LK CONSULT LIMITED

PART OF THE LK GROUP

PHASE 2 DEVELOPMENT NEW ISLINGTON MANCHESTER

PHASE 2 CONTAMINATION INVESTIGATION, RISK ASSESSMENT AND REMEDIATION STRATEGY



Prepared for:

Urban Splash
Timber Wharf
16-22 Worsley Street
Castlefield
Manchester
M15 4LD

By:

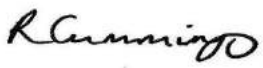
LK Consult Ltd
Eton Business Park
Eton Hill Road
Greater Manchester
M26 2ZS

Tel: 0161 763 7200
Email:cl@thelkgroup.com

Date: March 2017
Ref: LKC 16 1334

LK Consult Ltd

Document Verification

Site Address	New Islington Phase 2 Development, Manchester, M4 6AS		
Report Title	Phase 2 Contamination Investigation, Risk Assessment and Remediation Strategy.		
Job Number	LKC 16 1334	**Document Ref.**	CL-602-LKC 16 1334-03
Date Issued	March 2017	**Report Version**	R0
Prepared By	Rosie Cummings	**Signature**	
Reviewed By	Paul Quimby	**Signature**	

DISCLAIMER

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of Urban Splash. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

Those using this information in subsequent assessments or evaluations do so at their own risk.

EXECUTIVE SUMMARY

Site Details

Site Location:	South of Winders Drive, New Islington, Manchester. Centred at National Grid Reference 385310E 298530N.
Site Area:	0.73 Ha.
Current Land Use:	Disused ground with evidence of earthworks, construction materials and site cabins.
Proposed Development:	Planning Application No. 111587/FO/2016/N1: 20 residential housing with private gardens. 2 six storey buildings containing 84 residential apartments and commercial/retail units on the ground floor.
Purpose of Report:	Contamination Investigation, Risk Assessment and Remediation Strategy.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in December 2017. Ref: LKC 16 1334.
History:	Cotton Mill, Dye Works, Reservoirs, Canal and dock. Whole site was redeveloped in the 1970s for residential use.
Geology / Hydrogeology:	Glacial Till (Secondary Undifferentiated Aquifer) over Manchester Marls Formation (mudstone) (Secondary B Aquifer).
Mining:	Not within Development High Risk Area.
Relevant Environmental Setting:	New Islington Marina and canal immediately adjacent to SW. Shooter Brook in Victorian brick culvert runs under the site. Not within Source Protection Zone.
Preliminary Conceptual Model: PL=Pollutant Linkage	PL1 Direct Contact (Human Health): Moderate Risk (asbestos, metals, PAHs, petroleum hydrocarbons, Low Risk (pesticides). PL2 Inhalation of Vapours: Moderate Risk (volatile contaminants). PL3 Gas: Moderate Risk (hazardous and ground gas). PL4 Controlled waters: Moderate Risk (mobile contaminants). PL5 Sulphate Attack: Moderate Risk (sulphate). PL6 Water Pipelines: Moderate Risk (organic contaminants). PL7 Phytotoxic: Low Risk (metals).
Recommendations:	Site Investigation was recommended to further assess all the above pollutant linkages.

Ground Investigation Work Undertaken

Date of Investigation:	9th December to 9th February 2016.
Intrusive Investigation Work Undertaken:	3no. Window sample boreholes (WS101-WS103). 7no. Mechanically excavated trial pits (TP101-TP107). 7no. Cable percussion boreholes (CP101 to CP107). 10no. Dynamic Cone Penetration Tests (DCP101 to DCP110). 3 no. Soakaway Tests (S101 to S103). 3 no. Cable percussion boreholes (for UU) (CPUU101 to CPUU103).
Monitoring Wells:	Installed in all window sample holes and CP101, CP104 and CP105.
Soil Sampling:	22no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. Selected samples tested for chloride for concrete design.
Groundwater Sampling:	3no groundwater samples tested for metals, speciated PAHs, cyanide, pH, sulphate, hardness, 3no leachate samples tested for metals, speciated PAHs, cyanide, pH and sulphate.
Monitoring:	6no. gas monitoring visits over 3 months.

Ground Conditions

Location	General Ground conditions
Whole Site	Made Ground (including ash and clinker) to between 1.9 and 8.7mbgl. Stiff to very stiff sandy gravelly clay with interbeds of dense to very dense gravelly sand to >20mbgl. Sandy CLAY to >5.45mbgl Groundwater at 4.3mbgl to 14.1mbgl. Many holes were dry.

Contamination Risk Assessment

The table below shows a summary of the risk assessments undertaken for each pollutant linkage, the revised conceptual model and recommendation for either remediation and / or further investigation.

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to site users via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	**Low**	- No asbestos identified. Statistically no elevated contaminants identified on site. - **Recommendations:** No remediation required. Nominal 150mm topsoil cover in garden and landscaped areas to reduce contact with undesirable material (glass, brick etc.)
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	**Low**	- No volatile contamination identified. - **Recommendations:** No remediation required.
3	Gas posing a risk to buildings and site users via the migration of gas into building causing explosion and asphyxiation.	**Moderate**	- Slightly elevated carbon dioxide (5.7%v/v) on one occasion and low flow rates. Gas regime was risk assessed. - **Recommendations:** Site classed as CS1. No gas protection measures required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	**Low**	- Measurable elevated PAHs in leachate samples. Leachate test unreliable for organics. Not considered a risk to surface water. - Elevated sulphate in one sample of groundwater. Not considered to be a priority substance. - **Recommendations:** No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	**Moderate**	- Elevated sulphate identified in parts of the site. - **Recommendations:** Sulphate resistant concrete (DS-2 AC-2) .
6	Organic contaminants posing a risk to water pipes.	**Moderate**	- Organic contamination identified at potable pipe depth of 0.75-1.35mbgl. - **Recommendations:** UU risk assessment to be completed. The site will likely require barrier piping.
7	Phytotoxic metals posing a risk to flora via root uptake.	**Low**	- No phytotoxic metals above generic criteria. Materials within made ground unsuitable for garden areas eg. Glass, brick and ash. - **Recommendations:** No remediation required but 150mm cover in garden areas to cover over undesirable material.

Recommendations and Remedial Strategy

The table below shows the remediation and validation requirements for the site. This information should be documented in a Site Completion Report for submission to the Local Authority.

Phase	PL	Remediation Requirements	Validation Requirements
Pre-Construction	1 & 2	Earthworks Site Inspections / Unexpected Contamination A watching brief (daily / weekly) should be maintained during earthworks to confirm the ground conditions and identify any unusual ground conditions. Should any unusual ground conditions be encountered, work should stop and samples be collected for chemical analysis. Depending on the outcome of the chemical analysis further remediation may be required.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work (TBC).
		Any site own material reused on site should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following: 1,000 tonnes (c.600m cube) of non hazardous soil. 5,000 tonnes (c. 3,000 cube) of natural sand and gravels. 50,000 tonnes (c.25,000 cube) of bitumous material to be used in roadways. 5,000 tonnes (c. 3,000 cube) of crushed concrete / stone. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits.	To ensure material is compliant with appropriate waste regulations. Material will need to be tested at the rate and analytical suites presented in Table 8-2. If a MMP is required this needs to be registered by a Qualified Person (QP) and there must be'certainty of use' for any material to be re-used onsite or exported to site to ensure there is no 'sham recovery'.
	General	A nominal 150mm of clean topsoil required to reduce contact with underlying undesirable material matix.	Material should be suitable as a growing medium for topsoil following BS3882[1].
Build-Phase Construction	5	Sulphate Resistant Concrete Sulphate Resistant Concrete in line with DS-2 AC-2 recommended.	N/A
	6	Potable Water Pipes It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is likely that barrier pipe will be required.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.

The remediation recommended in the table above should be validated to ensure it has been carried out appropriately. This should be documented in a Completion/Validation Report and submitted to the Local Authority for completion.

[1] BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

CONTENTS

1	INTRODUCTION	1
2	PREVIOUS WORK	2
3	GROUND INVESTIGATION	10
4	GROUND CONDITIONS	14
5	GENERIC RISK ASSESSMENT	17
6	WASTE DISPOSAL ASSESSMENT	29
7	CONCLUSIONS	30
8	RECOMMENDATIONS AND REMEDIAL STRATEGY	31

FIGURES

Figure 1: Site Location Plan

Figure 2: Site Boundary Plan

Figure 3: Proposed Site Use

Figure 4: Historical Features

Figure 5: Site Investigation Location Plan

APPENDICES

Appendix A: Risk Matrix

Appendix B: Profile Logs

Appendix C: Certificate of Analysis - Soil

Appendix D: Certificate of Analysis - Water / Leaching Test

Appendix E: Gas Monitoring Results

Appendix F: Generic Assessment Criteria Values

Appendix G: Statistical Analysis

Appendix H: CATWASTE Assessment

1 INTRODUCTION

1.1 Background

LK Consult Ltd (LKC) has been commissioned by Urban Splash to carry out a Phase 2 geo-environmental investigation and risk assessment for the Phase 2 Development at New Islington, Manchester. The investigation was undertaken in support of a planning application (reference number 111587/FO/2016/N1) to develop the site for residential use.

The following work has previously been undertaken:

- Geotechnical Report, undertaken by LKC (Ref: LKC 16 1334 02 [Draft]), dated February 2017).
- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 16 1334 01, dated December 2016).
- Geotechnical and Geoenvironmental Investigation at Tutti Frutti Development, New Islington, Manchester by Coffey Geotechnics Ltd, ref: 546.8-080208-R1.3-msd, March 2008.
- Audit Report on Geotechnical and Geoenvironmental Investigation at New Islington, Manchester by Edge Consultants UK Ltd, Job No. 546.1, February 2004.

This investigation has been undertaken to confirm the ground conditions below the site to allow a contamination assessment to be undertaken.

The geotechnical assessment is provided under separate cover and except for sulphate is not considered further in this report.

The investigation will aim to confirm the risks of the potential pollutant linkages identified in the PRA and recommend further assessment / remediation, as required.

1.2 Site Details

A summary of the site details is presented in Table 1-1. Figures 1 and 2 indicate the site location and boundary. Figure 3 indicates the proposed development.

Location	Land south of Winders Drive, New Islington. Nearest postcode M4 6AS. Centred at approximate National Grid Reference 385310E 298530N.
Area	0.73 Ha.
Topography	Approximately 46-50 metres above ordnance datum (AOD). Site is generally flat. However, there is slope down to the northeast corner and a steep bank up to Coppersmith Road.
Current Land Use	Site The site currently comprises disused ground with evidence of earthworks, construction materials and site cabins. Surrounding Area North, Northwest and Northeast: Residential Properties. Southeast: Undeveloped Land. South and Southwest: New Islington Marina and canal.
Proposed Development	Planning Application No. 111587/FO/2016/N1: 20 three storey houses. 1 six storey building to create 44 self-contained residential apartments. 1 six storey apartment building to create 40 self-contained residential apartments on the first to fifth floors with non-residential uses (commercial / retail) at the ground floor. Associated car parking, landscaping and boundary treatments.

Table 1-1. Summary of site details.

2 PREVIOUS WORK

2.1 Summary of Existing Information

A PRA report (Ref: CL-602-16 1334-01, dated December 2016) has previously been undertaken by LKC and is summarised in Section 2.2-2.6.

2.2 Site History

The site history is summarised in Table 2-1. A summary of the historical features are shown on Figure 4.

Site Features	Location	Map Dates Present	Comments
Canal / Cannel Street	Centre	1848-1969	- Road running SW-NE through the centre of the site.
Cotton Mills / Engineering Works (1)	W	1851-1969	- Two Cotton Mills, including Perseverance Mill in the far west from 1851 mapping. No longer named from 1908 mapping, however industrial buildings remain. - Named as Engineering Works from 1922 mapping. - Detailed historic building plans from 1928 show name 'Bratby & Hinchliffe Ltd Aerated Water Engineers' and 'Westmacott & Son Chemist & Mineral Water Fac.' Various building shown including warehouses, testing rooms, drugs rooms, paint shop, bottling rooms, store and stables. - Western part of works cleared by 1962 mapping. Part of site may include 'A.L. Starkie Ltd Welding & Constructional Engineers'. - Named as Works / Engineering Works from 1965 mapping.
Canal Street Dye Works (2)	SE	1851-1922	- Including a number of buildings, tanks and chimneys. - Shown as disused on 1908 mapping. - Buildings remain on 1922 mapping but no longer named.
Reservoirs (3)	S	1851 only	- Associated with Canal Street Dye Works. No longer present on 1891 mapping.
Glass Works (4)	NE	1891-1969	- Named as Manchester Flint Glass Works from 1891 mapping. Including a number of buildings and chimneys. - Named as 'Molineaux Webb & Co Ltd Glass Works' on 1928 detailed historic building plan. Includes mold stores, sand store, barrel store and ruin. - Named as Kirby Street Glass Works from 1948 mapping. - Named as Warehouse, Works and Depot from 1965 mapping.
Canal branch and Dock (5)	E	1851-1969	- Running SW-NE and terminating approximately at the NE site boundary. - Extension (Dock) towards Canal Street. - By 1891 mapping reduced in size and Dock no longer present.
Dock Yard (6)	SE	1851 only	- Between Dock and Canal Street Dye Works.
Terraced buildings	Centre & N	1851-1969	- Along the E and W of Canal Street.
Church / Play Ground / School Grounds (7)	W	1851-1969	- West side of Canal Street. - Site boundary encroaches the corner of the St Judes Church from 1851 mapping. - Shown as Play Ground from 1891 mapping. - Shown as school grounds from 1948 mapping.

Table 2-1: Summary of historical features. See Figure 4 for location of numbers.

Site Features	Location	Map Dates Present	Comments
Stables / Garage (6)	E of Centre	1928-1969	- East of Canal Street. Formerly a dock yard. From 1928 mapping includes a number of stables and a straw store. Named as 'James Hancock Carrier'. - 1962 mapping, still shown as 'James Hancock Carrier' but includes garages, workshop and stores. - Shown as Works / Depot by 1965 mapping.
Factory / Works / Yard (2)	SE	1928-1969	- Former location of Dye Works. - Includes a picture frame factory, clothing works, yard, travelling crane, dried fruit warehouse, textile warehouse, cane basket warehouse. - Site cleared by 1974 mapping.
Public House (8)	N	1851-2009	- Named as Colliers Arms from 1851 mapping. At the corner of Canal Street and Kirby Street in the N corner of the site. - Public House still present following 1970s development. Layout different suggesting possible new build from 1978 mapping. - No longer present on 2013 mapping.
1970's Residential Development	Whole Site	1978-2000/2009	- Whole site redeveloped (with the possible exception of the public house in the north) by 1978 for residential use including apartments in the W of the site (William Murray Court), houses in the centre and E with associated roads, car parking and landscaping. - Winder Drive runs through the centre / W of site in a SW-NE direction. - By 2000 (aerial photograph) the apartments in the W have been demolished and land shown as open space (grass). - By 2006 mapping, some of the houses in the W have been demolished. - By 2009 mapping, site cleared with the exception of the N part of Winder Drive and the public house in the N. - Whole site cleared by 2013.
Road	E	2013-2016	- Road shown in the east of the site.
Construction Site	Whole Site	2016	- Construction site with evidence of earthworks. Machinery, vehicles and site cabins present.
Surrounding Area Features	**Distance/ Location**	**Map Dates Present**	**Comments**
Brick Field (9)	Adj. SE	1851 only	- No longer present on 1891 mapping.
Canal branch (5)	Adj to SE	1851-1969	- Also present on site. Canal runs to S and SE to The Manchester Ashton Under Lyne, Oldham and Stockport Canal. - Named as the Islington Branch on 1952 mapping.
Dye Works / Later Industrial Uses (2)	Adj.S	1851- 1969	- Also present in the S of the site. - Dye Works present until 1922 mapping (named as disused). - Later used for various other industrial uses. - Site cleared by 1974 mapping.
Works (4)	From 0-100m SE	1851-1969/ 1974	- Including Glass Work (also on site), Bedstead & Safe Works, Electric Engineering Works, Chemical Works, Clothing Works, Corporation Cleansing Dept (garage), Shirt Factory. - Majority of site cleared by 1974 (with the exception of the Corporation Cleansing Dept). - Redeveloped for housing by 1978.

Table 2-1 (cont.): Summary of historical features. See Figure 4 for location of numbers.

Site Features	Location	Map Dates Present	Comments
Ancoats Hospital (10)	90m SE	1891-2003	- No longer present on 2006 mapping.
Wharf / Works (11)	50m S	1851-1969	- Coal wharfs and brick works present on 1851 mapping. - Wire Works present by 1891 mapping. - Engineering Works (lift equipment) in the 1950-60's. - Site cleared by 1974 mapping.
Wharfs / Works (12)	45m SE	1851-1969	- Coal wharfs present on 1851 mapping. - No longer named on 1891 mapping but wharfs appear to remain with possible small works buildings. - Site cleared by 1974 mapping.
Mills / Work (1)	Adj. W/SW	1851-1969	- Also partially present on site. - Includes land between Horne Street, Sandford Street and Pott Street. - Includes Cotton Mills, mineral water factories, timber yard, iron yard, engineering works, haulage contractors and brush works. - Redeveloped by 1978 mapping.
Church / School / Play Grounds (7)	Adj. W	1851-1969	- Eastern corner within site boundary. - St Jude's Church from 1851 mapping. - St Jude's School with Play Grounds from 1891 mapping. - Redeveloped by 1978 mapping.
Canals / wharfs / works (13)	15m W	1851-1969/1974	- Includes land to the west of Pott Street. - A number of canal arms / basins present with adjacent wharfs. - Also includes cotton mills, galvanizing works, mineral water manufactory, timber yard, foundry, corporation yard and stone wharf, saw mill, hydraulic power station, clothing factory, mills, garage, works, engineering works. - Redeveloped by 1978 mapping.
Mill / Works (14)	55m N	1851-1983	- New Islington Mill (cotton) from 1851 mapping. - Engineering Works from 1908 mapping. - From 1951 mapping New Islington Mill in E and New Union Works (Electrical Engineering) in W. - Later named as Engineering Works. - Site cleared by 1990 mapping.
Foundry (15)	40m NE	1851-1951	- Named as New Islington Foundry (Brass and Iron). - No longer named in 1891 mapping. - Partially demolished by 1848 mapping. - No longer present on 1952 mapping.
Timber Yard (16)	55m E	1851 only	- Use unknown from 1891 mapping.
Foundry / Baths (17)	45m NW	1851 only	- Foundry present in SE corner of area 17. - Redeveloped as 'New Islington Baths & Wash Houses' by 1891 mapping.
Basin / Reservoir (18)	180m W	1851- 2016	- Shown as a canal basin on 1851 mapping. - Named as reservoir on 1891 mapping. - No longer present on 1908 mapping. - Present again from 2013 mapping.

Table 2-1 (cont.): Summary of historical features. See Figure 4 for location of numbers.

2.3 Environmental Setting

The environmental setting is summarised in Table 2-2.

Categories			Details
Geology	Artificial		- None recorded on site.
	Superficial		- Till (Diamicton).
	Bedrock		- Manchester Marls Formation (mudstone).
Hydro-geology	Aquifer Designation	Superficial	- Secondary Undifferentiated (superficial).
		Bedrock	- Secondary B.
	Source Protection Zone (SPZ)		- Site is not within an SPZ.
	Groundwater Abstractions		- None within 500m. Nearest 927m S, Moseley Rubber Co Ltd, General Cooling.
Hydrology	Nearest Surface Water		- Adj to SW and NW – New Islington Marina and canal. - Culvert onsite. Named as Shooters Brook, approximately 11mbgl deep and 1500mm diameter. Brick construction.
	Water Quality Data		- Rochdale Canal 83m NW – River Quality B.
	Flooding		- No risk from rivers or sea.
	Surface Water Abstractions		- None within 500m. Nearest 574m NE (Ashton Canal). British Waterways, General Cooling.
	Discharge Consent		- 2 within 250m: 177m S (Edwin Butterwoth & Co, discharge of other matter) and 209m SW (UU, sewage discharge), both consents revoked.
	Pollution Incidents		- 9 within 250m (all minor incidents). Nearest 116m E, unknown pollutant associated with a fire.
Minerals / Mining	Coal Mining Development High Risk Area (DHRA)		- Not within DHRA.
	Coal Report		- Could be affected by underground mining in 4 seams of coal at 350-1090m depth, last worked in 1961. Any ground movement due to coal mining should have stopped. - No known mine entries within, or within 20m of, the site.
	BGS Recorded Mineral Sites		- None within 500m. Nearest underground is Ardwick Lime Works Pit 772m SE (Great Mine Limestone), ceased. Nearest surface is Alderman Street Brick Works 927m SE (Till, Devensian (clay and shale)), ceased.
	Cheshire Brine Compensation District		- Not within site area.
Ground Stability (on-site)			- No hazard: compressible ground, ground dissolution. - Very low hazard: collapsible ground, landslide, running sand, shrinking / swelling clay.
Landfill sites	Known/Registered		- None within 250m.
	Potential		- 9 potentially infilled water features 0-250m (canal arms/basins). Varying dates of infill. - Potentially infilled reservoirs on site. Infilled prior to 1891. - Potentially infilled brickfield adjacent to the west of the site. Infilled prior to 1891.
Radon			- Probability of <1% of homes above Action Level. No further action required.
Designated Sites			- None within 250m.
Contemporary Trade Directory			- Nearest 125m SE, Garage Services (inactive).
Fuel Station Entries			- Nearest 536m W, Blossom Motor Company (obsolete).

Table 2-2: Summary of the environmental setting.

2.4 Previous Investigations

A number of intrusive investigations have been carried out on the site. The following reports have been reviewed and summarised below:

- Audit Report on Geotechnical and Geoenvironmental Investigation at New Islington, Manchester by Edge Consultants UK Ltd, Job No. 546.1, February 2004.
- Geotechnical and Geoenvironmental Investigation at Tutti Frutti Development, New Islington, Manchester by Coffey Geotechnics Ltd, ref: 546.8-080208-R1.3-msd, March 2008.

In addition, available historical borehole logs have been reviewed. Details of each site investigation are presented in the Preliminary Risk Assessment report.

Please note the previous site investigations were undertaken on much larger areas and there was difficulty in locating investigation locations in relation to the site.

2.5 BGS Borehole Information

A borehole is located in the southwestern boundary of the site as detailed below[2]:

NGR: 385240 298540
Drilled by: Geo-Research Ltd
Date: December 1971
BH No. 9

0-0.18m	Tarmac and stone setts.
0.18-2.0m	Made Ground – Clay and rubble.
2.0-12.85m	Stiff to hard brown silty CLAY with some grey and blue mottling and thin bands of silt and sand. Large boulder at 8.95m. Traces of coal and grey sandstone.
12.85-17.52m	Firm to hard brown silty CLAY with bands of yellow and red sand, many stones and boulders and bands of light brown clayey silt. N=38.
17.52-18.20m	Compact clayey SAND and GRAVEL with cobbles and boulders. N=20.
18.25-20.50m	Dense brown medium SAND and fine to coarse GRAVEL with cobbles and boulders – clayey in parts. N=26-32.
20.75-26.55m	Light brown uniform medium SAND with some pebbles and some speckles of coal. Slightly more pebbly from 26.00-26.55m. N=23-32.
26.55-27.7m	Hard grey/brown silty CLAY with many stones and boulders and bands of sandstone fragments. N=87.

