revision Issue	Drawn	Authorised
P1	R0	03-07-2017		CD	CW

Client: Generation Ltd	Job No: 102867	Date: 03-07-2017
	Drawing No: 002	Scale: N.T.S
Job Title: Brunswick Street	Drawing Title: Exploratory Hole Location Plan	

REC

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Osprey House, Pacific Quay
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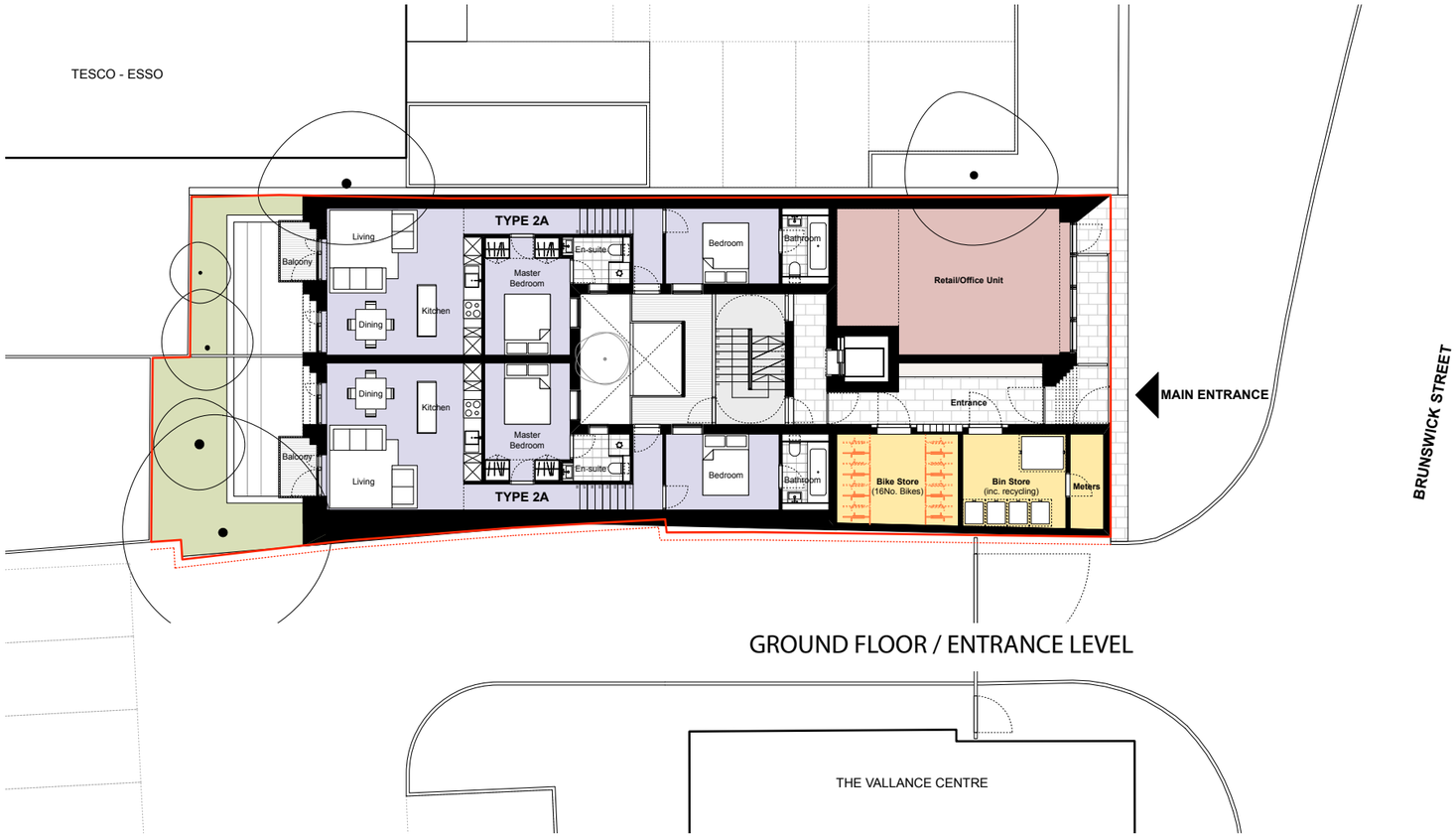
THE PROPOSALS

THE PROPOSALS

SITE PLANS

RESIDENTIAL DEVELOPMENT
BRUNSWICK STREET, ARDWICK

ACCOMODATION SCHEDULE		
	RESIDENTIAL	
	TYPE 1A 4No. 1 Bed apartment	409sqft ea. 38sqm ea.
	TYPE 2A 9No. 2 Bed apartment	646sqft ea. 60sqm ea.
	TYPE 2B 1No. 2 Bed apartment	689sqft ea. 64sqm ea.
	TYPE 2B 2No. 2 Bed duplex apartment	732sqft ea. 68sqm ea.
TOTAL	**16No. Residential Units**	**9602sqft** 892sqm
	ANCILLARY	
	Communal Bin/Bike Store (16no. bikes)	291sqft 27sqm
	Stair & Lobby	969sqft 90sqm
TOTAL		**1259sqft** 117sqm
	COMMERCIAL	
	Retail/Office Unit	377sqft 35sqm
TOTAL		**377sqft** 35sqm
	TOTAL (GIA)	**11238sqft** 1044sqm



GROUND FLOOR / ENTRANCE LEVEL

LOWER GROUND LEVEL

THE PROPOSALS

SITE PLANS

RESIDENTIAL DEVELOPMENT
BRUNSWICK STREET, ARDWICK

ACCOMODATION SCHEDULE		
	RESIDENTIAL	
	TYPE 1A 4No. 1 Bed apartment	409sqft ea. 38sqm ea.
	TYPE 2A 9No. 2 Bed apartment	646sqft ea. 60sqm ea.
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TOTAL	**16No. Residential Units**	**9602sqft** 892sqm
	ANCILLARY	
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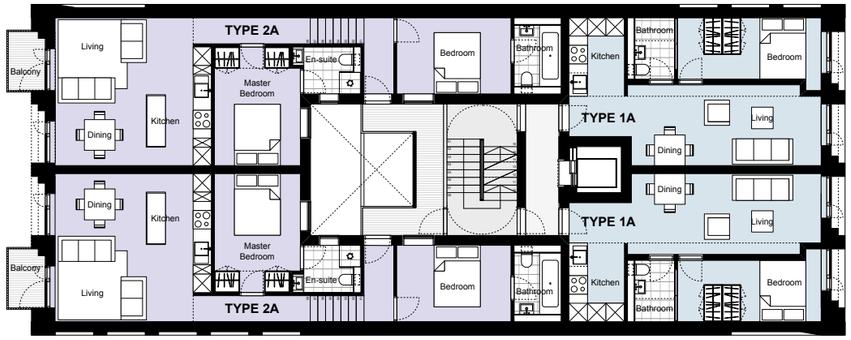
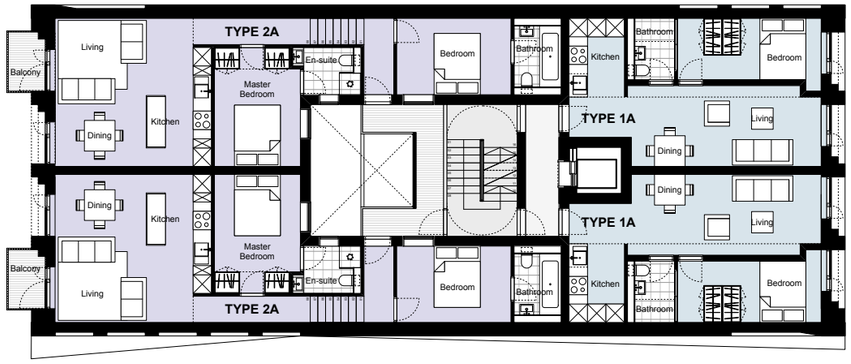
	Stair & Lobby	969sqft 90sqm
TOTAL		**1259sqft** 117sqm
	COMMERCIAL	
	Retail/Office Unit	377sqft 35sqm
TOTAL		**377sqft** 35sqm
	TOTAL (GIA)	**11238sqft** 1044sqm



SECOND FLOOR LEVEL



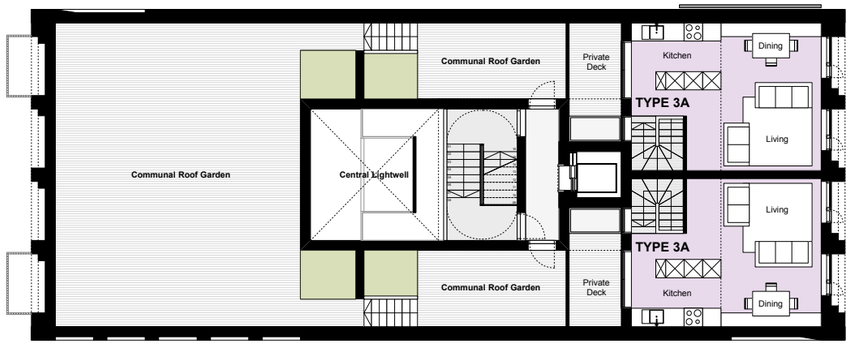
FIRST FLOOR LEVEL

THE PROPOSALS

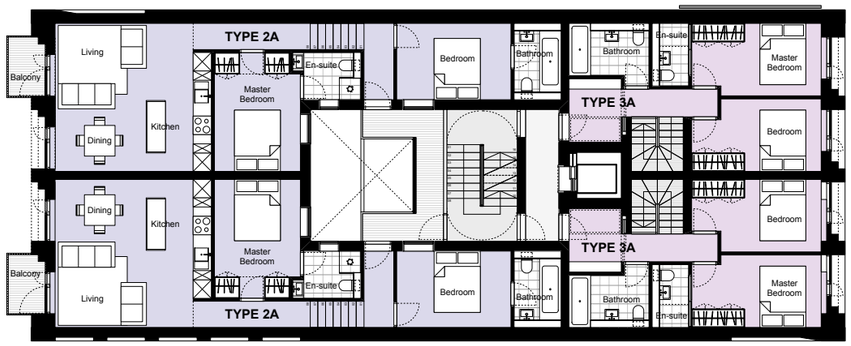
SITE PLANS

RESIDENTIAL DEVELOPMENT
BRUNSWICK STREET, ARDWICK

ACCOMODATION SCHEDULE		
	RESIDENTIAL	
	TYPE 1A 4No. 1 Bed apartment	409sqft ea. 38sqm ea.
	TYPE 2A 9No. 2 Bed apartment	646sqft ea. 60sqm ea.
	TYPE 2B 1No. 2 Bed apartment	689sqft ea. 64sqm ea.
	TYPE 2B 2No. 2 Bed duplex apartment	732sqft ea. 68sqm ea.
TOTAL	**16No. Residential Units**	**9602sqft** 892sqm
	ANCILLARY	
	Communal Bin/Bike Store (16no. bikes)	291sqft 27sqm
	Stair & Lobby	969sqft 90sqm
TOTAL		**1259sqft** 117sqm
	COMMERCIAL	
	Retail/Office Unit	377sqft 35sqm
TOTAL		**377sqft** 35sqm
	TOTAL (GIA)	**11238sqft** 1044sqm



