REMEDIATION PROPOSALS REPORT

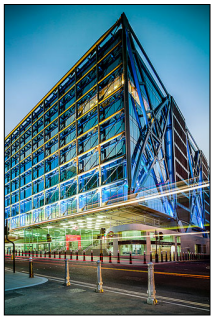
LSHTM
15–17 Tavistock Place
London WC1

Client: Kier

J13113D

October 2018



GEA

Document Control

Project title	London School of Hygiene and Tropical Medicine 15–17 Tavistock Place, London WC1H 9SH	**Project ref**	J13113D
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1	Final		16 October 2018	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the office indicated or to Steve Branch in our Herts office.

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This report is intended as a Ground Investigation Report (GIR) as defined in BS EN1997-2, unless specifically noted otherwise. The report is not a Geotechnical Design Report (GDR) as defined in EN1997-2 and recommendations made within this report are for guidance only.

CONTENTS

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Kier to provide a remediation proposals report for the London School of Hygiene and Tropical Medicine at Nos 15 to 17 Tavistock Place, London WC1H 9SH.

A desk study and ground investigation have previously been carried out for the site by GEA (report ref J13113, dated May 2013) and (report ref J13113A, dated August 2013). GEA has also carried out an additional investigation to further assess the extent of contamination (report ref J13113B, July 2018). These reports are referred to where appropriate and should be read in conjunction with this report.

1.1 Proposed Development

Consideration is being given to the demolition of the existing depot and the construction of a new four-storey building and partial single level basement extending beneath the central part of the site.

1.2 Site Description

The site is located approximately 300 m to the north-northwest of Russell Square London Underground station and fronts onto Tavistock Place to the southeast. It is bordered to the east and north by houses fronting onto Marchmont Street and Cartwright Gardens respectively and to the west by No 13 Tavistock Place; a four-storey end terrace building, with a single level basement. The Piccadilly Line London Underground tunnel is located approximately 20 m to the west of the site.

The development site forms the northern half of the London School of Hygiene and Tropical Medicine (LSHTM) at Nos 15 to 17 Tavistock Place. It is an irregular shaped area, with maximum dimensions of approximately 45 m northeast to southwest by 60 m northwest to southeast and is occupied by a single storey steel frame warehouse-type structure commonly referred to as the depot building. A small brick outbuilding, housing an above ground oil tank, and a two-storey office building are present adjacent to the southeastern wall of the depot. The depot is currently used for general storage, parking of vehicles and bicycles and houses a number of electricity sub-stations.

The main LSHTM building is a three-storey to four-storey structure to the south of the depot, with a partial single level basement. A gravel courtyard with raised planters arranged around the edge separates the depot and the main building.

A disused underground fuel storage tank is understood to have been located beneath the pathway to the south of the depot. The date of the last petroleum licence issued for the site commenced on 1st April 1981 and expired on 31st March 1993 and was for a quantity of petroleum spirit totalling 18,184 litres. No known leaks or spills have occurred on the site. A search of planning applications from the London Borough of Camden (application number 2009/5188/P, dated July 2009), has revealed that the removal of the tank, concrete bund along with associated pipework and pump was carried out by Environ in 2009, followed by validation testing of the surrounding excavated soils and production of a verification report.

Ground level in the area is essentially level and lies at an elevation of about 24.2 m OD as shown by the spot height located at the junction of Tavistock Place and Marchmont Street; the site slopes gently down from Tavistock Place towards the northwest. The site may be additionally located by National Grid Reference 530054, 182389.

1.3 Site History Summary

The previous desk study indicated the southern half of the site to have been developed by a row of terraced houses fronting onto Tavistock Place whilst the northern half of the site was occupied by a number of houses fronting onto South Crescent Mews in 1876. At some time between 1896 and 1916 the site was redeveloped as Nos 15 to 17 Tavistock Place and between 1916 and 1953 South Crescent Mews was demolished and two depots were constructed in its place: a milk distribution depot in the north of the site and a transport depot to the northwest of the site.

The site has been occupied by the London School of Hygiene and Tropical Medicine since 2009 and the milk distribution depot was redeveloped for storage at some point between 1954 and the present day. At some point between 1991 and 1994 the transport depot was demolished. The site and surrounding area have since remained essentially unchanged.

1.4 Ground Conditions

The previous investigations generally encountered a moderate to significant thickness of made ground, overlying the Lynch Hill Gravel, which was underlain by the London Clay over the Lambeth Group.

In general the made ground extended to depths of between 0.95 m (23.2 m OD) and 4.20 m (20.15 m OD) and within the depot building included a second 200 mm thick layer of concrete at depths of between 0.50 m and 0.80 m. A third layer of concrete was also identified at a single location.

The Lynch Hill Gravel initially comprised firm light orange-brown silty sandy clay or sandy clay with occasional fine to medium subrounded flint gravel becoming light orange-brown silty sandy gravel and slightly clayey silty sand and gravel and extended to depths of between 3.10 m (22.13 m OD) and 4.60 m. Beneath an initial horizon of reworked London Clay, comprising sandy clay with gravel to a depth of 8.40 m, the London Clay comprised firm becoming stiff to very stiff grey silty sandy clay and extended to depths of between 23.70 m and 25.45 m. The Lambeth Group comprised stiff brown mottled reddish brown and greenish brown silty sandy clay and was proved to the maximum depth investigated of 30.45 m.

Groundwater was encountered within the made ground at depths of 0.8 m and 2.0 m in Borehole No 9 and at 2.1 m in Borehole No 4. Moderate or slow inflows were also recorded in the London Clay at depths of 9.65 m and 18.90 m in Borehole No 4, and at 18.00 m in Borehole No 3. The inflow at 9.65 m is likely to have been associated with the presence of a claystone whilst the inflows at 18.00 m and 18.90 m are thought to be associated with sand layers. The remaining boreholes were dry during drilling, although subsequent monitoring has measured groundwater at depths ranging from 1.79 m (22.56 m OD) to 4.64 m (19.34 m OD).

1.5 Soil Contamination

In total 23 samples of the soil recovered from depths of between 0.20 m and 4.20 m were tested for the presence of contamination. The results of the chemical analyses indicate that no elevated concentrations of contaminants were measured in excess of the generic risk-based screening values with respect to commercial end use. However, total sulphate exceeded 2400 mg/kg at five locations. Additional testing on each of these samples to determine the water soluble sulphate content has revealed concentrations of between 0.33 g/l to 0.90 g/l. Elevated concentrations of lead with values of between 290 mg/kg and 1700 mg/kg were also measured in most samples of made ground.

Three samples of made ground were selected from Borehole Nos 3 and 11 and Trial Pit No 5, located in close proximity to the electrical substations and were tested for polychlorinated biphenyls (PCBs). No concentrations were measured above the detection limit, of 0.001 mg/kg.

Headspace testing was undertaken on all samples recovered during the 2018 investigation using a Photo-ionisation detector (PID), which measured very low hydrocarbon vapours within the soil.

A disused underground fuel storage tank is understood to have been located beneath the pathway to the south of the depot, although a search of planning applications from the London Borough of Camden (application number 2009/5188/P, dated July 2009), has revealed that the removal of the tank, concrete bund along with associated pipework and pump was carried out by Environ in 2009, followed by validation testing of the surrounding excavated soils and a verification report.

Asbestos screening was undertaken on 22 samples across the site, of which one was found to contain hard cement type material containing chrysotile asbestos; this sample was retrieved from Trial Pit H at a depth of 0.60 m (23.33 m OD). During fieldwork, asbestos cement board was also observed within Trial Pit E.

The presence of asbestos is considered to pose a risk to site workers and ground workers will need to follow standard site procedures. Such risks and procedures are further assessed below.

1.6 Groundwater Contamination

During the previous investigation, groundwater testing was carried out on a single sample taken from Borehole No 4, close to the location of the former buried tank, for the presence of a range of common inorganic contaminants in addition to TPH, PAH, VOCs and SVOCs. This contamination testing revealed an elevated concentration of aqueous total petroleum hydrocarbons, of 6100 µg/l when compared to the Environmental Quality Standards for surface water (EQS) and the Drinking Water Standards.

More recently, additional sampling recorded an elevated concentration of chloride at 230 mg/l compared to a screening value of 188 mg/l, in the sample from Borehole No 4. Elevated concentrations of ammonia, arsenic, lead and nickel were measured in the groundwater from Borehole No 15. These elevated concentrations, particularly the ammonia, are possibly attributable to a leaking sewer. The site is not underlain by a Principal Aquifer, nor are there any groundwater abstraction points within the vicinity and therefore, groundwater is not considered to be a sensitive receptor. In view of the absence of a conceivable source of groundwater contamination beneath the site, remedial works for groundwater are not proposed.

1.7 Soil Gas

There are no historic or existing landfill sites with a 500 m radius of the site although a significant thickness of made ground has locally been recorded on the site and may represent a potential source of soil gas. Gas monitoring was therefore undertaken on six occasions over approximately three months in Borehole Nos 14 and 15, with barometric pressures measured between 1001 mB and 1019 mB.

The monitoring results are appended and indicate that no methane or carbon dioxide has been detected. A low rate of flow was measured during the second visit of 1.7 I/h in Borehole No 14 and 1.8 I/h in Borehole No 15, otherwise, no flow rate was measured. Low concentrations of carbon monoxide and hydrogen sulphide have been measured, along with oxygen concentrations of between 20.5 % and 23.5 %. Very low levels of Volatile Organic Compounds were detected with a maximum concentration of 1.1 ppm measured within Borehole No 14, during the fourth visit.

In determining the significance of soil gas concentrations, both the gas concentrations and borehole flow rates are used to define a characteristic situation for a site based on the limiting borehole gas volume flow, renamed as the Gas Screening Value (GSV) for methane and carbon dioxide. In this case the following GSVs have been determined, in accordance with guidance provided by CIRIA[1].

Gas	Max concentration % vol.	Avg flow rate l/hr	GSV
Methane	< 0.1	1.8	0.0018
Carbon dioxide	< 0.1	1.8	0.0018

The gas screening value is calculated using the following formula:

$$GSV = flow\ rate \times (concentration\ of\ gas / 100)$$

The gas screening value of less than 0.07 l/hr indicates Characteristic Situation 1 (CS1). In accordance with BS 8485[2] the proposed development is likely to be classified as a Type C building, comprising commercial / public buildings. Table 4 of BS 8485 indicates the minimum gas protection score (points) for each type of building (A-D) using the CS level (1-6) previously determined. A Type C building with CS1 requires zero points in reference to gas protection measures, such that no gas protection measures are required. This requirement should however be reviewed if there are any changes to the development proposals.

1.8 Contamination Risk Assessment

One of the requirements of the Environment Act (1995) is that local authorities carry out inspections of their area with a view to identifying sites that may be contaminated. When assessing whether a site is contaminated the local authority will attempt to establish the presence of a 'pollution linkage'. A pollution linkage requires there to be a source of contamination, a sensitive receptor that can be adversely affected by the contamination and a pathway via which contamination can reach the target or receptor.

The following table provides a revised summary of the risk assessment and indicates where a pollution linkage has been established, for which remedial action may be required.

1 Wilson, S, Oliver, S, Mallett, H, Hutchings, H and Card, G (2006) *Assessing risks posed by hazardous ground gases to buildings* CIRIA Report C659

2 The British Standards Institution (2015), *BS 8484:2015 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.* 2nd Ed. BSI Standards Ltd

SOURCE	RECEPTOR	PATHWAY	COMMENTS
Contamination in soil: elevated concentrations of lead and asbestos in made ground	End users	Direct contact and inhalation of respirable fibres	End users will be effectively isolated from contaminants in the soil by the proposed new buildings and extent of hardstanding, which will cover the entirety of the site. Hence there is no pathway for direct contact or inhalation
	Groundwater (Secondary aquifer)	Limited pathway, as the site will be covered by buildings and hardstanding	The identified contaminants are of low solubility and do not, therefore, pose a risk to groundwater. The London Clay will prevent a pathway to the Principal Aquifer
	Adjacent sites and site workers during construction	Inhalation of respirable fibres, Ingestion of soil, dust or vegetation or skin contact	The asbestos encountered is not considered to be mobile. Limited precautions will be required during groundworks
	Plastic services	Direct contact	Consideration will need to be given to the use of barrier pipe
Soil gas	End users	Inhalation and explosion	No protection measures are necessary
Contamination in groundwater	Secondary aquifer	groundwater	The identified contaminants are assumed to have originated off-site and no precautions are necessary

2.0 GENERAL REMEDIATION PROVISIONS

All site procedures and design matters associated with handling any potentially contaminated soil will be assessed with reference to the following;

- the health and safety of construction workers and the general public during the construction operations;
- the health and safety of the end users of the development and the general public in the longer term;
- compliance with waste management regulations;
- the durability of the construction and its constituent materials; and
- the minimisation or avoidance of cross-border pollution, particularly within the groundwater.

Good construction practice and health and safety procedures will be adhered to at all times. In particular the specific requirements of Health and Safety Executive (HSE) guidance[3] and the COSHH[4] guidance must be followed in addition to the current Building Regulations. Guidelines prepared by CIRIA[5] should also be taken into account.