Groundwater recorded at 18.7mbgl.

2.6 Site Reconnaissance

A site reconnaissance was carried out on 22nd December 2016.

Relevant features identified on site are summarised below:

- Site is bounded by herras fencing.
- Site comprises open land with limited vegetation cover.
- Construction material and site cabins present (associated with adjacent development).

[2] http://scans.bgs.ac.uk/sobi_scans/boreholes/937117/images/12293698.html

- Some evidence of ground works having been undertaken.
- Site is generally flat. However there is slope down to the northeast corner and a steep bank up to Coppersmith Road.
- New housing present to the southeast, northwest and northeast. Canal to the southwest.

Possible Mare's Tail was identified on the south western part of the site during a previous site reconnaissance carried out by LKC in August 2016.

2.7 Contamination Sources / Pathways and Receptors

A summary of contamination sources are as follows:

Source	Contaminants
Cotton Mills and Dye Works[3]	Metals, inorganic compounds (e.g. cyanides, sodium compounds, sulphide compounds, chloride compounds, mineral acids, alkalis), chlorinated organic solvents, sizing agents, other organic compounds (e.g. formaldehydes, polyvinyl chloride), water repellents (organo silicon, oxazoline), fire/flame retardants (e.g. borax, ammonium phosphate, brominated organic compounds, metals oxides), soaps, detergents, pesticides, fuels, asbestos.
Engineering Works	Mineral Water Production and Welding & Constructional Engineers: Metals / metalloids, inorganic / organic compounds, fuels / oils, solvents, asbestos.
Glass Works[4]	Metals / metalloids, sulphate, acids, caustic soda, soda ash, fuels / oils, solvents.
Dock Yard / Wharfs[5]	Coal / coke cargo: metals / metalloids, sulphates, sulphides, cyanides. Other contaminants dependant on cargo.
Garage[6]	Asbestos, heavy metals, petroleum hydrocarbons, lubricants, other oils, solvents and anti-freeze.
Various other works onsite	Heavy metals, asbestos, PAHs, petroleum hydrocarbons, SVOCs/VOCs, other inorganic and organic compounds.
Onsite infilled features (reservoirs, canal basin / arm)	Ash, clinker, demolition rubble: Asbestos, heavy metals (such as arsenic and lead), sulphates, PAHs[7]. Hazardous gas (carbon dioxide and methane).
Made Ground from site levelling / demolition work	
Offsite infilled features	Hazardous Gas (carbon dioxide and methane).
Offsite Industrial Use	Contaminants similar to the above.

A summary of possible pathways are as follows:

- Human Health - ingestion (of soil, dust, home produce), inhalation (of dust, fibres, vapours, gas), dermal contact (of soils and dust).
- Controlled Waters: Surface run-off, migration of mobile contaminants through permeable strata and preferential pathways.
- Gas: Migration through permeable strata and preferential pathways. Build-up in confined spaces causing explosion and asphyxiation.
- Windblown dust.
- Direct contact.
- Root uptake.

A summary of possible receptors are as follows:

[3] Department of the Environment. Industry Profile. Textile Works and Dye Works. 1995.
[4] Department of the Environment. Industry Profile. Profile of Miscellaneous Industries (Glass Manufacturing Works). 1995.
[5] Department of the Environment. Industry Profile. Dockyards and Dockland. 1995.
[6] Department of the Environment. Industry Profile. Road vehicle fuelling, service and repair. 1995.
[7] Defra (2002). "Potential Contaminants for the Assessment of Land." R&D Publication CLR 8.

- Human Health: Future site residents, current site users, future site users, offsite land users.
- Controlled Waters: Culvert below site, New Islington Marina and canal, Secondary B aquifer, Secondary undifferentiated aquifer.
- Current and future buildings and structures.
- Potable water pipes.
- Flora within future gardens and soft landscaping.

2.8 LKC Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in CLR11[8] has been summarised in Table 2-3.

The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and determine what site investigation work is required.

The preliminary contamination conceptual model has identified seven generic potential pollutant linkages. Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552[9].

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix A.

Where LKC identified a low to very low risk, limited intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

Where LKC identifies a moderate or higher risk, intrusive work or precautionary remedial measures will be recommended.

The conceptual model is based on the future use of the site (post development), in line with proposed development scheme.

2.9 Recommendations

Based upon the Preliminary Contamination Conceptual Model a site investigation was recommended to assess the potential pollutant linkages further.

[8] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[9] CIRIA (2001). "Contaminated land risk assessment: A guide to good practice". C552.

Pollutant Linkage	Pathway	Receptor	Contaminant (source)	Probability	Consequence	Risk	Assessment and Recommendations
PL1	– Dermal contact. – Inhalation of soil, fibres and dust. – Ingestion of soils, dust, vegetables, soil attached to vegetables. – Windblown dust.	– Future site users. – Offsite receptors.	– ACM (made ground).	Low Likelihood	Severe	**Moderate**	– Although sources identified from historical features, none identified during previous investigations. Therefore, low likelihood assumed. – **Recommendation:** Intrusive investigation required.
			– Heavy metals and PAHs (ash in made ground).	Likely	Medium	**Moderate**	– Likely probability as sources identified from historical features and elevated metals and PAHs identified in previous investigations. – **Recommendation:** Intrusive investigation required.
			– Organic Compounds: fuels / oils / solvents etc. (industries on site).	Low Likelihood	Medium	**Moderate** / Low	– Although sources identified from historical features, none identified during previous investigations. Therefore, low likelihood assumed. – Moderate risk assumed as locations and details of testing from previous investigation not known. – **Recommendation:** Intrusive investigation required.
			– Pesticides (Cotton Mill)	Low Likelihood	Medium	Moderate / **Low**	– Persistent pesticide contamination not expected from cotton mills given the age of the mills and significant alterations to the site use. Therefore low likelihood and low risk assumed. – **Recommendation:** Intrusive investigation not required.
PL2	– Inhalation of vapours. – Migration through permeable strata / preferential pathways.	– Future site users. – Offsite receptors.	Volatile Contaminants: – fuels, solvents (industries on site). –	Low Likelihood	Medium	**Moderate** / Low	– Although sources identified from historical features, none identified during previous investigations. Therefore low likelihood assumed. – Moderate risk assumed as locations and details of testing from previous investigation not known. – **Recommendation:** Intrusive investigation required.
PL3	– Inhalation of gas. – Migration through permeable strata / preferential pathways. – Explosion in confined spaces.	– Future site users. – Buildings. – Offsite land users.	– Methane, carbon dioxide (made ground).	Low Likelihood	Severe	**Moderate**	– Low likelihood given depth of made ground anticipated, the infilled features on site and gas data from previous investigations near to the site (marginal exceedance in CO_2). – **Recommendation:** Gas monitoring required.
PL4	– Surface Run-off. – Migration through permeable strata / preferential pathways – Perched waters migration.	– Secondary B / Undifferentiated Aquifer. – New Islington marina and canal. – Culvert.	Mobile contaminants: – metals, PAHs, other organics / inorganics, pesticides (industries on site).	Low Likelihood	Medium	**Moderate** / Low	– Low likelihood as significant mobile contamination not identified during previous investigations and migration likely to be relatively limited. – Moderate risk assumed as locations and details of testing from previous investigation not known. – **Recommendation:** Limited investigation required.
PL5	– Sulphate attack on concrete.	– Building structure.	– Sulphate (ash made ground).	Likely	Mild	**Moderate** / Low	– Likely probability as sources identified from historical features and elevated sulphate identified in previous investigations. – Moderate risk assumed at this stage. – **Recommendation:** Intrusive investigation required.
PL6	– Ingestion of tainted water supply.	– Future site users. – Water pipes.	Organic Contaminants: – hydrocarbons, solvents, naphthalene (industries on site).	Likely	Medium	**Moderate**	– Likely probability given the sources identified from historical features and the limited data for organic contamination from previous investigations. – **Recommendation:** Intrusive investigation required.
PL7	– Direct Contact (plant uptake).	– Flora.	Phytotoxic Contaminants: – Metals (ash made ground).	Likely	Minor	**Low**	– Likely probability as sources identified from historical features and elevated metals identified in previous investigations. – **Recommendation:** Investigation work as part of PL1.

Table 2-3. Preliminary Contamination Conceptual Model.

3 GROUND INVESTIGATION

3.1 Site Investigation Design and Methodology

In order to assess the ground conditions at the site and to investigate the potential pollutant linkages identified in the preliminary contamination conceptual model an intrusive investigation was undertaken.

All geotechnical testing and assessment is compiled in 'LKC Geotechnical Report, (Ref: LKC 16 1334 02), dated March 2017 and not discussed further here.

The investigation was carried out on 9th to 23rd December 2016, soakaway tests were undertaken on 1st February 2017 and additional cable percussion boreholes for United Utilities were undertaken on 3rd to 9th February 2017.

All investigation locations were surveyed in and are shown on Figure 5.

Works undertaken comprised the following:

- 3 window sample boreholes drilled to 3.3-5.45 metres below ground level (mbgl) (ref. WS101 to WS103).
- 7 cable percussion boreholes drilled to 12.1-20.0mbgl (ref. CP101 to CP107).
- 7 trial pits (using JCB) excavated to 2.0-3.5mbgl (ref. TP101 to TP107).
- 10 Dynamic Cone Penetration tests to 1mbgl (ref. DCP101 to DCP110).
- 3 soakaway tests (using JCB) excavated to 2.6mbgl (ref. S101 to S103).
- 3 Cable Percussion Boreholes (for UU) to 10.15 -12.0mbgl (ref. CPUU101 to CPUU103.

All window sample holes were installed with gas and groundwater monitoring installations.

Three cable percussion holes were installed with gas and groundwater monitoring installations. Each of these was a dual phase installation, one deep and one shallow. The deep installation was to allow water level within the natural strata to be monitored for geotechnical purposes. Shallow wells contained the response zone within made ground to allow gas and groundwater to be monitored.

Cable percussion borehole locations were specified by Joule Consulting on behalf of Urban Splash. All holes were drilled in the location specified except for CP104 as a portacabin obstructed the location. The locations of CP101, 102, 103 and 104 were designed to target the large mansion buildings, although contamination testing was undertaken aswell.

LKC were given a specification from Joule Consulting that detailed the cable percussion borehole locations and required in situ and laboratory testing to allow pile design to be undertaken. LKC's geotechnical consultant advised additional laboratory testing to provide sufficient information for pile design.

CP103 and 104 were planned to be drilled to 20mbgl as piles were anticipated to be longer either side of Shooters Brook Culvert. LKC's geotechnical consultant advised that CP101 additionally should be advanced to 20mbgl. All other cable percussion boreholes were planned to be drilled to 14mbgl.

TP106 was repositioned after a tarmacadam obstruction, possibly a former road, was encountered at 2mbgl. A similar obstruction was struck at 1.8mbgl in TP106A but it was possible to continue to the required depth.

The window sample boreholes and trial pits locations were chosen to allow a good spread across the site for contamination purposes as well as target historical features including a former canal basin.

The number of site investigation points corresponds to approximately one location per 18m square centres. This is considered to be a conservative sampling density and is in line with BS10175[10] for a 'main investigation'. Although there were some targeted features made ground was similar and therefore was considered to be a suitable sampling grid.

All profile logs are provided in Appendix B and are in line with BS14688-1[11] and BS5930[12].

3.2 Well Installations

All 3no. (WS101-WS103) of the window sample boreholes were installed with monitoring wells for gas and groundwater monitoring. 3no. of 7 Cable percussion boreholes (CP101, CP104 and CP105) were installed for gas and groundwater monitoring. Monitoring wells were installed in accordance with BS10175 and CIRIA C665[13].

Dual wells were installed in cable percussion holes incorporating a shallow well to target made ground and a deep well to target natural ground.

Wells within window sample holes and the shallow wells within cable percussion holes generally comprised approximately 1m plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete. The deep wells within cable percussion holes comprised between approximately 4m and 10m of plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete.

Well installation details are provided in Profile Logs in Appendix B.

3.3 Sampling Protocol

3.3.1 Soil Sampling (Contamination)

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[14].

Soil was collected for onsite testing. A plastic zip bag was half filled with soil allowing a suitably sized headspace. The bag was sealed and stored for at least 20 minutes before being tested for total volatile organic compounds (TVOCs) using a PhoCheck Tiger photoionisation detector (PID). Results of the PID readings are presented on the profile logs (Appendix B). The on-site monitoring was carried out in line CIRIA C665[15] to aid in screening samples for volatile analysis.

[10] British Standard (2011). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2011.
[11] British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.
[12] British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.
[13] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[14] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.
[15] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket for chemical testing. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4˚C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix C. Table 3-1 shows the soil testing undertaken.

Suites and Contaminants	No. Samples	Location & Depth		Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	23	TP101 0.0-0.7m TP102 0.0-1.0m TP103 0.6-2.0m TP105 0.0-1.0m TP106A 0.0-1.8m WS101 0.0-1.0m WS103 0.0-1.0m CP101 0.0-1.0m CP102 7.5m CP104 0.0-1.0m CP105 3.9m CP107 0-1.0m	TP101 1.8-3.4m TP103 0.0-0.6m TP104 0.0-1.0m TP106 0.0-1.0m TP107 0.0-1.0m WS102 0.0-1.0m WS103 2.0-3.0m CP102 0.0-1.0m CP103 0.0-1.0m CP105 0.0-1.0m CP106 0.0-1.0m	A basic suite with a broad selection of contaminants tested on samples across the site where no significant evidence of contamination was identified (with the exception of occasional ash and coal) and no TVOCs identified from the PID tests. Selected chloride tested for concrete design.

Table 3-1. Summary of soil sample testing undertaken.
Notes: Metal/metalloids = arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; PAH=polycyclic aromatic hydrocarbons and SOM=Soil Organic Matter.

3.3.2 Water Sampling and Leaching Testing

To establish the condition of shallow and deep groundwater LKC took three groundwater samples (due to limited groundwater identified on site).

The groundwater samples were collected a minimum of 1 week after drilling had finished and following well development. Sample collection was undertaken using a disposable bailer. The borehole was purged of all standing water and the sample collected from the recharged water. The sample was collected in glass and plastic bottles and a glass vial. A water meter was used to test the pH, temperature and conductivity before sampling until equilibrium conditions were met, as per BS10175[16] guidelines.

Several of the monitoring wells were dry so it was only possible to take samples from four wells of which three were sent to the lab for testing.

During soakaway testing, three soil samples were taken from soakaway pits and sent to the laboratory for leachate testing. These tests were undertaken primarily to determine whether made ground in potential areas for soakaways would be suitable with regard to leachability.

All water samples were placed in glass bottles, plastic bottles and septum topped vials and stored in ice packed cool boxes. The samples were sent to Chemtest on the same day for analysis. The sampling suite is presented in Table 3-1.

Sampling was carried out in accordance with BS5930[17] and BS5667-11[18].

[16] British Standard (2011). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2011.
[17] British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.
[18] British Standard (2009). "Water Quality – Sampling. Part 11: Guidance on Sampling of Groundwaters". BS ISO 5667-11:2009.

Many of the tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix D. Table 3-2 shows the groundwater / leachate testing undertaken.

Suites and Contaminants	No. Samples	Location	Justification
Metals / metalloids, pH, sulphate, speciated PAHs and hardness.	6	CP101 deep (G) CP104 shallow (G) WS103 (G) S103 (L) S102 (L) S103 (L)	No significant contamination risk identified from the investigation and the soil results therefore basic suite considered appropriate for groundwater across the site. Good spread across site and other holes dry.

Table 3-2. Summary of groundwater sampling tests undertaken.
Notes:
L = Leachate Sample; G=Groundwater Sample
Metal/metalloids = arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; PAH=polycyclic aromatic hydrocarbons.

3.4 Gas Monitoring

Six gas monitoring visits have been undertaken over a 3 month period (23rd December 2016 to 23rd February 2017) in all installed boreholes.

The monitoring period and frequency is in line with CIRIA C665[19] for a very low generation potential of source and high sensitivity of development (residential with gardens). Although a moderate risk has been identified a low likelihood was assumed in the PRA. This monitoring period is considered suitable as an initial screen with more monitoring being suggested if gas readings fluctuate dramatically.

Monitoring was undertaken using a Geotechnical Instruments GA2000 plus and GA5000 in accordance with the monitoring protocol outlined in CIRIA C665 (flow rate measured first). The monitoring was undertaken over a range of weather conditions (including low and falling barometric pressure and heavy rain) to demonstrate worst-case conditions.

The gas monitoring results are reproduced in full in Appendix E.

3.5 Site Investigation Scope

The scope of the contaminated land investigation was agreed with the Local Authority prior to undertaking the work (email from Laura Miller, Manchester City Council dated 15.12.16).

Slight changes to the scope were made. One cable percussion borehole moved as site cabins caused an obstruction. One trial hole was moved as the proposed location was outside the perimeter fencing. One trial hole encountered what appeared to be a tarmac road at approximately 2mbgl so was moved.

LKC do not consider the changes to be significant and sufficient investigation work has been undertaken to thoroughly investigate the site.

3.6 Geotechnical Testing

All Geotechnical testing is discussed in LKC 16 1334 02 (R0) Geotechnical Report which has been issued under separate cover.

[19] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

4 GROUND CONDITIONS

4.1 Geology

4.1.1 Generalised Sequence

The ground conditions beneath the site comprised made ground underlain by natural sandy gravelly clay. A summary section of the logs are provided in Plate 4-1, with additional comments below. Detailed logs are presented in Appendix B.

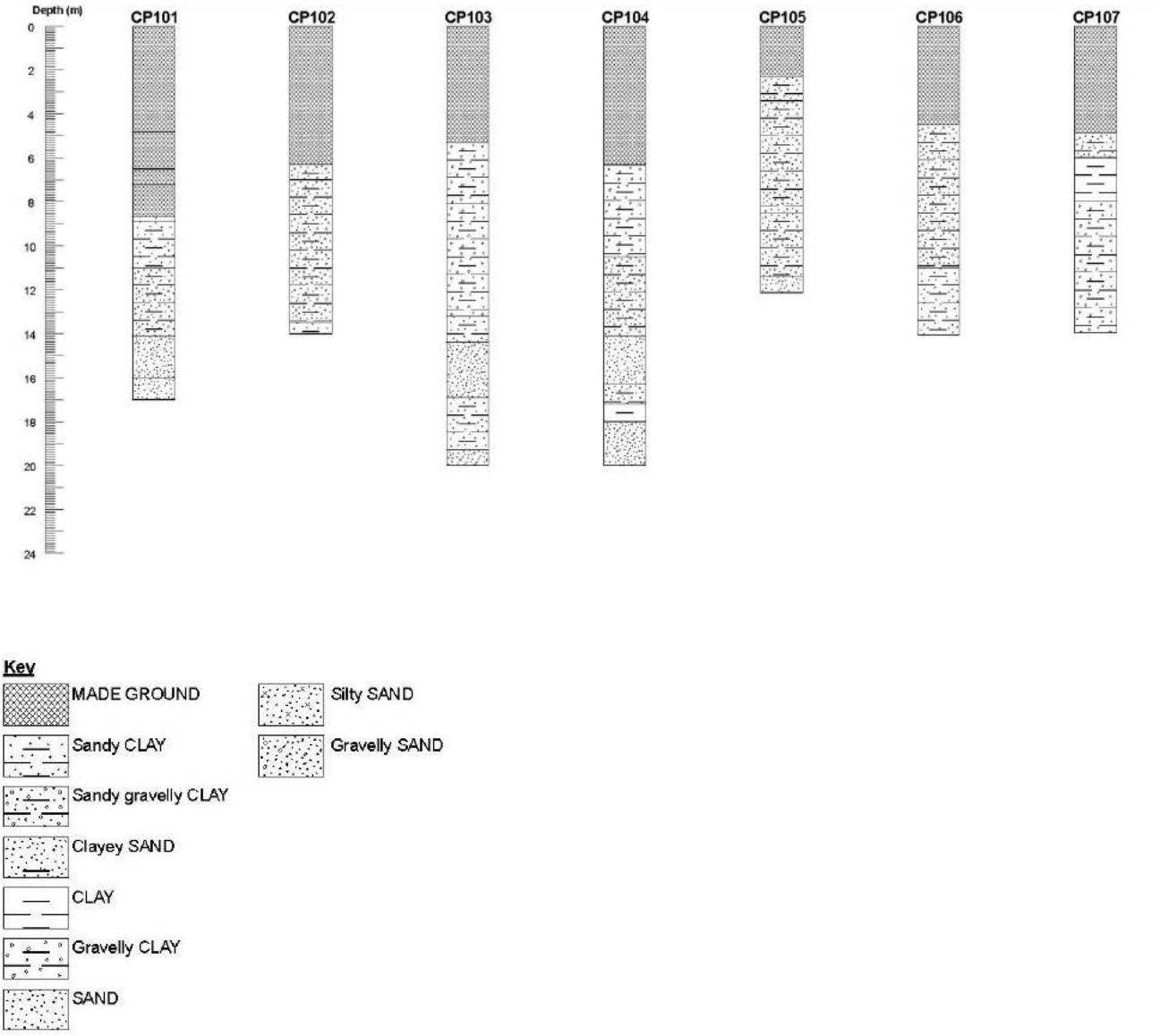


Plate 4-1: Summary of ground conditions.

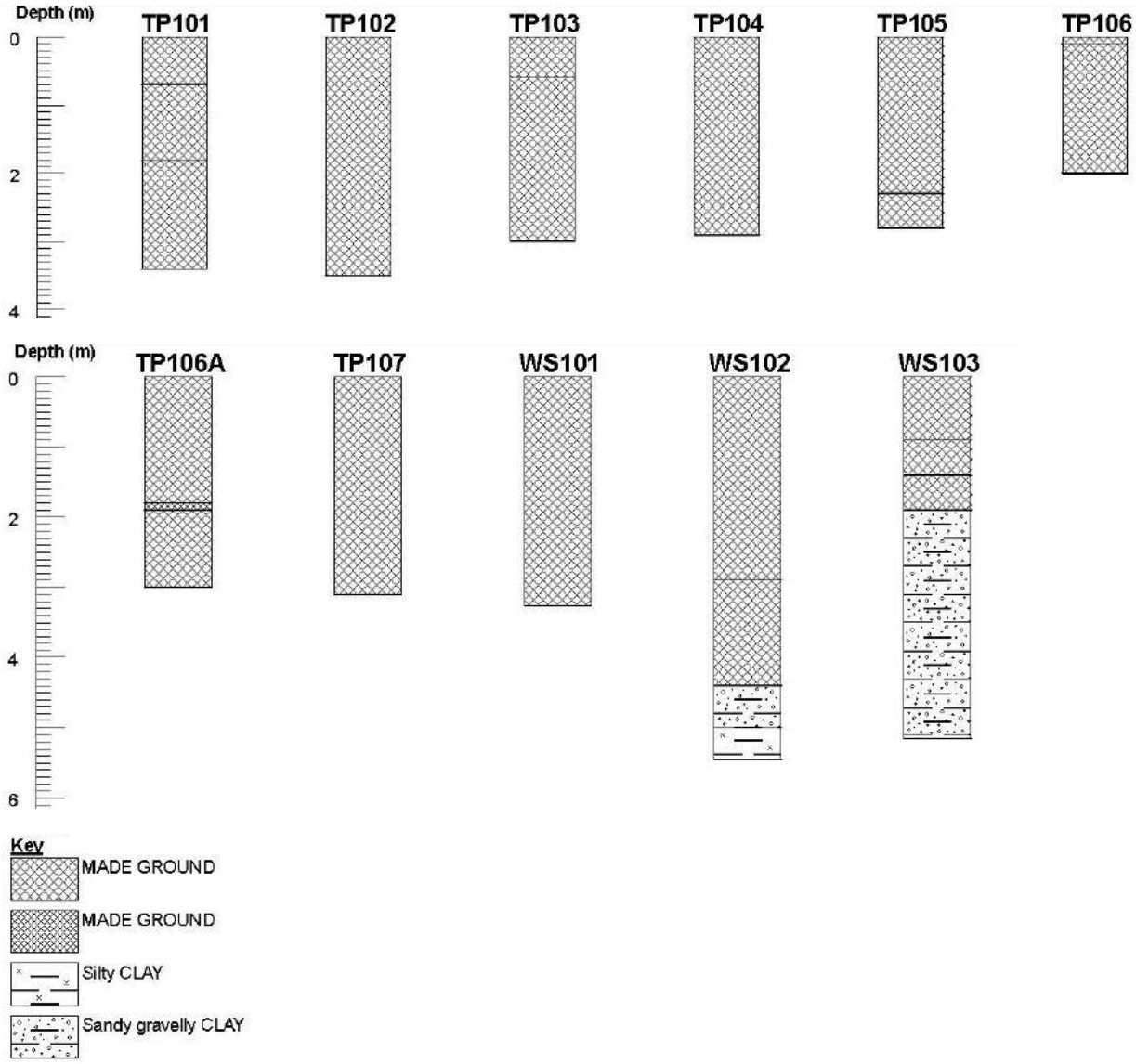


Plate 4-1 (cont.): Summary of ground conditions.