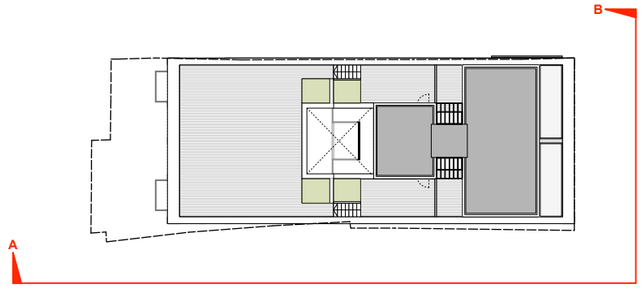
ROOF LEVEL

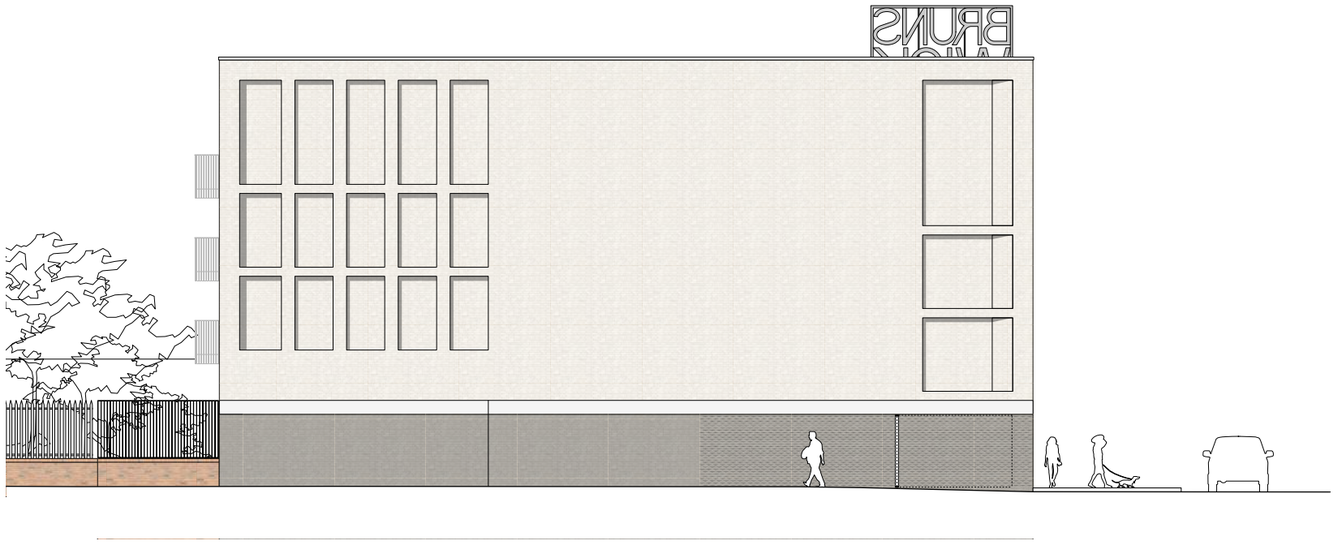


THIRD FLOOR LEVEL

THE PROPOSALS

SITE ELEVATIONS



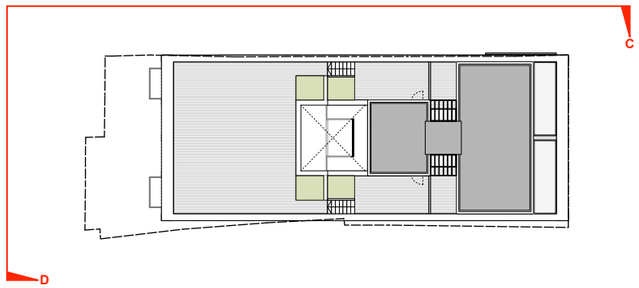


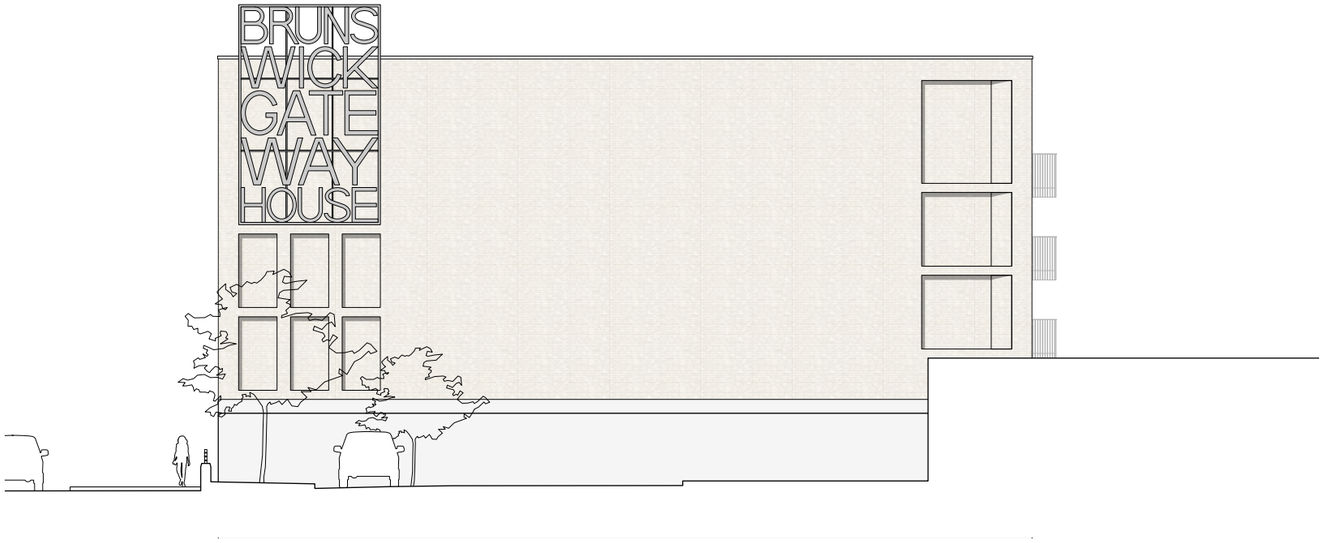
ELEVATION A / SIDE ELEVATION TO HEALTH CENTRE

ELEVATION B / FRONT ELEVATION ON BRUNSWICK STREET

THE PROPOSALS

SITE ELEVATIONS



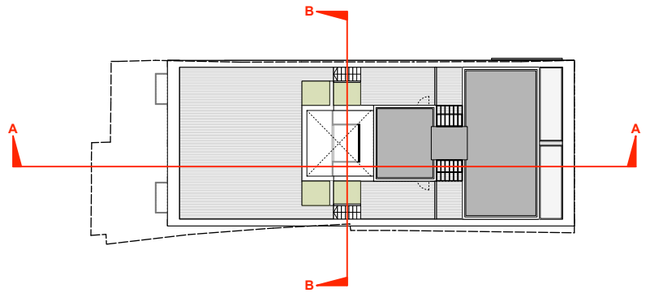


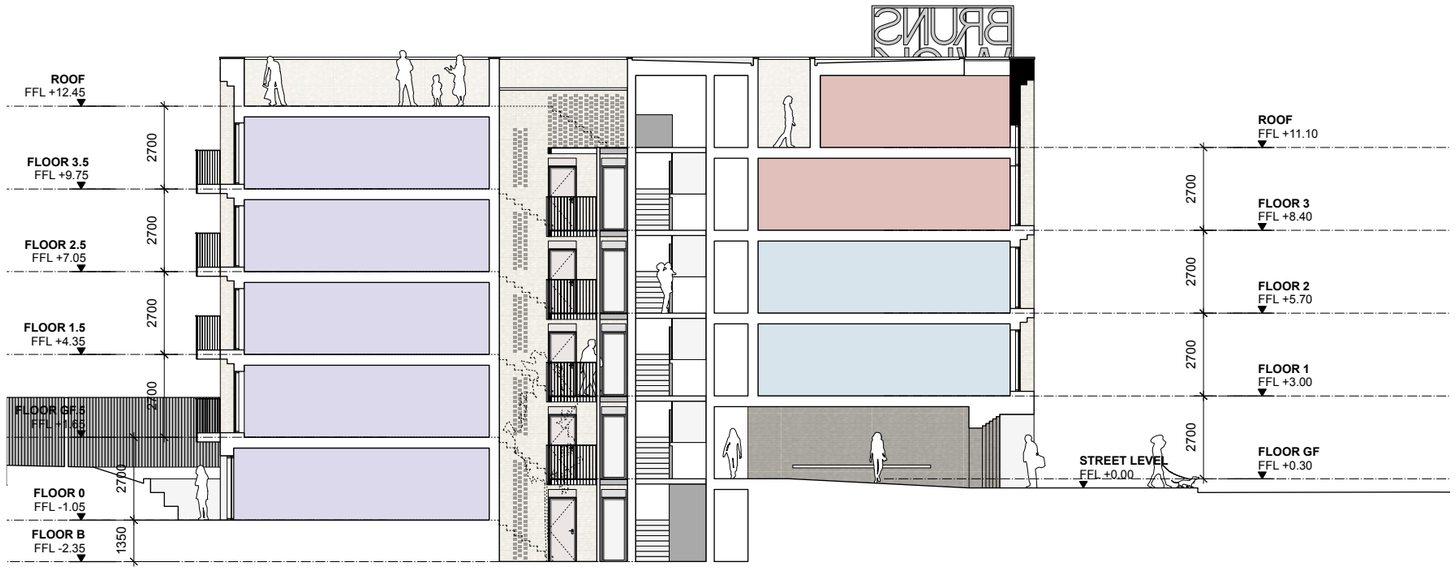
ELEVATION C / SIDE ELEVATION TO TESCO-ESSO