The HSE document sets out the approach to be adopted and the aspects that must be considered under the COSHH Regulations, including an assessment of the risks to health of both employees and the general public and identification of the means by which any risks may be controlled.

3 HSE 1992 HS(G)66 – *Protection of workers and the public during the development of contaminated land* HMSO
4 HSE 1998 – *Code of practice for the Control of Substances Hazardous to Health and Control of Carcinogenic Substances 2nd Edition*
5 CIRIA Report 132 – *A Guide for Safe Working on Contaminated Sites*

2.1 Safety Organisation

A safety structure will be produced that identifies an individual at senior level who has a primary responsibility for safety and has the authority to direct all other activities on site and identifies all other staff with particular safety responsibilities. The structure will define the lines of communication and responsibility for safety matters and identify the interfaces with both the regulatory authorities and emergency services.

The safety organisation will be supervised by an occupational hygienist and / or the Client's safety officer as appropriate. A documented contingency plan will be developed in order to ensure the provision of an appropriate level of first aid to handle medical emergencies effectively. All persons visiting or working on the site during the 'dirty' phase will be trained in the particular hazards and risks that may be present on site and the health and safety precautions required.

2.2 Safety Method Statements

The site manager, under the advice of the occupational hygienist and / or safety officer, will review and approve the safety method statements and be responsible for the safe co-ordination of different activities. The statements will include a risk assessment and exposure minimisation, together with details for the provision, maintenance, training for and use of any personal protective equipment that is required either routinely or as part of emergency procedures.

2.3 Risk Assessments

Prior to carrying out any element of the site work, the potential risks that are present as a result of site contamination will be identified and the potential for harm will be determined and recorded. The methodology employed for COSHH assessments is appropriate.

As a result of the risk assessment working methods should be modified as necessary to minimise the potential exposure to contaminated substances. Where the risk cannot be controlled by modified designs or working methods, a suitable level of personal protective equipment should be provided.

In addition to the site workers, consideration will also need to be given to possible impacts upon neighbouring sites, the local residents and the general public driving or walking outside the site boundary, trespassers and the environment (air, water and soil).

2.4 Site Briefing

Site workers should be made aware of the possible presence of contamination and a programme of working should be identified to protect workers handling any soil or groundwater and the method of site working should be in accordance with HSE guidelines and the requirements of the Local Authority. Such requirements are likely to include that all site workers are protected from skin contact with any soil, and eating, drinking and smoking on site should be strictly confined to clean areas. Guidelines prepared by CIRIA should also be taken into account. Where significant contamination is expected, site visitors will also be required to be briefed.

Prior to the commencement of ground works a site induction meeting should be held for all site personnel that may be affected by potential contamination, where the appointed geoenvironmental engineer should brief the workers on the history of the site and the nature of any contaminated soils they may encounter. This information will be included in a Discovery Strategy as outlined in section 2.4.1 above, which should include:

- health and safety considerations;
- the type of land, water or air bourn contamination expected at the site;
- any particular areas of the site likely to be affected; and
- staff responsibilities under the discovery strategy.

The site manager will need to provide written confirmation that the staff briefing was carried out in line with the above recommendations.

3.0 SPECIFIC REMEDIATION PROVISIONS

The objective of any remedial works will be to mitigate the environmental risks identified.

On the basis of the findings of the investigation it is considered that the following remediation proposals are appropriate in respect of the potential contamination that may remain beneath this site. A conceptual model of the envisaged contamination is presented in the form of a source–pathway–receptor analysis and precise objectives for the remediation are stated. Methods of achieving these objectives are then discussed.

3.1 Conceptual Model

It is proposed to demolish the existing depot and subsequently construct a new four-storey building and partial single level basement extending beneath the central part of the site. There are no new areas of soft landscaping proposed

The ground investigation indicated elevated concentrations of lead within the made ground in numerous locations and the presence of asbestos in the form of hard cement type material of chrysotile.

During construction work, site workers may be exposed to contamination through ingestion of soil, dust or vegetation, skin contact or inhalation and buried services should be protected from the contaminants in the made ground.

3.2 Remediation Proposals

3.2.1 Protection of Site Workers

Site workers should be made aware of the possible presence of contamination or suspected asbestos containing material and a programme of working should be identified to protect workers handling any soil or groundwater and the method of site working should be in accordance with HSE guidelines and the requirements of the Local Authority.

The method of site working should be in accordance with guidelines set out by HSE[6] and CIRIA[7] and the requirements of the London Borough of Camden Contaminated Land Officer. Such requirements are likely to include that all site workers are protected from skin contact with any soil, and eating, drinking and smoking on site should be strictly confined to clean areas. Guidelines prepared by CIRIA should also be taken into account.

[6] HSE (1992) HS(G)66 *Protection of workers and the general public during the development of contaminated land* HMSO

[7] CIRIA (1996) *A guide for safe working on contaminated sites* Report 132, Construction Industry Research and Information Association

Suitable provision will also need to be made during the groundwork due to the presence of asbestos and therefore the contractor will need to work in accordance with the Control of Asbestos Regulation 2006 and 2012, in that a structured training programme and health and safety procedure will need to be in place.

The site manager will need to be given sufficient training to enable them to give tool box talks to general workers on site. All people working on site should be supplied with and trained in the use of personal protective equipment (PPE) sufficient to protect them for the jobs that they carry out. Furthermore, those workers who have specific tasks that give rise to higher exposure to asbestos should have additional training in the health and safety precautions required to protect themselves and other site users.

It is recommended that a suitably qualified asbestos professional be present on site during any ground work involving the excavation and movement of any soils. The chosen asbestos professional should also hand pick and suitably bag and remove any suspicious material and identified ACM prior to movement taking place. Dust suppression measures will need to be carried out if suspected ACM are encountered.

3.2.2 Protection of Buried Services

Consideration may need to be given to the protection of buried plastic services laid within the made ground. Details of the proposed protection measures for buried plastic services will in any case need to be approved by Camden Council and Thames Water prior to the adoption of any scheme. It is possible that barrier pipe will be required.

New services installed externally and accessible to personnel for maintenance and repair will need to be placed in trenches lined with a permeable geotextile separation layer, such as Terram, and then backfilled with clean material such as pea shingle or sand. This is to protect future maintenance workers coming contact with potentially asbestos containing materials or any other contamination. All new service trenches will be backfilled with clean inert material.

During excavation of the service trenches, a geoenvironmental engineer should attend site to confirm that the services have been laid within clean inert material and this will form part of the validation works.

3.2.3 Unexpected Contamination

Ground workers will be made aware of the potential for contamination at this site and if any odorous, discoloured or suspicious material be encountered, work in that area should be suspended, pending further investigation and risk assessment. All such occurrences should be reported to the Camden Council Contamination Land Officer together with the proposed remediation measures to mitigate the risks posed.

On discovery of any suspicious material during the redevelopment, the following procedure should be followed:

- site personnel to immediately inform the site manager and should not investigate it themselves;
- the site manager should make a decision on whether the material is potentially contaminated and will inform an independent geoenvironmental engineer, with the area of work cordoned off and work ceased in the vicinity;

- the geoenvironmental engineer will then attend site to sample material for laboratory testing and will attempt to quantify the volume. The contaminated land officer at Camden Council will then be informed of the discovery and will be forwarded laboratory data and remedial strategy for their approval in the event that the material is to be classified as contaminated; and

- the discovery should be documented by the site manager including date of discovery, a plan detailing the position of the contamination and site photographs.

4.0 MONITORING & VALIDATION

It is proposed that the remedial works be monitored and validated by a suitably qualified geoenvironmental engineer with respect to the removal of any contamination.

If any suspicious material is encountered outside of the above remediation activities, a geoenvironmental engineer will attend site immediately to inspect the area in accordance with the Discovery Strategy. The decision-making process outlined above will then be implemented.

Upon completion of the remediation monitoring and verification analyses a completion report should be prepared detailing the works carried out and the monitoring of this work. This report will present the results of the onsite screening and photographic and site records of the remedial works together with waste disposal dockets for any contaminated soils removed. The report will provide an assessment of the success of the remediation and will assess the risk posed by any residual contaminants. If the work on site reveals further areas of contamination that cannot be addressed through an extension of the excavation works, a review of the remedial scheme will be carried out following consultation with the Environment Agency and Local Authority and details will be provided in the completion report.

At the end of the construction phase, an account of any suspected materials will be provided along with details of how the remediation strategy was altered.

4.1 Waste Disposal

Under the European Waste Directive, waste is classified as being either Hazardous or Non-Hazardous and landfills receiving waste are classified as accepting hazardous or non-hazardous wastes or the non-hazardous sub-category of inert waste in accordance with the Waste Directive. Waste classification is a staged process and this investigation represents the preliminary sampling exercise of that process. Once the extent and location of the waste that is to be removed has been defined, further sampling and testing may be necessary. The results from this ground investigation should be used to help define the sampling plan for such further testing, which could include WAC leaching tests where the totals analysis indicates the soil to be a hazardous waste or inert waste from a contaminated site. It should however be noted that the Environment Agency guidance WM3[8] states that landfill WAC analysis, specifically leaching test results, must not be used for waste classification purposes.

Any spoil arising from excavations or landscaping works, which is not to be re-used in accordance with the CL:AIRE[9] guidance, will need to be disposed of to a licensed tip. Waste going to landfill is subject to landfill tax at either the standard rate of £86.10 per tonne (about £155 per m^3) or at the lower rate of £2.70 per tonne (roughly £5 per m^3). However, the classifications for tax purposes and disposal purposes differ and currently all made ground

8 Environment Agency 2015. *Guidance on the classification and assessment of waste.* Technical Guidance WM3 First Edition
9 CL:AIRE March 2011. *The Definition of Waste: Development Industry Code of Practice* Version 2

and topsoil is taxable at the 'standard' rate and only naturally occurring soil and stones, which are accurately described as such in terms of the 2011 Order, would qualify for the 'lower rate' of landfill tax.

Based upon on the technical guidance provided by the Environment Agency it is considered likely that the soils for the proposed development site as represented by the chemical analyses carried out, would be generally classified as tabulated overleaf;

Soil Type	Waste Classification (Waste Code)	WAC Testing	Current applicable rate of Landfill Tax
Made ground (TPE and TPH)	Mixed waste (containing asbestos fragments)	No but confirm with receiving landfill	TBC
Made ground	Non-Hazardous (17 05 04)	Stable non-reactive hazardous waste in non-hazardous landfill	£88.95/tonne (Standard rate)-
Natural soils	Inert (17 05 04)	Should not be required but confirm with receiving landfill	£2.80 / tonne (Reduced rate for uncontaminated naturally occurring rocks and soils)

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[10] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified. The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

Appropriate records, such as waste transfer notes, demonstrating that the transport of soil material off-site for treatment and/or disposal should be kept appropriately. Waste tickets should be retained for the production of the verification report.

5.0 COMPLETION REPORT

Upon completion of the work on site a completion report should be prepared detailing the works carried out. This report will present the results of the onsite screening together with waste disposal dockets for any contaminated soils removed.

If the work on site reveals further areas of contamination that cannot be addressed through an extension of the excavation works, a review of the remedial scheme will be carried out following consultation with the Environment Agency and Camden Council and details will be provided in the completion report.