Made Ground was encountered in all exploratory holes. Thickness of Made Ground ranged from 1.9m in the NE corner of the site to 8.7m adjacent to the canal basin in the SW of the site. Made ground is generally described as soft to firm to stiff sandy gravelly CLAY with ash, brick, clinker, concrete, coal, tarmac, masonry, plastic & wood. Buried walls, brick and concrete foundations, large lumps of concrete/masonry, tarmacadam and former roads at various depths.

The maximum proven thickness of drift deposits of 14.7m was observed in BH103 (20m deep borehole). Generally the drift comprised stiff to very stiff (occasionally firm) sandy gravelly CLAY (glacial till) with interbeds of dense to very dense gravelly SAND (fluvioglacial deposit). As the PSD results confirm, the stiff clays may have high silt and sand content, and the fluvio-glacial sands may have relatively high silt and clay fractions.

Notable variations from the above general sequence of glacial till and fluvioglacial sands & gravels have been observed:

Stiff consistency brown slightly sandy laminated clays are described in BH103 from 13.20mbgl to 14.40mgbl; very stiff brown thinly laminated clays in BH104 from 17.20mbgl to 18.00mbgl; and stiff to very stiff consistency brown mottled grey clay with rare gravel

from 6.0mgbl to 8.0mbgl. Interbedded with the stiff to very stiff glacial till are thin beds of less strong clay (possibly to thickness of up to 1.0m) with lower shear strength than surrounding formation.

Bedrock was not encountered during fieldworks. The deepest borehole (BH104) was sunk to 20mbgl and terminated in sand and gravel drift deposits.

No visual / olfactory evidence of hydrocarbons or volatile contaminants was encountered in any locations.

In-ground structures were identified in TP106 and TP106A which appeared to be a former road at approximately 2.0mbgl.

4.2 Groundwater

4.2.1 Groundwater Levels

Groundwater strikes were recorded during the investigation in trial pits and boreholes. In addition, groundwater monitoring within the borehole wells has been undertaken on six occasions.

Results are summarised in Table 4-2.

BH/TP	Water Strike Depths (mbgl)	Well Response Zone (mbgl)	No. of Monitoring Visits	Monitoring Depths (mbgl)			Sample Taken?	Evidence of Contam?
				Min	Max	Base		
CP101	5.8	1.0-8.7 (MG)	6	6.6	7.4	8.7	N	N
	16.3	10.0-16.8 (C/S)	6	7.5	10.0	16.8	Y (G)	N
CP102	Dry	-	-	-	-	-	N	N
CP103	16.5	-	-	-	-	-	N	N
CP104	6.3	1.0-6.0 (MG)	6	4.3	4.6	6.1	Y (G)	N
		9.0-15.0 (C)	6	11.2	14.1	15.1	N	N
CP105	Dry	1.0-2.8 (ALL)	6	Dry	Dry	2.9	N	N
		4.0-10.0 (C)	6	Dry	Dry	9.7	N	N
CP106	Dry	-	-	-	-	-	N	N
CP107	4.9	-	-	-	-	-	N	N
WS101	Dry	1.0-3.0 (MG)	6	Dry	Dry	3.0	N	N
WS102	4.0	1.0-4.0 (ALL)	6	3.7	3.7	3.9	N	N
WS103	Dry	1.0 -4.5 (MG)	6	Dry	Dry	4.1	Y (G)	N
TP101	Dry	-	-	-	-	-	N	N
TP102	Damp	-	-	-	-	-	N	N
TP103	Dry	-	-	-	-	-	N	N
TP104	Dry	-	-	-	-	-	N	N
TP105	Dry	-	-	-	-	-	N	N
TP106	Dry	-	-	-	-	-	N	N
TP106A	Dry	-	-	-	-	-	N	N
TP107	Dry	-	-	-	-	-	N	N
S101	Dry	-	-	-	-	-	Y (L)	N
S102	Dry	-	-	-	-	-	Y (L)	N
S103	Dry	-	-	-	-	-	Y (L)	N

Table 4-2: Summary of water strike depths within boreholes and trial pits.
Response Zones:
MG=Made Ground; S=Sand; C=Clay; ALL=MG & Natural
Notes:
G=Groundwater Sample
L=Leach Test

5 GENERIC RISK ASSESSMENT

5.1 Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site specific basis, using a risk based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (CLR11[20]). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 5.6.

5.2 Soil Risk Assessment

5.2.1 Methodology

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

New C4SLs have recently been published[21,22]. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))[23] used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs *'could be used under the planning regime, as well as within Part 2A'.* Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs[24]. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions[25,26,27,28].

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs[29]. These follow the 'minimal' risk principal and more stringent exposure parameters and will be conservative.

The use of the old Soil Guideline Value (SGV) for lead of 450mg/kg was agreed with Manchester City Council (MCC).

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the PAHs[30,31] and

[20] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[21] Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."
[22] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[23] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[24] LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."
[25] EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.
[26] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[27] EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.
[28] EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.
[29] CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

naphthalene the most volatile and soluble[32]. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible[33]. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)[34] and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

Considering the mainly 'residential' land use LKC compared all soil results to a 'residential with plant uptake' land use.

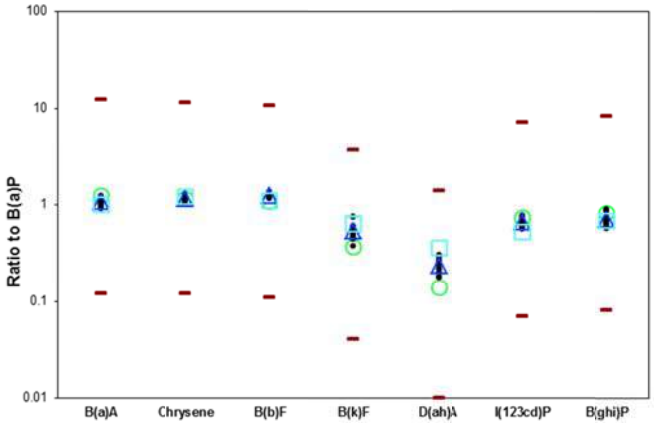
All criteria have been generated using the CLEA V1.06 model[35] based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

A summary of the generic assessment criteria is provided in Appendix F. ATRISK SSVs and CL:AIRE GACs were not required for this dataset and have not been included.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et.al*[36], which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two year carcinogenicity study.

Graph 5-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.



Graph 5-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 18 samples (where values were >LOD to allow the calculation of a ratio).

Notes:

[30] EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.
[31] USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."
[32] EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5-079/TR1.
[33] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[34] HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.
[35] EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.
[36] Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). " A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Biossay." Carcinogenesis. **Vol 19**, no. 1, pp. 117-124.

B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene; B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene
● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data △ = Mean ratio to B(a)P from all data at the site
□ = Mean ratio to B(a)P for UK data presented by HPA ▬ = Upper and Lower limits (order of magnitude from Culp data)
All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

5.2.2 *Soil Results Comparison against Assessment Criteria*

Elevated and pertinent results are presented in Table 5-1 below and all analysis sheets are presented in Appendix C.

Results have been compared to the relevant assessment criteria. Elevated and pertinent results are presented in Table 5.1.

Contaminant		Units	No. of samples	Elevated Results	Sample Location	Criteria (1%/2.5%/6%)	Source of Criteria
PAHs	Benzo(a)pyrene	mg/kg	23	9.6	TP101 (0.0-0.7m)	5	C4SL
				6.2	CP101 (0.0-1.0m)		
General	pH	pH	23	Range 8.1 – 10.5			
	SOM	%	23	Range 1.1 to 7.8			
	Asbestos	-	23	None Detected			

Table 5-1: Summary of elevated and pertinent analytical results.
Notes:
Only results that exceeded assessment criteria have been shown and results from **all depths** are noted.
Results have been compared to the nearest appropriate SOM.

Elevated results have been identified for benzo(a)pyrene (TP101 and CP101).

5.2.3 *Statistical Analysis*

Statistical analysis has been undertaken on the data generated from the made ground as the nature of the soil and the proposed land use is similar.

Current UK guidance on the use of statistical testing (CL:AIRE/CIEH[37]) for contaminated land has been revised from the original CLR7[38] methodology. The latest guidance separates the planning and Part 2A regimes and is based upon the Null Hypothesis and Alternate Hypothesis approach. LKC have used the ESI contaminated land statistics calculator[39] to undertake this work, which follows the new UK guidance.

For the planning scenario the question to be answered will be “can we confidently say that the level of contamination on this land is low relative to some appropriate measure of risk [e.g. C4SL, SSV or GAC values].” The statistical test should show which hypothesis is true within a defined level of confidence (normally 95%), using the upper confidence limit ($UCL_{0.95}$).

For the planning scenario, where the aim is demonstrate the land is suitable for use the Null Hypothesis is the level of concentration that “is the same as, or higher than, the critical concentration [e.g. C4SL, S4UL, SSV or GAC value]” and the Alternative

[37] CL:AIRE (2008). “Guidance on Comparing Soil Contamination Data with a Critical Concentration.”
[38] EA (2002). “Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and related Research (CLR7).”
[39] ESI (2011). “ESI Contaminated Land Statistics Calculator User Manual.” Version 2.

Hypothesis will be where the level of concentration "is lower than the critical concentration (Cc) ."

If the Null Hypothesis is rejected then it can be concluded that the Alternative Hypothesis is true (true mean (μ)<Cc) and that the potentially the site may be 'suitable for use.' If the Null Hypothesis is accepted (μ>Cc) then further measures may be needed and land may not be 'suitable for use.'

In addition, detection limits are dealt with by using half the limits of detection (LOD) as per the guidelines.

Furthermore, the guidance takes into account if the data follows a normal distribution (parametric), where a one-sided t-test can be used or non-normal distribution (non-parametric), where the Chebychev theorem should be used. This is done by using the Shapiro-Wilk test and graphical use of q-q plots.

Care must be used in selecting data for the statistical test. Where possible the site should be zoned (vertically and laterally). This is because these statistics cannot be undertaken on targeted (unbiased) samples. Although some areas were targeted for historical features made ground was similar. Therefore the use of the statistical analysis is considered applicable for all made ground identified on site.

Soil concentrations that are considered outliers may show areas that deviate from the true mean concentration and need to be investigated separately (e.g. they may be hotspots that need to be remediated separately). These are calculated using the Grubb test originally described in CLR7, but only relates to normally distributed data. Log transformation may be used on data to also establish normal distribution for outliers, if required, following CL:AIRE guidance. The test for outliers was based on a 1% level of significance.

Twenty one soil samples (relating to similar made ground) were used in the statistical analysis. Output sheets are provided in Appendix G.

The upper confidence limit ($UCL_{0.95}$) on the true mean concentration for the benzo(a)pyrene dataset is 4.1mg/kg compared to the critical concentration of 5mg/kg.

The Null Hypothesis for benzo(a)pyrene can be rejected and therefore statistically concentrations identified on the site are not considered a significant risk.

5.2.4 Hazard Index

As no significant concentrations of petroleum hydrocarbons were identified in any of the soil samples a hazard index (HI) as described by the Environment Agency[40] technical report (to examine the potential additivity of toxicological effects between the petroleum hydrocarbon fractions) has not been undertaken as part of this assessment.

5.2.5 Direct Contact Risk – Pollutant Linkage 1

Following statistical analysis, no contaminants have been identified on site at concentrations considered to pose a risk to the most sensitive future site users (child residents).

With regard to PAHs the direct contact pathways (pollutant linkage 1) is not considered to be present. The probability of PAH contamination affecting site users is considered

[40] EA (2005). "The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils." Science Report P5-080/TR3.

unlikely. With a medium consequence, the risk is considered to be low and remediation is not required

No asbestos was identified in any of the samples, therefore the probability of asbestos affected site users is considered to be unlikely. With a severe consequence, the risk is moderate / low. At this stage, a low risk is assumed (as no asbestos identified) and remediation is not required. However, as a precaution construction workers should be and vigilant for any suspected ACM during groundworks (discussed further in Section 8.2).

5.2.6 Inhalation Risk – Pollutant Linkage 2

No visual / olfactory evidence of volatile contaminants were identified during the investigation. The PID did not detect any TVOCs.

With respect to inhalation of vapours (pollutant linkage 2) the probability of volatile contaminants affecting site users is considered unlikely. The consequence is expected to be medium, giving a low risk and no remediation is required.

5.3 Gas Risk Assessment (Pollutant Linkage 3)

A total of six gas monitoring visits have been undertaken on the study site from all installed shallow wells. The shallow wells represent near surface potential gas generating conditions from the made ground source.

Gas monitoring results in full are presented in Appendix E. Following guidance set out in CIRIA C665[41] and BS8485[42] peak methane and steady carbon dioxide concentrations have been used in the gas risk assessment. In addition, and as per guidance, flow rates were measured first.

All gas concentrations, flow, pressure and groundwater levels are shown on Table 5-2.

[41] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[42] BSI (2015). "Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments." BS8485:2015.

Boreholes	Visit	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	H_2S (ppm)	CO (ppm)	Flow (l/h)	Groundwater (mbgl)	Range Pressure (mb)
CP101s	1	<0.1	1.1	13.7	<0.1	<0.1	<0.1	6.99	1012
	2	0.1	1.2	15.1	<0.1	<0.1	0.1	7.41	1029
	3	0.1	0.8	16.7	<0.1	<0.1	0.1	6.62	1033
	4	0.1	0.2	21.5	<0.1	<0.1	<0.1	6.73	986
	5	<0.1	0.8	16.6	<0.1	<0.1	<0.1	6.81	1019
	6	<0.1	1.4	15.6	<0.1	<0.1	<0.1	6.77	975
CP104s	1	<0.1	0.2	19.9	<0.1	1.0	<0.1	4.28	1012
	2	0.1	0.3	19.8	<0.1	<0.1	<0.1	4.60	1028
	3	0.1	0.4	18.6	<0.1	<0.1	<0.1	4.60	1033
	4	0.1	2.5	13.9	<0.1	<0.1	<0.1	4.58	986
	5	<0.1	0.5	18.6	<0.1	<0.1	<0.1	4.57	1020
	6	<0.1	**5.7**	5.3	<0.1	<0.1	0.1	4.51	974
CP105s	1	<0.1	0.1	20.4	<0.1	<0.1	-0.4	Dry	1012
	2	0.1	0.1	22.3	<0.1	<0.1	0.1	Dry	1029
	3	0.1	0.1	22.2	<0.1	<0.1	<0.1	Dry	1033
	4	0.1	0.1	21.9	<0.1	<0.1	<0.1	Dry	986
	5	<0.1	<0.1	21.2	<0.1	<0.1	<0.1	Dry	1019
	6	<0.1	2.1	17.8	<0.1	<0.1	<0.1	Dry	977
WS101	1	<0.1	2.2	0.7	<0.1	<0.1	0.1	Dry	1012
	2	<0.1	1.0	16.0	<0.1	<0.1	<0.1	Dry	1029
	3	0.1	0.1	22.0	<0.1	<0.1	<0.1	Dry	1033
	4	0.1	0.2	21.7	<0.1	<0.1	<0.1	Dry	986
	5	<0.1	0.4	20.3	<0.1	<0.1	<0.1	Dry	1019
	6	<0.1	1.7	11.3	<0.1	<0.1	<0.1	Dry	975
WS102	1	<0.1	0.1	3.1	<0.1	<0.1	<0.1	3.74	1012
	2	0.1	2.0	6.1	<0.1	<0.1	<0.1	3.76	1028
	3	0.1	1.3	3.2	<0.1	<0.1	<0.1	3.72	1033
	4	0.1	1.9	3.9	<0.1	<0.1	<0.1	3.71	986
	5	<0.1	1.8	7.0	<0.1	<0.1	-0.1	3.76	1020
	6	0.1	2.4	3.8	<0.1	<0.1	0.1	3.75	974
WS103	1	<0.1	2.1	11.8	<0.1	<0.1	0.1	Dry	1012
	2	0.1	0.3	21.6	<0.1	<0.1	0.1	Dry	1029
	3	<0.1	0.3	20.6	<0.1	<0.1	<0.1	1.93	1034
	4	<0.1	0.7	19.3	<0.1	<0.1	0.1	1.88	986
	5	<0.1	0.4	19.6	<0.1	<0.1	<0.1	2.06	1020
	6	<0.1	0.1	22.3	<0.1	<0.1	0.1	1.81	978

Table 5-2: Summary of gas monitoring.

Notes:

If concentrations / flow are zero then equipment detection limits are assumed.

Table shows peak concentrations of CH_4, O_2, H_2S, CO and steady concentrations of CO_2.

Bold where CO_2 exceeds 5% v/v and CH_4 exceeds 1% v/v.

Concentrations of methane are low (maximum of 0.1%v/v). Concentrations of carbon dioxide have generally been low although one reading of 5.7%v/v was recorded on one occasion which coincided with very low atmospheric pressure and storm conditions (Storm Doris). All other readings have been less than 5% v/v. Flow rates were consistently low (positive flow was. 0.1l/h).

Gas Screening Value

In accordance with CIRIA C665[43], a Gas Screening Value (GSV) may be calculated. Assuming worst-case scenario maximum gas concentrations and flow for each borehole have been used to calculate the GSV. The GSV can be used to determine the characteristic situation (CS).

[43] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

Table 5-3 shows the maximum GSV for each borehole and the appropriate characteristic situation (based on GSV only). An overall site assessment (WS101-WS106) has also been included (worst case values across the site). A worse case negative flow was used (-0.4l/hr) even though this would not be a risk driver to gas accumulation in any future buildings.

Boreholes	Max GSV (l/hr)	CS / TL
CP101s	0.0014	CS1 / Green
CP104s	0.0057	CS1 / Green
CP105s	0.0084	CS1 / Green
WS101	0.0022	CS1 / Green
WS102	0.0024	CS1 / Green
WS103	0.0021	CS1 / Green
All Holes	0.0004 (CH_4) 0.0228 (CO_2)	CS1 / Green

Table 5-3: Summary of worst-case Gas Screening Values (GSV).
Notes:
CS – Characteristic Situation; TL= Traffic Light.

In accordance with CIRIA C665, if carbon dioxide and methane are recorded above 5%v/v and 1%v/v respectively, you should consider upgrading the characteristic situation from CS1 to CS2.

LKC considers any remediation requirements would be unreasonable for this site. There has only been one visit with carbon dioxide marginally exceeding 5% v/v and this was during exceptional atmospheric conditions (Storm Doris). Therefore, LKC considers worst case conditions have been met and considering only a minimal exceedence and very low flow rates significant gas generation that could potentially migrate into future buildings is unlikely. Therefore, there is no requirement to increase the characteristic situation and the site should be classed as CS1.

Based on the above LKC consider the probability of methane and carbon dioxide (Pollutant Linkage 3) affecting site users and buildings as unlikely. Assuming a severe consequence, there is a moderate/low risk. Given the minimal gas concentrations and flow rates, a low risk is considered most appropriate and no remediation is required associated with methane and carbon dioxide.

5.4 Controlled Water Assessment (Pollutant Linkage 4)

LKC considers the New Islington Marina (canal) and Shooters Brook Culvert are the primary receptors relating to surface waters

The underlying Secondary B Aquifer and undifferentiated aquifer are not considered receptors due to limited groundwater reserve, minimal potable water supply in the area and underlying clay impeding migration.

LKC have compared results above Limits of Detection (LOD). Where relevant the review of priority substances take precedence considering threshold values for groundwater cannot be used '*as part of site specific investigations'*. The hierarchy is as follows:

- River Basin District Standards[44] and updated Water Framework Directive[45] for Annual Average / Maximum Allowable Concentration Environmental Quality Standards (AA-MAC-EQS) for priority substances (surface water risk).
- 2001 Environment Agency Values for EQS.
- 2001 Environment Agency Values for UK Drinking Water Standard (UKDWS)[46].
- Resource Protection Values (RPVs)[47].
- Minimal Reporting Values (MRVs).

The risk from List 2 compound (EC Dangerous Substance Directive 76/464/EEC) in a freshwater ecosystem is governed by the hardness of the water. Where applicable the hardness was taken into account for these contaminants.

Elevated contaminants are presented in Table 5-4 below and all analysis sheets are presented in Appendix D.

Contaminant	Units	No. of samples	Elevated Result	Location	Assessment Criteria	Source of Criteria
Anthracene	µg/l	3	3.4	S101 (L)	0.4	MAC - EQS
			2.2	S102 (L)		
			2.3	S103 (L)		
Fluoranthene	µg/l	3	23	S101 (L)	1.0	MAC - EQS
			17	S102 (L)		
			19	S103 (L)		
Benzo(a)pyrene	µg/l	3	12	S101 (L)	0.1	MAC - EQS
			7.5	S102 (L)		
			9.3	S103 (L)		
Benzo(b)fluoranthene / Benzo(k)fluoranthene	µg/l	3	∑=17.7	S101 (L)	∑=0.03	AA - EQS
			∑=11.3	S102 (L)		
			∑=14.3	S103 (L)		
Benzo(ghi)perylene / Indeno(123cd)pyrene	µg/l	3	∑=15.2	S101 (L)	∑=0.002	AA – EQS
			∑=8.6	S102 (L)		
			∑=10.5	S103 (L)		
Sulphate	mg/l	3	970	WS103 (G)	400	EQS (2001)
Hardness	mg/l	3	100 - 1100			
pH	pH	3	Range 8.3 to 9.1			

Table 5-4: Summary of elevated groundwater/leaching test results.

Notes:

EQS (2001) and AA / MAC-EQS (2015) = surface water criteria.

UKDWS (2001) = Groundwater criteria (potable supply).