ELEVATION D / REAR ELEVATION AND PRIVATE GARDENS

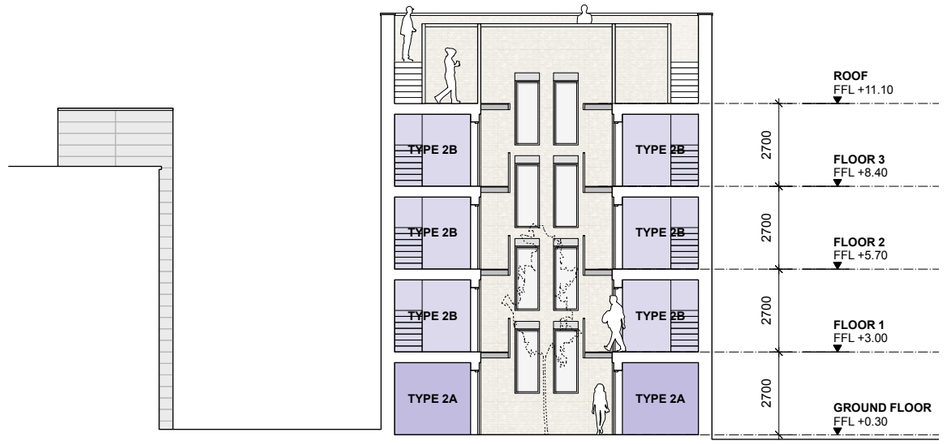
THE PROPOSALS

SITE SECTIONS





SECTION AA



SECTION BB

THE PROPOSALS

CONTEXT ELEVATIONS

THE PROPOSALS

CONTEXT ELEVATIONS

APPENDIX IV

EXPLORATORY LOGS

Borehole Log

Borehole No.
WS101
Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: Northing:	Hole Type WS
Location: Manchester	Plant: WS Rig	Level (m AOD): Final Depth (m): 4.19	Scale: 1:30
Client: Generation Ltd	Crew: Ian Taylor	Start Date: 30/06/2017 End Date: 30/06/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	ES					MADE GROUND: Medium dense light brown very gravelly fine to medium SAND with low cobble content. Gravel is fine to coarse angular to subangular of brick, concrete and limestone.
		0.70	D					
		1.20	SPT	N=19 (11,8/7,5,3,4)				*From 1.40m: Becomes slightly gravelly and clayey.*
					1.80			MADE GROUND: Very soft brown sandy gravelly CLAY. Gravel is fine to coarse angular to subangular of brick.
		2.00	SPT	N=11 (2,2/2,3,3,3)	2.10			Medium dense light brown very sandy fine to coarse subrounded to rounded GRAVEL of sandstone. [GLACIOFLUVIAL DEPOSITS]
		2.30	ES					
		3.00	SPT	N=16 (6,4/4,4,4,4)				
		3.10	D		3.20			Dense light orangey brown gravelly fine to medium SAND. Gravel is fine subrounded to rounded of sandstone. [GLACIOFLUVIAL DEPOSITS]
		3.50	ES					
		4.00	SPT	50 (25 for 125mm/50 for 60mm)				
					4.19			End of Borehole at 4.19m

1 2 3 4 5 6

Remarks:

Hand Dug Inspection Pit Completed to 1.20m bgl (below ground level).
Standard Penetration Tests (SPT) completed from 1.20m and every meter thereafter.
No groundwater encountered.
Refusal on SPT at 4.185m bgl on very dense sand.
Install: 1.00m Plain, 1.10m slotted.

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Borehole Log

Borehole No.
WS102
Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: Northing:	Hole Type WS
Location: Manchester	Plant: WS Rig	Level (m AOD): Final Depth (m): 4.12	Scale: 1:30
Client: Generation Ltd	Crew: Ian Taylor	Start Date: 30/06/2017 End Date: 30/06/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70	ES					MADE GROUND: Medium dense light brown very sandy fine to coarse angular to subangular GRAVEL of brick, concrete and limestone with a low cobble content. Cobbles are angular to subangular of brick and concrete.
		1.20	SPT	N=21 (2,3/3,5,6,7)				
					1.70			MADE GROUND: Very soft brown sandy gravelly CLAY. Gravel is fine to coarse angular to subangular of brick.
		2.00	SPT	N=2 (2,0/0,1,0,1)	2.00			No Recovery (Brick cobble encountered on end of sampler).
		3.00	SPT	N=32 (2,1/1,1,20,10)				
		3.80	SPT	50 (25 for 110mm/50 for 205mm)				
					4.12			End of Borehole at 4.12m

1 2 3 4 5 6

Remarks:

Hand Dug Inspection Pit Completed to 1.20m bgl (below ground level).
Standard Penetration Tests (SPT) completed from 1.20m and every meter thereafter.
No Recovery from 2.00m to 4.00m due to brick cobble encountered on sampler.
No groundwater encountered.
SPT Test carried out at 3.80m bgl to prove a refusal on sampler.
No Install.

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: Northing:	Hole Type WS
Location: Manchester	Plant: WS Rig	Level (m AOD): Final Depth (m): 3.66	Scale: 1:30
Client: Generation Ltd	Crew: Ian Taylor	Start Date: 30/06/2017 End Date: 30/06/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								MADE GROUND: Medium dense to dense grey very sandy fine to coarse angular to subangular GRAVEL of limestone, brick, concrete and glass with a low cobble content. Cobbles are angular to subangular of brick and concrete.
		0.50	ES					
		0.80	D					
		1.20	SPT	N=30 (2,3/6,7,9,8)				
		2.00	SPT	N=23 (1,5/16,4,2,1)				
		2.80	D					
		3.00	SPT	N=23 (2,1/2,3,3,15)				
		3.10	ES					
					3.20			Very soft brown gravelly very sandy CLAY. Gravel is fine to medium angualr to subrounded of sandstone. [GLACIOFLUVIAL DEPOSITS]
		3.45	SPT	50 (25 for 70mm/50 for 140mm)	3.40			Very dense reddish brown slightly gravelly fine to medium SAND. Gravel is fine to medium subangular to rounded of sandstone. [GLACIOFLUVIAL DEPOSITS]
					3.66			End of Borehole at 3.66m

Depth scale: 1, 2, 3, 4, 5, 6

Remarks:

Hand Dug Inspection Pit Completed to 1.20m bgl (below ground level).
Standard Penetration Tests (SPT) completed from 1.20m and every meter thereafter.
No groundwater encountered.
SPT Test carried out at 3.45m bgl to prove a refusal on sampler.
Install: 1.00m Plain, 2.20m slotted.

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: WS
Location: Manchester	Plant: WS Rig	Level (m AOD): / Final Depth (m): 5.00	Scale: 1:30
Client: Generation Ltd	Crew: Ian Taylor	Start Date: 30/06/2017 / End Date: 30/06/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.80	D					MADE GROUND: Very loose dark grey very sandy fine to coarse angular to subangular GRAVEL of limestone, brick, concrete with a low cobble content. Cobbles are angular to subangular of brick.	
		1.00	ES						1
		1.20	SPT	N=2 (1,1/0,1,0,1)					
		2.00	SPT	N=4 (2,16/0,1,1,2)	2.00				2
		2.30	D					MADE GROUND: Loose dark brown sandy clayey fine to coarse angular to subangular GRAVEL of brick, concrete, glass, plastic, slate and concrete with a moderate cobble content. Cobbles are angular to subangular of brick.	
					2.60			MADE GROUND: Soft brown to firm sandy gravelly CLAY. Gravel is fine to coarse angular to subangular of brick and concrete.	
		2.80	D						
		3.00	SPT	N=6 (3,2/2,1,1,2)					3
					3.20			Medium strength stiff light brown slightly sandy slightly gravelly CLAY. Gravel is fine subangular to rounded of sandstone. [GLACIOFLUVIAL DEPOSITS]	
		3.30	ES						
		3.50	D						
		4.00	SPT	N=11 (3,2/3,3,3,2)					4
		5.00	SPT	N=12 (2,3/3,3,3,3)	5.00			End of Borehole at 5.00m	5
									6

Remarks:

Hand Dug Inspection Pit Completed to 1.20m bgl (below ground level).
Standard Penetration Tests (SPT) completed from 1.20m and every meter thereafter.
No groundwater encountered.
Borhole completed at 5.00m bgl.
No Install.

CONCEPT LIFE SCIENCES

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: WS
Location: Manchester	Plant: WS Rig	Level (m AOD): / Final Depth (m): 5.00	Scale: 1:30
Client: Generation Ltd	Crew: Ian Taylor	Start Date: 30/06/2017 / End Date: 30/06/2017	REC Engineer: E.L

Sample and In Situ Testing			Depth (m)	Stratum Description
Depth (m)	Type	Results		
0.60	ES			MADE GROUND: Very loose light grey sandy fine to coarse angular to subangular GRAVEL of limestone, brick, concrete, metal, glass and plastic with a low cobble content. Cobbles are angular to subangular of brick.
1.00	D			
1.20	SPT	N=3 (1,0/0,1,1,1)	1.20	MADE GROUND: Medium dense red sandy fine to coarse angular to subangular GRAVEL of brick with a high cobble content. Cobbles are angular to subangular of brick.
2.00	SPT	N=12 (2,1/10,1,0,1)		
2.80	ES		2.70	Low strength firm brown sandy gravelly CLAY. Gravel is fine to medium angular to subrounded of sandstone. [GLACIOFLUVIAL DEPOSITS]
2.90	D			
3.00	SPT	N=7 (1,2/2,1,2,2)		
3.45 - 4.00	U			
4.00	SPT	N=8 (2,2/1,2,2,3)		
5.00	SPT	N=8 (2,2/2,2,2,2)	4.90	Red slightly gravelly fine to medium SAND. Gravel is fine to medium angular to subrounded of sandstone. [GLACIOFLUVIAL DEPOSITS]
			5.00	End of Borehole at 5.00m

Remarks:

Hand Dug Inspection Pit Completed to 1.20m bgl (below ground level).
Standard Penetration Tests (SPT) completed from 1.20m and every meter thereafter.
No groundwater encountered.
Borhole completed at 5.00m bgl.
Install: 2.70m plain, 2.3m slotted.

CONCEPT LIFE SCIENCES

Rotary Core Log

Borehole No. **BH201**

Sheet 1 of 2

Project Name: Brunswick Street	Project No. 102867	Co-ords:	Hole Type RC
Location: Manchester		Level:	Scale 1:50
Client: Generation Ltd		Dates: 10/08/2017	Logged By E.L

Well	Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										1. Bricks and Concrete [MADE GROUND]
							4.50			1. Very dense brown sands and gravel [GLACIOFLUVIAL DEPOSITS]
							6.50			NO RECOVERY: Suspected very dense light brown gravelly SAND [GLACIOFLUVIAL DEPOSITS]
		6.50 - 7.50		0	0	0				
		7.50 - 8.50		0	0	0				
		8.50 - 9.80		0	0	0				

Continued on Next Sheet

Remarks:

Rotary open hole with Rotary coring follow-on.
No groundwater encountered.
1. Drillers Remarks

Rotary Core Log

Borehole No. **BH201**

Sheet 2 of 2

Project Name: Brunswick Street	Project No. 102867	Co-ords:	Hole Type RC
Location: Manchester		Level:	Scale 1:50
Client: Generation Ltd		Dates: 10/08/2017	Logged By E.L

Well	Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description	
		9.80 - 12.00		0	0	0					11
		12.00 - 15.00	NR	33	7	0					12, 13
			NI				14.00			Highly weathered reddish brown medium grained SANDSTONE [CHESTER PEBBLE BEDS FORMATION] *Between 14.00m and 15.00m: Closely spaced horizontal occasionally sub-horizontal (3 degrees), smooth and rough clean planar. Discontinuities.*	14
			18				15.00				15
		15.00 - 18.00	NR	43	25	7				NO RECOVERY: Suspected extremely weathered reddish brown medium grained SANDSTONE [CHESTER PEBBLE BEDS FORMATION]	16
			NI				16.70			Highly weathered reddish brown medium grained SANDSTONE [CHESTER PEBBLE BEDS FORMATION] *Between 16.70m and 18.00m: Closely spaced horizontal occasionally sub-horizontal (3 degrees), smooth and rough clean planar. Discontinuities.*	17
			12				18.00			End of Borehole at 18.00m	18
											19, 20