10 Environment Agency 23 Oct 2007 *Regulatory Position Statement Treating non-hazardous waste for landfill - Enforcing the new requirement*

APPENDIX

Site plan

Contamination Testing Results (Soil)

Groundwater Testing Results

Waste Analysis Classification (WAC) Testing Results

Archive Contamination Testing Results

Gas Monitoring Visits

Groundwater Monitoring Visits

Buried Tank Verification Report

Discovery Strategy

GEA

www.gea-ltd.co.uk

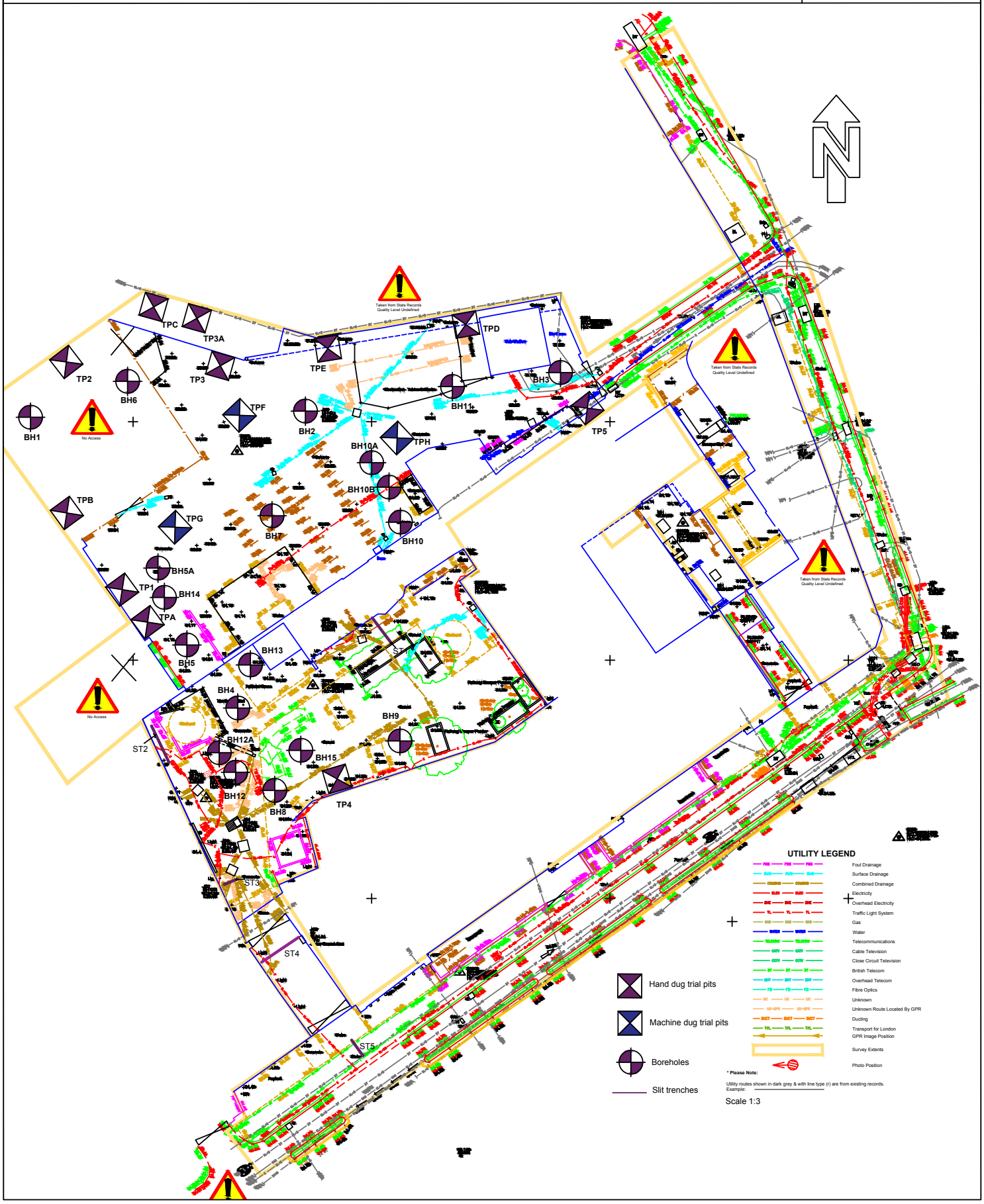
Herts 01727 824666 | Notts | 01509 674888

Site Plan

Site	15 - 17 Tavistock Place, London, WC1H 9SH
Client	Kier
Engineer	

Job Number J13113C

Sheet 1/1



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Analytical Report Number : 18-84982

Project / Site name:	15-17 Tavistock Place, London	**Samples received on:**	08/05/2018
Your job number:	J13113B	**Samples instructed on:**	10/05/2018
Your order number:	J13113 (B)	**Analysis completed by:**	17/05/2018
Report Issue Number:	1	**Report issued on:**	17/05/2018
Samples Analysed:	6 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

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

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

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

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 18-84982

Project / Site name: 15-17 Tavistock Place, London
Your Order No: J13113 (B)

Lab Sample Number				958597	958598	958599	958600	958601
Sample Reference				TPD	TPE	TPC	TPG	TPF
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	0.50	0.60	0.40
Date Sampled				02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	14	8.8	13	13	12
Total mass of sample received	kg	0.001	NONE	1.1	1.2	1.1	1.2	1.3
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	6.4	7.6	9.0	11.2	9.6
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	2900	1200	8900	2000	2100
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.5	0.27	1.8	0.44	0.47
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	2.0	1.7	9.5
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	2.9	16	18	78	35
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.6	0.5	0.7	0.9	0.6
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.28	< 0.05	0.59
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.29	< 0.05	0.57
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.27	< 0.05	0.50
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	0.84	< 0.80	1.66

Analytical Report Number: 18-84982

Project / Site name: 15-17 Tavistock Place, London
Your Order No: J13113 (B)

Lab Sample Number				958597	958598	958599	958600	958601
Sample Reference				TPD	TPE	TPC	TPG	TPF
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	0.50	0.60	0.40
Date Sampled				02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	8.7	18	15	11
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	17	27	16	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	29	19	35	98	44
Lead (aqua regia extractable)	mg/kg	1	MCERTS	87	110	430	1700	660
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	0.5	1.2	1.9	4.0
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	12	26	19	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	72	36	140	85	59

Petroleum Hydrocarbons

TPH C10 - C40	mg/kg	10	MCERTS	< 10	180	< 10	< 10	< 10
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	9.4	< 4.0	< 4.0	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	21	< 1.0	< 1.0	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	130	< 1.0	< 1.0	< 1.0

Analytical Report Number: 18-84982

Project / Site name: 15-17 Tavistock Place, London
Your Order No: J13113 (B)

Lab Sample Number				958602				
Sample Reference				TPH				
Sample Number				None Supplied				
Depth (m)				0.60				
Date Sampled				02/05/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	10				
Total mass of sample received	kg	0.001	NONE	1.4				
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile - Hard/Cement Type Material				
Asbestos in Soil	Type	N/A	ISO 17025	Detected				
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.1				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Total Sulphate as SO_4	mg/kg	50	MCERTS	1700				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.39				
Sulphide	mg/kg	1	MCERTS	< 1.0				
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	8.4				
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.4				
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	0.50				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	0.86				
Pyrene	mg/kg	0.05	MCERTS	0.77				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.37				
Chrysene	mg/kg	0.05	MCERTS	0.43				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.36				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.27				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.32				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	3.88				

Analytical Report Number: 18-84982

Project / Site name: 15-17 Tavistock Place, London
Your Order No: J13113 (B)

Lab Sample Number				958602				
Sample Reference				TPH				
Sample Number				None Supplied				
Depth (m)				0.60				
Date Sampled				02/05/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	34				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	290				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	2.0				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	67				

Petroleum Hydrocarbons

TPH C10 - C40	mg/kg	10	MCERTS	82				
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1				
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0				
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0				
TPH (C16 - C21)	mg/kg	1	MCERTS	9.8				
TPH (C21 - C35)	mg/kg	1	MCERTS	46				

Analytical Report Number : 18-84982

Project / Site name: 15-17 Tavistock Place, London

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
958597	TPD	None Supplied	0.50	Brown clay and sand with gravel.
958598	TPE	None Supplied	1.00	Brown clay and sand with gravel and chalk.
958599	TPC	None Supplied	0.50	Brown sand with gravel and vegetation.
958600	TPG	None Supplied	0.60	Brown clay and sand with gravel and brick.
958601	TPF	None Supplied	0.40	Brown clay and sand with gravel and brick.
958602	TPH	None Supplied	0.60	Brown clay and sand with gravel and brick.

Analytical Report Number : 18-84982

Project / Site name: 15-17 Tavistock Place, London

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding.	L076-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L076-PL	D	MCERTS

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

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TPC		S	18-84982	958599	c	Sulphide in soil	L010-PL	c
TPC		S	18-84982	958599	c	Total cyanide in soil	L080-PL	c
TPD		S	18-84982	958597	c	Sulphide in soil	L010-PL	c
TPD		S	18-84982	958597	c	Total cyanide in soil	L080-PL	c
TPE		S	18-84982	958598	c	Sulphide in soil	L010-PL	c
TPE		S	18-84982	958598	c	Total cyanide in soil	L080-PL	c
TPF		S	18-84982	958601	c	Sulphide in soil	L010-PL	c
TPF		S	18-84982	958601	c	Total cyanide in soil	L080-PL	c
TPG		S	18-84982	958600	c	Sulphide in soil	L010-PL	c
TPG		S	18-84982	958600	c	Total cyanide in soil	L080-PL	c
TPH		S	18-84982	958602	c	Sulphide in soil	L010-PL	c
TPH		S	18-84982	958602	c	Total cyanide in soil	L080-PL	c

GEA
Widbury Barn
Widbury Hill
Ware
Herts SG12 7QE

Generic Risk-Based Soil Screening Values

Site	15 -17 Tavistock Place, London WC1H 9SH
Client	Kier
Engineer	Wilde Carter Clack

Job Number J13113B

Sheet 1 / 1

Proposed End Use Commercial

Soil pH 8

Soil Organic Matter content % 1.0

Contaminant	Screening Value mg/kg	Data Source
Metals		
Arsenic	640	C4SL
Cadmium	410	C4SL
Chromium (III)	30400	LQM/CIEH
Chromium (VI)	49	C4SL
Copper	71,700	LQM/CIEH
Lead	2330	C4SL
Elemental Mercury	170	SGV
Inorganic Mercury	3600	SGV
Nickel	1350	LQM/CIEH
Selenium	13000	SGV
Zinc	665,000	LQM/CIEH
Hydrocarbons		
Benzene	27	C4SL
Toluene	870	SGV
Ethyl Benzene	48000	SGV
Xylene	475	SGV
Aliphatic C5-C6	3400	LQM/CIEH
Aliphatic C6-C8	8300	LQM/CIEH
Aliphatic C8-C10	2100	LQM/CIEH
Aliphatic C10-C12	10000	LQM/CIEH
Aliphatic C12-C16	61000	LQM/CIEH
Aliphatic C16-C35	1,600,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	3700	LQM/CIEH
Aromatic C10-C12	17000	LQM/CIEH
Aromatic C12-C16	36000	LQM/CIEH
Aromatic C16-C21	28000	LQM/CIEH
Aromatic C21-C35	28000	LQM/CIEH
PRO (C_5 –C_{10})	18397	Calc
DRO (C_{12} –C_{28})	1,725,000	Calc
Lube Oil (C_{28} –C_{44})	1,628,000	Calc
TPH	**1000**	Trigger for speciated testing

Contaminant	Screening Value mg/kg	Data Source
Anions		
Soluble Sulphate	500 mg/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	10	Methanogenic potential
Total Cyanide	12000	WRAS
Total Mono Phenols	3200	SGV
PAH		
Naphthalene	200.00	C4SL exp & LQM/CIEH
Acenaphthylene	84,000	LQM/CIEH
Acenaphthene	85,000	LQM/CIEH
Fluorene	64,000	LQM/CIEH
Phenanthrene	22,000	LQM/CIEH
Anthracene	530,000	LQM/CIEH
Fluoranthene	23,000	LQM/CIEH
Pyrene	54,000	LQM/CIEH
Benzo(a) Anthracene	90.0	C4SL exp & LQM/CIEH
Chrysene	140	C4SL exp & LQM/CIEH
Benzo(b) Fluoranthene	100.0	C4SL exp & LQM/CIEH
Benzo(k) Fluoranthene	140.0	C4SL exp & LQM/CIEH
Benzo(a) pyrene	42.00	C4SL
Indeno(1 2 3 cd) Pyrene	60.0	C4SL exp & LQM/CIEH
Dibenzo(a h) Anthracene	13.00	C4SL exp & LQM/CIEH
Benzo (g h i) Perylene	650	C4SL exp & LQM/CIEH
Screening value for PAH	**600.0**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	552	LQM/CIEH
tetrachloroethane (PCA)	150	LQM/CIEH
tetrachloroethene (PCE)	63.1	LQM/CIEH
trichloroethene (TCE)	6.42	LQM/CIEH
1,2-dichloroethane (DCA)	0.71	LQM/CIEH
vinyl chloride (Chloroethene)	0.0587	LQM/CIEH
tetrachloromethane (Carbon tetra	3	LQM/CIEH
trichloromethane (Chloroform)	79.4	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which pose 'LOW' risk to human health. Concentrations measured in excess of these values indicate a potential risk which require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

C4SL - Defra Category 4 Screening value based on Low Level of Toxicological Risk

C4SL exp & LQM/CIEH calculated using C4SL revisions to exposure assessment but LQM/CIEH health criteria values

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experience indicates that Benzo(a) pyrene (one of the most common and most carcinogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

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Widbury Hill
Ware
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Generic Risk-Based Soil Screening Values

Site	15 -17 Tavistock Place, London WC1H 9SH	**Job Number** J13113B
Client	Kier	**Sheet** 2 / 2
Engineer	Wilde Carter Clack	

Proposed End Use **Commercial**

The key generic assumptions for this end use are as follows;

- ❑ that groundwater will not be a critical risk receptor;
- ❑ that the critical receptor for human health will be a working female aged 16 to 65 years old;
- ❑ that the exposure duration will be 49 years;
- ❑ that the building type equates to a three-storey office.
- ❑ that the critical exposure pathways will be direct soil and indoor dust ingestion, skin contact with soils and dust, and inhalation of dust and vapours;

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However, where concentrations are measured in excess of the generic screening value there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include:

- ❑ additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- ❑ site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- ❑ soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

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Analytical Report Number : 18-80633