Concentrations of PAHs in the leaching test exceeded very stringent values. However the risk is not considered significant due to the leaching test is aggressive (de-ionised water) and is not in aqueous equilibrium (steady state) with the solid sample. This may cause rapid dissolution and overestimation of the aqueous phase concentrations compared to groundwater in contact with contaminated soils. Although dissolution may be reduced for

[44] Defra (2010). "The River Basin Districts Typology, Standards and Groundwater Threshold Values". Water Framework Directive (England and Wales) Directions 2010.

[45] Defra (2015). " Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015".

[46] EA (2002). "Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the Environment Protection Act 1990."

[47] SEPA (2010). "Assigning Groundwater Assessment Criteria for Pollutant Inputs." WAT-PS-10-01.

highly hydrophobic contaminants[48], such as B(a)P it is likely that the initial leaching will remove the most readily available hydrocarbons and subsequent flushing would reduce the leachable concentrations[49]. Traditionally the leaching test was developed for inorganic constituents and the leaching of organics is poorly understood[50].

No contaminants in groundwater exceeded relevant screening criteria, apart from concentrations of sulphate that exceeded the EQS (2001) of 400mg/l. However, based on the 2001 criteria, sulphate is not a priority substance and therefore LKC does not consider it to be a risk.

Based on the above, LKC considers the probability of contaminants on site affecting the main surface water receptors (New Islington Marina and Shooters Brook Culvert) as low. Given the medium consequence, a low/moderate risk is anticipated (Pollutant Linkage 4) and no remediation is required.

5.5 Additional Risk Assessment

5.5.1 Concrete (Pollutant Linkage 5)

Water soluble sulphate and pH tests were carried out on soil and groundwater samples. Full results are presented in Appendix C (soils) and Appendix D (groundwater) and summarised in Table 5-4.

Strata	pH		Sulphate	
	Soil	Groundwater	Soil (g/l)	Groundwater (mg/l)
Made Ground	8.1 – 10.5	8.1-8.2	0.024-0.350	36-970
Natural	8.2 - 8.7		<0.010-0.052	

Table 5-4: Summary of pH and sulphate results.

pH in all samples was recorded as greater than 5.5 so assessment of the impact of chloride was not required.

Sulphate resistant concrete will be required at the site. The site was classified as DS-2 AC-2.

Based on the above, the probability of sulphate concentrations affecting buildings is likely. Given the consequence is considered to be mild, the risk (pollutant linkage 5) is anticipated to be moderate/low risk and remediation (sulphate resistant concrete) is remediation is required. This should be confirmed with the structural engineer.

5.5.2 Potable Water Supply (Pollutant Linkage 6)

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination[51]. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed. The following contaminants were not considered to be a risk and therefore not included in the analysis suites: speciated petroleum hydrocarbons, chlorinated compounds, BTEX compounds, phenols, cresols, ethers, nitrobenzene, ketones, aldehydes and amines.

[48] EA (1999)."Methodology for the Derivation of Remedial Targets for the Soil and Groundwater to Protect Water Resources." R&D Technical Report, P20
[49] EA (2006)."Remedial targets Methodology: Hydrological Risk Assessment for Land Contamination."
[50] EA (2009). "Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for Hydrological Risk Assessment."
[51] UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."

Elevated TVOCs (inc. naphthalene) have been identified in made ground across the site based on very stringent criteria of 0.5mg/kg.

It is likely that barrier pipe will be required across the site subject to the depth and location of the water pipes and in consultation with UU.

Once details of the pipeline location and depths are known a UU Risk Assessment should be undertaken.

At this stage, the probability of organic contaminants affecting potable water pipes is likely. Given the consequence is considered to be medium, the risk (Pollutant Linkage 6) is anticipated to be moderate risk and remediation (i.e. barrier pipe) is likely to be required (subject to further risk assessment).

5.5.3 Phytotoxicity (Pollutant Linkage 7)

Soil results were compared to phytotoxic guideline values as outlined in BS3882[52].

No elevated contaminants were identified therefore the probability of phytotoxic contaminants affecting vegetation is considered to be unlikely. With a minor consequence, the risk (Pollutant Linkage 7) is anticipated to be very low.

In addition to the above, the characteristics of the made ground should also be taken into account if it is to be used as a topsoil / growing medium for flora. The material should be assessed against the parameters outlined in Table 1 of BS3882 (not included within this assessment). Made ground with undesirable material (e.g. brick, ash, glass) was noted across the site. Irrespective of the contamination risk, this material should not be used as topsoil and it is recommended that a suitable topsoil of at least 150mm is placed over this undesirable made ground.

5.6 Revised Contamination Conceptual Model

The preliminary contamination conceptual model (Table 2-3) has been revised following the risk assessments undertaken in Sections 5.1-5.5. The revised contamination conceptual model follows the same methodology and guidance used in the preliminary contamination conceptual model. The risk matrix is provided in Appendix A.

The revised contamination conceptual model is presented in Table 5-5.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers during development work. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors associated with the future use of the site. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

[52] BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.

Further details of the remedial proposals and a remedial option appraisal are given in Section 8.

Pollutant Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL1	– Dermal contact. – Inhalation of soil, fibres and dust. – Ingestion of soils, dust, vegetables, soil attached to vegetables. – Windblown dust.	– Future residents. – Site users. – Offsite receptors.	- ACM.	Unlikely	Severe	Moderate / **Low**	– No asbestos identified during SI therefore low risk considered appropriate. – **Recommendation**: No remediation required*[1] but nominal 150mm cover to prevent access to undesirable material.
			- Heavy metals and PAH.	Unlikely	Medium	**Low**	– Statistically no elevated contaminants across the site. – **Recommendation:** No remediation required but nominal 150mm cover to prevent access to undesirable material.
PL2	– Inhalation of vapours. – Migration through permeable strata and preferential pathways.	– Future residents. – Site users.	- Volatile Contaminants.	Unlikely	Medium	**Low**	– No elevated volatile contaminants across site. – **Recommendation:** No remediation required.
PL3	– Inhalation of gas. – Migration through permeable strata and preferential pathways. – Explosion in confined spaces (methane only).	– Future residents. – Buildings. – Offsite land users.	- Carbon dioxide	Unlikely	Severe	**Moderate /** Low	– Slightly elevated carbon dioxide identified (max. 5.7%v/v) on one occasion with low flow rate. GSV classified as CS1. – Additional risk assessment noted a low risk. – **Recommendation:** No remediation required.
			- Methane	Unlikely	Severe	Moderate / **Low**	– No significant methane concentrations identified (max. 0.1%v/v) and low flow rate. – Low risk assumed as GSV for methane classified as CS1. – **Recommendation**: No remediation required.
PL4	– Surface Run-off. – Migration through permeable strata and preferential pathways – Perched waters migration.	– Surface water: – New Islington Marina – Shooters Brook Culvert.	Mobile contaminants: - PAHs. - Sulphate	Low Likelihood	Medium	Moderate / **Low**	– Secondary B aquifer not considered a viable receptor – Measurable elevated PAHs in leachate samples identified. Leachate test considered to be unreliable for organics and given the environmental settings and ground conditions encountered not considered to pose a significant risk to surface water. – Elevated sulphate recorded in water samples but not considered to be a priority substance. – **Recommendation**: No remediation required.
PL5	– Sulphate attack on concrete.	– Building structure.	– Sulphate.	Likely	Mild	**Moderate** / Low	– Elevated sulphate identified across the site (max. 970mg/l) therefore moderate risk considered appropriate. – **Recommendation:** Sulphate resistant concrete in line with DS-2 AC-2.
PL6	– Ingestion of tainted water supply.	– Future site users (via potable water).	Organic Contaminants: – Naphthalene.	Likely	Medium	**Moderate**	– Likely probability as elevated naphthalene encountered which could permeate water pipes and contaminate water supply. – **Recommendation:** Barrier piping likely to be required subject to UU risk assessment
PL7	– Direct Contact (plant uptake).	– Flora.	Phytotoxic Contaminants.	Unlikely	Minor	**Very Low**	– No elevated contaminants identified*[2]. – **Recommendation**: No remediation required. But approx. 150mm cover to prevent access to undesirable material.

Table 5-5. Revised Contamination Conceptual Model.

Notes

*[1] Although no ACM identified, contractors should be vigilant during earthworks of any potential ACM. This is discussed further in Section 8.2.3

*[2] Although no phytotoxic contaminants identified in soils, the characteristics of the made ground should also be taken into account if it is to be used as a topsoil / growing medium for flora. The material should be assessed against the parameters outlined in Table 1 of BS3882:2015 (not included within this assessment).

6 WASTE DISPOSAL ASSESSMENT

The soil contamination results as presented in Appendix C have been used to help determine the disposal route should any material be earmarked for off-site disposal.

As an initial screen the soil results were inputted into '**CAT-WASTE**^{SOIL}'. This is a web-based facility that allows an assessment of contaminant soils and classifies the soils as either hazardous or non-hazardous waste.

It is understood that **CAT-WASTE**^{SOIL} has been designed to cover the European Waste Catalogue code number 17 05 03 "soil and stones containing dangerous substances" and follows current guidance[53,54,55,56,57].

Where less than limits of detection (LOD) were recorded, the value of the LOD was inputted.

The results show that all the samples tested are classified as **NON-HAZARDOUS WASTE**. The output sheets are provided in Appendix H.

[53] EA (2013). "Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Waste". Technical Guidance WM3. 1st Edition 2015.
[54] The Hazardous Waste Directive, (HWD, Council Directive 91/689/EC).
[55] European Waste Catalogue, 2002 (EWC 2002, Commission Decision 2000/532/EC) as amended by Commission Decision 2001/118/EC, 2001/119/EC and Council Decision 2001/573/E.
[56] List of Wastes (England) Regulations 2005.
[57] Approved Supply List (Eighth Edition), 2002. ISBN: 0 7176 2368 8.

7 CONCLUSIONS

7.1 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 7-1 below (more detailed model provided in Section 5). Where a moderate / low risk was identified, the assumed risk at this stage has been shown.

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to site users via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	**Low**	- No asbestos identified. Statistically no elevated contaminants identified on site. - **Recommendations:** No remediation required. Nominal 150mm topsoil cover in garden and landscaped areas to reduce contact with undesirable material (glass, brick etc.)
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	**Low**	- No volatile contamination identified. - **Recommendations:** No remediation required.
3	Gas posing a risk to buildings and site users via the migration of gas into building causing explosion and asphyxiation.	**Moderate**	- Slightly elevated carbon dioxide (5.7%v/v) on one occasion and low flow rates. Gas regime was risk assessed. - **Recommendations:** Site classed as CS1. No gas protection measures required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	**Low**	- Measurable elevated PAHs in leachate samples. Leachate test unreliable for organics. Not considered a risk to surface water. - Elevated sulphate in one sample of groundwater. Not considered to be a priority substance. - **Recommendations:** No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	**Moderate**	- Elevated sulphate identified in parts of the site. - **Recommendations:** Sulphate resistant concrete (DS-2 AC-2) .
6	Organic contaminants posing a risk to water pipes.	**Moderate**	- Organic contamination identified at potable pipe depth of 0.75-1.35mbgl. - **Recommendations:** UU risk assessment to be completed. The site will likely require barrier piping.
7	Phytotoxic metals posing a risk to flora via root uptake.	**Low**	- No phytotoxic metals above generic criteria. Materials within made ground unsuitable for garden areas eg. Glass, brick and ash. - **Recommendations:** No remediation required but 150mm cover in garden areas to cover over undesirable material.

Table 7-1: Summary Risk Table.

Remedial recommendations are presented in Section 7.

8 RECOMMENDATIONS AND REMEDIAL STRATEGY

The recommendations provided below are considered appropriate for the site based on the site investigation work undertaken. LKC should stress that no remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

8.1 Remediation and Validation

Table 8-1 details the remedial recommendations / requirements. The table shows work required pre-construction (i.e. during earthworks) and during / post construction.

Phase	PL	Remediation Requirements	Validation Requirements
Pre-Construction	1 & 2	Earthworks Site Inspections / Unexpected Contamination A watching brief (daily / weekly) should be maintained during earthworks to confirm the ground conditions and identify any unusual ground conditions. Should any unusual ground conditions be encountered, work should stop and samples be collected for chemical analysis. Depending on the outcome of the chemical analysis further remediation may be required.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work (TBC).
		Any site own material reused on site should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following: 1,000 tonnes (c.600m cube) of non hazardous soil. 5,000 tonnes (c. 3,000 cube) of natural sand and gravels. 50,000 tonnes (c.25,000 cube) of bitumous material to be used in roadways. 5,000 tonnes (c. 3,000 cube) of crushed concrete / stone. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits.	To ensure material is compliant with appropriate waste regulations. Material will need to be tested at the rate and analytical suites presented in Table 8-2. If a MMP is required this needs to be registered by a Qualified Person (QP) and there must be'certainty of use' for any material to be re-used onsite or exported to site to ensure there is no 'sham recovery'.
	General	A nominal 150mm of clean topsoil required to reduce contact with underlying undesirable material matix.	Material should be suitable as a growing medium for topsoil following BS3882[58].
Build-Phase Construction	5	Sulphate Resistant Concrete Sulphate Resistant Concrete in line with DS-2 AC-2 recommended.	N/A
	6	Potable Water Pipes It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is likely that barrier pipe will be required.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.

Table 8-1: Remediation and validation requirements
Notes: See Table 5-5 for pollutant linkage (PL) details.

[58] BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

8.1.1 Validation of Imported Subsoil / Topsoil

Chemical validation of all imported soils to be used on site in gardens and soft landscaping areas should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

A summary of the required imported material sampling requirements are presented in Table 8-2. Ideally, the material should be sampled at source to prevent double handling if soil fails, with confirmatory sampling undertaken on importation to site. However, where this is not possible then material imported should be segregated based on source and soil type. Validation samples should be taken prior to placement in gardens and landscaped areas to ensure suitability for use.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil	Greenfield	Suite A	1 sample per 50m^3 (minimum of 3 samples per source)
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 150m^3 (minimum of 3 samples per source)
Physical Stone Break Layer	First Generation i.e. quarried sand (subsoil) or stone (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / screened)	Suite B	1 sample per 500m^3 (minimum of 3 samples per source)

Table 8-2: Sampling requirements for imported soils.

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

In addition, it should be ensured that the matrix of the topsoil is suitable as a growing medium and no undesirable material is present (in line with BS3882[59]). LKC advise this information is provided by the supplier before material is imported onto site and approved by the appointed landscaper.

Imported material to be used in gardens will be compared against residential with plant uptake criteria (as used in the contamination risk assessment (Section 5-1)). Appropriate remedial target criteria are presented in Appendix F.

8.2 OTHER CONSIDERATIONS

8.2.1 Health and Safety Considerations

In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance[60]) should be adopted by all workers involved with site enabling and construction works.

[59] BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.
[60] HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

8.2.2 Asbestos Management Strategy

Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733[61].

8.2.3 Piling in Contaminated Land

It is understood that the building will be piled into the bedrock. This may provide a preferential pathway for contaminants to the Secondary B Aquifer. Once the method of piling has been determined, good practice for the drilling of piles on contaminated sites should be adhered to, such as guidance provided by the Environment Agency[62].

8.2.4 Mares Tail

There is anecdotal evidence of Mares Tail being present on site. If this is identified during earthworks or construction, it should be dealt with appropriately.

8.3 Site Completion Report

It is recommended that any remediation carried out on the site is validated by a third party and suitable documentary evidence provided in a Site Completion Report, such as photographs, consignment documents and analytical results. This should include as a minimum:

- Verification testing of all imported soil for garden and soft landscaping areas.
- Information on the installation of protective pipes and / or sterile trenches.
- Details of any unexpected contamination identified onsite, suitably risk assessed and / or validated.
- Provision of any disposal tickets.

The aim of the Completion Report will be to demonstrate to the Local Authority that the site has been suitably remediated to the extent that construction works may commence and, in accordance with the National Planning Policy Framework (NPPF)[63].

- The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;
- After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990[64];
- Adequate site investigation information, prepared by a competent person, is presented.

Once the above is satisfied the Local Authrotiy should be able to discharge all the relevant contaminated land conditions.

[61] CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.
[62] Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.
[63] DCL (2012) 'National Planning Policy Framework'. Department of Communities and Local Government. March 2012.
[64] Defra(2006) 'Environmental Protection Act 1990: Part 2A Contaminated Land.' Defra Circular 01/2006.

FIGURES

APPENDIX A

RISK MATRIX

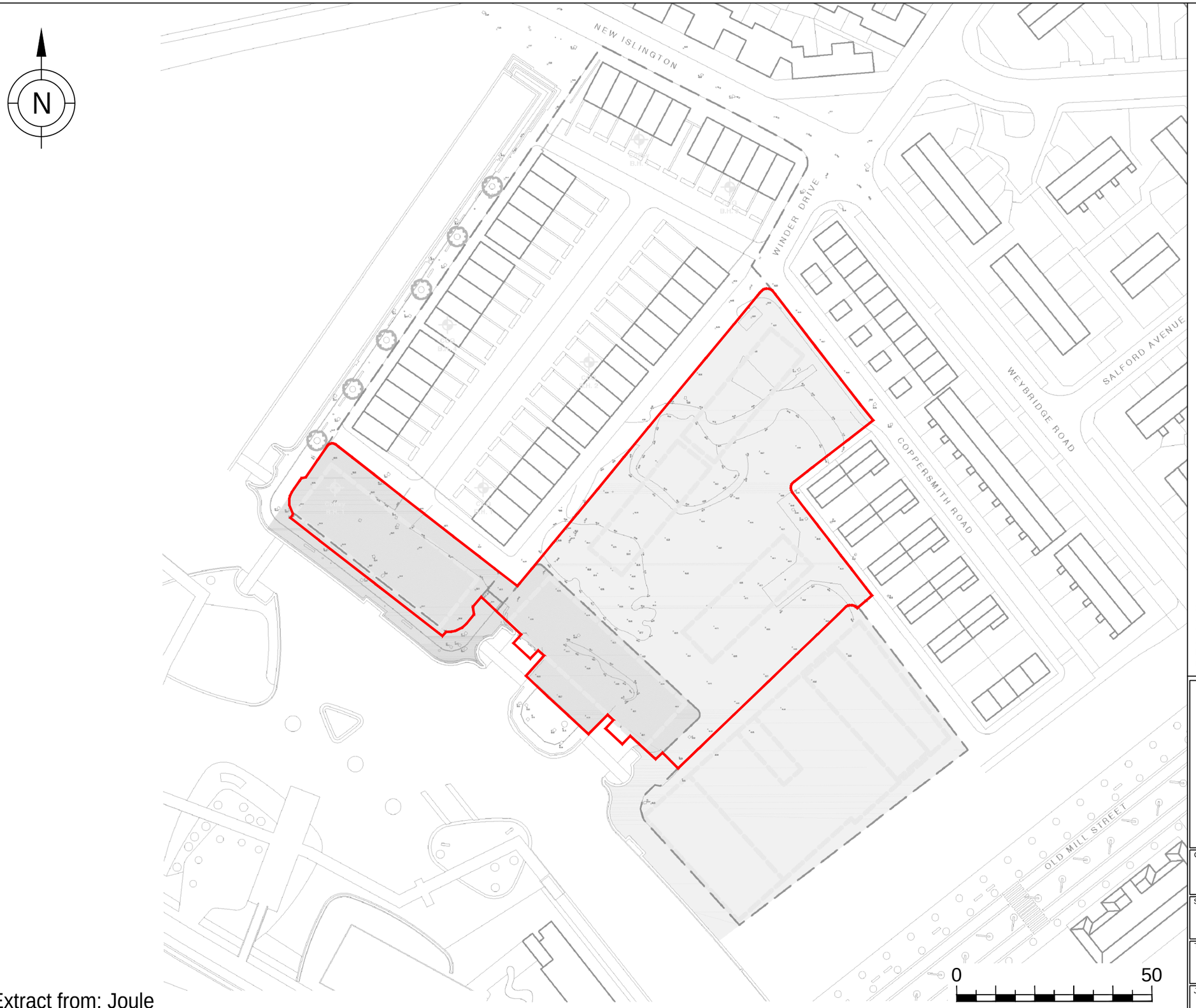


Contains Ordnance Survey data © Crown copyright and database right 2010

Figure 1: Site Location Plan, Phase 2 Development, New Islington, Manchester

Drawn: December 2016 Scale: 1:25,000 @ A4 (see scale bar)

LK CONSULT LIMITED



KEY

Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: Urban Splash

Site: Phase 2 Development, New Islington, Manchester

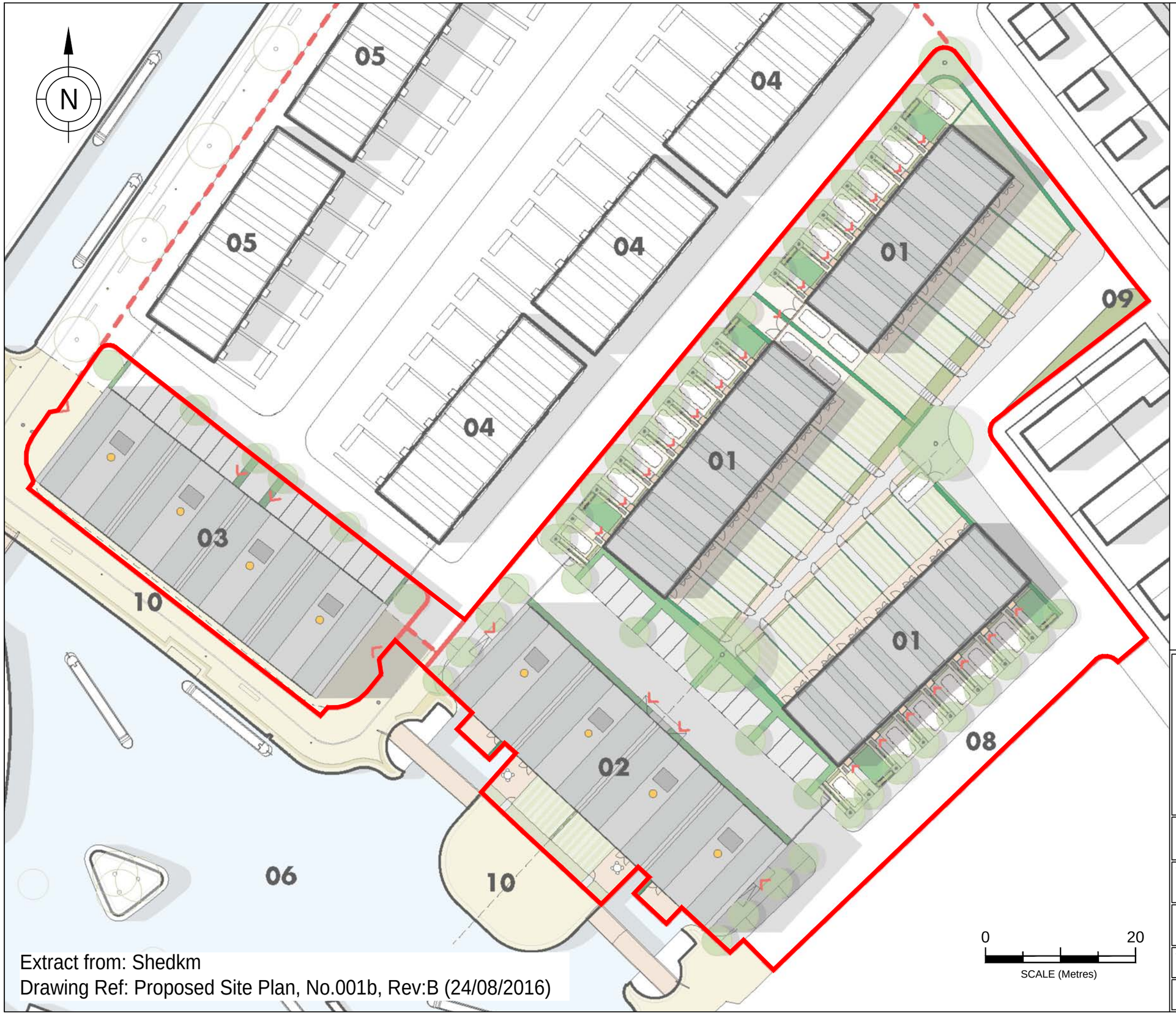
Title: Site Boundary Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1334	1:1000 @ A3	2	