Remarks:

Rotary open hole with Rotary coring follow-on.
No groundwater encountered.
1. Drillers Remarks

Rotary Core Log

Borehole No. **BH202** Sheet 1 of 2			
Project Name: Brunswick Street	Project No. 102867	Co-ords:	Hole Type RC
Location: Manchester		Level:	Scale 1:50
Client: Generation Ltd		Dates: 11/08/2017	Logged By E.L

Well	Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										1. Bricks and Concrete [MADE GROUND]
							3.60			1. Very dense brown sands and gravel [GLACIOFLUVIAL DEPOSITS]
							9.00			NO RECOVERY: Suspected very dense light brown gravelly SAND [GLACIOFLUVIAL DEPOSITS]

Continued on Next Sheet

Remarks:

Rotary open hole with Rotary coring follow-on.
No groundwater encountered.
1. Drillers Remarks

Rotary Core Log

Borehole No. **BH202** Sheet 2 of 2			
Project Name: Brunswick Street	Project No. 102867	Co-ords:	Hole Type RC
Location: Manchester		Level:	Scale 1:50
Client: Generation Ltd		Dates: 11/08/2017	Logged By E.L

Well	Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description	
		9.00 - 12.00	NR NI 10	28	16	11	11.15			Highly weathered reddish brown medium grained SANDSTONE [CHESTER PEBBLE BEDS FORMATION] *Between 11.15m and 12.00m: Closely spaced horizontal occasionally sub-horizontal (3 degrees), smooth and rough clean planar. Discontinuities.*	11
		12.00 - 15.00	NR 10	85	43	25	12.00 12.45			NO RECOVERY: Suspected extremely weathered reddish brown medium grained SANDSTONE [CHESTER PEBBLE BEDS FORMATION] Highly weathered reddish brown medium grained SANDSTONE [CHESTER PEBBLE BEDS FORMATION] *Between 12.45m and 15.00m: Closely spaced horizontal occasionally sub-horizontal (3 degrees), smooth and rough clean planar. Discontinuities.*	12 13 14
							15.00			End of Borehole at 15.00m	15 16 17 18 19 20

Remarks:

Rotary open hole with Rotary coring follow-on.
No groundwater encountered.
1. Drillers Remarks

Trial Pit Log

Borehole No. **TP201**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: TP
Location: Manchester	Plant: JCB 3CX	Level (m AOD): / Final Depth (m): 3.00	Scale: 1:20
Client: Generation Ltd	Crew: Clive Hurt Plant	Start Date: 09/08/2017 / End Date: 09/08/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.40	WAC					MADE GROUND: Light brown very sandy fine to coarse angular to subangular GRAVEL of limestone, brick and concrete with a high cobble content and a low boulder content. Cobbles and boulders are angular to subangular of brick and concrete.
					0.70			MADE GROUND: Red angular to subangular COBBLES of brick. *From 0.70m: Brick wall on east side of pit, running in a north-south direction.*
					3.00			End of Borehole at 3.00m

1
2
3
4

Remarks:

Trial pit terminated at 3.00m bgl due to collapsing in.
Unstable from 0.50m bgl.
Brick wall identified from 0.70m to 3.00m bgl along east side of pit running in a north-south direction.

Stability: Unstable

Pit Dimensions (m)

Length:	2.50
Width:	1.50
Depth:	3.00

Trial Pit Log

Borehole No. **TP202**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: TP
Location: Manchester	Plant: JCB 3CX	Level (m AOD): / Final Depth (m): 3.00	Scale: 1:20
Client: Generation Ltd	Crew: Clive Hurt Plant	Start Date: 09/08/2017 / End Date: 09/08/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	WAC					MADE GROUND: Light brown very sandy fine to coarse angular to subangular GRAVEL of limestone, brick and concrete with a medium cobble content and a low boulder content. Cobbles and boulders are angular to subangular of brick and concrete.
					0.80			MADE GROUND: Red angular to subangular COBBLES of brick with a low boulder content. Boulders are angular to subangular of concrete. *From 1.00m: Brick walls along east and south sides of pit, running in a north-south and east-west direction respectively.*
					3.00			End of Borehole at 3.00m

1 2 3 4

Remarks:

Trial pit terminated at 3.00m bgl due to collapsing in.
Unstable from 1.20m bgl.
Brick wall identified from 1.00m to 3.00m bgl along east side of pit runnning in a north-south direction.
Additional brick wall from 1.00m to 3.00m bgl identified along south side of pit running in a east-west direction

Stability: Unstable

Pit Dimensions (m)	
Length:	2.50
Width:	1.50
Depth:	3.00

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Trial Pit Log

Borehole No. **TP203**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: TP
Location: Manchester	Plant: JCB 3CX	Level (m AOD): / Final Depth (m): 2.80	Scale: 1:20
Client: Generation Ltd	Crew: Clive Hurt Plant	Start Date: 09/08/2017 / End Date: 09/08/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.80	ES					MADE GROUND: Light brown very sandy fine to coarse angular to subangular GRAVEL of limestone, brick, concrete, plastic, slate, timber and glass with a high cobble content. Cobbles are angular to subangular of brick, concrete, slate and timber. *From 0.70m: Brick wall on west side of pit, running in a east-west direction.*
					1.50			MADE GROUND: Red angular to subangular COBBLES of brick with a low boulder content. Boulders are angular to subangular of concrete. High amount of miscellaneous anthropogenic material such as tyres and metal fencing.
					3.00			End of Borehole at 2.80m

Remarks:

Trial pit terminated at 2.80m bgl due to collapsing in.
Unstable from 0.50m bgl.
Brick wall identified from 1.00m to 3.00m bgl along west side of pit runnning in a east-west direction.

Stability: Unstable

Pit Dimensions (m)	
Length:	2.50
Width:	1.50
Depth:	2.80

Trial Pit Log

Borehole No. **TP204**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: TP
Location: Manchester	Plant: JCB 3CX	Level (m AOD): / Final Depth (m): 1.90	Scale: 1:20
Client: Generation Ltd	Crew: Clive Hurt Plant	Start Date: 09/08/2017 / End Date: 09/08/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.50	ES					MADE GROUND: Dark brown very sandy fine to coarse angular to subangular GRAVEL of brick, concrete, limestone and timber with a low cobble content. Cobbles are angular to subangular of brick.	
								Between 0.65m and 0.90m: Concrete footing of eastern perimeter brick wall.	
		1.00	WAC						1
					1.90			End of Borehole at 1.90m	2
									3
									4

Remarks:

Trial pit completed at 1.90m having established the depth of the concrete footing for the eastern perimeter brick wall.
Concrete footing identified at 0.65m bgl; 0.25m in thickness.

Stability: Stable

Pit Dimensions (m)	
Length:	2.00
Width:	1.00
Depth:	1.90

Trial Pit Log

Borehole No.
TP205
Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: Northing:	Hole Type TP
Location: Manchester	Plant: JCB 3CX	Level (m AOD): Final Depth (m): 0.90	Scale: 1:20
Client: Generation Ltd	Crew: Clive Hurt Plant	Start Date: 09/08/2017 End Date: 09/08/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES					MADE GROUND: Dark brown very sandy fine to coarse angular to subangular GRAVEL of brick, concrete, limestone and timber with a low cobble content. Cobbles are angular to subangular of brick.
		0.50	WAC					*Between 0.45m and 0.73m: Concrete footing of eastern perimeter brick wall.*
					0.90			End of Borehole at 0.90m

1
2
3
4

Remarks:
Trial pit completed at 0.90m having established the depth of the concrete footing for the eastern perimeter brick wall.
Concrete footing identified at 0.45m bgl; 0.28m in thickness.
Stability: Stable

Pit Dimensions (m)
Length: 2.00
Width: 1.00
Depth: 0.90

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Trial Pit Log

Borehole No. **TP206**

Sheet 1 of 1

Project Name: Brunswick Street	Proj. ID: 102867	Easting: / Northing:	Hole Type: TP
Location: Manchester	Plant: JCB 3CX	Level (m AOD): / Final Depth (m): 1.90	Scale: 1:20
Client: Generation Ltd	Crew: Clive Hurt Plant	Start Date: 09/08/2017 / End Date: 09/08/2017	REC Engineer: E.L

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		1.00	ES					MADE GROUND: Dark brown very sandy fine to coarse angular to subangular GRAVEL of brick, concrete, limestone and timber with a high cobble content. Cobbles are angular to subangular of brick.	1
								Between 1.60m and 1.80m: Concrete footing of western perimeter brick wall.	
					1.90			End of Borehole at 1.90m	2
									3
									4

Remarks:

Trial pit completed at 1.90m having established the depth of the concrete footing for the western perimeter brick wall.
Concrete footing identified at 1.60m bgl; 0.20m in thickness.

Stability: Stable

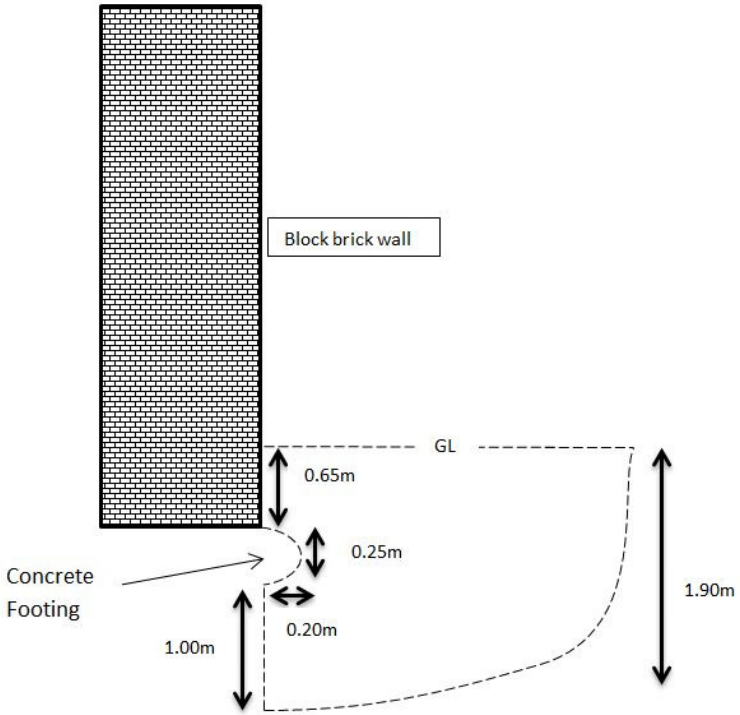
Pit Dimensions (m)	
Length:	1.20
Width:	2.50
Depth:	1.90