Project / Site name:	Tavistock Place	**Samples received on:**	29/03/2018
Your job number:	J13113B	**Samples instructed on:**	29/03/2018
Your order number:	J13113B	**Analysis completed by:**	05/04/2018
Report Issue Number:	1	**Report issued on:**	05/04/2018
Samples Analysed:	2 water samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Analytical Report Number: 18-80633

Project / Site name: Tavistock Place

Your Order No: J13113B

Lab Sample Number				934550	934551			
Sample Reference				BH4	BH15			
Sample Number				None Supplied	None Supplied			
Depth (m)				2.48	2.88			
Date Sampled				27/03/2018	27/03/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.5	9.1			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	1200	1100			
Sulphate as SO_4	µg/l	45	ISO 17025	41700	163000			
Sulphate as SO_4	mg/l	0.045	ISO 17025	41.7	163			
Sulphide	µg/l	5	NONE	< 5.0	< 5.0			
Chloride	mg/l	0.15	ISO 17025	230	110			
Ammonia as NH_3	µg/l	15	ISO 17025	< 15	2800			
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	5.10	13.3			
Nitrate as N	mg/l	0.01	ISO 17025	1.16	2.27			
Nitrate as NO_3	mg/l	0.05	ISO 17025	5.15	10.0			
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.59	36.2			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03	0.57			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.4	3.8			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	320			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	7.1	100			
Petroleum Hydrocarbons								
TPH (C8 - C10)	µg/l	10	ISO 17025	< 10	< 10			
TPH (C10 - C12)	µg/l	10	NONE	< 10	< 10			
TPH (C12 - C16)	µg/l	10	NONE	< 10	< 10			
TPH (C16 - C21)	µg/l	10	NONE	< 10	< 10			
TPH (C21 - C35)	µg/l	10	NONE	< 10	< 10			

Analytical Report Number: 18-80633

Project / Site name: Tavistock Place

Your Order No: J13113B

Lab Sample Number				934550	934551			
Sample Reference				BH4	BH15			
Sample Number				None Supplied	None Supplied			
Depth (m)				2.48	2.88			
Date Sampled				27/03/2018	27/03/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			

Analytical Report Number: 18-80633

Project / Site name: Tavistock Place

Your Order No: J13113B

Lab Sample Number				934550	934551			
Sample Reference				BH4	BH15			
Sample Number				None Supplied	None Supplied			
Depth (m)				2.48	2.88			
Date Sampled				27/03/2018	27/03/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05			
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05			
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05			
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05			
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05			
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05			
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05			
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05			
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05			
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05			
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05			
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05			
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05			
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05			
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05			
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05			
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05			
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05			
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05			
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05			
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05			
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05			
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05			
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05			
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05			
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05			
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05			
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05			
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

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

Analytical Report Number : 18-80633

Project / Site name: Tavistock Place

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammonia as NH3 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode.	In-house method	L029-PL	W	NONE
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
TPH in (Water)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding.	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

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

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
BH15		W	18-80633	934551	b	Volatile organic compounds in water	L073B-PL	b
BH4		W	18-80633	934550	b	Volatile organic compounds in water	L073B-PL	b

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

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Groundwater Screening Values

Site	15 - 17 Tavistock Place, London, WC1H 8SH
Client	Kier
Engineer	Wilde Carter Clack

Job Number J13113B

Sheet 1 / 1

Contaminant	Guideline Value	Data Source
Metals	***µg/l***	
Arsenic	7.5	EQS (groundwater)
Boron	750	EQS (groundwater)
Cadmium	3.75	EQS (groundwater)
Chromium	37.5	EQS (groundwater)
Copper	1,500	EQS (groundwater)
Iron	200	UK DWS
Lead	7.5	EQS (groundwater)
Mercury	0.75	EQS (groundwater)
Nickel	15	EQS (groundwater)
Zinc	23.1	EQS (groundwater)
Anions	***mg/l***	
Ammonia	0.29	EQS (groundwater)
Bromate (BrO_3)	0.0075	EQS (groundwater)
Chloride	188	EQS (groundwater)
Fluoride	1	EQS (groundwater)
Nitrate	37.5	EQS (groundwater)
Sulphate	188	EQS (groundwater)
Hydrocarbons	***µg/l***	
Benzene	0.75	EQS (groundwater)
Toluene	157	EQS (groundwater)
Ethyl Benzene	300	WHO
Xylene	63.6	EQS (groundwater)
Aliphatic C5-C6	20	No published threshold
Aliphatic C6-C8	20	No published threshold
Aliphatic C8-C10	300	WHO
Aliphatic C10-C12		
Aliphatic C12-C16	0.8	Solubility Limit
Aliphatic C16-C21	0.0013	Solubility Limit
Aliphatic C21-C35		
Aromatic C6-C7	0.75	See Benzene
Aromatic C7-C8	120	WHO
Aromatic C8-C10	120	WHO
Aromatic C10-C12		
Aromatic C12-C16		
Aromatic C16-C21	90	WHO
Aromatic C21-C35		

Contaminant	Guideline Value	Data Source
Others	***µg/l***	
Cyanide	50	UK DWS
Total Mono Phenols	14.9	EQS (groundwater)
Pentachlorophenol	1	EQS (surface water)
Organochlorine pesticides	0.03	per species UK DWS
Other Pesticides	0.1	per species UK DWS
Total pesticides	0.5	UK DWS
Tributyltin	0.0015	EQS (surface water)
pH	<6.5, >9.5	UK DWS
Electrical conductivity (µS/cm)	1,880	EQS (groundwater)
PAH	***µg/l***	
Naphthalene	0.075	EQS (groundwater)
Anthracene	0.193	EQS (groundwater)
Fluoranthene	0.075	EQS (groundwater)
Benzo(b)fluoranthene	0.075	EQS (groundwater)
Benzo(k)fluoranthene	0.017	EQS (surface water)
Benzo(g,h,i)perylene	0.0082	EQS (surface water)
Benzo(a) pyrene	0.0075	EQS (groundwater)
Total PAH	0.1	UK DWS
Chlorinated Solvents	***µg/l***	
Dichloromethane	20	EQS (surface water)
Trichloromethane (chloroform)	7.5	EQS (groundwater)
Tetrachloromethane (CCl_4)	75	EQS (groundwater)
vinyl chloride (Chloroethene)	0.375	EQS (groundwater)
1,2-dichloroethane (DCA)	21,2	EQS (groundwater)
1,1,1 trichloroethane (TCA)	212	EQS (groundwater)
1,1,2 trichloroethane (TCA)	848	EQS (groundwater)
tetrachloroethane (PCA)	7.5	EQS (groundwater)
trichloroethene (TCE)	7.5	EQS (groundwater)
tetrachloroethene (PCE)	7.5	EQS (groundwater)

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk

Concentrations measured in excess of these values indicate a potential risk to groundwater quality , and thus require further, site specific risk assessment.

UK DWS - United Kingdom Drinking Water Standard - Drinking Water Inspectorate & Health Protection Agency, 2009

EQS - Environmental Quality Standards -The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

WHO - World Health Organisation, Guidelines for Drinking-water Quality, 2010

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Analytical Report Number : 18-84988

Project / Site name:	15-17 Tavistock Place, London	**Samples received on:**	08/05/2018
Your job number:	J13113B	**Samples instructed on:**	10/05/2018
Your order number:	J13113 (B)	**Analysis completed by:**	17/05/2018
Report Issue Number:	1	**Report issued on:**	17/05/2018
Samples Analysed:	8 wac multi samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client: GEA		
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958613				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPD						
Depth (m)	1.00						
Solid Waste Analysis							
TOC (%)**	0.6				3%	5%	6%
Loss on Ignition (%) **	2.4				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.5				--	>6	--
Acid Neutralisation Capacity (mol / kg)	3.4				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		0.085	0.5	2	25
Barium *	0.013	0.0081		0.087	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0010	0.0025		0.023	0.5	10	70
Copper *	0.038	0.045		0.44	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.015	0.0049		0.062	0.5	10	30
Nickel *	0.0025	0.0028		0.027	0.4	10	40
Lead *	< 0.0050	0.011		0.099	0.5	10	50
Antimony *	< 0.0050	< 0.0050		0.024	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.012	0.0138		0.14	4	50	200
Chloride *	< 4.0	< 4.0		< 15	800	4000	25000
Fluoride	0.23	0.23		2.3	10	150	500
Sulphate *	260	22		530	1000	20000	50000
TDS*	380	78		1200	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	17	12		130	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	88						
Moisture (%)	12						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.23						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958614				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPE						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.3				3%	5%	6%
Loss on Ignition (%) **	1.5				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.6				--	>6	--
Acid Neutralisation Capacity (mol / kg)	11				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.026	0.017		0.19	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0024	0.0035		0.033	0.5	10	70
Copper *	0.018	0.017		0.17	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.026	0.0086		0.11	0.5	10	30
Nickel *	< 0.0010	< 0.0010		0.0071	0.4	10	40
Lead *	< 0.0050	0.065		0.56	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.010	0.0090		0.091	4	50	200
Chloride *	6.1	< 4.0		17	800	4000	25000
Fluoride	< 0.050	< 0.050		0.43	10	150	500
Sulphate *	510	49		1200	1000	20000	50000
TDS*	670	110		1900	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	8.2	6.3		66	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	90						
Moisture (%)	9.8						
Stage 1							
Volume Eluate L2 (litres)	0.33						
Filtered Eluate VE1 (litres)	0.26						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958615				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPE						
Depth (m)	1.00						
Solid Waste Analysis							
TOC (%)**	0.5				3%	5%	6%
Loss on Ignition (%) **	2.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.7				--	>6	--
Acid Neutralisation Capacity (mol / kg)	8.8				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.010	< 0.010		0.080	0.5	2	25
Barium *	0.013	0.029		0.26	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	< 0.0010	0.0090		0.078	0.5	10	70
Copper *	0.021	0.032		0.30	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.012	0.0032		0.044	0.5	10	30
Nickel *	< 0.0010	0.0045		0.038	0.4	10	40
Lead *	< 0.0050	0.037		0.31	0.5	10	50
Antimony *	< 0.0050	< 0.0050		0.024	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.0078	0.0256		0.23	4	50	200
Chloride *	6.3	< 4.0		20	800	4000	25000
Fluoride	< 0.050	< 0.050		0.46	10	150	500
Sulphate *	160	14		360	1000	20000	50000
TDS*	410	73		1200	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	8.7	12		110	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	90						
Moisture (%)	10						
Stage 1							
Volume Eluate L2 (litres)	0.33						
Filtered Eluate VE1 (litres)	0.26						

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958616				**Landfill Waste Acceptance Criteria**		
					Limits		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPC						
Depth (m)	0.60						
Solid Waste Analysis							
TOC (%)**	0.7				3%	5%	6%
Loss on Ignition (%) **	3.3				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.6				--	>6	--
Acid Neutralisation Capacity (mol / kg)	11				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.033	0.016		0.19	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.12	0.022		0.37	0.5	10	70
Copper *	0.042	0.027		0.29	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.020	0.0034		0.058	0.5	10	30
Nickel *	0.0024	< 0.0010		0.0075	0.4	10	40
Lead *	< 0.0050	< 0.0050		0.026	0.5	10	50
Antimony *	< 0.0050	< 0.0050		0.035	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.022	0.0150		0.16	4	50	200
Chloride *	4.9	< 4.0		< 15	800	4000	25000
Fluoride	0.096	0.071		0.75	10	150	500
Sulphate *	1800	410		6200	1000	20000	50000
TDS*	1300	420		5600	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	15	6.8		80	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	88						
Moisture (%)	12						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.27						

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958617				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPG						
Depth (m)	0.60						
Solid Waste Analysis							
TOC (%)**	0.9				3%	5%	6%
Loss on Ignition (%) **	4.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	7.9				--	>6	--
Acid Neutralisation Capacity (mol / kg)	19				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.019	0.0088		0.10	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0029	0.0028		0.028	0.5	10	70
Copper *	0.027	0.020		0.21	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.028	0.0049		0.083	0.5	10	30
Nickel *	< 0.0010	< 0.0010		0.0067	0.4	10	40
Lead *	< 0.0050	0.029		0.25	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.0098	0.0107		0.11	4	50	200
Chloride *	20	< 4.0		45	800	4000	25000
Fluoride	0.57	0.36		3.9	10	150	500
Sulphate *	220	16		460	1000	20000	50000
TDS*	380	71		1200	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	6.8	10		98	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	86						
Moisture (%)	14						
Stage 1							
Volume Eluate L2 (litres)	0.31						
Filtered Eluate VE1 (litres)	0.26						

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958618				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPF						
Depth (m)	0.40						
Solid Waste Analysis							
TOC (%)**	0.5				3%	5%	6%
Loss on Ignition (%) **	2.3				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	160				500	--	--
Total PAH (WAC-17) (mg/kg)	3.1				100	--	--
pH (units)**	10.4				--	>6	--
Acid Neutralisation Capacity (mol / kg)	46				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.010	< 0.010		0.064	0.5	2	25
Barium *	0.0062	< 0.0050		0.046	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.011	0.0019		0.035	0.5	10	70
Copper *	0.051	0.024		0.28	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.018	< 0.0030		0.052	0.5	10	30
Nickel *	0.0029	< 0.0010		< 0.0050	0.4	10	40
Lead *	< 0.0050	0.014		0.12	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.014	0.0064		0.077	4	50	200
Chloride *	11	< 4.0		28	800	4000	25000
Fluoride	0.11	0.076		0.81	10	150	500
Sulphate *	180	22		500	1000	20000	50000
TDS*	410	110		1600	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	10	6.4		71	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	92						
Moisture (%)	8.0						
Stage 1							
Volume Eluate L2 (litres)	0.33						
Filtered Eluate VE1 (litres)	0.30						