Drawn By:	Checked By:	Drawn:
AC	RC	Dec 2016

Extract from: Joule
Drawing Ref: Existing Site Plan, No.SI 20 (August 2016)

© Copyright Joule Consulting Engineers Limited



Extract from: Shedkm
Drawing Ref: Proposed Site Plan, No.001b, Rev:B (24/08/2016)

KEY

Site Boundary

proposed three stroey terraced houses	01
mansion house apartments (ground floor commerical)	02
mansion house apartments (ground floor residentail)	03
two storey terraced houses NI Phase 01	04
three storey terraced houses NI Phase 01	05
New Islington mairna	06
vacant land for development	07
proposed access road	08
landscape top suit existing falls	09
completed public realm to New Islington marina	10
residential entrances	^
commerical entrances	^

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

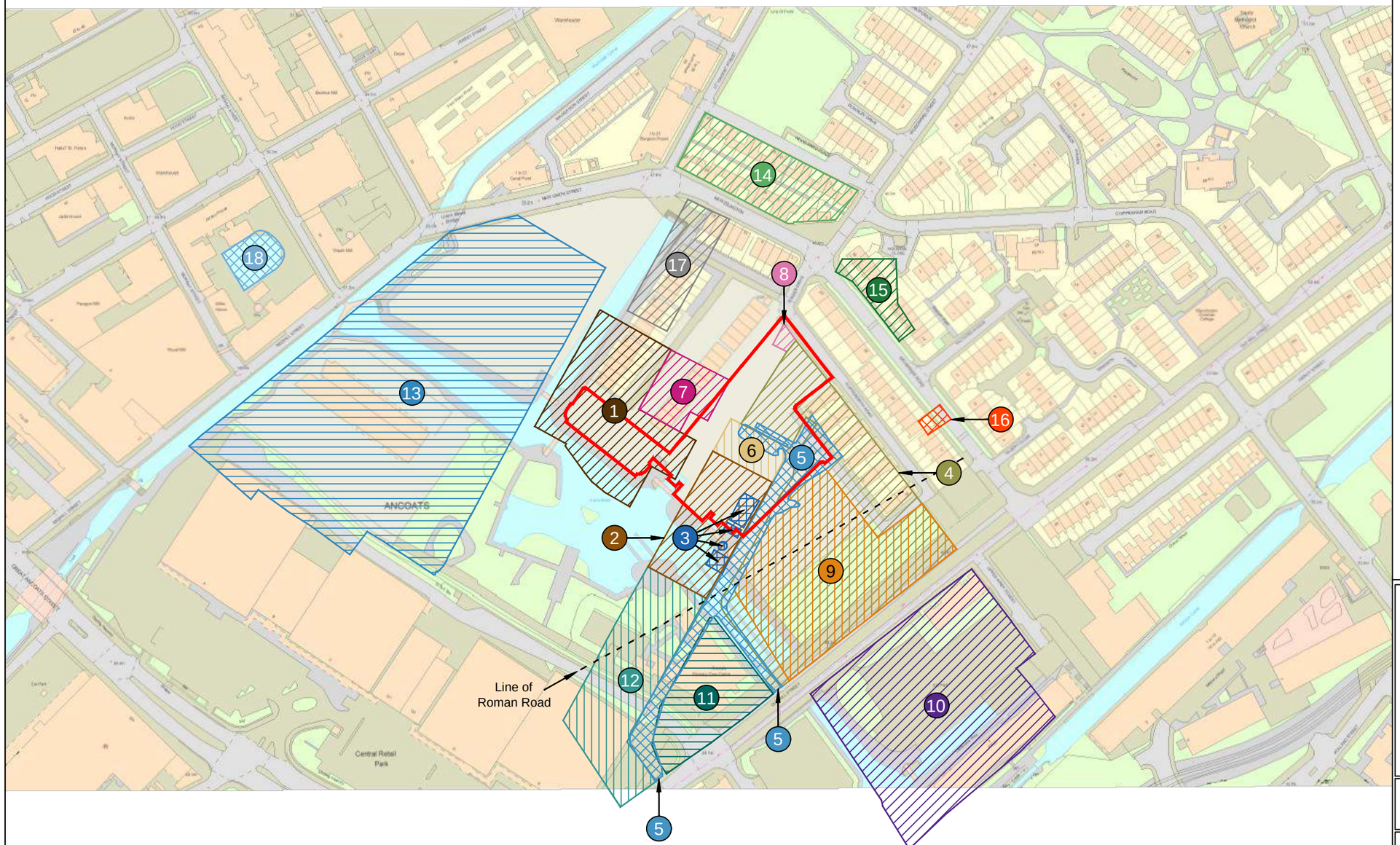
Client: Urban Splash

Site: Phase 2 Development, New Islington, Manchester

Title: Proposed Site Use

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1334	1:500 @ A3	3	

Drawn By:	Checked By:	Drawn:
AC	RC	Dec 2016



Extract from: Envirocheck
Drawing Ref: Existing Site Plan (December 2016)

0 50 100
SCALE (Metres)

KEY

- Site Boundary
- 1 Cotton Mills/Engineering Works/ Other Works
- 2 Canal Street Dye Works
- 3 Reservoirs
- 4 Glass Works/ Other Works
- 5 Canal Branch & Dock
- 6 Dock Yard/Stables/Garage
- 7 Church/School/Play Ground
- 8 Public House
- 9 Brick Field
- 10 Hospital
- 11 Wharfs/Works
- 12 Wharfs/Works
- 13 Canals/Wharfs/Works
- 14 Mill/Works
- 15 Foundry
- 16 Timber Yard
- 17 Foundry
- 18 Basin/Reservoir

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

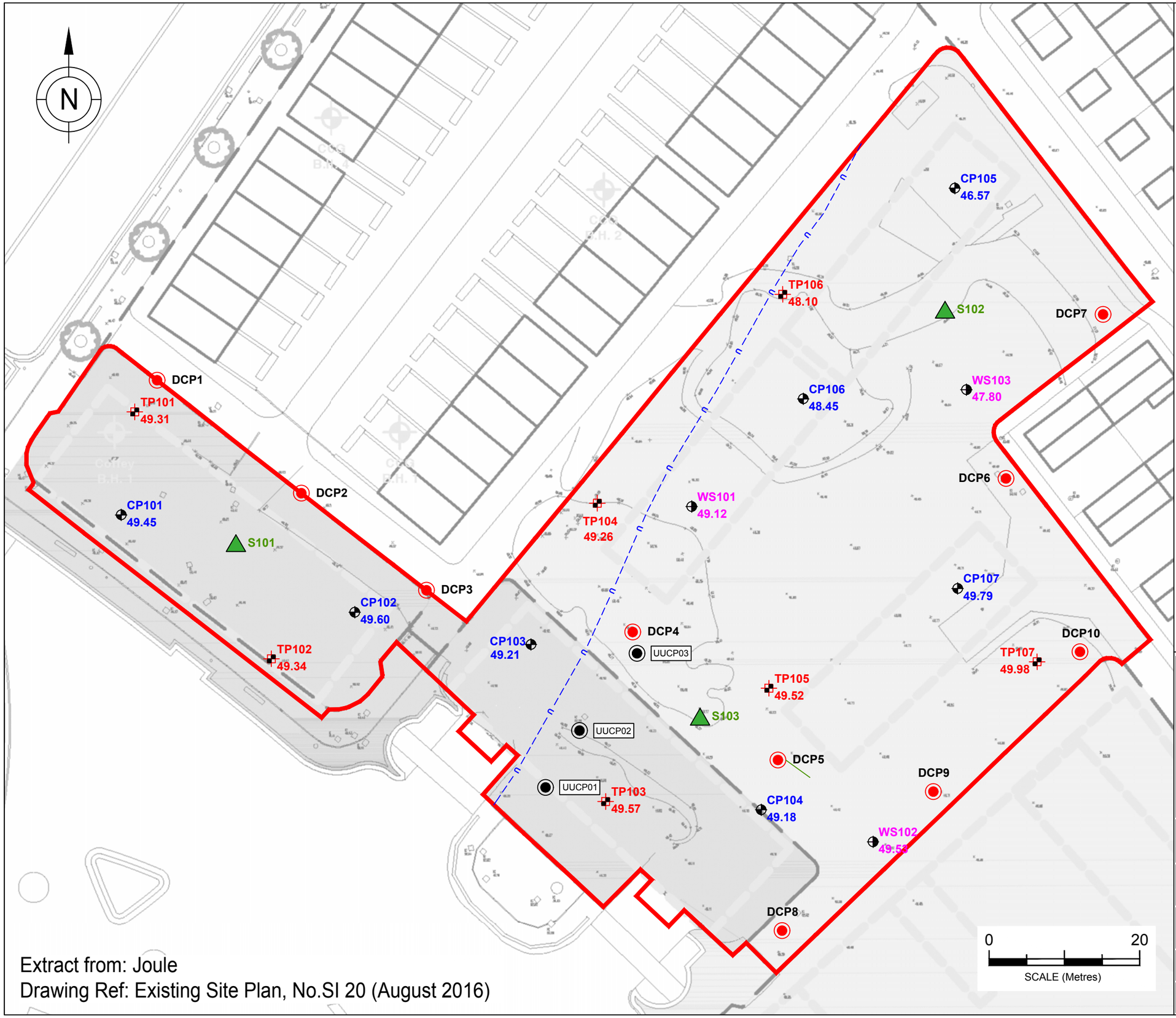
Client: Urban Splash

Site: Phase 2 Development, New Islington, Manchester

Title: Historical Features

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1334	1:2500 @ A3	4	

Drawn By:	Checked By:	Drawn:
AC	CB	Dec 2016



Extract from: Joule
Drawing Ref: Existing Site Plan, No.SI 20 (August 2016)

KEY

- Site Boundary
- Window Sample Borehole (WS)
- Trial Pit (TP)
- Cable Percussive Borehole (CP)
- Dynamic Cone Penetrometer Hole (DCP)
- Line of Culvert
- UU Cable Percussive Borehole (UUCP)
- Soakaway Location (S)

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: Urban Splash

Site: Phase 2 Development, New Islington, Manchester

Title: Site Investigation Location Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1334	1:500 @ A3	5	

Drawn By:	Checked By:	Drawn:
AC	RC	Mar 2017

Risk Evaluation

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552[65]. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude if the probability (likelihood) of the risk occurring (Table B).

Consequence (Severity)		
Classification	**Definition**	**Example**
Severe	- Short term (acute) risk to human health likely to results in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. - Short term risk of pollution (note: water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. - Catastrophic damage to buildings/properties. - A short term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	- High Concentrations of cyanide on the surface of an informal recreation area. - Major spillage of contaminants from site into controlled waters. - Explosion, causing building collapse (can also equate to short term human health risk if buildings are occupied).
Medium	- Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). - Pollution of sensitive water resources (note Water Resources Act contains no scope for considering significance of pollution). - A significant change in a particular ecosystem, or organism forming part of such ecosystem.	- Concentrations of a contaminant from site exceed generic, or site specific assessment criteria. - Leaching of contaminants from a site to a major or minor aquifer (Principal and Secondary). - Death of a species within a designated nature reserve.
Mild	- Pollution of non-sensitive water resources. - Significant damage to crops, buildings, structures and services ('significant harm' as defined in DETR, 2000). - Damage to sensitive buildings/structures/services or the environment.	- Pollution of non-classified groundwater. - Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	- Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. - Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). - Easily repairable damage to buildings, structures and services.	- The presence of contaminants at such concentrations that protective equipment is required during site works. - The loss of plants in a landscaping scheme. - Discoloration of concrete.

Table A. Classification of Consequence

Probability (Likelihood)	
Classification	**Definition**
High Likelihood	- There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	- There is a pollutant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. - Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	- There is a pollutant linkage and circumstances are possible under which an event could occur. - However it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	- There is a pollutant linkage but circumstances are such that it is improbable that an event would occur in the very long term.

Table B. Classification of Probability.

[65] CIRIA C552 (2001) Contaminated Land Risk Assessment - A guide to good practice.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table C. Comparison of Consequence against Probability

Once the risk has been determined the corresponding action can be assessed (Table D).

Risk	Action Required
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that sever harm to a designated receptor is currently happening. This risk, if realised, is likely to results in a substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table D. Description of the Classification and Likely Action Required.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk is identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

APPENDIX B

PROFILE LOGS

Window Sample Logs

Trial Pit Logs

Cable Percussion Logs

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Number
New Islington, Manchester	WS101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Urban Splash	LKC 16 1334
	Location	**Dates** 13-12-2016	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00 0.00-1.00	D1 PID <0.1ppm					MADE GROUND: Firm consistency dark brown sandy very gravelly clay with occasional cobbles of brick and sandstone, and with plastic, metal and rubber. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded, of brick, sandstone, tile, coal, clinker, and glass.			
1.00-1.45 1.00-2.00 1.00-2.00	SPT N=11 D2 PID <0.1ppm		3,3/3,3,3,2		(3.26)				
2.00-2.45 2.00-3.00 2.00-3.00	SPT N=8 D3 PID <0.1ppm		2,2/3,2,2,1						
3.00-3.23	SPT 50/75		7,5/5,45		3.26	Complete at 3.26m			

Remarks
No groundwater encountered.

Scale (approx)	Logged By
1:40	NS

Figure No.
LKC 16 1334.WS101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Number
New Islington, Manchester	**WS102**

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Urban Splash	LKC 16 1334
	Location	**Dates** 13-12-2016	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00 0.00-1.00	D1 PID <0.1ppm					MADE GROUND: Firm to stiff consistency dark brown sandy gravelly clay with rare plastic. Sand is fine to coarse. Gravel is fine to medium, angular to sub-rounded, of brick, coal, sandstone, limestone and clinker.			
1.00-1.45 1.00-2.00 1.00-2.00	SPT N=15 D2 PID <0.1ppm		3,3/4,3,4,4		(2.90)				
2.00-2.45 2.00-2.90 2.00-2.90	SPT N=6 D3 PID <0.1ppm		1,1/2,1,1,2						
3.00-3.45	SPT N=16		3,3/3,3,5,5		2.90 (1.50)	MADE GROUND: White / brown sandy clayey gravel. Sand is fine to coarse. Gravel is fine to medium, angular to sub-angular, of limestone (MOT).		▽1	
4.00-4.45	SPT N=13		Water strike(1) at 4.00m. 2,3/3,3,3,4						
4.50-5.00 4.50-5.00	D4 PID <0.1ppm				4.40 (0.60)	Firm consistency brown very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine, angular to sub-angular, of coal and sandstone.			
5.00-5.45	SPT N=23		3,3/4,5,6,8		5.00 (0.45) 5.45	Stiff conssitency brown slightly silty CLAY. Complete at 5.45m			

Remarks

Scale (approx)	Logged By
1:40	NS

Figure No. LKC 16 1334.WS102

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Number
New Islington, Manchester	WS103

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Urban Splash	LKC 16 1334
	Location	**Dates** 13-12-2016	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00 0.00-1.00	D1 PID <0.1ppm				(0.90)	MADE GROUND: Firm consistency sandy gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular, of brick, coal and limestone.			
					0.90				
1.00-1.45 1.00-1.90 1.00-1.90	SPT N=26 D2 PID <0.1ppm		10,9/9,6,6,5		(0.50)	MADE GROUND: White / orange very sandy gravel. Sand is medium to coarse. Gravel is fine to medium, angular to sub-angular, of limestone (MOT).			
					1.40				
					(0.50)	MADE GROUND: Firm consistency sandy gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular, of brick, coal, clinker and limestone.			
					1.90				
2.00-2.45 2.00-3.00 2.00-3.00 2.00-3.00	SPT N=15 B1 D3 PID <0.1ppm		3,3/3,4,4,4			Firm consistency brown mottled grey and orange sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, angular to sub-rounded, of coal and sandstone.			
3.00-3.45	SPT N=35		6,7/7,9,9,10						
					(3.25)				
3.70-4.15	SPT N=31		4,5/5,7,9,10						
4.70-5.15	SPT N=35		6,7/7,9,9,10						
					5.15	Complete at 5.15m			

Remarks
No groundwater encountered.

Scale (approx)	Logged By
1:40	NS

Figure No.
LKC 16 1334.WS103

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site New Islington, Manchester			**Trial Pit Number** S101
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 2.2m x 0.6m x 2.6m	**Ground Level (mOD)**	**Client** Urban Splash **Job Number** LKC 16 1334
	Location	**Dates** 01-02-2017	**Engineer** LKC **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-2.00	D1				(2.60)	MADE GROUND: Dark brown / black sandy gravelly cobbley clay with occasional ash and clinker, metal, wood, plastic and glass. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rouded, of brick, slate, concrete and coal. Cobbles are sub-angular of brick and concrete.		
					2.60	Complete at 2.60m		



Remarks
Excavating from 2.00m.
No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:25	NS	LKC 16 1334.S101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site New Islington, Manchester			**Trial Pit Number** S102
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 1.7m x 0.6m x 2.0m	**Ground Level (mOD)**	**Client** Urban Splash	**Job Number** LKC 16 1334
	Location	**Dates** 01-02-2017	**Engineer** LKC	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-2.00	D1				(1.90)	MADE GROUND: Dark brown / black sandy gravelly cobbley clay with occasional ash and clinker, metal, wood, wire, plastic and glass. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rouded, of brick, slate, tarmacadam, concrete and coal. Cobbles are sub-angular of brick and concrete.		
					1.90 (0.10) 2.00	MADE GROUND: Yellow brown cobbley sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular, of sandstone and brick. Cobbles are angular to sub-angular of sandstone and brick. Complete at 2.00m		



Remarks
Excavating from 2.00m.
No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:25	NS	LKC 16 1334.S101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com		**Site** New Islington, Manchester	**Trial Pit Number** **S103**
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 1.8m x 0.6m x 2.1m **Location**	**Ground Level (mOD)** **Dates** 01-02-2017	**Client** Urban Splash **Engineer** LKC	**Job Number** LKC 16 1334 **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-2.00	D1				(1.90)	MADE GROUND: Dark brown / black sandy gravelly cobbley clay with occasional ash and clinker, metal, wood, wire, plastic and glass. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rouded, of brick, slate, tarmacadam, concrete and coal. Cobbles are sub-angular of brick and concrete.		
					1.90	Complete at 2.10m		



Remarks
Excavating from 2.00m.
No groundwater encountered.

Scale (approx)	Logged By	Figure No.
1:25	NS	LKC 16 1334.S101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP101

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.45	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385243.979 E 398522.811 N	14-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00	D1						MADE GROUND: Brown very sandy gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded, of brick, coal, concrete, limestone, ash and clinker.			
1.20-1.65	SPT N=18			2,3/5,5,4,4						
2.10-2.51	SPT 50/255			1,3/6,8,18,18		(4.80)				
3.20-3.63	SPT 50/275			6,6/6,10,18,18,16						
4.00-4.45	SPT N=41			6,7/8,8,10,15						
4.80-4.89	SPT 25*/50 50/40			25/50	44.65	4.80	NO RECOVERY			
				Fast(1) at 5.80m, no rise after 15 mins, sealed at 9.20m.		(1.70)			▼1	
6.50-6.95	SPT N=22			3,4/4,5,6,7	42.95	6.50	MADE GROUND: Soft brown very sandy slightly gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded, of brick, clinker, limestone, coal and concrete.			
						(0.70)				
7.40-7.59	SPT 50/40			9,14/50	42.25	7.20	MADE GROUND: Reddish brown very sandy gravel. Sand is fine to coarse. Gravel is fine to medium, angular to sub-angular, of brick.			
						(1.50)				
8.70-9.15	SPT N=14			2,2/2,3,4,5	40.75	8.70	Soft consistency brown slightly sandy CLAY with occasional gravel. Sand is fine to coarse. Gravel is fine to medium, sub-rounded, of sandstone.			
					40.55	(0.20) 8.90	Firm to stiff consistency brown slightly sandy CLAY with occasional gravel. Sand is fine to coarse. Gravel is fine to medium, sub-rounded, of sandstone.			
9.50-9.80	B1									

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP101

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.45	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385243.979 E 398522.811 N	14-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(2.10)				
10.10-10.55	U100									
10.60	D2									
11.00-11.45	SPT N=35			4,5/7,8,10,10	38.45	11.00	Stiff to very stiff consistency brown slightly sandy slightly gravelly CLAY with sand lenses. Sand is fine to coarse. Gravel is fine, angular to sub-rounded, of sandstone, coal and mudstone.			
12.00-12.45	U100									
12.50	D3					(3.10)				
12.50-12.80	B2									
12.80-13.25	SPT N=38			6,7/8,10,10,10						
13.50-13.95	U100									
14.10-14.40	B3				35.35	14.10	Very dense orange brown slightly silty SAND with occasional gravel. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded, of sandstone.			
14.20-14.52	SPT 50/170			9,14/17,25,8						
						(1.90)			▼2	
15.10-15.37	SPT 50/115			10,13/24,26						
15.70-15.92	SPT 50/70			9,15/50						
					33.45	16.00	Very dense brown slightly clayey SAND. Sand is medium to coarse.		▽2	
				Slow(2) at 16.30m, rose to 15.70m in 20 mins.		(1.00)				
16.70-17.00	SPT 50/145			10,15/21,29						
					32.45	17.00	Complete at 17.00m			

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP102

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.60	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385275 E 398509.899 N	08-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	D1						MADE GROUND: Dark brown gravelly sandy clay with occasional cobble of concrete. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded, of brick, concrete, ash, and clinker.		
1.20-1.65	SPT N=4			1,2/2,1,0,1					
2.10-2.55	SPT N=17			6,5/3,3,6,5					
						(6.30)			
3.20-3.65	SPT N=16			3,4/3,3,4,6					
4.10-4.55	SPT N=25			10,8/6,5,8,6					
5.00-5.45	SPT N=24			4,4/7,7,6,4					
6.20-6.65	SPT N=19			1,4/4,4,4,7	43.30	6.30	Stiff consistency brown mottled grey gravelly slightly sandy CLAY. Sand is fine to medium. Gravel is fine, angular, to sub-rounded, of coal and sandstone.		
						(0.70)			
7.00-7.45	U100				42.60	7.00	Firm to very stiff consistency brown mottled grey gravelly slightly sandy CLAY. Sand is fine to medium. Gravel is fine, angular, to sub-rounded, of coal and sandstone.		
7.50-7.95	SPT N=36			5,5/7,8,10,11					
7.50	D2								
8.00-8.30	B1								
8.50-8.95	U100								
9.00	D3								
9.50-9.95	SPT N=38			4,5/6,7,11,14					

Remarks
Excavating from 1.00m.