CONCEPT LIFE SCIENCES

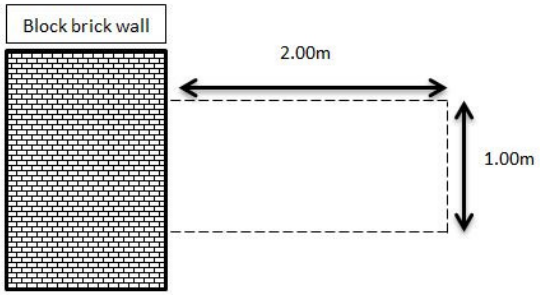
KEY: N

TP104

CROSS SECTION



BIRDS EYE VIEW



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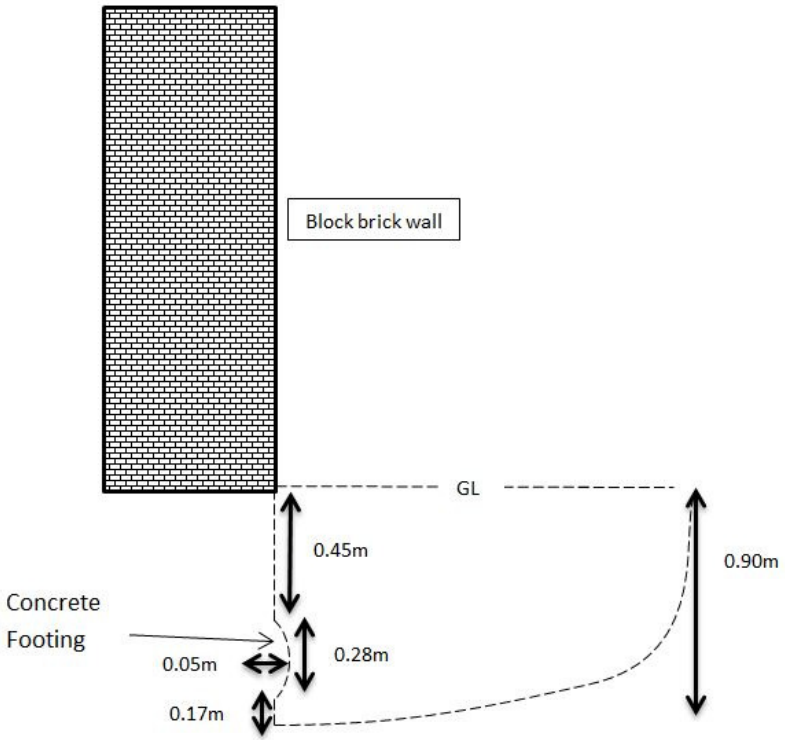
Job Title:	Client:	Job No: 102867	Notes:	Drawing Title:
Brunswick Street	Brunswick Living Ltd	Drawn By: CA	N.T.S	TP104
		Approved by: CW		

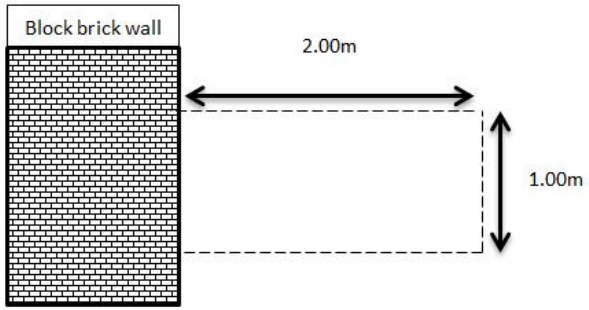
KEY:

TP105

CROSS SECTION



BIRDS EYE VIEW



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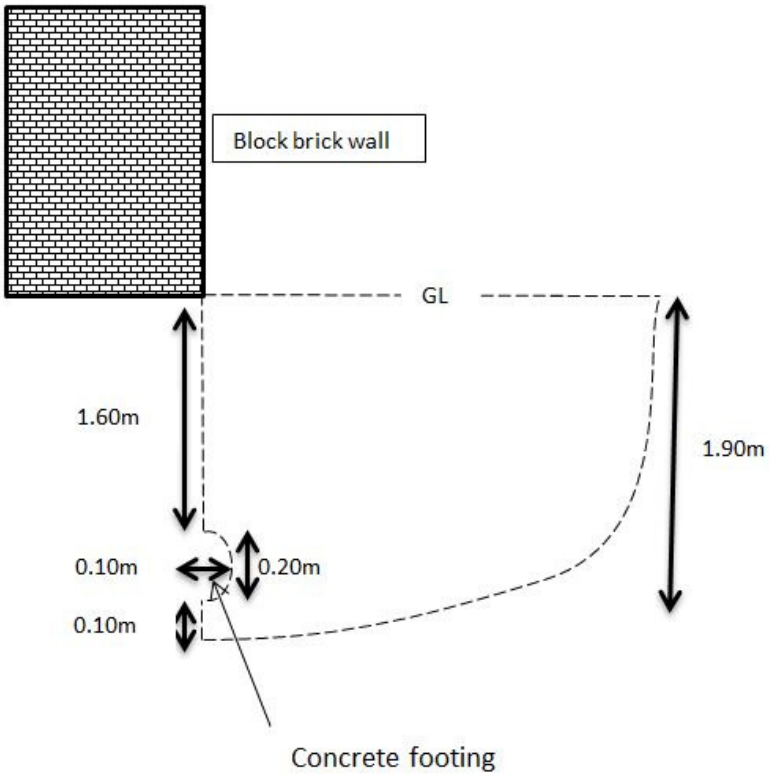
Brunswick Street	Brunswick Living Ltd	Drawn By: CA Approved by: CW	N.T.S	TP105

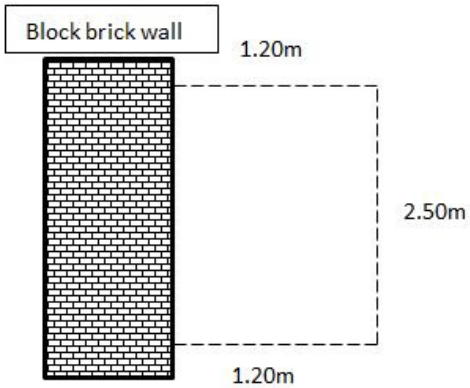
KEY: N

TP106

CRROSS SECTION



BIRDS EYE VIEW



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Brunswick Street	Brunswick Living Ltd	Drawn By: CA Approved by: CW	N.T.S	TP106

APPENDIX V

CHEMICAL TESTING RESULTS

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Scientific Analysis Laboratories registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
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Tel : 0161 874 2400
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Report Number: 665102-1

Date of Report: 21-Jul-2017

Customer: Resource Environmental Consultants Ltd
Osprey House
Pacific Quay
Broadway
Salford
M50 2UE

Customer Contact: Miss Louise Stock

Customer Job Reference: 102867
Customer Purchase Order: 003098
Customer Site Reference: Brunswick St
Date Job Received at Concept: 30-Jun-2017
Date Analysis Started: 03-Jul-2017
Date Analysis Completed: 21-Jul-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

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

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept SOPs

All results have been reviewed in accordance with Section 25 of the Concept, Analytical Quality Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**665102 001**	**665102 003**	**665102 004**	**665102 005**	**665102 007**
				Customer Sample Reference	**WS101**	**WS101**	**WS102**	**WS103**	**WS104**
				Bottom Depth	**0.50**	**3.50**	**0.70**	**0.50**	**1.00**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Moisture @105C	T162	AR	0.1	%	**8.5**	**7.3**	**5.0**	**11**	**17**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**665102 008**
				Customer Sample Reference	**WS105**
				Bottom Depth	**0.60**
				Date Sampled	**29-JUN-2017**
				Matrix Class	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Moisture @105C	T162	AR	0.1	%	**10**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
REC Ltd 002S

				Concept Reference	**665102 001**	**665102 004**	**665102 005**	**665102 007**	**665102 008**
				Customer Sample Reference	**WS101**	**WS102**	**WS103**	**WS104**	**WS105**
				Bottom Depth	**0.50**	**0.70**	**0.50**	**1.00**	**0.60**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**11**	**5**	**11**	**16**	**3**
Cadmium	T6	M40	1	mg/kg	**1**	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**17**	**22**	**24**	**23**	**20**
Lead	T6	M40	1	mg/kg	**420**	**41**	**180**	**200**	**48**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Copper	T6	M40	1	mg/kg	**91**	**14**	**51**	**56**	**16**
Nickel	T6	M40	1	mg/kg	**23**	**20**	**22**	**20**	**15**
Zinc	T6	M40	1	mg/kg	**230**	**140**	**180**	**140**	**67**
pH	T7	AR			**7.7**	**7.6**	**7.6**	**7.5**	**7.4**
SO4(Total)	T6	A40	0.01	%	**0.13**	**0.05**	**0.06**	**0.09**	**0.05**
SO4(2:1)	T6	AR	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Barium	T6	A40	1	mg/kg	**320**	**65**	**130**	**140**	**71**
Beryllium	T6	A40	2	mg/kg	<2	<2	<2	<2	<2
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Cyanide(Total)	T921	AR	1	mg/kg	<1	<1	<1	<1	<1
Phenols(Mono)	T921	AR	1	mg/kg	<1	<1	<1	<1	<1
Vanadium	T6	M40	1	mg/kg	**23**	**22**	**26**	**26**	**19**

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
PAH US EPA 16 (B and K split) and Phenol

				Concept Reference	**665102 001**	**665102 003**	**665102 004**	**665102 005**	**665102 007**
				Customer Sample Reference	**WS101**	**WS101**	**WS102**	**WS103**	**WS104**
				Bottom Depth	**0.50**	**3.50**	**0.70**	**0.50**	**1.00**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Naphthalene	T207	M105	0.1	mg/kg	**0.4**	<0.1	<0.1	**1.2**	**0.2**
Acenaphthylene	T207	M105	0.1	mg/kg	**0.1**	<0.1	<0.1	(9) <1.0	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	**0.3**	<0.1	<0.1	**3.5**	**0.3**
Fluorene	T207	M105	0.1	mg/kg	**0.3**	<0.1	<0.1	**2.4**	**0.2**
Phenanthrene	T207	M105	0.1	mg/kg	**2.1**	<0.1	**0.1**	**19**	**1.7**
Anthracene	T207	M105	0.1	mg/kg	**0.5**	<0.1	<0.1	**4.0**	**0.4**
Fluoranthene	T207	M105	0.1	mg/kg	**2.8**	<0.1	**0.2**	**24**	**2.7**
Pyrene	T207	M105	0.1	mg/kg	**2.7**	<0.1	**0.2**	**22**	**2.5**
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	**1.6**	<0.1	**0.1**	**9.2**	**1.3**
Chrysene	T207	M105	0.1	mg/kg	**1.7**	<0.1	**0.1**	**9.7**	**1.4**
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	**1.7**	<0.1	**0.1**	**9.4**	**1.1**
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	**1.5**	<0.1	**0.1**	**7.8**	**1.3**
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	**1.7**	<0.1	<0.1	**8.6**	**1.3**
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	**0.9**	<0.1	<0.1	**4.4**	**0.7**
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	**0.4**	<0.1	<0.1	**2.2**	**0.4**
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	**1.2**	<0.1	<0.1	**4.7**	**0.8**
PAH(total)	T207	M105	0.1	mg/kg	**20**	<0.1	**1.0**	**130**	**16**
Phenol	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	(9) <1.0	<0.1