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958619				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPF						
Depth (m)	0.90						
Solid Waste Analysis							
TOC (%)**	0.4				3%	5%	6%
Loss on Ignition (%) **	2.1				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	8.3				--	>6	--
Acid Neutralisation Capacity (mol / kg)	21				--	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.010	< 0.010		0.052	0.5	2	25
Barium *	0.026	0.020		0.21	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0016	0.0050		0.045	0.5	10	70
Copper *	0.023	0.027		0.27	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.027	0.0051		0.085	0.5	10	30
Nickel *	< 0.0010	0.0023		0.021	0.4	10	40
Lead *	0.0064	0.11		0.92	0.5	10	50
Antimony *	< 0.0050	< 0.0050		< 0.020	0.06	0.7	5
Selenium *	< 0.010	< 0.010		0.076	0.1	0.5	7
Zinc *	0.0097	0.0205		0.19	4	50	200
Chloride *	7.4	< 4.0		20	800	4000	25000
Fluoride	0.14	0.11		1.1	10	150	500
Sulphate *	170	14		390	1000	20000	50000
TDS*	410	76		1300	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	6.9	8.4		82	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	88						
Moisture (%)	12						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.27						

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Waste Acceptance Criteria Analytical Results

Report No:	**18-84988**						
					Client:	**GEA**	
Location	**15-17 Tavistock Place, London**						
Lab Reference (Sample Number)	958620				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/05/2018				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TPH						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.3				3%	5%	6%
Loss on Ignition (%) **	2.0				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg) #	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--
pH (units)**	8.5				--	>6	--
Acid Neutralisation Capacity (mol / kg)	27				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	< 0.010	< 0.010		< 0.050	0.5	2	25
Barium *	0.019	0.013		0.14	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0068	0.0049		0.051	0.5	10	70
Copper *	0.022	0.015		0.16	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.039	0.0067		0.11	0.5	10	30
Nickel *	0.0016	0.0027		0.025	0.4	10	40
Lead *	< 0.0050	0.029		0.26	0.5	10	50
Antimony *	< 0.0050	< 0.0050		0.032	0.06	0.7	5
Selenium *	< 0.010	< 0.010		0.055	0.1	0.5	7
Zinc *	0.013	0.0133		0.13	4	50	200
Chloride *	4.8	< 4.0		< 15	800	4000	25000
Fluoride	0.47	0.26		2.9	10	150	500
Sulphate *	210	21		470	1000	20000	50000
TDS*	320	67		1000	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	7.0	7.5		74	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	91						
Moisture (%)	9.1						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.24						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accrediited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 18-84988

Project / Site name: 15-17 Tavistock Place, London

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
958613	TPD	None Supplied	1.00	Brown clay and sand with gravel.
958614	TPE	None Supplied	0.50	Brown loam and sand with gravel and brick.
958615	TPE	None Supplied	1.00	Brown clay and sand with gravel and brick.
958616	TPC	None Supplied	0.60	Brown loam and sand with gravel and vegetation.
958617	TPG	None Supplied	0.60	Brown clay and sand with gravel and brick.
958618	TPF	None Supplied	0.40	Brown clay and sand with gravel and brick.
958619	TPF	None Supplied	0.90	Brown loam and sand with gravel.
958620	TPH	None Supplied	0.50	Brown loam and sand with gravel and brick.

Analytical Report Number : 18-84988

Project / Site name: 15-17 Tavistock Place, London

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046-PL	W	NONE
BTEX (Sum of BTEX compounds) in soil	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037-PL	W	NONE
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033-PL	W	ISO 17025
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
Mineral Oil in Soil C10 - C40	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method based on USEPA 8270	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PCB's by GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L031-PL	W	ISO 17025
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS

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

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TPC		M	18-84988	958616	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPC		M	18-84988	958616	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPC		M	18-84988	958616	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPC		M	18-84988	958616	b	PCB's by GC-MS in soil	L027-PL	b
TPC		M	18-84988	958616	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPD		M	18-84988	958613	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPD		M	18-84988	958613	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPD		M	18-84988	958613	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPD		M	18-84988	958613	b	PCB's by GC-MS in soil	L027-PL	b
TPD		M	18-84988	958613	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPE		M	18-84988	958614	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPE		M	18-84988	958614	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPE		M	18-84988	958614	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPE		M	18-84988	958614	b	PCB's by GC-MS in soil	L027-PL	b
TPE		M	18-84988	958614	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPE		M	18-84988	958615	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPE		M	18-84988	958615	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPE		M	18-84988	958615	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPE		M	18-84988	958615	b	PCB's by GC-MS in soil	L027-PL	b
TPE		M	18-84988	958615	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPF		M	18-84988	958618	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPF		M	18-84988	958618	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPF		M	18-84988	958618	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPF		M	18-84988	958618	b	PCB's by GC-MS in soil	L027-PL	b
TPF		M	18-84988	958618	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPF		M	18-84988	958619	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPF		M	18-84988	958619	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPF		M	18-84988	958619	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPF		M	18-84988	958619	b	PCB's by GC-MS in soil	L027-PL	b
TPF		M	18-84988	958619	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPG		M	18-84988	958617	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPG		M	18-84988	958617	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPG		M	18-84988	958617	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPG		M	18-84988	958617	b	PCB's by GC-MS in soil	L027-PL	b
TPG		M	18-84988	958617	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TPH		M	18-84988	958620	b	BTEX (Sum of BTEX compounds) in soil	L073B-PL	b
TPH		M	18-84988	958620	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TPH		M	18-84988	958620	b	Mineral Oil in Soil C10 - C40	L076-PL	b
TPH		M	18-84988	958620	b	PCB's by GC-MS in soil	L027-PL	b
TPH		M	18-84988	958620	b	Speciated WAC-17 PAHs in soil	L064-PL	b

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

GEA
Tyttenhanger House
Coursers Road
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FAO Douglas Atkinson

LABORATORY TEST REPORT

Results of analysis of 7 samples
received 24 May 2013

J13113 15-17 Tavistock Place, London, WC1H 9SH

Chemtest
The right chemistry to deliver results

Report Date
04 June 2013

Login Batch No						**230912**					
Chemtest LIMS ID						AI73345	AI73346	AI73347	AI73348	AI73349	AI73350
Sample ID						D1	D4	D1	D2	D1	D1
Sample No						BH11	BH11	BH8	BH8	TP3	TP1
Sampling Date						22/5/2013	22/5/2013	22/5/2013	22/5/2013	21/5/2013	21/5/2013
Depth						0.2m	2.0m	0.5m	1.0m	0.2m	0.3m
Matrix						*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*							
2030	Moisture		%	n/a		9.71	14	11.5	10.4	6.08	6.4
	Stones content (>50mm)		%	n/a		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			M		brown	brown	brown	brown	brown	brown
	Soil texture			M		sand	clay	sand	sand	sand	sand
	Other material			M		stones	stones	stones brick	stones brick	stones brick	stones brick
2010	pH			M			8.4	11.3	10.7	11.2	11.3
2300	Cyanide (total)	57125	mg kg-¹	M			<0.5	<0.5	<0.5	<0.5	<0.5
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M			1.6	11	7.3	2.5	3.5
2625	Total Organic Carbon		%	M			1.0	1.0	0.85	0.61	1.1
2220	Chloride (extractable)	16887006	g l-¹	M			<0.010	0.019	0.011	<0.010	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M				0.25	0.39	0.90	0.41
2430	Sulfate (total) as SO4		mg kg-¹	M			500	6000	3900	3800	4900
2450	Arsenic	7440382	mg kg-¹	M			7.8	16	13	17	21
	Cadmium	7440439	mg kg-¹	M			<0.10	0.26	0.23	0.19	<0.10
	Chromium	7440473	mg kg-¹	M			15	31	20	15	22
	Copper	7440508	mg kg-¹	M			40	24	25	29	34
	Mercury	7439976	mg kg-¹	M			1.2	0.21	0.29	1.7	0.85
	Nickel	7440020	mg kg-¹	M			12	24	16	14	19
	Lead	7439921	mg kg-¹	M			140	110	110	600	530
	Selenium	7782492	mg kg-¹	M			<0.20	<0.20	<0.20	<0.20	<0.20
	Zinc	7440666	mg kg-¹	M			48	95	88	120	83
2670	TPH >C5-C6		mg kg-¹	U			< 0.1	< 0.1 [1]	< 0.1 [1]	< 0.1	< 0.1
	TPH >C6-C7		mg kg-¹	U			< 0.1	< 0.1 [1]	< 0.1 [1]	< 0.1	< 0.1
	TPH >C7-C8		mg kg-¹	M			< 0.1	< 0.1 [1]	< 0.1 [1]	< 0.1	< 0.1

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 24/05/2013 and 04/06/2013

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

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AL4 0PG

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LABORATORY TEST REPORT

Results of analysis of 7 samples
received 24 May 2013

J13113 15-17 Tavistock Place, London, WC1H 9SH

Chemtest
The right chemistry to deliver results

Report Date
04 June 2013

Login Batch No					**230912**
Chemtest LIMS ID					AI73351
Sample ID					D1
Sample No					TP5
Sampling Date					21/5/2013
Depth					0.3m
Matrix					*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*	
2030	Moisture		%	n/a	8.64
	Stones content (>50mm)		%	n/a	<0.02
2040	Soil colour			M	brown
	Soil texture			M	sand
	Other material			M	stones
2010	pH			M	
2300	Cyanide (total)	57125	mg kg-¹	M	
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M	
2625	Total Organic Carbon		%	M	
2220	Chloride (extractable)	16887006	g l-¹	M	
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	
2430	Sulfate (total) as SO4		mg kg-¹	M	
2450	Arsenic	7440382	mg kg-¹	M	
	Cadmium	7440439	mg kg-¹	M	
	Chromium	7440473	mg kg-¹	M	
	Copper	7440508	mg kg-¹	M	
	Mercury	7439976	mg kg-¹	M	
	Nickel	7440020	mg kg-¹	M	
	Lead	7439921	mg kg-¹	M	
	Selenium	7782492	mg kg-¹	M	
	Zinc	7440666	mg kg-¹	M	
2670	TPH >C5-C6		mg kg-¹	U	
	TPH >C6-C7		mg kg-¹	U	
	TPH >C7-C8		mg kg-¹	M	

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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04 June 2013

					230912					
					AI73345	AI73346	AI73347	AI73348	AI73349	AI73350
					D1	D4	D1	D2	D1	D1
					BH11	BH11	BH8	BH8	TP3	TP1
					22/5/2013	22/5/2013	22/5/2013	22/5/2013	21/5/2013	21/5/2013
					0.2m	2.0m	0.5m	1.0m	0.2m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2670	TPH >C8-C10		mg kg-1	M		< 0.1	< 0.1 [1]	0.21 [1]	0.12	< 0.1
	TPH >C10-C12		mg kg-1	M		< 0.1	< 0.1 [1]	0.29 [1]	< 0.1	< 0.1
	TPH >C12-C16		mg kg-1	M		< 0.1	2.5 [1]	1.6 [1]	1.6	1.1
	TPH >C16-C21		mg kg-1	M		< 0.1	16 [1]	11 [1]	5.6	3.4
	TPH >C21-C35		mg kg-1	M		< 0.1	53 [1]	37 [1]	26	14
	Total Petroleum Hydrocarbons		mg kg-1	U		< 10	71 [1]	50 [1]	33	18
2700	Naphthalene	91203	mg kg-1	M		< 0.1	0.17	0.12	< 0.1	0.29
	Acenaphthylene	208968	mg kg-1	M		< 0.1	0.18	0.11	0.34	0.11
	Acenaphthene	83329	mg kg-1	M		< 0.1	0.56	0.23	0.52	0.16
	Fluorene	86737	mg kg-1	M		< 0.1	0.64	0.27	0.27	< 0.1
	Phenanthrene	85018	mg kg-1	M		< 0.1	4.5	2.5	1.8	0.53
	Anthracene	120127	mg kg-1	M		< 0.1	1.5	0.88	0.79	0.24
	Fluoranthene	206440	mg kg-1	M		< 0.1	5.8	4	2	1.2
	Pyrene	129000	mg kg-1	M		< 0.1	4.6	3.1	1.4	0.86
	Benzo[a]anthracene	56553	mg kg-1	M		< 0.1	2.9	2	0.79	0.82
	Chrysene	218019	mg kg-1	M		< 0.1	3	2.3	0.84	0.73
	Benzo[b]fluoranthene	205992	mg kg-1	M		< 0.1	2.3	1.7	0.71	0.76
	Benzo[k]fluoranthene	207089	mg kg-1	M		< 0.1	2.2	1.6	0.63	0.79
	Benzo[a]pyrene	50328	mg kg-1	M		< 0.1	2.5	1.8	0.54	0.67
	Dibenzo[a,h]anthracene	53703	mg kg-1	M		< 0.1	0.31	0.26	< 0.1	0.12
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M		< 0.1	1.4	1.2	0.24	0.71
	Benzo[g,h,i]perylene	191242	mg kg-1	M		< 0.1	1.3	1.2	0.22	0.39
	Total (of 16) PAHs		mg kg-1	M		< 2	34	23	11	8.4
2815	PCB 101	37680732	mg kg-1	M	< 0.01					
	PCB 118	31508006	mg kg-1	M	< 0.01					