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH102

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP102

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.60	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385275 E 398509.899 N	08-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.10-10.55	U100					(6.50)			
10.60	D4								
10.90-11.35	SPT N=34			4,6/7,7,9,11					
11.50-11.80	B2								
12.20-12.65	SPT N=37			5,7/8,9,10,10					
13.50-13.95	U100				36.10	13.50	Stiff consistency brown sandy laminated CLAY. Sand is fine to medium.		
						(0.50)			
14.00	D5				35.60	14.00	Complete at 14.00m		

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH102

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP103

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.21	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385298.404 E 398505.611 N	15-12-2016-16-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	D1						MADE GROUND: Grey brown very sandy gravelly clay with rare tile. Sand is fine to medium. Gravel is fine to coarse, sub-angular to angular, of birck, coal, ash, and clinker.		
1.20-1.65	SPT N=6			1,2/2,1,1,2					
2.20-2.65	SPT N=3			1,0/1,0,1,1					
						(5.30)			
3.10-3.55	SPT N=39			4,5/7,9,10,13					
4.20-4.65	SPT N=44			7,8/10,10,11,13					
					43.91	5.30			
5.50-5.95	SPT N=36			4,5/6,10,10,10			Firm to very stiff consistency brown mottled grey slightly gravelly CLAY. Gravel is fine, angular to sub-angular, of coal and sandstone.		
6.00-6.30	B1								
6.50-6.95	U100								
						(2.80)			
7.00	D2								
7.30-7.75	SPT N=39			4,5/8,9,10,12					
					41.11	8.10			
8.10-8.55	U100						Very stiff consitency brown slightly gravelly CLAY with occasional coal fragments. Gravel is fine, sub-rounded to rounded, of sandstone.		
8.60	D3								
8.70-9.00	B2								
9.00-9.45	SPT N=43			4,6/9,10,11,13					

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH103

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP103

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.21	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385298.404 E 398505.611 N	15-12-2016-16-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00-10.45	U100								
10.50	D4					(5.10)			
10.70-11.15	SPT N=42			5,7/9,10,10,13					
11.70-12.15	U100								
12.20	D5								
12.50-12.95	SPT N=32			5,6/7,8,8,9					
					36.01	13.20	Stiff consistency brown slightly sandy laminated CLAY. Sand is fine to medium.		
13.20-13.50	B3								
13.50-13.95	U100					(1.20)			
14.00	D6								
					34.81	14.40	Very dense orange brown very gravelly SAND. Sand is fine to medium. Gravel is fine to medium, angular to rounded, of coal and sandstone.		
14.50-14.80	SPT 50/145			10,14/21,29					
15.60-15.89	SPT 50/135			10,13/20,30		(2.50)			
16.30-16.57	SPT 50/115			11,13/24,26					▼1
				Fast(1) at 16.50m, rose to 16.10m in 20 mins.					▽1
					32.31	16.90	Stiff to very stiff consistency sandy CLAY with occasional gravel of coal and sandstone.		
17.30-17.75	U100								
17.80	D7								
18.00-18.30	B4					(2.40)			
18.50-18.95	SPT N=41			6,9/11,10,10,10					
					29.91	19.30	Very dense orange gravelly SAND. Sand is fine to medium. Gravel is fine to medium, sub-rounded to rounded, of sandstone.		
19.60-20.04	SPT 50/285			6,8/10,12,13,15		(0.70)			
					29.21	20.00			

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH103

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

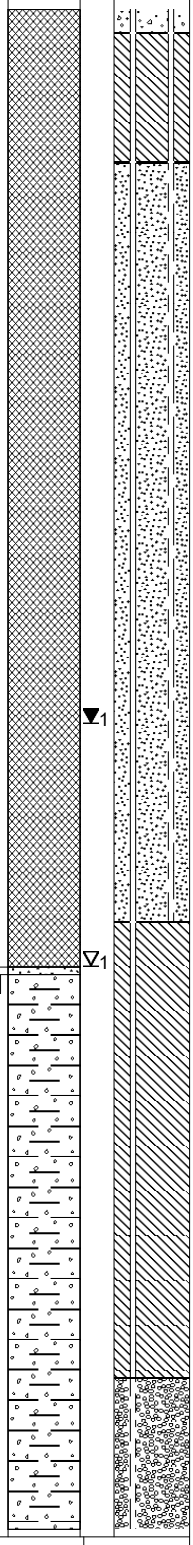
LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP104

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.18	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385328.983 E 398483.662 N	20-12-2016-21-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
0.00-1.00	D1						MADE GROUND: Brown slightly sandy slightly gravelly clay with rare clinker gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded, of brick, sandstone, and coal.
1.20-1.65	SPT N=10			2,2/3,3,2,2			
2.10-2.55	SPT N=7			2,2/2,1,2,2			
						(6.30)	
3.20-3.65	SPT N=16			3,4/4,4,4,4			
4.50-4.95	SPT N=11			1,2/3,3,3,2			
5.50-5.95	SPT N=13			2,3/3,2,4,4			
				Fast(1) at 6.30m, rose to 4.70m in 20 mins, sealed at 7.50m.	42.88	6.30	
					42.83	6.35	Orangish brown fine to medium SAND.
6.30-6.75	SPT N=32			4,4/6,7,8,11			Soft to very stiff consistency dark brown slightly gravelly thinly laminated CLAY. Gravel is fine to medium, sub-angular to sub-rounded, of coal and sandstone.
7.00-7.30	B1						
7.50-7.95	U100						
8.00	D2						
8.30-8.75	SPT N=33			4,5/6,6,9,12			
						(4.15)	
9.10-9.55	U100						
9.60	D3						
9.70-10.15	SPT N=32			5,5/7,7,8,10			



Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH104

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP104

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.18	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385328.983 E 398483.662 N	20-12-2016-21-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.30	B2									
10.50-10.95	U100				38.68	10.50	Very stiff consistency dark brown slightly sandy slightly gravelly CLAY with lenses of brown very sandy silt and orange sand. Sand is fine to medium. Gravel is fine to medium, sub-angular to sub-rounded, of coal and sandstone.			
11.00	D4									
11.20-11.50	B3									
11.50-11.95	SPT N=42			5,9/10,10,11,11		(3.60)				
12.50-12.89	SPT 50/235			7,11/14,14,15,7						
13.60-14.05	SPT N=45			7,10/10,12,12,11						
14.10-14.38	SPT 50/125			9,15/23,27	35.08	14.10	Very dense orange brown SAND with rare gravel. Sand is fine to medium. Gravel is fine, sub-rounded of coal and sandstone.			
14.50-14.80	B4									
15.30-15.62	SPT 50/170			9,12/18,22,10		(2.20)				
16.30-16.59	SPT 50/135			7,10/22,28	32.88	16.30	Stiff to very stiff consistency reddish brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine, sub-angular to sub-rounded of coal and sandstone.			
16.60-16.90	B5					(0.90)				
17.20-17.50	B6				31.98	17.20	Very stiff brown thinly laminated CLAY.			
17.40-17.85	U100					(0.80)				
18.00-18.27	SPT 50/115			7,14/23,27	31.18	18.00	Very dense orange brown slightly gravelly SAND. Sand is medium to coarse. Gravel is fine to medium, sub-angular to sub-rounded, of coal and sandstone.			
18.50-18.80	B7									
19.10-19.37	SPT 50/115			10,14/25,25		(2.00)				
19.80-20.11	SPT 50/160			9,12/18,22,10	29.18	20.00				

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH104

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP105

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		46.57	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385354.7 E 398566.182 N	12-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00	D1						MADE GROUND: Brown sandy very gravelly clay with rare plastic and occasional clinker gravel. Sand is medium to coarse. Gravel is fine to coarse, angular to sub-rounded, of brick, limestone, sandstone, and coal.			
0.00-1.00	PID <0.1ppm									
						(2.30)				
1.20-1.65	SPT N=10			2,3/2,3,3,2						
					44.27	2.30				
2.30-2.75	SPT N=10			1,2/1,2,2,5			Stiff consistency brown mottled grey sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine, angular to sub-angular, of coal and sandstone.			
						(1.10)				
3.00-3.30	B1									
					43.17	3.40				
3.90	U100						Stiff consistency brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine, angular to sub-angular, of coal and sandstone.			
4.50-4.95	SPT N=32			4,7/8,8,8,8						
5.00-5.30	B2									
5.50-5.95	SPT N=36			5,7/8,9,9,10						
						(5.10)				
6.60-7.05	U100									
7.10	D2									
7.40-7.85	SPT N=37			4,8/9,9,9,10						

Remarks

Scale (approx)	Logged By
1:40	NS

Figure No. LKC 16 1334.BH105

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP105

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		46.57	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385354.7 E 398566.182 N	12-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
8.50-8.95	U100				38.07	8.50	Very stiff consistency brown sandy slightly gravelly CLAY with sand lenses. Sand is fine to coarse. Gravel is fine, angular to sub-angular, of coal and sandstone.			
9.00	D3									
9.60-10.05	SPT N=33			5,7/7,8,8,10						
10.00-10.30	B3					(2.90)				
10.70-11.13	SPT 50/275			5,9/10,12,12,16						
11.00-11.30	B4									
11.50-11.77	SPT 50/115			7,15/21,29	35.17	11.40	Very dense reddish brown slightly clayey SAND with occasional sandstone gravel. Sand is fine to coarse.			
11.90-12.12	SPT 50/70			10,14/50		(0.72)				
					34.45	12.12	Complete at 12.12m			

Remarks

Scale (approx)	Logged By
1:40	NS

Figure No.
LKC 16 1334.BH105

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP106

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		48.45	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385334.572 E 398538.219 N	09-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	D1						MADE GROUND: Brown slightly gravelly clay with frequent crushed brick and rare clinker gravel. Gravel is fine to medium, angular to sub-angular, of brick and coal.		
1.20-1.65	SPT N=5			1,2/1,1,1,2					
2.30-2.75	SPT N=10			2,2/2,2,3,3		(4.50)			
3.50-3.95	SPT N=13			2,3/3,3,4,3					
4.50-4.95	SPT N=30			3,4/6,6,8,10	43.95	4.50	Very stiff consistency brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium, sub-angular to sub-rounded, of coal and sandstone.		
5.00-5.30	B1								
5.50-5.95	U100								
6.00	D2								
6.20-6.65	SPT N=36			5,7/8,9,9,10					
7.00-7.30	B2								
8.00-8.45	U100					(6.50)			
8.50	D3								
9.00-9.45	SPT N=37			6,6/8,8,10,11					
10.00-10.45	SPT N=32			5,6/7,8,8,9					

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No. LKC 16 1334.BH106

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP106

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		48.45	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385334.572 E 398538.219 N	09-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
11.00-11.45	U100				37.45	11.00	Very stiff consistency slightly sandy CLAY with sand lenses and occasional gravel. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded, of coal and sandstone.		
11.50	D4								
12.00-12.45	SPT N=38			6,7/9,10,10,9					
						(3.05)			
12.70-13.15	D5								
12.70-13.15	U100								
13.00-13.30	B3								
13.60-14.05	SPT N=30			5,6/7,7,8,8					
					34.40	14.05	Complete at 14.05m		

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No. LKC 16 1334.BH106

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP107

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.79	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385355.068 E 398513.052 N	20-12-2016-21-12-2016	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							MADE GROUND: Brown very sandy gravelly CLAY with rare clinker gravel. Sand is medium to coarse. Gravel is fine to medium, angular to sub-angular, of brick, concrete, sandstone, and coal.		
1.20-1.65	SPT N=4			1,0/2,0,1,1					
2.20-2.65	SPT N=5			1,2/2,1,1,1		(4.90)			
3.00-3.31	SPT 50/160			9,10/19,21,10					
4.00-4.33	SPT 43/180			6,10/11,11,21					▼1
				Fast(1) at 4.90m, rose to 4.70m in 20 mins, sealed at 5.00m.	44.89	4.90			▽1
4.90-5.35 5.50-5.80	SPT N=35 B1			4,5/7,7,10,11		(1.10)	Very stiff consistency brown mottled grey slightly sandy slightly gravelly thinly laminated CLAY. Sand is fine to medium. Gravel is fine, angular to sub-rounded, of coal and sandstone.		
6.50-6.65	U100				43.79	6.00			
6.70 6.80-7.25	D1 SPT N=34			5,7/8,8,9,9		(2.00)	Stiff to very stiff consistency brown mottled grey CLAY with rare gravel. Gravel is fine to medium, angular to sub-rounded, of coal and sandstone.		
7.50-7.95	U100								
8.00-8.45 8.00	SPT N=35 D2			6,7/8,9,9,9	41.79	8.00	Stiff to very stiff consistency brown mottled grey slightly gravelly CLAY. Gravel is fine to medium, angular to sub-rounded, of coal and sandstone.		
9.00-9.45	U100								
9.50	D3								
9.70-10.15	SPT N=37			6,8/9,9,10,9					

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BH107

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	CP107

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.79	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385355.068 E 398513.052 N	20-12-2016-21-12-2016	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.20-10.50	B2								
11.00-11.45	U100					(5.95)			
11.50	D4								
11.50-11.80	B3								
12.20-12.65	SPT N=32			5,5/7,7,8,10					
13.50-13.95	SPT N=33			4,5/7,8,9,9					
					35.84	13.95	Complete at 13.95m		

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No. LKC 16 1334.BH107

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	UUCP101

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.37	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385298.489 E 398484.024 N	09-02-2017	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(4.80)	MADE GROUND: Grey brown very sandy gravelly clay with rare tile. Sand is fine to medium. Gravel is fine to coarse, sub-angular to angular, of brick, concrete, coal, ash and clinker.			
					44.57	4.80				
						(0.70)	MADE GROUND: Brown slightrly sandy clay with rare brick content. Sand is fine to coarse.			
					43.87	5.50				
5.90-6.20	B1						Very stiff consistency brown mottled grey slightly gravelly CLAY. Gravel is fine, angular to sub-angular, of coal and sandstone.			
7.50-7.95	U100									
8.00	D1									
8.20-8.50	B2					(5.50)				
9.00-9.45	U100									
9.50	D2									
9.70-10.00	B3									

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BHUU03

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	UUCP101

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.37	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385298.489 E 398484.024 N	09-02-2017	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.60-11.05	U100									
11.10	D3				38.37	11.00	Very stiff consistency brown sandy CLAY. Sand is fine to medium.			
11.50-11.80	B4					(1.00)				
					37.37	12.00	Complete at 12.00m			

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BHUU03

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	UUCP102

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.35	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385302.575 E 398495.351 N	03-02-2017	LKC	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(5.60)	MADE GROUND: Grey brown very sandy gravelly clay with rare tile. Sand is fine to medium. Gravel is fine to coarse, sub-angular to angular, of brick, coal, ash and clinker.			
					43.75	5.60				
6.00-6.30	B1						Very stiff consistency brown mottled grey slightly gravelly CLAY. Gravel is fine, angular to sub-angular, of coal and sandstone.			
7.40-7.85	U100									
7.90	D1					(4.55)				
8.00-8.30	B2									
9.00-9.45	U100									
9.50	D2									

Remarks
Borehole refused on a boulder at 10.15mbgl.

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BHUU03

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	UUCP102

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.35	Urban Splash	LKC 16 1334

Location	Dates	Engineer	Sheet
385302.575 E 398495.351 N	03-02-2017	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.10-10.15	SPT 0*/50 50/0			/50	39.20	10.15	Boulder encountered at 10.10mbgl. Complete at 10.15m			

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BHUU03

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** New Islington, Manchester		**Borehole Number** **UUCP103**
Boring Method Cable Percussion	**Casing Diameter**	**Ground Level (mOD)** 49.24	**Client** Urban Splash	**Job Number** LKC 16 1334
	Location 385308.101 E 398506.305 N	**Dates** 09-02-2017	**Engineer** LKC	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(4.80)	MADE GROUND: Grey brown very sandy gravelly clay with rare tile. Sand is fine to medium. Gravel is fine to coarse, sub-angular to angular, of brick, concrete, coal, ash and clinker.			
					44.44	4.80				
5.20-5.50	B1						Very stiff consistency brown mottled grey slightly gravelly CLAY. Gravel is fine, angular to sub-angular, of coal and sandstone.			
7.40-7.85	U100									
7.90	D1					(6.20)				
8.00-8.30	B2									
9.00-9.45	U100									
9.50	D2									

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BHUU03

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Borehole Number
New Islington, Manchester	UUCP103

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		49.24	Urban Splash	LKC 16 1334
	Location	**Dates**	**Engineer**	**Sheet**
	385308.101 E 398506.305 N	09-02-2017	LKC	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.30	B3									
10.50-10.95	U100									
11.00	D3				38.24	11.00	Very stiff consistency brown silty CLAY.			
11.20-11.50	B4					(1.00)				
					37.24	12.00	Complete at 12.00m			

Remarks

Scale (approx)	Logged By
1:50	NS

Figure No.
LKC 16 1334.BHUU03

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

APPENDIX C

CERTIFICATE OF ANALYSIS - SOIL

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Amended Report

Report No.:	16-30395-2		
Initial Date of Issue:	21-Dec-2016	**Date of Re-Issue:**	17-Jan-2017
Client	LK Consult		
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Contaminated Land Rosemary Cummings		
Project	LKC 16 1334 - New Islington Phase 2-3		
Quotation No.:		**Date Received:**	12-Dec-2016
Order No.:	732237	**Date Instructed:**	12-Dec-2016
No. of Samples:	11		
Turnaround (Wkdays):	8	**Results Due:**	21-Dec-2016
Date Approved:	21-Dec-2016		
Approved By:			



Details: Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 - New Islington Phase 2-3

Client: LK Consult				**Chemtest Job No.:**	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395
Quotation No.:				**Chemtest Sample ID.:**	389668	389671	389673	389675	389678	389681	389683	389684	389687
				Client Sample ID.:	TP105	TP106	TP106A	TP107	CP102	TP101	TP101	TP102	TP103
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0
				Bottom Depth (m):	1.0	1.0	1.8	1.0	1.0	0.7	3.4	1.0	0.6
				Date Sampled:	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016
				Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	13	14	14	15	14	15	15	15
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
pH	M	2010		N/A	8.9	8.5	8.7	8.5	10.5	8.8	8.6	8.6	8.7
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.56	0.096	0.070	0.076	0.041	0.098	0.087	0.20	0.073
Chloride (Extractable)	U	2220	mg/kg	20						< 20	< 20	32	40
Arsenic	M	2450	mg/kg	1.0	13	14	14	17	15	15	21	22	15
Cadmium	M	2450	mg/kg	0.10	0.37	0.36	0.38	0.68	1.6	0.53	0.68	0.59	0.42
Chromium	M	2450	mg/kg	1.0	27	28	24	27	17	25	41	43	23
Copper	M	2450	mg/kg	0.50	55	44	38	70	47	44	75	73	43
Mercury	M	2450	mg/kg	0.10	0.27	0.19	0.17	0.39	0.17	0.21	0.82	0.58	0.24
Nickel	M	2450	mg/kg	0.50	33	35	31	26	18	29	34	41	28
Lead	M	2450	mg/kg	0.50	140	100	95	190	85	120	270	230	110
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	26	28	23	22	16	23	35	30	23
Zinc	M	2450	mg/kg	0.50	120	99	89	190	140	140	230	200	120
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.1	2.8	2.6	5.5	4.1	4.0	5.3	6.7	3.1
Naphthalene	M	2700	mg/kg	0.10	0.62	2.1	0.77	0.64	2.7	3.2	1.7	0.15	0.60
Acenaphthylene	M	2700	mg/kg	0.10	0.13	0.43	0.38	0.39	0.49	4.1	0.66	0.28	0.42
Acenaphthene	M	2700	mg/kg	0.10	0.34	1.5	2.2	0.99	1.5	1.2	1.0	1.4	0.65
Fluorene	M	2700	mg/kg	0.10	0.36	1.6	1.6	0.83	1.1	4.7	1.2	1.5	0.61
Phenanthrene	M	2700	mg/kg	0.10	2.3	8.9	11	6.2	7.6	28	8.1	9.4	4.3
Anthracene	M	2700	mg/kg	0.10	0.55	2.2	3.0	1.3	0.48	7.2	1.8	0.72	1.2
Fluoranthene	M	2700	mg/kg	0.10	2.8	9.6	11	9.1	9.8	26	11	9.4	6.6
Pyrene	M	2700	mg/kg	0.10	3.3	10	11	9.2	0.39	25	12	9.3	6.9
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.4	4.4	4.4	4.1	4.6	12	4.9	4.0	3.2
Chrysene	M	2700	mg/kg	0.10	1.4	4.6	4.7	4.8	5.3	11	5.2	4.5	3.7
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.6	4.6	4.9	5.2	5.7	11	5.6	4.5	3.9
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.98	2.0	2.2	2.3	2.8	4.6	2.5	2.1	1.9
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.3	3.7	3.9	4.1	4.7	9.6	4.3	3.8	3.1
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	0.74	2.3	2.8	2.9	2.9	5.8	3.3	2.9	2.3
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.53	0.94	0.95	1.1	1.2	1.9	1.3	0.76	0.90
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	0.85	2.4	2.4	3.0	3.2	5.4	3.1	2.4	2.1

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 - New Islington Phase 2-3

Client: LK Consult												
Quotation No.:			**Chemtest Job No.:**		16-30395	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395	16-30395
			Chemtest Sample ID.:		389668	389671	389673	389675	389678	389681	389683	389684	389687
			Client Sample ID.:		TP105	TP106	TP106A	TP107	CP102	TP101	TP101	TP102	TP103
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0
			Bottom Depth (m):		1.0	1.0	1.8	1.0	1.0	0.7	3.4	1.0	0.6
			Date Sampled:		08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016	08-Dec-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Total Of 16 PAH's	M	2700	mg/kg	2.0	19	61	67	56	55	160	68	57	42

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 - New Islington Phase 2-3

Client: LK Consult		**Chemtest Job No.:**			16-30395	16-30395
Quotation No.:		**Chemtest Sample ID.:**			389688	389690
		Client Sample ID.:			TP103	TP104
		Sample Type:			SOIL	SOIL
		Top Depth (m):			0.6	0.0
		Bottom Depth (m):			2.0	1.0
		Date Sampled:			08-Dec-2016	08-Dec-2016
		Asbestos Lab:			COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	13	18
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay
pH	M	2010		N/A	8.7	8.3
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.29	0.35
Chloride (Extractable)	U	2220	mg/kg	20	44	30
Arsenic	M	2450	mg/kg	1.0	20	20
Cadmium	M	2450	mg/kg	0.10	0.62	0.49
Chromium	M	2450	mg/kg	1.0	25	28
Copper	M	2450	mg/kg	0.50	57	53
Mercury	M	2450	mg/kg	0.10	0.34	0.36
Nickel	M	2450	mg/kg	0.50	23	32
Lead	M	2450	mg/kg	0.50	140	160
Selenium	M	2450	mg/kg	0.20	< 0.20	0.31
Vanadium	U	2450	mg/kg	5.0	20	31
Zinc	M	2450	mg/kg	0.50	140	180
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	5.5	7.8
Naphthalene	M	2700	mg/kg	0.10	0.78	1.4
Acenaphthylene	M	2700	mg/kg	0.10	0.26	0.40
Acenaphthene	M	2700	mg/kg	0.10	0.90	1.1
Fluorene	M	2700	mg/kg	0.10	0.75	1.1
Phenanthrene	M	2700	mg/kg	0.10	5.6	9.2
Anthracene	M	2700	mg/kg	0.10	1.3	2.0
Fluoranthene	M	2700	mg/kg	0.10	8.0	12
Pyrene	M	2700	mg/kg	0.10	8.1	12
Benzo[a]anthracene	M	2700	mg/kg	0.10	3.5	5.3
Chrysene	M	2700	mg/kg	0.10	3.9	5.6
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	4.5	6.4
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	2.1	2.5
Benzo[a]pyrene	M	2700	mg/kg	0.10	3.6	5.0
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	2.5	3.4
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.79	1.2
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	2.1	3.2