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
PAH US EPA 16 (B and K split) and Phenol

				Concept Reference	**665102 008**
				Customer Sample Reference	**WS105**
				Bottom Depth	**0.60**
				Date Sampled	**29-JUN-2017**
				Matrix Class	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Naphthalene	T207	M105	0.1	mg/kg	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	<0.1
Pyrene	T207	M105	0.1	mg/kg	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1
Chrysene	T207	M105	0.1	mg/kg	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1
PAH(total)	T207	M105	0.1	mg/kg	<0.1
Phenol	T207	M105	0.1	mg/kg	<0.1

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
REC Banded TPH

				Concept Reference	**665102 001**	**665102 004**	**665102 005**	**665102 007**	**665102 008**
				Customer Sample Reference	**WS101**	**WS102**	**WS103**	**WS104**	**WS105**
				Bottom Depth	**0.50**	**0.70**	**0.50**	**1.00**	**0.60**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
TPH (C5-C6)	T54	AR	0.10	mg/kg	(110) <0.20	<0.10	<0.10	(110) <0.20	<0.10
TPH (C6-C8)	T54	AR	0.10	mg/kg	(110) <0.20	<0.10	<0.10	(110) <0.20	<0.10
TPH (C8-C10)	T54	AR	0.10	mg/kg	(110) <0.20	<0.10	<0.10	(110) <0.20	<0.10
TPH (C35-C44)	T8	M105	1	mg/kg	**(13) 100**	(13) <1	**(13) 33**	**(13) 96**	(13) <1
TPH (C10-C12)	T206	M105	1	mg/kg	(13) <1	(13) <1	**(13) 2**	(13) <1	(13) <1
TPH (C12-C16)	T206	M105	1	mg/kg	**(13) 5**	(13) <1	**(13) 22**	**(13) 12**	(13) <1
TPH (C16-C21)	T206	M105	1	mg/kg	**(13) 53**	(13) <1	**(13) 110**	**(13) 68**	(13) <1
TPH (C21-C35)	T206	M105	1	mg/kg	**(13) 400**	(13) <1	**(13) 200**	**(13) 260**	(13) <1

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
pH and Sulphate

				Concept Reference	**665102 003**	**665102 007**
				Customer Sample Reference	**WS101**	**WS104**
				Bottom Depth	**3.50**	**1.00**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
pH	T7	A40			**7.8**	**7.5**
SO4(2:1)	T6	AR	0.1	g/l	<0.1	<0.1

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
REC TOC and SOM

				Concept Reference	**665102 001**	**665102 003**	**665102 004**	**665102 005**	**665102 008**
				Customer Sample Reference	**WS101**	**WS101**	**WS102**	**WS103**	**WS105**
				Bottom Depth	**0.50**	**3.50**	**0.70**	**0.50**	**0.60**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Soil Organic Matter	T287	A40	0.1	%	**8.9**	<0.1	**2.8**	**5.5**	**5.2**
Total Organic Carbon	T21	A40	0.1	%	**5.2**	<0.1	**1.6**	**3.2**	**3.0**

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
Misc

				Concept Reference	**665102 001**	**665102 004**	**665102 005**	**665102 007**	**665102 008**
				Customer Sample Reference	**WS101**	**WS102**	**WS103**	**WS104**	**WS105**
				Bottom Depth	**0.50**	**0.70**	**0.50**	**1.00**	**0.60**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Asbestos ID	T27	AR			N.D.	N.D.	Chrysotile Fibres Detected	N.D.	N.D.

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Leachate Analysed as Water
REC 002W

				Concept Reference	**665102 002**	**665102 006**	**665102 009**
				Customer Sample Reference	**WS101**	**WS103**	**WS105**
				Bottom Depth	**0.70**	**3.10**	**1.00**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
As (Dissolved)	T281	10:1	0.2	µg/l	**3.7**	**3.0**	**3.0**
Cd (Dissolved)	T281	10:1	0.02	µg/l	**0.21**	**0.05**	**0.10**
Cr (Dissolved)	T281	10:1	1	µg/l	**4**	**3**	**3**
Pb (Dissolved)	T281	10:1	0.3	µg/l	**68**	**11**	**14**
Hg (Dissolved)	T281	10:1	0.05	µg/l	<0.05	<0.05	**0.07**
Se (Dissolved)	T281	10:1	0.5	µg/l	<0.5	**0.6**	<0.5
Cu (Dissolved)	T281	10:1	0.5	µg/l	**15**	**7.5**	**5.3**
Ni (Dissolved)	T281	10:1	1	µg/l	**4**	**2**	**2**
Zn (Dissolved)	T281	10:1	2	µg/l	**120**	**9**	**18**
pH	T7	10:1			**7.7**	**7.8**	**7.8**
Cyanide(Total)	T4	10:1	0.05	mg/l	<0.05	<0.05	<0.05
Ba (Dissolved)	T281	10:1	1	µg/l	**54**	**26**	**14**
Be (Dissolved)	T281	10:1	0.05	µg/l	**0.17**	**0.08**	**0.08**
Boron	T6	10:1	0.01	mg/l	**0.02**	**0.06**	**0.01**
Sulphate	T686	10:1	0.5	mg/l	**6.0**	**32**	**3.2**
Chromium VI	T686	10:1	0.003	mg/l	<0.003	<0.003	<0.003
V (Dissolved)	T281	10:1	2	µg/l	**5**	**6**	**3**

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Leachate Analysed as Water
PAH US EPA 16 (B and K split) and Phenol

				Concept Reference	**665102 002**	**665102 006**	**665102 009**
				Customer Sample Reference	**WS101**	**WS103**	**WS105**
				Bottom Depth	**0.70**	**3.10**	**1.00**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Naphthalene	T149	10:1	0.01	µg/l	(13) **0.28**	(100,13) <0.10	(100,13) <0.20
Acenaphthylene	T149	10:1	0.01	µg/l	(13) **1.7**	(13) **3.3**	(13) **3.0**
Acenaphthene	T149	10:1	0.01	µg/l	(13) **11**	(13) **18**	(13) **16**
Fluorene	T149	10:1	0.01	µg/l	(13) **5.4**	(13) **9.6**	(13) **8.0**
Phenanthrene	T149	10:1	0.01	µg/l	(13) **2.5**	(13) **4.5**	(13) **3.1**
Anthracene	T149	10:1	0.01	µg/l	(13) **0.61**	(13) **0.81**	(13) **0.78**
Fluoranthene	T149	10:1	0.01	µg/l	(13) **0.42**	(13) **0.14**	(13) **0.29**
Pyrene	T149	10:1	0.01	µg/l	(13) **0.39**	(13) **0.07**	(13) **0.22**
Benzo(a)Anthracene	T149	10:1	0.01	µg/l	(13) **0.16**	(13) **0.01**	(13) **0.07**
Chrysene	T149	10:1	0.01	µg/l	(13) **0.18**	(13) <0.01	(13) **0.09**
Benzo(b)fluoranthene	T149	10:1	0.01	µg/l	(13) **0.17**	(13) <0.01	(13) **0.08**
Benzo(k)fluoranthene	T149	10:1	0.01	µg/l	(13) **0.18**	(13) <0.01	(13) **0.07**
Benzo(a)Pyrene	T149	10:1	0.01	µg/l	(13) **0.21**	(13) <0.01	(13) **0.08**
Indeno(123-cd)Pyrene	T149	10:1	0.01	µg/l	(13) **0.16**	(13) <0.01	(13) **0.06**
Dibenzo(ah)Anthracene	T149	10:1	0.01	µg/l	(13) **0.04**	(13) <0.01	(13) **0.01**
Benzo(ghi)Perylene	T149	10:1	0.01	µg/l	(13) **0.29**	(13) <0.01	(13) **0.08**
PAH(total)	T149	10:1	0.01	µg/l	**24**	**36**	**32**
Phenol	T149	10:1	0.5	µg/l	(13) <0.5	(13) <0.5	(13) <0.5

Concept Reference: 665102
Project Site: Brunswick St
Customer Reference: 102867

Leachate Analysed as Water
Miscellaneous

				Concept Reference	**665102 002**	**665102 006**	**665102 009**
				Customer Sample Reference	**WS101**	**WS103**	**WS105**
				Bottom Depth	**0.70**	**3.10**	**1.00**
				Date Sampled	**29-JUN-2017**	**29-JUN-2017**	**29-JUN-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Ammoniacal nitrogen	T686	10:1	0.05	mg/l	**0.38**	**0.16**	**0.21**

Index to symbols used in 665102-1

Value	Description
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
10:1	Leachate
AR	As Received
A40	Assisted dried < 40C
N.D.	Not Detected
110	LOD raised due to low internal standard recovery.
100	LOD determined by sample aliquot used for analysis
9	LOD raised due to dilution of sample
13	Results have been blank corrected.
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Water samples have been analysed exceeding recommended holding times for Naphthalene. It is possible therefore that the results provided may be compromised.
Asbestos was subcontracted.

Method Index

Value	Description
T4	Colorimetry
T6	ICP/OES
T8	GC/FID
T162	Grav (1 Dec) (105 C)
T921	Colorimetry (CF) (MCERT)
T281	ICP/MS (Filtered)
T7	Probe
T27	PLM
T206	GC/FID (MCERTS)
T207	GC/MS (MCERTS)
T287	Calc TOC/0.58
T686	Discrete Analyser
T2	Grav
T21	OX/IR
T54	GC/MS (Headspace)
T149	GC/MS (SIR)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Naphthalene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Acenaphthylene	T207	M105	0.1	mg/kg	U	001,003-005,007-008
Acenaphthene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Fluorene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Phenanthrene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Anthracene	T207	M105	0.1	mg/kg	U	001,003-005,007-008
Fluoranthene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Pyrene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Chrysene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001,003-005,007-008
PAH(total)	T207	M105	0.1	mg/kg	U	001,003-005,007-008
Phenol	T207	M105	0.1	mg/kg	M	001,003-005,007-008
Soil Organic Matter	T287	A40	0.1	%	N	001,003-005,008
Total Organic Carbon	T21	A40	0.1	%	N	001,003-005,008
Ammoniacal nitrogen	T686	10:1	0.05	mg/l	U	002,006,009
pH	T7	A40			U	003,007
Naphthalene	T149	10:1	0.01	µg/l	U	002,006,009
Acenaphthylene	T149	10:1	0.01	µg/l	U	002,006,009
Acenaphthene	T149	10:1	0.01	µg/l	U	002,006,009
Fluorene	T149	10:1	0.01	µg/l	U	002,006,009
Phenanthrene	T149	10:1	0.01	µg/l	U	002,006,009
Anthracene	T149	10:1	0.01	µg/l	U	002,006,009
Fluoranthene	T149	10:1	0.01	µg/l	U	002,006,009
Pyrene	T149	10:1	0.01	µg/l	U	002,006,009
Benzo(a)Anthracene	T149	10:1	0.01	µg/l	U	002,006,009
Chrysene	T149	10:1	0.01	µg/l	U	002,006,009
Benzo(b)fluoranthene	T149	10:1	0.01	µg/l	U	002,006,009
Benzo(k)fluoranthene	T149	10:1	0.01	µg/l	U	002,006,009
Benzo(a)Pyrene	T149	10:1	0.01	µg/l	U	002,006,009
Indeno(123-cd)Pyrene	T149	10:1	0.01	µg/l	U	002,006,009
Dibenzo(ah)Anthracene	T149	10:1	0.01	µg/l	U	002,006,009
Benzo(ghi)Perylene	T149	10:1	0.01	µg/l	U	002,006,009
PAH(total)	T149	10:1	0.01	µg/l	U	002,006,009
Phenol	T149	10:1	0.5	µg/l	U	002,006,009