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 24/05/2013 and 04/06/2013

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LABORATORY TEST REPORT

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Chemtest
The right chemistry to deliver results

Report Date
04 June 2013

					230912
					AI73351
					D1
					TP5
					21/5/2013
					0.3m
					SOIL
2670	TPH >C8-C10		mg kg-¹	M	
	TPH >C10-C12		mg kg-¹	M	
	TPH >C12-C16		mg kg-¹	M	
	TPH >C16-C21		mg kg-¹	M	
	TPH >C21-C35		mg kg-¹	M	
	Total Petroleum Hydrocarbons		mg kg-¹	U	
2700	Naphthalene	91203	mg kg-¹	M	
	Acenaphthylene	208968	mg kg-¹	M	
	Acenaphthene	83329	mg kg-¹	M	
	Fluorene	86737	mg kg-¹	M	
	Phenanthrene	85018	mg kg-¹	M	
	Anthracene	120127	mg kg-¹	M	
	Fluoranthene	206440	mg kg-¹	M	
	Pyrene	129000	mg kg-¹	M	
	Benzo[a]anthracene	56553	mg kg-¹	M	
	Chrysene	218019	mg kg-¹	M	
	Benzo[b]fluoranthene	205992	mg kg-¹	M	
	Benzo[k]fluoranthene	207089	mg kg-¹	M	
	Benzo[a]pyrene	50328	mg kg-¹	M	
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	
	Total (of 16) PAHs		mg kg-¹	M	
2815	PCB 101	37680732	mg kg-¹	M	< 0.01
	PCB 118	31508006	mg kg-¹	M	< 0.01

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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LABORATORY TEST REPORT

Results of analysis of 7 samples
received 24 May 2013

J13113 15-17 Tavistock Place, London, WC1H 9SH

Report Date
04 June 2013

					230912					
					AI73345	AI73346	AI73347	AI73348	AI73349	AI73350
					D1	D4	D1	D2	D1	D1
					BH11	BH11	BH8	BH8	TP3	TP1
					22/5/2013	22/5/2013	22/5/2013	22/5/2013	21/5/2013	21/5/2013
					0.2m	2.0m	0.5m	1.0m	0.2m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2815	PCB 138	35065282	mg kg-¹	M	< 0.01					
	PCB 153	35065271	mg kg-¹	M	< 0.01					
	PCB 180	35065293	mg kg-¹	N	< 0.01					
	PCB 28	7012375	mg kg-¹	M	< 0.01					
	PCB 52	35693993	mg kg-¹	M	< 0.01					
2920	Phenols (total)		mg kg-¹	N		<0.3	<0.3	<0.3	<0.3	<0.3

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 24/05/2013 and 04/06/2013

* Accreditation status

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LABORATORY TEST REPORT

Results of analysis of 7 samples
received 24 May 2013

J13113 15-17 Tavistock Place, London, WC1H 9SH

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Report Date
04 June 2013

					230912
					AI73351
					D1
					TP5
					21/5/2013
					0.3m
					SOIL
2815	PCB 138	35065282	mg kg-¹	M	< 0.01
	PCB 153	35065271	mg kg-¹	M	< 0.01
	PCB 180	35065293	mg kg-¹	N	< 0.01
	PCB 28	7012375	mg kg-¹	M	< 0.01
	PCB 52	35693993	mg kg-¹	M	< 0.01
2920	Phenols (total)		mg kg-¹	N	

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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LABORATORY TEST REPORT

Results of analysis of 6 samples
received 11 June 2013

J13113 - 15-17 Tavistock Place, London, WC1H 9SH

Chemtest
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Report Date
19 June 2013

Login Batch No						**232094**					
Chemtest LIMS ID						AI80671	AI80672	AI80673	AI80674	AI80676	AI80677
Sample ID						BH1	BH2	BH3	BH3	BH4	BH4
Sample No											
Sampling Date						7/6/2013	7/6/2013	7/6/2013	7/6/2013	7/6/2013	7/6/2013
Depth						1.50m	1.50m	0.50m	1.50m	1.00m	2.00m
Matrix						*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*							
2030	Moisture		%	n/a		12.1	4.69	22.1	15.3	13.5	8.14
	Stones content (>50mm)		%	n/a		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			M		brown	brown	brown	brown	brown	brown
	Soil texture			M		clay	sand	clay	clay	clay	clay
	Other material			M		stones	stones	stones	stones	stones	stones
2010	pH			M		8.2	10.2		9.0	8.1	8.3
2300	Cyanide (total)	57125	mg kg-¹	M		<0.5	<0.5		<0.5	<0.5	<0.5
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M		<0.50	0.71		0.94	2.4	3.6
2625	Total Organic Carbon		%	M		0.85	1.2		0.42	1.6	<0.10
2220	Chloride (extractable)	16887006	g l-¹	M		0.017	0.032		<0.010	0.18	0.054
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M			0.33				
2430	Sulfate (total) as SO4		mg kg-¹	M		1700	3800		370	650	970
2450	Arsenic	7440382	mg kg-¹	M		16	24		11	20	6.5
	Cadmium	7440439	mg kg-¹	M		<0.10	<0.10		<0.10	<0.10	<0.10
	Chromium	7440473	mg kg-¹	M		17	25		18	21	10
	Copper	7440508	mg kg-¹	M		62	32		24	38	10
	Mercury	7439976	mg kg-¹	M		0.65	0.91		1.00	1.4	<0.10
	Nickel	7440020	mg kg-¹	M		16	26		15	22	12
	Lead	7439921	mg kg-¹	M		420	460		170	210	20
	Selenium	7782492	mg kg-¹	M		<0.20	<0.20		<0.20	<0.20	<0.20
	Zinc	7440666	mg kg-¹	M		44	74		66	49	24
2670	TPH >C5-C6		mg kg-¹	U		< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	TPH >C6-C7		mg kg-¹	U		< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	TPH >C7-C8		mg kg-¹	M		< 0.1	< 0.1		< 0.1	< 0.1	< 0.1

All tests undertaken between 12/06/2013 and 19/06/2013

* Accreditation status

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LABORATORY TEST REPORT

Results of analysis of 6 samples
received 11 June 2013

J13113 - 15-17 Tavistock Place, London, WC1H 9SH

Chemtest
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Report Date
19 June 2013

					232094					
					AI80671	AI80672	AI80673	AI80674	AI80676	AI80677
					BH1	BH2	BH3	BH3	BH4	BH4
					7/6/2013	7/6/2013	7/6/2013	7/6/2013	7/6/2013	7/6/2013
					1.50m	1.50m	0.50m	1.50m	1.00m	2.00m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2670	TPH >C8-C10		mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	2.3
	TPH >C10-C12		mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	7.0
	TPH >C12-C16		mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	1.7
	TPH >C16-C21		mg kg-¹	M	< 0.1	3.4		< 0.1	< 0.1	1.3
	TPH >C21-C35		mg kg-¹	M	< 0.1	18		< 0.1	< 0.1	8.1
	Total Petroleum Hydrocarbons		mg kg-¹	U	< 10	21		< 10	< 10	20
2700	Naphthalene	91203	mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	Acenaphthene	83329	mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	Fluorene	86737	mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	Phenanthrene	85018	mg kg-¹	M	0.22	0.33		0.16	< 0.1	< 0.1
	Anthracene	120127	mg kg-¹	M	< 0.1	0.17		< 0.1	< 0.1	< 0.1
	Fluoranthene	206440	mg kg-¹	M	0.25	0.55		0.19	< 0.1	< 0.1
	Pyrene	129000	mg kg-¹	M	0.24	0.49		0.17	< 0.1	< 0.1
	Benzo[a]anthracene	56553	mg kg-¹	M	0.1	0.2		< 0.1	< 0.1	< 0.1
	Chrysene	218019	mg kg-¹	M	0.13	0.24		< 0.1	< 0.1	< 0.1
	Benzo[b]fluoranthene	205992	mg kg-¹	M	0.18	0.41		0.14	< 0.1	< 0.1
	Benzo[k]fluoranthene	207089	mg kg-¹	M	0.14	0.21		< 0.1	< 0.1	< 0.1
	Benzo[a]pyrene	50328	mg kg-¹	M	0.1	0.17		< 0.1	< 0.1	< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1	< 0.1		< 0.1	< 0.1	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	< 0.1	0.12		< 0.1	< 0.1	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	0.47	0.28		< 0.1	< 0.1	< 0.1
	Total (of 16) PAHs		mg kg-¹	M	< 2	3.2		< 2	< 2	< 2
2815	PCB 101	37680732	mg kg-¹	M			< 0.01			
	PCB 118	31508006	mg kg-¹	M			< 0.01			

All tests undertaken between 12/06/2013 and 19/06/2013

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

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LABORATORY TEST REPORT

Results of analysis of 6 samples
received 11 June 2013

J13113 - 15-17 Tavistock Place, London, WC1H 9SH

Report Date
19 June 2013

					232094					
					AI80671	AI80672	AI80673	AI80674	AI80676	AI80677
					BH1	BH2	BH3	BH3	BH4	BH4
					7/6/2013	7/6/2013	7/6/2013	7/6/2013	7/6/2013	7/6/2013
					1.50m	1.50m	0.50m	1.50m	1.00m	2.00m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2815	PCB 138	35065282	mg kg-¹	M			< 0.01			
	PCB 153	35065271	mg kg-¹	M			< 0.01			
	PCB 180	35065293	mg kg-¹	N			< 0.01			
	PCB 28	7012375	mg kg-¹	M			< 0.01			
	PCB 52	35693993	mg kg-¹	M			< 0.01			
2920	Phenols (total)		mg kg-¹	N	<0.3	<0.3		<0.3	<0.3	<0.3

All tests undertaken between 12/06/2013 and 19/06/2013

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

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Generic Risk-Based Soil Guideline Values

Site	15 - 17 Tavistock Place, London, WC1H 9SH	**Job Number** J13113A
Client	University College London	**Sheet** 1 / 1
Engineer	Carter Clack	

Proposed End Use Commercial

Soil pH 8

Soil Organic Matter content % 2.5

Contaminant	Guideline Value mg/kg	Data Source
Metals		
Arsenic	640	SGV
Cadmium	230	SGV
Chromium (III)	30400	LQM/CIEH
Chromium (VI)	35	LQM/CIEH
Copper	71,700	LQM/CIEH
Lead	750	withdrawn SGV
Elemental Mercury	170	SGV
Inorganic Mercury	3600	SGV
Nickel	1800	LQM/CIEH
Selenium	13000	SGV
Zinc	665,000	LQM/CIEH
Hydrocarbons		
Benzene	57	SGV
Toluene	2200	SGV
Ethyl Benzene	48000	SGV
Xylene	1300	SGV
Aliphatic C5-C6	6200	LQM/CIEH
Aliphatic C6-C8	18000	LQM/CIEH
Aliphatic C8-C10	5100	LQM/CIEH
Aliphatic C10-C12	24000	LQM/CIEH
Aliphatic C12-C16	83000	LQM/CIEH
Aliphatic C16-C35	1,800,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	8600	LQM/CIEH
Aromatic C10-C12	29000	LQM/CIEH
Aromatic C12-C16	37000	LQM/CIEH
Aromatic C16-C21	28000	LQM/CIEH
Aromatic C21-C35	28000	LQM/CIEH
PRO (C_5 –C_{10})	40157	Calc
DRO (C_{12} –C_{28})	1,948,000	Calc
Lube Oil (C_{28} –C_{44})	1,828,000	Calc
TPH	**500**	Trigger for speciated testing