Results - Soil

Project: LKC 16 1334 - New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-30395	16-30395
Quotation No.:			**Chemtest Sample ID.:**		389688	389690
			Client Sample ID.:		TP103	TP104
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0.6	0.0
			Bottom Depth (m):		2.0	1.0
			Date Sampled:		08-Dec-2016	08-Dec-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Total Of 16 PAH's	M	2700	mg/kg	2.0	49	72

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Amended Report

Report No.:	16-30580-2		
Initial Date of Issue:	22-Dec-2016	**Date of Re-Issue:**	17-Jan-2017
Client	LK Consult		
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Rosemary Cummings Contaminated Land		
Project	LKC 16 1334 New Islington Phase 2-3		
Quotation No.:		**Date Received:**	13-Dec-2016
Order No.:	732237	**Date Instructed:**	13-Dec-2016
No. of Samples:	5		
Turnaround (Wkdays):	8	**Results Due:**	22-Dec-2016
Date Approved:	22-Dec-2016		
Approved By:			
Details:	Robert Monk, Technical Development Chemist		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult					**Chemtest Job No.:**	16-30580	16-30580	16-30580	16-30580	16-30580
Quotation No.:					**Chemtest Sample ID.:**	390489	390492	390495	390497	390498
					Client Sample ID.:	WS101	WS102	WS103	WS103	CP105
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.0	0.0	0.0	2.0	0.0
					Bottom Depth (m):	1.0	1.0	1.0	3.0	1.0
					Date Sampled:	12-Dec-2016	12-Dec-2016	12-Dec-2016	12-Dec-2016	12-Dec-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A		-	-	-	-	
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	
Moisture	N	2030	%	0.020		14	15	15	17	14
Soil Colour	N	2040		N/A		Brown	Brown	Brown	Brown	
Other Material	N	2040		N/A		Stones	Stones	Stones	NONE	
Soil Texture	N	2040		N/A		Clay	Clay	Clay	Clay	
pH	M	2010		N/A		8.5	8.6	8.1	8.2	
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010		0.12	0.15	0.27	0.024	
Chloride (Extractable)	U	2220	mg/kg	20		36	< 20	20	< 20	< 20
Arsenic	M	2450	mg/kg	1.0		21	14	11	12	
Cadmium	M	2450	mg/kg	0.10		0.44	0.21	< 0.10	< 0.10	
Chromium	M	2450	mg/kg	1.0		23	27	26	43	
Copper	M	2450	mg/kg	0.50		57	41	29	30	
Mercury	M	2450	mg/kg	0.10		0.27	0.22	< 0.10	< 0.10	
Nickel	M	2450	mg/kg	0.50		28	30	35	56	
Lead	M	2450	mg/kg	0.50		180	100	45	18	
Selenium	M	2450	mg/kg	0.20		< 0.20	< 0.20	< 0.20	< 0.20	
Vanadium	U	2450	mg/kg	5.0		26	23	27	40	
Zinc	M	2450	mg/kg	0.50		160	130	77	69	
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	
Organic Matter	M	2625	%	0.40		5.9	3.5	1.9	1.1	
Naphthalene	M	2700	mg/kg	0.10		1.1	1.5	< 0.10	< 0.10	
Acenaphthylene	M	2700	mg/kg	0.10		0.27	0.37	< 0.10	< 0.10	
Acenaphthene	M	2700	mg/kg	0.10		0.84	0.49	< 0.10	< 0.10	
Fluorene	M	2700	mg/kg	0.10		0.88	0.62	< 0.10	< 0.10	
Phenanthrene	M	2700	mg/kg	0.10		5.7	3.8	< 0.10	< 0.10	
Anthracene	M	2700	mg/kg	0.10		1.6	0.80	< 0.10	< 0.10	
Fluoranthene	M	2700	mg/kg	0.10		8.5	4.4	0.23	< 0.10	
Pyrene	M	2700	mg/kg	0.10		9.1	4.7	0.21	< 0.10	
Benzo[a]anthracene	M	2700	mg/kg	0.10		3.9	1.8	< 0.10	< 0.10	
Chrysene	M	2700	mg/kg	0.10		4.3	1.9	< 0.10	< 0.10	
Benzo[b]fluoranthene	M	2700	mg/kg	0.10		5.4	2.3	< 0.10	< 0.10	
Benzo[k]fluoranthene	M	2700	mg/kg	0.10		1.9	0.76	< 0.10	< 0.10	
Benzo[a]pyrene	M	2700	mg/kg	0.10		4.3	1.7	< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10		2.8	1.2	< 0.10	< 0.10	
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10		0.77	0.30	< 0.10	< 0.10	
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10		3.9	1.5	< 0.10	< 0.10	

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-30580	16-30580	16-30580	16-30580	16-30580
Quotation No.:			**Chemtest Sample ID.:**		390489	390492	390495	390497	390498
			Client Sample ID.:		WS101	WS102	WS103	WS103	CP105
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.0	0.0	0.0	2.0	0.0
			Bottom Depth (m):		1.0	1.0	1.0	3.0	1.0
			Date Sampled:		12-Dec-2016	12-Dec-2016	12-Dec-2016	12-Dec-2016	12-Dec-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Total Of 16 PAH's	M	2700	mg/kg	2.0	55	28	< 2.0	< 2.0	

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

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

Final Report

Report No.:	16-30825-1
Initial Date of Issue:	21-Dec-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Contaminated Land Rosemary Cummings
Project	LKC 16 1334 New Islington Phase 2-3

Quotation No.:		**Date Received:**	16-Dec-2016
Order No.:	732237	**Date Instructed:**	19-Dec-2016
No. of Samples:	3		
Turnaround (Wkdays):	3	**Results Due:**	21-Dec-2016
Date Approved:	21-Dec-2016		

Approved By:



Details: Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-30825	16-30825	16-30825
Quotation No.:			**Chemtest Sample ID.:**		391692	391693	391694
			Client Sample ID.:		WS102	CP106	CP101
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		4.5	0	0
			Bottom Depth (m):		5.0	1.0	1.0
			Date Sampled:		14-Dec-2016	12-Dec-2016	13-Dec-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	13	15	13
Soil Colour	N	2040		N/A	Brown	Brown	Brown
Other Material	N	2040		N/A	NONE	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay
pH	M	2010		N/A	8.7	8.5	8.9
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.27	0.12
Chloride (Extractable)	U	2220	mg/kg	20	26	58	60
Arsenic	M	2450	mg/kg	1.0	7.0	25	13
Cadmium	M	2450	mg/kg	0.10	0.28	0.49	0.33
Chromium	M	2450	mg/kg	1.0	18	32	24
Copper	M	2450	mg/kg	0.50	19	61	93
Mercury	M	2450	mg/kg	0.10	< 0.10	0.34	0.23
Nickel	M	2450	mg/kg	0.50	28	33	26
Lead	M	2450	mg/kg	0.50	11	360	97
Selenium	M	2450	mg/kg	0.20	< 0.20	0.21	< 0.20
Vanadium	U	2450	mg/kg	5.0	18	26	22
Zinc	M	2450	mg/kg	0.50	54	150	94
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	1.6	6.2	2.9
Naphthalene	M	2700	mg/kg	0.10	< 0.10	0.26	0.40
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	0.12	0.46
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	0.81	3.4
Fluorene	M	2700	mg/kg	0.10	< 0.10	0.72	3.2
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	5.5	16
Anthracene	M	2700	mg/kg	0.10	< 0.10	1.4	5.5
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	7.4	19
Pyrene	M	2700	mg/kg	0.10	< 0.10	7.4	19
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	2.8	7.1
Chrysene	M	2700	mg/kg	0.10	< 0.10	3.1	7.8
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	3.5	7.4
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	1.1	2.9
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	2.9	6.2
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	1.8	3.6
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	0.52	1.6
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	1.7	4.2

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult					**Chemtest Job No.:**	16-30825	16-30825	16-30825
Quotation No.:					**Chemtest Sample ID.:**	391692	391693	391694
					Client Sample ID.:	WS102	CP106	CP101
					Sample Type:	SOIL	SOIL	SOIL
					Top Depth (m):	4.5	0	0
					Bottom Depth (m):	5.0	1.0	1.0
					Date Sampled:	14-Dec-2016	12-Dec-2016	13-Dec-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Total Of 16 PAH's	M	2700	mg/kg	2.0		< 2.0	41	110

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

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

Final Report

Report No.:	16-31108-1
Initial Date of Issue:	22-Dec-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rosemary Cummings
Project	LKC 16 1334 New Islington Phase 2-3

Quotation No.:		**Date Received:**	20-Dec-2016
Order No.:	732250	**Date Instructed:**	20-Dec-2016
No. of Samples:	1		
Turnaround (Wkdays):	3	**Results Due:**	22-Dec-2016
Date Approved:	22-Dec-2016		

Approved By:



Details: Robert Monk, Technical Development Chemist

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-31108
Quotation No.:			**Chemtest Sample ID.:**		393010
			Client Sample ID.:		CP103
			Sample Type:		SOIL
			Top Depth (m):		0
			Bottom Depth (m):		1.0
			Date Sampled:		15-Dec-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.020	12
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones
Soil Texture	N	2040		N/A	Clay
pH	M	2010		N/A	8.7
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.22
Chloride (Extractable)	U	2220	mg/kg	20	68
Arsenic	M	2450	mg/kg	1.0	15
Cadmium	M	2450	mg/kg	0.10	0.47
Chromium	M	2450	mg/kg	1.0	24
Copper	M	2450	mg/kg	0.50	37
Mercury	M	2450	mg/kg	0.10	0.22
Nickel	M	2450	mg/kg	0.50	28
Lead	M	2450	mg/kg	0.50	94
Selenium	M	2450	mg/kg	0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	21
Zinc	M	2450	mg/kg	0.50	110
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	M	2625	%	0.40	3.6
Naphthalene	M	2700	mg/kg	0.10	1.0
Acenaphthylene	M	2700	mg/kg	0.10	0.18
Acenaphthene	M	2700	mg/kg	0.10	0.80
Fluorene	M	2700	mg/kg	0.10	0.80
Phenanthrene	M	2700	mg/kg	0.10	5.1
Anthracene	M	2700	mg/kg	0.10	1.6
Fluoranthene	M	2700	mg/kg	0.10	6.0
Pyrene	M	2700	mg/kg	0.10	6.3
Benzo[a]anthracene	M	2700	mg/kg	0.10	2.5
Chrysene	M	2700	mg/kg	0.10	3.0
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	3.3
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	1.4
Benzo[a]pyrene	M	2700	mg/kg	0.10	2.4
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	1.5
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.52
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	2.1

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-31108
Quotation No.:			**Chemtest Sample ID.:**		393010
			Client Sample ID.:		CP103
			Sample Type:		SOIL
			Top Depth (m):		0
			Bottom Depth (m):		1.0
			Date Sampled:		15-Dec-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Total Of 16 PAH's	M	2700	mg/kg	2.0	39

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-31133-1
Initial Date of Issue:	22-Dec-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rosemary Cummings Contaminated Land
Project	LKC 16 1334 - New Islington Phase 2-3

Quotation No.:		**Date Received:**	20-Dec-2016
Order No.:	732237	**Date Instructed:**	20-Dec-2016
No. of Samples:	2		
Turnaround (Wkdays):	3	**Results Due:**	22-Dec-2016
Date Approved:	22-Dec-2016		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 - New Islington Phase 2-3

Client: LK Consult		**Chemtest Job No.:**			16-31133	16-31133
Quotation No.:		**Chemtest Sample ID.:**			393151	393152
		Client Sample ID.:			CP105	CP102
		Sample Type:			SOIL	SOIL
		Top Depth (m):			3.90	7.50
		Date Sampled:			12-Dec-2016	08-Dec-2016
		Asbestos Lab:			COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	13	14
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	NONE	Stones
Soil Texture	N	2040		N/A	Clay	Clay
pH	M	2010		N/A	8.4	8.4
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.026	0.052
Arsenic	M	2450	mg/kg	1.0	6.1	7.4
Cadmium	M	2450	mg/kg	0.10	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0	26	28
Copper	M	2450	mg/kg	0.50	22	22
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	36	38
Lead	M	2450	mg/kg	0.50	13	13
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	24	26
Zinc	M	2450	mg/kg	0.50	55	57
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	1.5	2.2
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

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

Final Report

Report No.:	16-31245-1
Initial Date of Issue:	23-Dec-2016
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rosemary Cummings
Project	LKC 16 1334 New Islington Phase 2-3

Quotation No.:		**Date Received:**	21-Dec-2016
Order No.:	732250	**Date Instructed:**	21-Dec-2016
No. of Samples:	2		
Turnaround (Wkdays):	3	**Results Due:**	23-Dec-2016
Date Approved:	23-Dec-2016		

Approved By:



Details: Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-31245	16-31245
Quotation No.:			**Chemtest Sample ID.:**		393739	393740
			Client Sample ID.:		CP104	CP107
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0	0
			Bottom Depth (m):		1.0	1.0
			Date Sampled:		20-Dec-2016	20-Dec-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	15	12
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones, Brick	Stones, Brick
Soil Texture	N	2040		N/A	Loam	Loam
pH	M	2010		N/A	9.0	8.9
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.19	0.053
Chloride (Extractable)	U	2220	mg/kg	20	20	< 20
Arsenic	M	2450	mg/kg	1.0	14	19
Cadmium	M	2450	mg/kg	0.10	0.48	0.74
Chromium	M	2450	mg/kg	1.0	29	37
Copper	M	2450	mg/kg	0.50	37	40
Mercury	M	2450	mg/kg	0.10	0.28	0.23
Nickel	M	2450	mg/kg	0.50	29	21
Lead	M	2450	mg/kg	0.50	120	130
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	26	33
Zinc	M	2450	mg/kg	0.50	110	110
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	4.3	6.7
Naphthalene	M	2700	mg/kg	0.10	0.31	0.77
Acenaphthylene	M	2700	mg/kg	0.10	0.12	0.20
Acenaphthene	M	2700	mg/kg	0.10	0.99	0.62
Fluorene	M	2700	mg/kg	0.10	0.71	0.56
Phenanthrene	M	2700	mg/kg	0.10	5.5	4.1
Anthracene	M	2700	mg/kg	0.10	1.3	1.1
Fluoranthene	M	2700	mg/kg	0.10	6.5	6.1
Pyrene	M	2700	mg/kg	0.10	6.5	6.5
Benzo[a]anthracene	M	2700	mg/kg	0.10	2.5	2.7
Chrysene	M	2700	mg/kg	0.10	3.0	2.8
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	2.9	3.8
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.94	1.6
Benzo[a]pyrene	M	2700	mg/kg	0.10	2.3	3.0
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	1.4	1.9
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	0.54
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	1.4	2.6

Results - Soil

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult			**Chemtest Job No.:**		16-31245	16-31245
Quotation No.:			**Chemtest Sample ID.:**		393739	393740
			Client Sample ID.:		CP104	CP107
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0	0
			Bottom Depth (m):		1.0	1.0
			Date Sampled:		20-Dec-2016	20-Dec-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Total Of 16 PAH's	M	2700	mg/kg	2.0	36	39

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

APPENDIX D

CERTIFICATE OF ANALYSIS – WATER / LEACHING TEST

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Amended Report

Report No.:	17-01333-2		
Initial Date of Issue:	24-Jan-2017	**Date of Re-Issue:**	02-Mar-2017
Client	LK Consult		
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Rosemary Cummings Contaminated Land		
Project	LKC 16 1334 New Islington Phase 2-3		
Quotation No.:		**Date Received:**	20-Jan-2017
Order No.:	732283	**Date Instructed:**	20-Jan-2017
No. of Samples:	4		
Turnaround (Wkdays):	3	**Results Due:**	24-Jan-2017
Date Approved:	24-Jan-2017		
Approved By:			
Details:	Robert Monk, Technical Development Chemist		

Chemtest
The right chemistry to deliver results

Results - Water

Project: LKC 16 1334 New Islington Phase 2-3

Client: LK Consult		**Chemtest Job No.:**			17-01333	17-01333	17-01333
Quotation No.:		**Chemtest Sample ID.:**			401357	401358	401359
		Client Sample ID.:			CP101d	CP104s	WS103
		Sample Type:			WATER	WATER	WATER
		Date Sampled:			19-Jan-2017	19-Jan-2017	19-Jan-2017
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
pH	U	1010		N/A	8.2	8.2	8.1
Sulphate	U	1220	mg/l	1.0	36	150	970
Total Hardness as CaCO3	U	1270	mg/l	15	100	350	1100
Arsenic (Dissolved)	U	1450	µg/l	1.0	2.4	1.3	1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	1.5	0.14	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	< 1.0	1.6	6.3
Copper (Dissolved)	U	1450	µg/l	1.0	4.4	2.8	6.9
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	1.0	2.3	3.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	1.8	7.4
Vanadium (Dissolved)	U	1450	µg/l	1.0	1.8	< 1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	6.6	5.2	20
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	14	13	17
Naphthalene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20	< 0.20	< 0.20

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO3 equivalent.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GC FID detection

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

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

Final Report

Report No.:	17-02608-1
Initial Date of Issue:	07-Feb-2017
Client	LK Consult
Client Address:	Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Rosemary Cummings Contaminated Land
Project	LKC 16 1334 - New Islington Phase 2-3

Quotation No.:		**Date Received:**	03-Feb-2017
Order No.:	732250	**Date Instructed:**	03-Feb-2017
No. of Samples:	3		
Turnaround (Wkdays):	3	**Results Due:**	07-Feb-2017
Date Approved:	07-Feb-2017		

Approved By:



Details: Keith Jones, Technical Manager

Results - Leachate

Project: LKC 16 1334 - New Islington Phase 2-3

Client: LK Consult		**Chemtest Job No.:**			17-02608	17-02608	17-02608
Quotation No.:		**Chemtest Sample ID.:**			407135	407136	407137
		Client Sample ID.:			S101	S102	S103
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			0.00	0.00	0.00
		Bottom Depth (m):			2.00	2.00	2.00
		Date Sampled:			01-Feb-2017	01-Feb-2017	01-Feb-2017
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
pH	U	1010		N/A	9.1	8.4	8.3
Sulphate	U	1220	mg/l	1.0	38	83	110
Arsenic (Dissolved)	U	1450	µg/l	1.0	26	4.6	5.5
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	3.3	2.0	1.7
Copper (Dissolved)	U	1450	µg/l	1.0	11	3.8	5.9
Mercury (Dissolved)	U	1450	µg/l	0.50	0.59	< 0.50	0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	2.1	< 1.0	1.2
Lead (Dissolved)	U	1450	µg/l	1.0	4.8	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	3.7	2.3	1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	42	3.6	3.0
Zinc (Dissolved)	U	1450	µg/l	1.0	5.0	5.0	6.6
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	57	16	15
Naphthalene	U	1700	µg/l	0.10	1.7	< 0.10	< 0.10
Acenaphthylene	U	1700	µg/l	0.10	0.74	0.36	0.21
Acenaphthene	U	1700	µg/l	0.10	3.3	1.3	1.3
Fluorene	U	1700	µg/l	0.10	1.8	0.81	0.88
Phenanthrene	U	1700	µg/l	0.10	12	8.5	9.0
Anthracene	U	1700	µg/l	0.10	3.4	2.2	2.3
Fluoranthene	U	1700	µg/l	0.10	23	17	19
Pyrene	U	1700	µg/l	0.10	24	19	19
Benzo[a]anthracene	U	1700	µg/l	0.10	10	6.5	8.2
Chrysene	U	1700	µg/l	0.10	12	8.1	9.6
Benzo[b]fluoranthene	U	1700	µg/l	0.10	12	7.4	9.3
Benzo[k]fluoranthene	U	1700	µg/l	0.10	5.7	3.9	5.0
Benzo[a]pyrene	U	1700	µg/l	0.10	12	7.5	9.3
Indeno(1,2,3-c,d)Pyrene	U	1700	µg/l	0.10	7.1	4.2	4.7
Dibenz(a,h)Anthracene	U	1700	µg/l	0.10	1.7	0.33	0.77
Benzo[g,h,i]perylene	U	1700	µg/l	0.10	8.1	4.4	5.8
Total Of 16 PAH's	U	1700	µg/l	2.0	140	92	100

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GC FID detection

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

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

APPENDIX E

GAS MONITORING RESULTS

LK CONSULT LTD

GAS MONITORING RECORD

SITE	New Islington
REF	LKC 16 1334
DATE	23-Dec-2016
STAFF	KW
VISIT	1 of 6

EQUIPMENT*[1]		
Instrument / Model Type	Serial Number	Comments
Geotechnical Instruments GA2000+	GA10350	Serviced, calibrated & gas checked.
Solinst Interface Meter	81454-14	Operating Normally

ATMOSPHERIC / GROUND CONDITIONS	
Atmospheric Pressure Trend on Site	Steady
Atmospheric Pressure (Prev 24hrs)	Rising
Weather Conditions	Overcast, cold, some rain, breezy
Ground Conditions	Wet and boggy

Borehole ID	Date/Time	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Peak CH4 (% v/v)	% of Lower Explosive Limit*2	CO Pod (ppm)	H2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Relative Pressure (mb)	Internal Flow *3 (ltr/hr)	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Notes
CP101s	23/12/2016 10:19	0.0	1.1	13.7	0.0	0.0	0.0	0.0	85.2	1012	-0.1	0.0	6.92	8.27	
CP104s	23/12/2016 09:56	0.0	0.2	19.9	0.1	0.0	1.0	0.0	79.9	1012	-0.1	0.0	4.28	6.13	
CP105s	23/12/2016 10:52	0.0	0.1	20.4	0.0	0.0	0.0	0.0	79.5	1012	0.0	-0.4	N/A	2.89	Borehole dry.
WS101	23/12/2016 10:32	0.0	2.2	0.7	0.0	0.0	0.0	0.0	97.1	1012	-0.1	0.1	N/A	3.03	Borehole dry.
WS102	23/12/2016 09:46	0.0	0.1	3.1	0.0	0.0	0.0	0.0	96.8	1012	-0.2	0.0	3.74	3.86	
WS103	23/12/2016 10:39	0.0	2.1	11.8	0.1	0.0	0.0	0.0	86.1	1012	0.0	0.1	N/A	4.05	Borehole dry.