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
As (Dissolved)	T281	10:1	0.2	µg/l	U	002,006,009
Cd (Dissolved)	T281	10:1	0.02	µg/l	U	002,006,009
Cr (Dissolved)	T281	10:1	1	µg/l	U	002,006,009
Pb (Dissolved)	T281	10:1	0.3	µg/l	U	002,006,009
Hg (Dissolved)	T281	10:1	0.05	µg/l	U	002,006,009
Se (Dissolved)	T281	10:1	0.5	µg/l	U	002,006,009
Cu (Dissolved)	T281	10:1	0.5	µg/l	U	002,006,009
Ni (Dissolved)	T281	10:1	1	µg/l	U	002,006,009
Zn (Dissolved)	T281	10:1	2	µg/l	U	002,006,009
pH	T7	10:1			U	002,006,009
Cyanide(Total)	T4	10:1	0.05	mg/l	U	002,006,009
Ba (Dissolved)	T281	10:1	1	µg/l	U	002,006,009
Be (Dissolved)	T281	10:1	0.05	µg/l	U	002,006,009
Boron	T6	10:1	0.01	mg/l	N	002,006,009
Chromium VI	T686	10:1	0.003	mg/l	U	002,006,009
Sulphate	T686	10:1	0.5	mg/l	U	002,006,009
V (Dissolved)	T281	10:1	2	µg/l	U	002,006,009
Moisture @105C	T162	AR	0.1	%	N	001,003-005,007-008
Retained on 10mm sieve	T2	M40	0.1	%	N	001,003-005,007-008
Asbestos ID	T27	AR			SU	001,004-005,007-008
Arsenic	T6	M40	2	mg/kg	M	001,004-005,007-008
Cadmium	T6	M40	1	mg/kg	M	001,004-005,007-008
Chromium	T6	M40	1	mg/kg	M	001,004-005,007-008
Lead	T6	M40	1	mg/kg	M	001,004-005,007-008
Mercury	T6	M40	1	mg/kg	M	001,004-005,007-008
Selenium	T6	M40	3	mg/kg	M	001,004-005,007-008
Copper	T6	M40	1	mg/kg	M	001,004-005,007-008
Nickel	T6	M40	1	mg/kg	M	001,004-005,007-008
Zinc	T6	M40	1	mg/kg	M	001,004-005,007-008
pH	T7	AR			M	001,004-005,007-008
SO4(Total)	T6	A40	0.01	%	N	001,004-005,007-008
SO4(2:1)	T6	AR	0.1	g/l	N	001,003-005,007-008
Chromium VI	T6	AR	1	mg/kg	N	001,004-005,007-008
Barium	T6	A40	1	mg/kg	U	001,004-005,007-008
Beryllium	T6	A40	2	mg/kg	U	001,004-005,007-008
Boron (water-soluble)	T6	AR	1	mg/kg	N	001,004-005,007-008
Cyanide(Total)	T921	AR	1	mg/kg	M	001,004-005,007-008
Phenols(Mono)	T921	AR	1	mg/kg	M	001,004-005,007-008
Vanadium	T6	M40	1	mg/kg	M	001,004-005,007-008
TPH (C5-C6)	T54	AR	0.10	mg/kg	N	001,004-005,007-008
TPH (C6-C8)	T54	AR	0.10	mg/kg	N	001,004-005,007-008
TPH (C8-C10)	T54	AR	0.10	mg/kg	N	001,004-005,007-008
TPH (C35-C44)	T8	M105	1	mg/kg	N	001,004-005,007-008
TPH (C10-C12)	T206	M105	1	mg/kg	M	001,004-005,007-008
TPH (C12-C16)	T206	M105	1	mg/kg	M	001,004-005,007-008
TPH (C16-C21)	T206	M105	1	mg/kg	M	001,004-005,007-008
TPH (C21-C35)	T206	M105	1	mg/kg	M	001,004-005,007-008

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

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Tel : 0161 874 2400
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Report Number: 675122-1

Date of Report: 18-Aug-2017

Customer: Resource Environmental Consultants Ltd
Osprey House
Pacific Quay
Broadway
Salford
M50 2UE

Customer Contact: Mr Colin Wardle

Customer Job Reference: 102867
Customer Purchase Order: 003343
Customer Site Reference: Brunswick St
Date Job Received at Concept: 09-Aug-2017
Date Analysis Started: 14-Aug-2017
Date Analysis Completed: 18-Aug-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

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

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked
and authorised by :
Aleksandra Pacula
Project Manager

Issued by :
Aleksandra Pacula
Project Manager

Waste Acceptance Criteria

Customer Sample Reference : TP101 WAC
SAL Sample Reference : 675122 001
Project Site : Brunswick St
Customer Reference : 102867
Bottom Depth : 0.40
Date Sampled : 09-AUG-2017
Matrix Class : Sandy Soil

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Loss on Ignition	Grav	0.1	%	N	**4.5**			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	**5.0**	100.0		
PCB EC7 (Sum)	Calc	0.070	mg/kg	U	(9, 26) <0.070	1.0		
pH	Probe			M	**7.9**		> 6.0	
Total Organic Carbon	OX/IR	0.1	%	N	**5.2**	**3.0**	**5.0**	6.0
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **100**	500.0		

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	**0.013**	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.018**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.13**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	**10**	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.013**	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.042**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**140**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**3.8**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	**0.042**	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	**0.012**	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**77**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc WAC ICP/MS	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.030**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Waste Acceptance Criteria

Customer Sample Reference : TP104 WAC
SAL Sample Reference : 675122 005
Project Site : Brunswick St
Customer Reference : 102867
Bottom Depth : 1.00
Date Sampled : 09-AUG-2017
Matrix Class : Sandy Soil

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Loss on Ignition	Grav	0.1	%	N	**5.6**			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	**5.0**	100.0		
PCB EC7 (Sum)	Calc	0.070	mg/kg	U	(9, 26) <0.070	1.0		
pH	Probe			M	**7.8**		> 6.0	
Total Organic Carbon	OX/IR	0.1	%	N	**6.5**	**3.0**	**5.0**	**6.0**
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **190**	500.0		

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	**0.020**	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.038**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.11**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	**0.00022**	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	<10	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.014**	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.029**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**120**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**8.7**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	**0.013**	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	**0.13**	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.0064**	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**54**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc WAC ICP/MS	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	<0.020	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
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Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**AR**	**AR**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	**13**	**12**

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**M40**	**M40**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Retained on 10mm sieve	Grav	0.1	%	N	<0.1	<0.1

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
WAC Metals

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**A40**	**A40**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Antimony	ICP/OES	1	mg/kg	U	**3**	**5**
Barium	ICP/OES	1	mg/kg	U	**150**	**120**
Beryllium	ICP/OES	2	mg/kg	U	<2	<2

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
WAC Metals

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**AR**	**AR**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Boron (water-soluble)	ICP/OES	1	mg/kg	N	<1	<1
Chromium VI	ICP/OES	1	mg/kg	N	<1	<1

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
WAC Metals

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**M40**	**M40**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Arsenic	ICP/OES	2	mg/kg	M	**11**	**23**
Cadmium	ICP/OES	1	mg/kg	M	<1	<1
Chromium	ICP/OES	1	mg/kg	M	**17**	**18**
Copper	ICP/OES	1	mg/kg	M	**46**	**88**
Lead	ICP/OES	1	mg/kg	M	**210**	**230**
Manganese	ICP/OES	1	mg/kg	M	**360**	**800**
Mercury	ICP/OES	1	mg/kg	M	**3**	<1
Molybdenum	ICP/OES	1	mg/kg	M	**3**	**7**
Nickel	ICP/OES	1	mg/kg	M	**17**	**27**
Selenium	ICP/OES	3	mg/kg	M	<3	<3
Vanadium	ICP/OES	1	mg/kg	M	**24**	**31**
Zinc	ICP/OES	1	mg/kg	M	**140**	**97**

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
BTEX

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**M105**	**M105**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	(13) <10	(13) <10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10	<10

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
PCB EC7

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**M105**	**M105**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Polychlorinated biphenyl BZ#28	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10	(26,9) <10
Polychlorinated biphenyl BZ#52	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10	(26,9) <10
Polychlorinated biphenyl BZ#101	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10	(9,26) <10
Polychlorinated biphenyl BZ#118	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(26,9) <10	(9,26) <10
Polychlorinated biphenyl BZ#153	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(26,9) <10	(9,26) <10
Polychlorinated biphenyl BZ#138	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10	(26,9) <10
Polychlorinated biphenyl BZ#180	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(26,9) <10	(9,26) <10

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**M105**	**M105**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.5**	**0.3**
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	<0.1	<0.1
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	**1.0**	**0.7**
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	**1.0**	**0.9**
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.4**	**0.4**
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.5**	**0.5**
Benzo(b/k)Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.8**	**0.9**
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.4**	**0.5**
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.2**	**0.3**
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	**0.1**
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	**0.2**	**0.3**
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	**5.0**	**5.0**
Coronene	GC/MS	0.1	mg/kg	N	<0.1	<0.1
Phenol	GC/MS (MCERTS)	0.1	mg/kg	M	<0.1	<0.1

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Soil Analysed as Soil
Total Petroleum Hydrocarbons

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**M105**	**M105**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Total Petroleum Hydrocarbons	GC/FID	1	mg/kg	M	(13) **100**	(13) **170**
Total Petroleum Hydrocarbons (C35-C40)	GC/FID	1	mg/kg	N	(13,9) <10	(13) **18**