Contaminant	Guideline Value mg/kg	Data Source
Anions		
Soluble Sulphate	0.5 g/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	10	Methanogenic potential
Total Cyanide	12000	WRAS
Total Mono Phenols	3200	SGV
PAH		
Naphthalene	480.00	LQM/CIEH
Acenaphthylene	97,000	LQM/CIEH
Acenaphthene	98,000	LQM/CIEH
Fluorene	69,000	LQM/CIEH
Phenanthrene	22,000	LQM/CIEH
Anthracene	540,000	LQM/CIEH
Fluoranthene	23,000	LQM/CIEH
Pyrene	54,000	LQM/CIEH
Benzo(a) Anthracene	95.0	LQM/CIEH
Chrysene	140	LQM/CIEH
Benzo(b) Fluoranthene	100.0	LQM/CIEH
Benzo(k) Fluoranthene	140.0	LQM/CIEH
Benzo(a) pyrene	14.00	LQM/CIEH
Indeno(1 2 3 cd) Pyrene	61.0	LQM/CIEH
Dibenzo(a h) Anthracene	13.00	LQM/CIEH
Benzo (g h i) Perylene	660	LQM/CIEH
Total PAH	**93.3**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	1400	LQM/CIEH
tetrachloroethane (PCA)	260	LQM/CIEH
tetrachloroethene (PCE)	290	LQM/CIEH
trichloroethene (TCE)	25	LQM/CIEH
1,2-dichloroethane (DCA)	1	LQM/CIEH
vinyl chloride (Chloroethene)	0.081	LQM/CIEH
tetrachloromethane (Carbon tetra	6.6	LQM/CIEH
trichloromethane (Chloroform)	190	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk to human health. Concentrations measured in excess of these valuesindicate a potential risk, and thus require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

withdrawn SGV - Former SGV, derived from the CLEA 2000 model and published by DEFRA pending confirmation of new approach to modeling lead

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

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LABORATORY TEST REPORT

Results of analysis of 1 sample
received 18 July 2013

J13113A 15-17 Tavistock Place, London, WC1H 9SH

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Report Date
26 July 2013

Login Batch No					**234983**
Chemtest LIMS ID					AI96562
Sample ID					J1
Sample No					BH4
Sampling Date					16/7/2013
Depth					3.0m
Matrix					*WATER*
SOP↓	Determinand↓	CAS No↓	Units↓	*	
1010	pH	PH		U	7.9
1020	Electrical Conductivity	EC	µS cm-¹	U	1900
1220	Chloride	16887006	mg l-¹	U	450
	Ammonia (free)	7664417	mg l-¹	U	0.10
	Nitrate	14797558	mg l-¹	U	<0.50
1325	Sulfide	18496258	mg l-¹	U	<0.050
1610	Total Organic Carbon	TOC	mg l-¹	N	22
1220	Sulfate	14808798	mg l-¹	U	310
1450	Arsenic	7440382	µg l-¹	U	5.9
	Cadmium	7440439	µg l-¹	U	<0.080
	Mercury	7439976	µg l-¹	U	<0.50
	Nickel	7440020	µg l-¹	U	4.4
	Lead	7439921	µg l-¹	U	<1.0
1670	TPH (Aqueous Phase)		µg l-¹	U	6100
1920	Phenols (total)		mg l-¹	N	< 0.03

All tests undertaken between 18/07/2013 and 26/07/2013

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

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AMENDED LABORATORY TEST REPORT

Results of analysis of 1 sample
received 18 July 2013

J13113A 15-17 Tavistock Place, London, WC1H 9SH

Report Date
19 August 2013

Login Batch No					**234983**
Chemtest LIMS ID					AI96562
Sample ID					J1
Sample No					BH4
Sampling Date					16/7/2013
Depth					3.0m
Matrix					*WATER*
SOP↓	Determinand↓	CAS No↓	Units↓	*	
1010	pH	PH		U	7.9
1020	Electrical Conductivity	EC	µS cm-¹	U	1900
1220	Chloride	16887006	mg l-¹	U	450
	Ammonia (free)	7664417	mg l-¹	U	0.10
	Nitrate	14797558	mg l-¹	U	<0.50
1325	Sulfide	18496258	mg l-¹	U	<0.050
1610	Total Organic Carbon	TOC	mg l-¹	N	22
1220	Sulfate	14808798	mg l-¹	U	310
1450	Arsenic	7440382	µg l-¹	U	5.9
	Cadmium	7440439	µg l-¹	U	<0.080
	Mercury	7439976	µg l-¹	U	<0.50
	Nickel	7440020	µg l-¹	U	4.4
	Lead	7439921	µg l-¹	U	<1.0
1670	TPH (Aqueous Phase)		µg l-¹	U	6100
1675	TPH aliphatic >C5-C6		µg l-¹	N	< 0.1
	TPH aliphatic >C6-C8		µg l-¹	N	49
	TPH aliphatic >C8-C10		µg l-¹	N	480
	TPH aliphatic >C10-C12		µg l-¹	N	490
	TPH aliphatic >C12-C16		µg l-¹	N	67
	TPH aliphatic >C16-C21		µg l-¹	N	< 0.1
	TPH aliphatic >C21-C35		µg l-¹	N	< 0.1
	TPH aliphatic >C35-C44		µg l-¹	N	< 0.1
	TPH aromatic >C5-C7		µg l-¹	N	5.5
	TPH aromatic >C7-C8		µg l-¹	N	5.3

All tests undertaken between 18/07/2013 and 15/08/2013

* Accreditation status

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AMENDED LABORATORY TEST REPORT

Results of analysis of 1 sample
received 18 July 2013

J13113A 15-17 Tavistock Place, London, WC1H 9SH

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Report Date
19 August 2013

					234983
					AI96562
					J1
					BH4
					16/7/2013
					3.0m
					WATER
1675	TPH aromatic >C8-C10		µg l-¹	N	190
	TPH aromatic >C10-C12		µg l-¹	N	280
	TPH aromatic >C12-C16		µg l-¹	N	170
	TPH aromatic >C16-C21		µg l-¹	N	9.9
	TPH aromatic >C21-C35		µg l-¹	N	< 0.1
	TPH aromatic >C35-C44		µg l-¹	N	< 0.1
	Total Petroleum Hydrocarbons		µg l-¹	N	1700
	Total Aliphatic Hydrocarbons		µg l-¹	N	1100
	Total Aromatic Hydrocarbons		µg l-¹	N	660
1920	Phenols (total)		mg l-¹	N	< 0.03

All tests undertaken between 18/07/2013 and 15/08/2013

* Accreditation status

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Groundwater Screening Values

Site	15–17 Tavistock Place, London, WC1H 9SH	**Job Number** J13113A
Client	University College London	**Sheet** 1 / 1
Engineer	Carter Clack	

Contaminant	Guideline Value µg/l	Data Source
Metals		
Arsenic	50	EQS (freshwater)
Cadmium	5	EQS (freshwater)
Chromium	10	EQS (freshwater)
Lead	10	EQS (freshwater)
Mercury	1	EQS (freshwater)
Nickel	20	EQS (freshwater)
Hydrocarbons		
Benzene	30	EQS (freshwater)
Toluene	50	EQS (freshwater)
Ethyl Benzene	20	EQS (freshwater)
Xylene	30	EQS (freshwater)
Aliphatic C5-C6	15000	WHO
Aliphatic C6-C8	15000	WHO
Aliphatic C8-C10	300	WHO
Aliphatic C10-C12	300	WHO
Aliphatic C12-C16	300	WHO
Aliphatic C16-C21	300*	WHO
Aliphatic C21-C35	300*	WHO
Aromatic C6-C7	See Benzene	EQS (freshwater)
Aromatic C7-C8	See Toluene	EQS (freshwater)
Aromatic C8-C10	See Ethylbenzene	EQS (freshwater)
Aromatic C10-C12	100	WHO
Aromatic C12-C16	100	WHO
Aromatic C16-C21	90	WHO
Aromatic C21-C35	90	WHO
Total Petroeum Hydrocarbons (dissolved / emulsions)	**300**	Trigger for speciated testing

Contaminant	Guideline Value µg/l	Data Source
Anions		
Sulphate	400000	EQS (freshwater)
Sulphide		None available
Chloride	250000	EQS (freshwater)
Others		
Organic Carbon		No 'abnormal' change
Ammonia	15	EQS (freshwater)
Nitrate	50000	UK DWS
Electrical conductivity (µS/cm)	2500	UK DWS
Total Mono Phenols	30	EQS (freshwater)
PAH		
Naphthalene	10.00	EQS (freshwater)
Anthracene	0.02	EQS (freshwater)
Fluoranthene	0.02	EQS (freshwater)
Benzo(a) pyrene	0.03	EQS (freshwater)
Total PAH	**0.1**	UK DWS
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	100	EQS (freshwater)
tetrachloroethane (PCA)	10	EQS (freshwater)
tetrachloroethene (PCE)	10	EQS (freshwater)
trichloroethene (TCE)	10	EQS (freshwater)
1,2-dichloroethane (DCA)	10	EQS (freshwater)
vinyl chloride (Chloroethene)	0.5	UK DWS
tetrachloromethane (Carbon tetra	12	EQS (freshwater)
trichloromethane (Chloroform)	100	UK DWS

* There are no WHO guidelines for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions of C8-C16 has been applied.

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk

Concentrations measured in excess of these valuesindicate a potential risk, and thus require further, site specific risk assessment.

EQS - Environmental Quality Standards

WHO - World Health Organisation

UK DWS - United Kingdom Drinking Water Standard

GEA
www.gea-ltd.co.uk
Herts | 01727 824666 Notts | 01509 674888

Gas Monitoring

Site	15 - 17 Tavistock Place, London, WC1H 9SH		**Job Number** J13113B
Client	Kier		**Sheet** 1/2
Engineer	Wilde Carter Clack		

Date	27/03/2018	09/04/2018	23/04/2018
Air Temperature °C	-	10.5	17
Barometric Pressure (mB)	1001	1001	1011
Visit No	1	2	3

Borehole No	14	15	14	15	14	15
Standpipe Depth (m)	4.9	4.88	4.89	4.29	4.85	4.98
Condition of Standpipe	Good	Good	Good	Good	Good	Good
Combustible gas (CH4) % LEL	0	0	0	0	0	0
Combustible gas (CH4) % vol	0	0	0	0	0	0
Carbon Dioxide (CO2) % vol	0	0	0	0	0	0
Oxygen (O2) % vol	21.2	21.1	23	23.1	23.5	22.9
Carbon Monoxide ppm	0	0	1	1	0	0
Hydrogen Sulphide (H2S) ppm	0	0	1	2	1	0
Flow Rate (max) l/hr	0	0	1.7	1.8	0	0
Relative Downhole Pressure mb	0	0	7	7	0	0
Water Level m	4.64	2.88	4.37	2.29	4.10	2.90
PID ppm	0	0	1	0	0.0	0.0
Remarks						

GEA
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Gas Monitoring

Site	15 - 17 Tavistock Place, London, WC1H 9SH	**Job Number** J13113B
Client	Kier	**Sheet** 2/2
Engineer	Wilde Carter Clack	

Date	09/05/2018		23/05/2018		06/06/2018	
Air Temperature °C	-		-		15.5	
Barometric Pressure (mB)	1004		1019		1012	
Visit No	4		5		6	
Borehole No	14	15	14	15	14	15
Standpipe Depth (m)	-	-	4.85	4.89	4.88	4.90
Condition of Standpipe	Good	Good	Good	Good	Good	Good
Combustible gas (CH4) % LEL	0	0	-	-	0	0
Combustible gas (CH4) % vol	0	0	0	0	0	0
Carbon Dioxide (CO2) % vol	0	0	0.2	0.1	0	0
Oxygen (O2) % vol	20.6	20.8	20.5	20.6	20.8	20.8
Carbon Monoxide ppm	0	0	0	0	0	0
Hydrogen Sulphide (H2S) ppm	0	0	1	0	0	0
Flow Rate (max) l/hr	0	0	0	0	0	0
Relative Downhole Pressure mb	0	0	0	0	0	0
Water Level m	-	-	3.69	3.06	3.63	2.85
PID ppm	1.1	0.2	0.2	0.7	1	0
Remarks						

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 26/01/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: HD

SHEET: 1/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	3.07	6.15	
BH3	4.46	6.11	
BH4	1.79	3.80	

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 06/02/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: LS

SHEET: 2/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	2.22	6.22	
BH3	4.24	6.24	
BH4	2.16	3.86	

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 27/03/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: LS

SHEET: 3/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	2.79	6.23	
BH3	4.25	6.29	
BH4	2.48	3.88	
BH14	4.64	4.89	
BH15	2.88	4.88	

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 09/04/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: LS

SHEET: 4/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	2.76	6.24	
BH3	4.20	6.27	
BH4	1.79	3.89	
BH14	4.37	4.89	
BH15	2.29	4.29	

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 23/04/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: OH

SHEET: 5/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	2.68	6.20	
BH3	4.20	6.20	
BH4	2.40	3.90	
BH14	4.10	4.85	
BH15	2.90	4.98	

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 23/05/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: LS

SHEET: 6/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	2.87	6.24	
BH3	4.33	6.25	
BH4	2.65	3.89	
BH14	3.69	4.85	
BH15	3.06	4.89	

GROUNDWATER MONITORING RECORD

JOB NUMBER: J13113B

SITE LOCATION: 15 – 17 Tavistock Place, London, WC1H 9SH

CLIENT: Kier

ENGINEER:

DATE: 23/05/2018

GEA JOB ENGINEER: LS

GEA MONITORING ENGINEER: LS

SHEET: 7/7

Borehole Identification	Depth to water (m)	Depth to base (m)	Additional Notes
BH1	2.75	6.24	
BH3	4.25	6.24	
BH4	2.38	3.87	
BH14	3.63	4.88	
BH15	2.85	4.90	

ENVIRON

22nd July 2009

Colin Stapleton
Specialist Technical Officer
Cultural and Environmental Directorate
Town Hall Extension
Argyle Street
London
WC1H 8EQ

Our Ref: JM/RB/LUK2014451_02

Dear Colin,

Re: 15/17 Tavistock Place – Tank Removal

We write to you in regards to the validation testing undertaken at the above named site in respect to the removal of the underground fuel storage tank located in the courtyard area of the site as presented in Figure 1 Appendix 1. The validation works were carried out after having undertaken an initial environmental assessment and site investigation (LUK2014451_01, April 2009) which was issued to EHO as part of the planning condition.