ABBREVIATIONS

*[1]	Refer to Note 1
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
% v/v	Percentage volume by total volume
ppm	Parts per million
mb	Millibars
ltr/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air
OEL	Occupational exposure limit

NOTES

1. Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records. and service certificates.
2. CH4 is explosive between the range of 5 - 15% v/v. 100% lower explosive limit is equal to 5% v/v CH4.
3. Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr)
4. After CIRIA C665. GSV = gas concentration (%) x flow rate. Peak CH4 and Steady CO2 values used.
5. Monitoring is carried out in line with procedures set by LKC Ltd with reference to CIRIA C665. Refer to procedural documents

LK CONSULT LTD

GAS MONITORING RECORD

SITE	New Islington
REF	LKC 16 1334
DATE	5-Jan-2017
STAFF	KW
VISIT	2 of 6

EQUIPMENT*1		
Instrument / Model Type	Serial Number	Comments
Geotechnical Instruments GA5000	G502417	Serviced, calibrated & gas checked.
Geotech oil in water meter	81454-14	Operating Normally

ATMOSPHERIC / GROUND CONDITIONS	
Atmospheric Pressure Trend on Site	Rising
Atmospheric Pressure (Prev 24hrs)	Rising
Weather Conditions	Sunny, cold, breezy
Ground Conditions	Frozen, thawed in some areas

Borehole ID	Date/Time	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Peak CH4 (% v/v)	% of Lower Explosive Limit*2	CO Pod (ppm)	H2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Internal Flow *3 (ltr/hr)	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Notes
CP101s	05/01/2017 12:22	0.1	1.2	15.1	0.1	2.0	0.0	0.0	83.6	1029	0.1	7.41	8.70	
CP104s	05/01/2017 12:02	0.1	0.3	19.8	0.1	2.0	0.0	0.0	79.8	1028	0.0	4.60	6.09	
CP105s	05/01/2017 12:42	0.1	0.1	22.3	0.1	2.0	0.0	0.0	77.5	1029	0.1	N/A	2.90	Borehole dry.
WS101	05/01/2017 12:30	0.0	1.0	16.0	0.1	0.0	0.0	0.0	83.0	1029	0.0	N/A	3.05	Borehole dry.
WS102	05/01/2017 11:55	0.1	2.0	6.1	0.1	2.0	0.0	0.0	91.8	1028	0.0	3.76	3.86	
WS103	05/01/2017 12:50	0.1	0.3	21.6	0.1	2.0	0.0	0.0	78.0	1029	0.1	N/A	4.06	Borehole dry.

ABBREVIATIONS

*1	Refer to Note 1
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
% v/v	Percentage volume by total volume
ppm	Parts per million
mb	Millibars
ltr/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air
OEL	Occupational exposure limit

NOTES

1. Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records. and service certificates.
2. CH4 is explosive between the range of 5 - 15% v/v. 100% lower explosive limit is equal to 5% v/v CH4.
3. Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr)
4. After CIRIA C665. GSV = gas concentration (%) x flow rate. Peak CH4 and Steady CO2 values used.
5. Monitoring is carried out in line with procedures set by LKC Ltd with reference to CIRIA C665. Refer to procedural documents

LK CONSULT LTD

GAS MONITORING RECORD

SITE	New Islington Phase 2-3
REF	LKC 16 1334
DATE	19-Jan-2017
STAFF	KW
VISIT	3 of 6

EQUIPMENT*[1]		
Instrument / Model Type	Serial Number	Comments
Geotechnical Instruments GA5000	G502417	Serviced, calibrated & gas checked.
Geotech oil in water meter	81454-14	Operating Normally

ATMOSPHERIC / GROUND CONDITIONS	
Atmospheric Pressure Trend on Site	Variable
Atmospheric Pressure (Prev 24hrs)	Variable
Weather Conditions	Overcast, mild
Ground Conditions	Wet and boggy

Borehole ID	Date/Time	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Peak CH4 (% v/v)	% of Lower Explosive Limit*2	CO Pod (ppm)	H2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Internal Flow *3 (ltr/hr)	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Notes
CP101s	19/01/2017 10:15	0.1	0.8	16.7	0.1	2.0	0.0	0.0	82.4	1033	0.1	6.62	8.64	
CP104s	19/01/2017 10:00	0.1	0.4	18.6	0.1	2.0	0.0	0.0	80.9	1033	0.0	4.60	6.05	
CP105s	19/01/2017 10:37	0.1	0.1	22.2	0.1	2.0	0.0	0.0	77.6	1033	0.0	N/A	2.90	Borehole dry.
WS101	19/01/2017 10:29	0.1	0.1	22.0	0.1	2.0	0.0	0.0	77.8	1033	0.0	N/A	3.05	Borehole dry.
WS102	19/01/2017 09:53	0.1	1.3	3.2	0.1	2.0	0.0	0.0	95.4	1033	0.0	3.72	3.85	
WS103	19/01/2017 10:53	0.0	0.3	20.6	0.1	0.0	0.0	0.0	79.1	1034	0.0	1.93	4.05	

ABBREVIATIONS

*[1]	Refer to Note 1
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
% v/v	Percentage volume by total volume
ppm	Parts per million
mb	Millibars
ltr/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air
OEL	Occupational exposure limit

NOTES

1. Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records. and service certificates.
2. CH4 is explosive between the range of 5 - 15% v/v. 100% lower explosive limit is equal to 5% v/v CH4.
3. Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr)
4. After CIRIA C665. GSV = gas concentration (%) x flow rate. Peak CH4 and Steady CO2 values used.
5. Monitoring is carried out in line with procedures set by LKC Ltd with reference to CIRIA C665. Refer to procedural documents

LK CONSULT LTD

GAS MONITORING RECORD

SITE	New Islington Phase 2-3
REF	LKC 16 1334
DATE	2-Feb-2017
STAFF	KW
VISIT	4 of 6

EQUIPMENT*[1]		
Instrument / Model Type	Serial Number	Comments
Geotechnical Instruments GA5000	G502417	Serviced, calibrated & gas checked.
Geotech dipmeter	81318	Operating Normally

ATMOSPHERIC / GROUND CONDITIONS	
Atmospheric Pressure Trend on Site	Steady
Atmospheric Pressure (Prev 24hrs)	Falling
Weather Conditions	Overcast, mild, breezy
Ground Conditions	Wet

Borehole ID	Date/Time	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Peak CH4 (% v/v)	% of Lower Explosive Limit*2	CO Pod (ppm)	H2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Internal Flow *3 (ltr/hr)	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Notes
CP101s	02/02/2017 11:48	0.1	0.2	21.5	0.1	2.0	0.0	0.0	78.2	986	0.0	6.73	8.70	
CP104s	02/02/2017 11:32	0.1	2.5	13.9	0.1	2.0	0.0	0.0	83.5	986	0.0	4.58	6.01	
CP105s	02/02/2017 12:10	0.1	0.1	21.9	0.1	2.0	0.0	0.0	77.9	986	0.0	N/A	2.88	Borehole dry.
WS101	02/02/2017 12:01	0.1	0.2	21.7	0.1	2.0	0.0	0.0	78.0	986	0.0	N/A	3.04	Borehole dry.
WS102	02/02/2017 11:20	0.1	1.9	3.9	0.1	2.0	0.0	0.0	94.1	986	0.0	3.71	3.85	
WS103	02/02/2017 12:22	0.0	0.7	19.3	0.1	0.0	0.0	0.0	80.0	986	0.1	1.88	4.03	

ABBREVIATIONS

*[1]	Refer to Note 1
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
% v/v	Percentage volume by total volume
ppm	Parts per million
mb	Millibars
ltr/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air
OEL	Occupational exposure limit

NOTES

1. Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records. and service certificates.
2. CH4 is explosive between the range of 5 - 15% v/v. 100% lower explosive limit is equal to 5% v/v CH4.
3. Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr)
4. After CIRIA C665. GSV = gas concentration (%) x flow rate. Peak CH4 and Steady CO2 values used.
5. Monitoring is carried out in line with procedures set by LKC Ltd with reference to CIRIA C665. Refer to procedural documents

LK CONSULT LTD

GAS MONITORING RECORD

SITE	New Islington Phase 2-3 Urban S
REF	LKC 16 1334
DATE	16-Feb-2017
STAFF	KW
VISIT	5 of 6

EQUIPMENT*[1]		
Instrument / Model Type	Serial Number	Comments
Geotechnical Instruments GA2000+	GA10350	Serviced, calibrated & gas checked.
Geotech Dipmeter	81318	Operating Normally

ATMOSPHERIC / GROUND CONDITIONS	
Atmospheric Pressure Trend on Site	Falling
Atmospheric Pressure (Prev 24hrs)	Variable
Weather Conditions	Overcast, mild, breezy
Ground Conditions	Wet

Borehole ID	Date/Time	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Peak CH4 (% v/v)	% of Lower Explosive Limit*2	CO Pod (ppm)	H2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Relative Pressure (mb)	Internal Flow *3 (ltr/hr)	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Notes
CP101s	16/02/2017 11:19	0.0	0.8	16.6	0.0	0.0	0.0	0.0	82.6	1019	-0.2	0.0	6.81	8.61	
CP104s	16/02/2017 10:46	0.0	0.5	18.6	0.0	0.0	0.0	0.0	80.9	1020	-0.2	0.0	4.57	6.01	
CP105s	16/02/2017 11:43	0.0	0.0	21.2	0.0	0.0	0.0	0.0	78.8	1019	-0.1	0.0	N/A	2.88	Borehole dry.
WS101	16/02/2017 11:35	0.0	0.4	20.3	0.0	0.0	0.0	0.0	79.3	1019	-0.2	0.0	N/A	3.04	Borehole dry.
WS102	16/02/2017 10:37	0.0	1.8	7.0	0.0	0.0	0.0	0.0	91.2	1020	-0.3	-0.1	3.76	3.86	
WS103	16/02/2017 10:28	0.0	0.4	19.6	0.0	0.0	0.0	0.0	80.0	1020	-0.3	0.0	2.06	4.06	

ABBREVIATIONS

*[1]	Refer to Note 1
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
% v/v	Percentage volume by total volume
ppm	Parts per million
mb	Millibars
ltr/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air
OEL	Occupational exposure limit

NOTES

1. Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records. and service certificates.
2. CH4 is explosive between the range of 5 - 15% v/v. 100% lower explosive limit is equal to 5% v/v CH4.
3. Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr)
4. After CIRIA C665. GSV = gas concentration (%) x flow rate. Peak CH4 and Steady CO2 values used.
5. Monitoring is carried out in line with procedures set by LKC Ltd with reference to CIRIA C665. Refer to procedural documents

LK CONSULT LTD

GAS MONITORING RECORD

SITE	New Islington Phase 2 - 3
REF	LKC 16 1334
DATE	23-Feb-2017
STAFF	KW
VISIT	6 of 6

EQUIPMENT*[1]		
Instrument / Model Type	Serial Number	Comments
Geotechnical Instruments GA5000	G502417	Serviced, calibrated & gas checked.
Geotech dipmeter	81318	Operating Normally

ATMOSPHERIC / GROUND CONDITIONS	
Atmospheric Pressure Trend on Site	Rising
Atmospheric Pressure (Prev 24hrs)	Falling
Weather Conditions	Overcast, very windy, raining, cold
Ground Conditions	Wet and boggy

Borehole ID	Date/Time	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Peak CH4 (% v/v)	% of Lower Explosive Limit*2	CO Pod (ppm)	H2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Internal Flow *3 (ltr/hr)	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Notes
CP101s	23/02/2017 10:44	0.0	1.4	15.6	0.1	0.0	0.0	0.0	83.0	975	0.0	6.77	8.61	
CP104s	23/02/2017 10:10	0.0	5.7	5.3	0.1	0.0	0.0	0.0	89.0	974	0.1	4.51	5.95	
CP105s	23/02/2017 11:16	0.0	2.1	17.8	0.0	0.0	0.0	0.0	80.1	977	0.0	N/A	2.88	Borehole dry.
WS101	23/02/2017 11:06	0.0	1.7	11.3	0.0	0.0	0.0	0.0	87.0	975	0.0	N/A	3.04	Borehole dry.
WS102	23/02/2017 10:02	0.1	2.4	3.8	0.1	2.0	0.0		93.7	974	0.1	3.75	3.86	
WS103	23/02/2017 11:29	0.0	0.1	22.3	0.0	0.0	0.0		77.6	978	0.1	1.81	4.05	

ABBREVIATIONS

*[1]	Refer to Note 1
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
% v/v	Percentage volume by total volume
ppm	Parts per million
mb	Millibars
ltr/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air
OEL	Occupational exposure limit

NOTES

1. Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records. and service certificates.
2. CH4 is explosive between the range of 5 - 15% v/v. 100% lower explosive limit is equal to 5% v/v CH4.
3. Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr)
4. After CIRIA C665. GSV = gas concentration (%) x flow rate. Peak CH4 and Steady CO2 values used.
5. Monitoring is carried out in line with procedures set by LKC Ltd with reference to CIRIA C665. Refer to procedural documents

APPENDIX F

GENERIC ASSESSMENT CRITERIA VALUES

Summary of Category 4 Screening Levels: 2015

Substance	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel	6%	180	180	230	980	230	3,400
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	Naphthalene	1%	2.3 ^{f}	2.3 ^{f}	4.1 ^{f}	190 ^{f} (76.4) ^{sol}	4,900 ^{f}	1,200 ^{f} (76.4) ^{sol}
		2.5%	5.6 ^{f}	5.6 ^{f}	10 ^{f}	460 ^{f} (183) ^{sol}	4,900 ^{f}	1,900 ^{f} (183) ^{sol}
		6%	13 ^{f}	13 ^{f}	24 ^{f}	1,100 ^{f} (432) ^{sol}	4,900 ^{f}	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4
		2.5%	0.98	1.2	0.67	15	2.2	4.7
		6%	1.1	1.2	1.2	15	2.2	4.8

NOTES

$^{sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = naphthalene is based on comparison of inhalation exposure with TDI_{inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Petroleum Hydrocarbons	**Aliphatic**							
	EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304)^{sol}	95,000 (304) ^{sol}
	EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
	EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
	EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
	EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
	EC>16-35	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	EC>35-44	1%	65,000 (8.48) ^{f,sol}	65,000 (8.48) ^{f,sol}	260,000 ^{f}	160,000 ^{f}	250,000 ^{f}	450,000 ^{f}
	Aliphatic							
	EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
	EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
	EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
	EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
	EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}
	EC>16-35	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	EC>35-44	2.5%	92,000 (21) ^{f,sol}	92,000 (21) ^{f,sol}	270,000 ^{f}	1,700,000 ^{f}	250,000 ^{f}	480,000 ^{f}
	Aliphatic							
	EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
	EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
	EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
	EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
	EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
	EC>16-35	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	EC>35-44	6%	110,000^{f}	110,000^{f}	270,000 ^{f}	1,800,000^{f}	250,000 ^{f}	490,000 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
	EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
	EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
	EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
	EC>16-21	1%	260 ^{f}	1,900 ^{f}	46 ^{f}	28,000 ^{f}	3,800 ^{f}	7,600 ^{f}
	EC>21-35	1%	1,100 ^{f}	1,900 ^{f}	370 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	1%	1,100 ^{f}	1,900 ^{f}	370^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
	EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
	EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
	EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
	EC>16-21	2.5%	540 ^{f}	1,900 ^{f}	110 ^{f}	28,000 ^{f}	3,800 ^{f}	7,700 ^{f}
	EC>21-35	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>35-44	2.5%	1,500 ^{f}	1,900 ^{f}	820 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	Aromatic							
	EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
	EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
	EC>16-21	6%	930^{f}	1,900 ^{f}	260 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
	EC>21-35	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	EC>35-44	6%	1,700 ^{f}	1,900 ^{f}	1,600 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}
	Aliphatic +Aromatic >EC44	1%	1,600 ^{f}	1,900 ^{f}	1,200 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		2.5%	1,800 ^{f}	1,900 ^{f}	2,100 ^{f}	28,000 ^{f}	3,800 ^{f}	7,800 ^{f}
		6%	1,900 ^{f}	1,900 ^{f}	3,000 ^{f}	28,000 ^{f}	3,800 ^{f}	7,900 ^{f}

NOTES

$^{Sol\ /\ vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil: Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) vap
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) vap
		6%	39	40	240	3,000	140,000	100,000 (6,392) vap
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) sol
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) sol
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitritoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) sol
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) vap
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) vap
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) vap
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) vap	1.2	5,600 (3.0E-03) vap	1,200	2,300
		2.5%	18	280 (7.0E-03) vap	2.9	7,400 (7.0E-03) vap	1,200	2,400
		6%	41	410 (1.6E-02) vap	6.8	8,400 (1.6E-02) vap	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on sandy loam soils with a pH 7.

	Contaminant	SOM	LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
			Res +	Res -	Allot.	Comm.	POS_{resi}	POS_{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^{g}	94	0.13 ^{g}	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

$^{Sol / vap}$ = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^{g} = derived based on 2,3,4,6-tetrachlorophenol.

APPENDIX G

STATISTICAL ANALYSIS

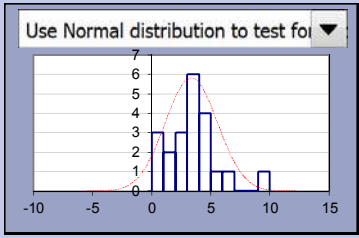
Test Results

B(a)P

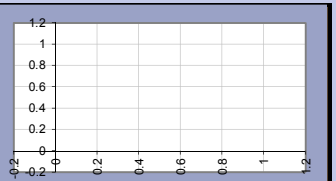
Client/client ref: Urban Splash | Site ref: LKC 16 1334 | Date: 24.03.17

Project ref: New Islington | Data description: Made Ground | User details: PQ

Dataset:	B(a)P
Sample mean $\overline{x}$	3.3357
Sample standard deviation, s	2.1997
Sample size, n	21
Critical concentration, Cc	5



Outliers & non-detects	
Outliers present?	No
Significance level	1%
Outliers excluded	0
Non-detects	3

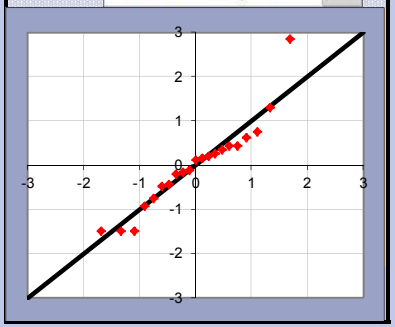


Normality test

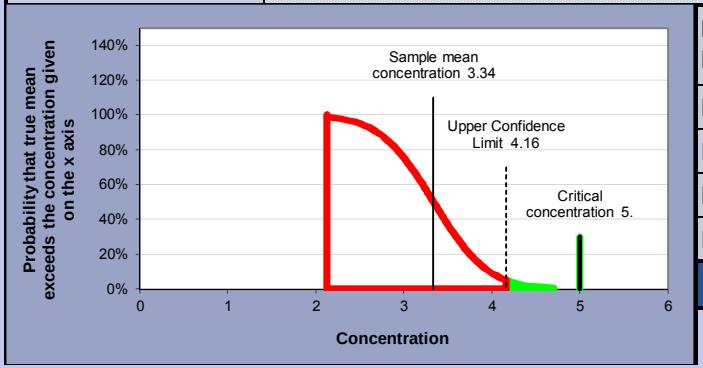
Significance level: 5%

Normal distribution

Use: Auto: One-sample t-test



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	**100%**
Base decision on:	evidence level
Evidence level required:	**95%**
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | **Back to summary** | **Go to outlier test** | **Go to normality test**

APPENDIX H

CATWASTE ASSESSMENT

ATKINS CatWasteSoil

Classification Assessment Tool of Soil Wastes - Hazard Summary Sheet

Site Name	New Islington Phase 2 Development
Location	Manchester
Site ID	LKC 16 1334
Job Number	
Date	27/02/2017
User Name	c.baranek@thelkgroup.com
Company Name	LK Consult Ltd

Hole ID	Sample Depth	Hazardous Waste Y/N	HP1	HP2	HP3	HP4	HP5	HP6	HP7	HP8	HP9
TP105	0.0	N	No	No	No	No	No	No	No	No	No
TP106	0.0	N	No	No	No	No	No	No	No	No	No
TP106A	0.0	N	No	No	No	No	No	No	No	No	No
TP107	0.0	N	No	No	No	No	No	No	No	No	No
CP102	0.0	N	No	No	No	No	No	No	No	No	No
TP101	0.0	N	No	No	No	No	No	No	No	No	No
TP101	1.8	N	No	No	No	No	No	No	No	No	No
TP102	0.0	N	No	No	No	No	No	No	No	No	No
TP103	0.0	N	No	No	No	No	No	No	No	No	No
TP103	0.6	N	No	No	No	No	No	No	No	No	No
TP104	0.0	N	No	No	No	No	No	No	No	No	No
WS101	0.0	N	No	No	No	No	No	No	No	No	No
WS102	0.0	N	No	No	No	No	No	No	No	No	No
WS103	0.0	N	No	No	No	No	No	No	No	No	No
WS103	2.0	N	No	No	No	No	No	No	No	No	No
WS102	0.0	N	No	No	No	No	No	No	No	No	No
CP106	4.5	N	No	No	No	No	No	No	No	No	No
CP101	0	N	No	No	No	No	No	No	No	No	No
CP103	0	N	No	No	No	No	No	No	No	No	No
CP105	3.90	N	No	No	No	No	No	No	No	No	No
CP102	7.50	N	No	No	No	No	No	No	No	No	No
CP104	0	N	No	No	No	No	No	No	No	No	No
CP107	0	N	No	No	No	No	No	No	No	No	No

This output data has been generated by the CAT-Waste Soil waste classification tool provided by Atkins Consultants Ltd and J.McArdle Contracts and should be read in conjuntion with the standard Terms and Conditions

ATKINS CatWasteSoil

Site Name	New Islington Phase 2 Development
Location	Manchester
Site ID	LKC 16 1334
Job Number	
Date	27/02/2017
User Name	c.baranek@thelkgroup.com
Company Name	LK Consult Ltd

Hole ID	Sample Depth	Hazardous Waste Y/N	HP10	HP11	HP12	HP13	HP14	HP15	HP16
TP105	0.0	N	No	No	No	No	No	No	No
TP106	0.0	N	No	No	No	No	No	No	No
TP106A	0.0	N	No	No	No	No	No	No	No
TP107	0.0	N	No	No	No	No	No	No	No
CP102	0.0	N	No	No	No	No	No	No	No
TP101	0.0	N	No	No	No	No	No	No	No
TP101	1.8	N	No	No	No	No	No	No	No
TP102	0.0	N	No	No	No	No	No	No	No
TP103	0.0	N	No	No	No	No	No	No	No
TP103	0.6	N	No	No	No	No	No	No	No
TP104	0.0	N	No	No	No	No	No	No	No
WS101	0.0	N	No	No	No	No	No	No	No
WS102	0.0	N	No	No	No	No	No	No	No
WS103	0.0	N	No	No	No	No	No	No	No
WS103	2.0	N	No	No	No	No	No	No	No
WS102	0.0	N	No	No	No	No	No	No	No
CP106	4.5	N	No	No	No	No	No	No	No
CP101	0	N	No	No	No	No	No	No	No
CP103	0	N	No	No	No	No	No	No	No
CP105	3.90	N	No	No	No	No	No	No	No
CP102	7.50	N	No	No	No	No	No	No	No
CP104	0	N	No	No	No	No	No	No	No
CP107	0	N	No	No	No	No	No	No	No

Eton Business Park, Eton Hill Road,
Manchester M26 2ZS

Tel: 0161 763 7200

The Corn Exchange, Fenwick Street,
Liverpool L2 7QL

Tel: 0151 235 8716

Unit 121, Wright Business Centre,
1 Lonmay Road, Glasgow G33 4EL

Tel: 0141 773 6269

www.thelkgroup.com

PART OF THE LK GROUP