Concept Reference: 675122
Project Site: Brunswick St
Customer Reference: 102867

Leachate to BS EN 12457-2 (10:1) Analysed as Water

Waste Acceptance Criteria

				Concept Reference	**675122 001**	**675122 005**
				Customer Sample Reference	**TP101 WAC**	**TP104 WAC**
				Test Sample	**10:1**	**10:1**
				Bottom Depth	**0.40**	**1.00**
				Date Sampled	**09-AUG-2017**	**09-AUG-2017**
				Matrix Class	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Arsenic (Dissolved)	ICP/MS (Filtered)	0.2	µg/l	U	**1.8**	**3.8**
Barium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**13**	**11**
Molybdenum (Dissolved)	ICP/MS (Filtered)	1	µg/l	N	**1**	**13**
Total Dissolved Solids	Grav	100	mg/l	N	<100	<100
Phenols (Total-Mono)	Colorimetry	0.1	mg/l	U	<0.1	<0.1
Dissolved Organic Carbon	OX/IR	1	mg/l	N	**14**	**12**
Electrical Conductivity	Probe	10	µS/cm	N	**120**	**110**
Antimony (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**1**	**2**
Cadmium (Dissolved)	ICP/MS (Filtered)	0.02	µg/l	U	<0.02	**0.02**
Chromium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**1**	**1**
Copper (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	**4.2**	**2.9**
Lead (Dissolved)	ICP/MS (Filtered)	0.3	µg/l	U	**4.2**	**1.3**
Mercury (Dissolved)	ICP/MS (Filtered)	0.05	µg/l	U	<0.05	<0.05
Nickel (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1	<1
Selenium (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	<0.5	**0.6**
Zinc (Dissolved)	ICP/MS (Filtered)	2	µg/l	U	**3**	<2
Chloride	Discrete Analyser	1	mg/l	U	**1**	<1
Fluoride	Discrete Analyser	0.05	mg/l	U	**0.38**	**0.87**
Sulphate	Discrete Analyser	0.5	mg/l	U	**7.7**	**5.4**

Index to symbols used in 675122-1

Value	Description
10:1 S	Data for BS EN 12457-2 (10:1)
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
A40	Assisted dried < 40C
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
AR	As Received
10:1	Leachate to BS EN 12457-2 (10:1)
13	Results have been blank corrected.
9	LOD raised due to dilution of sample
26	LOD raised because the analysis was performed by an alternative technique
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

APPENDIX VI

GEOTECHNICAL TESTING RESULTS

LABORATORY REPORT

4043

Contract Number: PSL17/3150

Report Date: 11 July 2017

Client's Reference: 102867

Client Name: Resource & Environmental Consultants Ltd
Osprey House
Pacific Quay
Broadway
Manchester
M50 2UE

For the attention of: Colin Wardle

Contract Title: Test 1

Date Received: 30/6/2017
Date Commenced: 30/6/2017
Date Completed: 11/7/2017

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
WS105		U	3.45	4.00	Firm brown slightly gravelly slightly sandy CLAY.

UKAS TESTING 4043	PSL Professional Soils Laboratory	Test 1	Contract No: PSL17/3150
			Client Ref: 102867

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

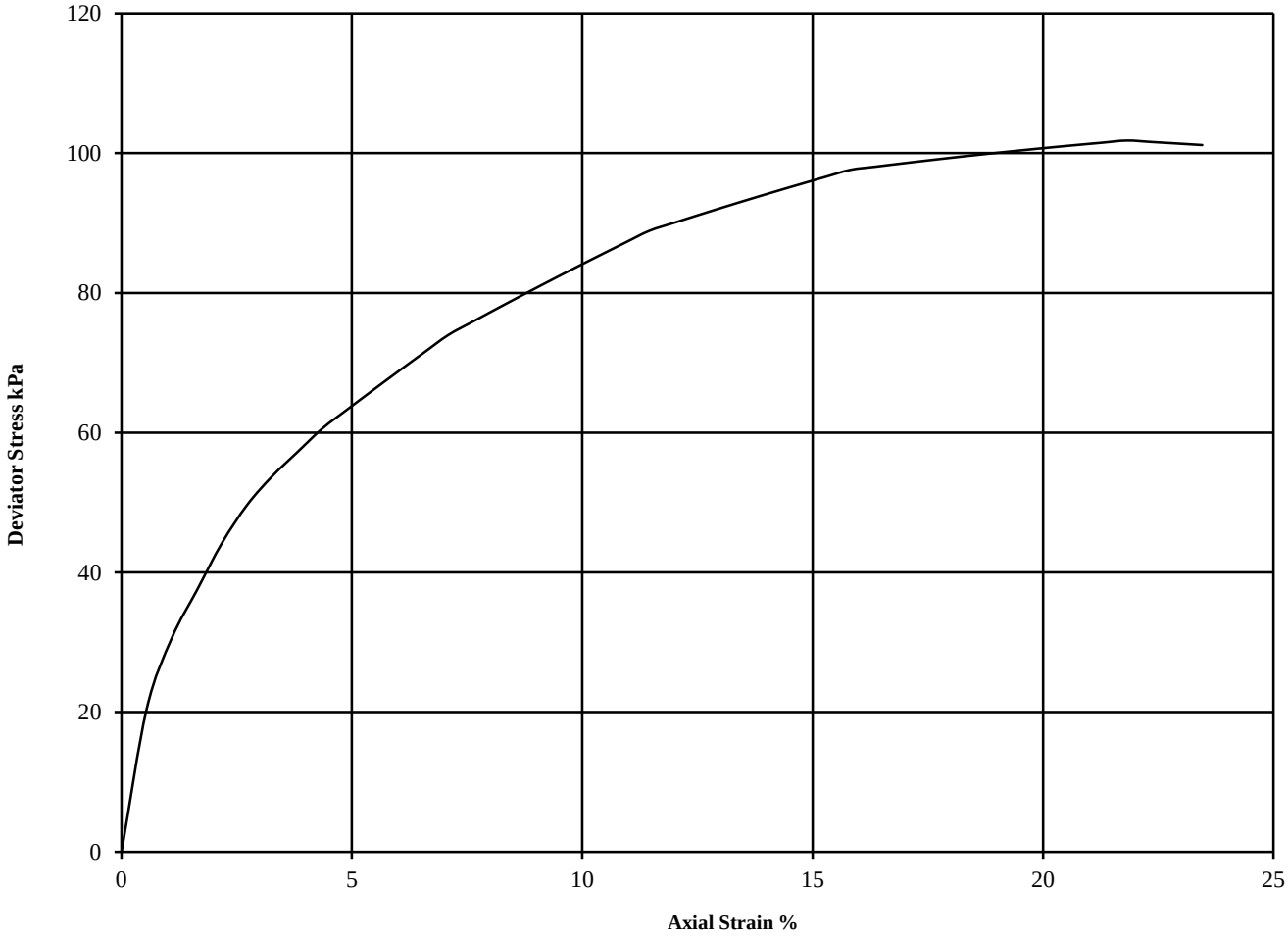
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: WS105 **Top Depth (m):** 3.45

Sample Number: **Base Depth (m):** 4.00

Sample Type U



Diameter (mm):		66.0	Height (mm):		121.0	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 0.47
1	22	1.88	1.55	70	102	51	21.8	Intermediate	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Test 1

Contract No: PSL17/3150

Client Ref: 102867

Certificate of Analysis

Certificate Number 17-05318

20-Jul-17

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 17-05318

Client Reference PSL17/3150

Order No (not supplied)

Contract Title TEST 1

Description 4 Soil samples.

Date Received 14-Jul-17

Date Started 14-Jul-17

Date Completed 20-Jul-17

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 10725 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 17-05318
Client Ref PSL17/3150
Contract Title TEST 1

			Lab No	1204533	1204534	1204535	1204536
			Sample ID	WS101	WS103	WS104	WS105
			Depth	3.10-3.10	2.80-2.80	2.30-2.30	2.90-2.90
			Other ID				
			Sample Type	D	D	D	D
			Sampling Date	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Metals							
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	10	19	< 10
Inorganics							
pH	DETSC 2008#			8.2	8.9	9.1	8.0
Chloride Aqueous Extract	DETSC 2055	1	mg/l	13	23	32	6.9
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	16	22	6.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	25	250	1800	95
Sulphur as S, Total	DETSC 2320	0.01	%	0.01	0.09	0.25	0.03
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.02	0.12	0.65	0.05

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-05318
Client Ref PSL17/3150
Contract TEST 1

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1204533	WS101 3.10-3.10 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1204534	WS103 2.80-2.80 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1204535	WS104 2.30-2.30 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1204536	WS105 2.90-2.90 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

LABORATORY REPORT

4043

Contract Number: PSL17/4070

Report Date: 11 September 2017

Client's Reference: 102867

Client Name: REC Manchester
Osprey House
Pacific Quay
Broadway
Manchester
M50 2UE

For the attention of: Colin Wardle

Contract Title: Brunswick Street

Date Received: 22/8/2017
Date Commenced: 22/8/2017
Date Completed: 11/9/2017

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)

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e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

DETERMINATION OF UNCONFINED COMPRESSIVE STRENGTH

ISRM Suggested Methods, pp 111 –116, 1981.

Hole Number	Sample Number	Sample Type	Top Depth (m)	Base Depth (m)	Sample Diameter (mm)	Sample Length (mm)	Height Ratio	Initial Mass (g)	Bulk Density (Mg/m)	Moisture Content (%)	Dry Density (Mg/m)	Load Failure (kN)	UCS (MPa)	Failure Mode	Date Tested	Remarks
BH102		C	11.75	11.90	75	130	1.7	1140	1.98	11.2	1.78	19.3	4.4	Brittle	08/09/17	
BH102		C	13.76	13.90	75	130	1.7	1110	1.93	14.2	1.69	23.6	5.3	Brittle	08/09/17	
BH102		C	14.20	14.35	75	130	1.7	1203	2.09	15.3	1.82	18.8	4.3	Brittle	08/09/17	

PSL
Professional Soils Laboratory

Brunswick Street

Contract No:
PSL17/4070
Client Ref:
102867

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101	14.50		A	U	75	50	3750	4774.65	69.10	-	0.34	0.071	1.157	0.08	Valid	
BH101	17.20		A	U	75	56	4200	5347.61	73.13	-	0.18	0.034	1.187	0.04	Valid	
BH101	17.30		A	U	75	54	4050	5156.62	71.81	-	0.25	0.048	1.177	0.06	Valid	
BH101	17.85		A	U	75	55	4125	5252.11	72.47	-	0.09	0.017	1.182	0.02	Valid	
BH102	13.50		A	U	75	63	4725	6016.06	77.56	-	0.20	0.033	1.218	0.04	Valid	

Note All testing carried out on samples at as received water content Par = parallel, Perp = perpendicular, U = Random A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Brunswick Street

Contract No:
PSL17/4070
Client Ref:
102867

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101	14.50		D	U	-	75	5625	75.00	-	0.01	0.002	1.200	0.00	Valid	
BH101	17.20		D	U	-	75	5625	75.00	-	0.08	0.014	1.200	0.02	Valid	
BH101	17.30		D	U	-	75	5625	75.00	-	0.08	0.014	1.200	0.02	Valid	
BH101	17.85		D	U	-	75	5625	75.00	-	0.04	0.007	1.200	0.01	Valid	
BH102	13.50		D	U	-	75	5625	75.00	-	0.07	0.012	1.200	0.01	Valid	

Note All testing carried out on samples at as received water content Par = parallel, Perp = perpendicular, U = Random A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Brunswick Street

Contract No: PSL17/4070

Client Ref: 102867