This letter report presents results of the validation testing undertaken on material surrounding the excavated tank that is to remain in situ and provides an assessment of the results, in terms of likely risks to the underlying groundwater.

ENVIRON attended site on 10th July 2009 to observe the exposed excavation that contained the *former underground fuel storage tank for visual signs of contamination and for the collection of soil* samples from the side walls and base of the excavation. The approximate extent of the excavation along with the validation sampling points are shown in Figure 2, Appendix 1.

Excavation Works

IBEX were commissioned by London School of Medicine to undertake the excavation and removal of the underground storage tank, previously used on site for the fuelling of vehicles. The works were undertaken on 10th July 2009 and involved the following:

- The underground fuel tank was previously cleaned and degassed then foam filled prior to these works to make it safe prior to removal, although there is no record of when this was undertaken and by whom. To ensure that the tanks were foam filled and that no liquid was present the tanks were dipped by IBEX;
- The excavation of a 20,000 litre Petrol Tank within the courtyard (as shown in Figure 2 Appendix 1);
- The removal from site and disposal of the excavated storage tank;
- The removal of the concrete bund in which the tank resided; and
- The removal of all associated pipe work and pump.

During ENVIRON's visit, no visual or olfactory evidence of hydrocarbon contamination was observed underlying the concrete bund in which the tank was situated. This was confirmed by carrying out headspace testing on the material which was excavated along with the tank. The concrete bund surrounding the tank was approximately 300mm thick on all sides and the base, and according to IBEX appeared visually to be in good condition with no cracks or staining present. ENVIRON

observed the remnants of the concrete surround on 10th July 2009 (although it was not intact due to being pulled apart in the removal process) and confirmed the concrete had no visual signs of staining, on the sections available for inspection.

The total depth of the excavation was approximately 3.5m bgl, at its deepest whilst the length was approximately 5m and width of the excavation being approximately 4m.

Photographs of the excavation faces and base, material from the bottom of the excavation, the pipeline exposed, the excavated tank and that surrounded the tank were taken by ENVIRON on the 10th July 2009 and are included in the photographic plates in Appendix 2.

Validation Works

As detailed above, ENVIRON attended site to collect validation samples of the excavation on the 10th July 2009.

A total of 6 validation samples (VAL-TP-N, VAL-TP-S, VAL-TP-E, VAL-TP-W, VAL-TP-BASE, VAL-TP-FL shown in Figure 2) were collected from the side walls, the base of the excavation along the fuel line in the vicinity of the fuel filling point and were subjected to testing for potential contaminants associated with the petroleum fuel namely petroleum hydrocarbons (C5-C10) plus benzene, toluene, ethylene and xylene (BTEX). In addition, a soil sample was collected from the stockpiled material which was considered not be impacted by hydrocarbon contamination and ear marked for re-use as backfill within the excavation. This was subject to the same testing as the validation sampling.

Soil samples were collected from the side walls and base of the excavation and were all tested by dynamic headspace analysis for the presence of volatile organic compounds (VOCs) using a photo-ionisation detector (PID). Dynamic headspace analysis comprises the manual agitation of a bagged soil sample to facilitate the VOCs present in the soil partitioning into the headspace above (i.e. soil gas) which is then analysed using the PID. The PID screens for a wide range of VOCs including hydrocarbon compounds, but does not indicate specific compounds. The measurements obtained by the instrument in parts per million by volume (ppmv) provide a semi-quantitative indication of the concentration of hydrocarbon vapours that are present in the soil pore spaces. Samples collected from the sides and base of the excavation and subjected to headspace testing, all readings were below the detection limit of the instrument (<0.01ppm), indicating the absence of VOCs within the material to be left in situ.

The material from around the tank was stockpiled and labelled STP01. This material was deemed suitable for re-use within the excavation as backfill as no signs of hydrocarbon contamination were noted. To ensure that the material was suitable for re-use a sample was taken (STP01) and sent for laboratory testing.

The validation sampling locations are presented in Figure 2, Appendix 1 and laboratory certificates are presented in Appendix 3.

Validation Results

The results indicated the following:

- Headspace readings for the soil samples collected from the sides and base of the excavation were all reported to be below the PID method detection limit (<0.01ppm), indicating the no significant presence of hydrocarbon contamination within the remaining soil;

- All six soil samples (VAL-TP-N, VAL-TP-S, VAL-TP-E, VAL-TP-W, VAL-TP-BASE, VAL-TP-FL) indicated no significant hydrocarbons to be present with concentrations ranging between below the method detection limit (<0.01mg/kg) and 1.5mg/kg; and

- The sample taken from the stockpiled material for re-use (STP01) also indicated no significant petroleum hydrocarbons to be present (0.034mg/kg).

Conclusion

In conclusion, having removed the tank from site and considering the chemical analysis results obtained from materials that are to remain on site, there is no longer an apparent source of petroleum hydrocarbons associated with the former underground fuel storage tank which could pose a significant risk to site users or the underlying groundwater.

We hope the above and attached information fulfils your requirements. If however, you have any queries relating to any of the information provided, please do not hesitate to contact the undersigned.

Yours sincerely

Jamie Mills
Principal

Roy Bailey
Consultant

cc:
Claire O'Connner – London School of Hygiene and Tropical Medicine
Sam Moss – BNP Paribas Real Estate

ENVIRON

APPENDIX 3: Laboratory Certificates

Roy Bailey
Environ UK Ltd
Kent House Business Centre
Romney Place
Maidstone
Kent
ME15 6LH

15 July 2009

TEST REPORT

Our Report Number: 09-65364

Your Order Reference: N/A

1 soil sample received on 13/07/2009

Final instructions received on 10/07/2009

Project Name: Tavistock Place

Project Code: UK2014451

Laboratory analysis started on 13 July 2009
All laboratory analysis completed by 15 July 2009

Rexona Rahman
Analytical Reporting Manager
ALCONTROL LABORATORIES

Daljit Jandu
Project Co-Ordinator
ALCONTROL LABORATORIES

ALcontrol Laboratories
Sample Description

Job Number: 09-65364
Client: Environ UK Ltd
Project Code: UK2014451

Matrix: Soil
Project Name: Tavistock Place

Laboratory Reference No	Sample Reference	Sample Depth (m)	Date Sampled	Sample Description
389224	STP01	-	01/07/09	Orange / brown sand with gravel

ALcontrol Laboratories
Table Of Results

Project Name: Tavistock Place
Client : Environ UK Ltd

Job Number : 09-65364
Matrix : Soil
Project Code: UK2014451

Sample Reference	**STP01**					Method No	Units	LOD
Sample Depth (m)	**-**							
Date Sampled	**01/07/09**							
Date Scheduled	**10/07/09**							
Laboratory Reference No	**389224**							
Analysis								
Moisture Content (Dry Weight)	8.3					021	%	0.1
Moisture Content (Wet Weight)	7.6					021	%	0.1
** VPH/BTEX SUITE **								
MTBE	< 0.01					068S[IM]	mg/kg	0.01
Benzene	< 0.01					068S[IM]	mg/kg	0.01
Toluene	< 0.01					068S[IM]	mg/kg	0.01
Ethylbenzene	< 0.01					068S[IM]	mg/kg	0.01
m,p-Xylenes	< 0.01					068S[IM]	mg/kg	0.01
o-Xylene	< 0.01					068S[IM]	mg/kg	0.01
1,3,5-Trimethylbenzene	< 0.01					068S[IM]	mg/kg	0.01
1,2,4-Trimethylbenzene	< 0.01					068S[IM]	mg/kg	0.01
VPH Compounds (C5-C10)	0.034					068S[IM]	mg/kg	0.01
VPH Compounds (C10-C12)	< 0.01					068S	mg/kg	0.01
VPH Compounds (C5-C12)	0.039					068S	mg/kg	0.01

[I] ISO 17025 accredited.
[M] MCERTS accredited for sand, loam and clay.

ALcontrol Laboratories
Table Of Results - Appendix

Job Number : 09-65364

Project Code: UK2014451

Project Name: Tavistock Place
Client : Environ UK Ltd

Summary of methods contained within report :

Method No	Reference	Description	Water Analysis
068S	In-house method	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) including BTEX and MTBE compounds by Headspace GC-FID (VPH).	W

Soil results are expressed on a dry weight basis. Where the test uses as-received sample, a moisture correction factor is applied to the wet weight result. This factor is determined gravimetrically using weight loss on drying at 30º (+/-5) C.

Appendix

Code	Description
[redacted]	
*	Detection limit(s) raised due to matrix interference
¥	Detection limit(s) raised due to reduced amount of sample available for analysis
‡	Dilution factor applied due to nature of sample
NSM	No suspect material detected This must not be interpreted as a statement that there is no asbestos in the sample as loose fibres may not be found during visual screening
$	Analysis sub-contracted
U/S	Analysis unsuitable for sample due to its matrix or properties
I/S	Insufficient sample
M/S	Sample cannot be located within the laboratory
ND	Not detected (below relevant analytical detection limit)
ç	Sample filtered prior to analysis
§	Please note product present, therefore this result is for indicative purpose only
[redacted]	
†	Sample type outside the scope of our MCERTS accreditation since matrix not included in method validation
¢	Unsuitable for analysis due to asbestos content
[redacted]	
æ	Please note TOC's & LOI's have been repeated and the apparently anomalous results confirmed
¶	UKAS and/or MCERTS accreditation removed due to duration of sample in laboratory prior to testing
¤	The BOD analysis was carried out prior to the COD analysis and included an oily layer, which is the likely cause of the anomalous results
Note:	Analysis carried out for organic compounds on water samples containing free product is on a "best endeavour" basis
Note:	All results calculated from organic carbon on a dry weight basis
Note:	Fe(II) and dissolved Fe are analysed by different methods, sometimes leading to slight discrepancy between results
Note:	"Total" results calculated by summing individual components are not rounded
Note:	The reporting limit stated in the LOD column is the standard method reporting limit, derived statistically from validation data, however it is occasionally necessary to raise reporting limits due to matrix interference or limited sample availability
Note:	During soil preparation, best efforts are made to produce analytical subsamples representative of the entire submitted sample, without exclusion of stones

Roy Bailey
Environ UK Ltd
Kent House Business Centre
Romney Place
Maidstone
Kent
ME15 6LH

20 July 2009

TEST REPORT

Our Report Number: 09-65365

Your Order Reference: N/A

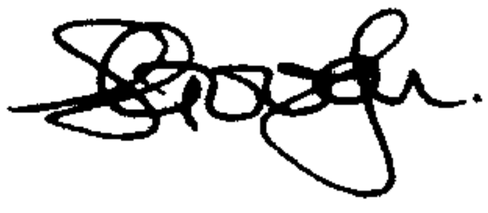
6 soil samples received on 13/07/2009

Final instructions received on 10/07/2009

Project Name: Tavistock Place

Project Code: UK2014451

Laboratory analysis started on 13 July 2009
All laboratory analysis completed by 20 July 2009



Sharon Googh
Project Co-Ordinator
ALCONTROL LABORATORIES

Luis Nunes
Project Co-Ordinator
ALCONTROL LABORATORIES

ALcontrol Laboratories
Sample Description

Job Number: 09-65365
Client: Environ UK Ltd
Project Code: UK2014451

Matrix: Soil
Project Name: Tavistock Place

Laboratory Reference No	Sample Reference	Sample Depth (m)	Date Sampled	Sample Description
389218	VAL-TP-N	2.8	01/07/09	Brown sand with rubble
389219	VAL-TP-S	2.6	01/07/09	Brown sandy clay with rubble
389220	VAL-TP-E	2.9	01/07/09	Brown sandy clay with gravel
389221	VAL-TP-W	1.9	01/07/09	Brown sandy clay with gravel
389222	VAL-TP-Base	3.5	01/07/09	Dark brown clay
389223	VAL-FL	0.4	01/07/09	Brown sand with gravel

ALcontrol Laboratories
Table Of Results

Job Number : 09-65365
Matrix : Soil
Project Code: UK2014451

Project Name: Tavistock Place
Client : Environ UK Ltd

Sample Reference	VAL-TP-N	VAL-TP-S	VAL-TP-E	VAL-TP-W	VAL-TP-Base	[illegible]	[illegible]	[illegible]
Sample Depth (m)	2.8	2.6	2.9	1.9	3.5			
Date Sampled	01/07/09	01/07/09	01/07/09	01/07/09	01/07/09			
Date Scheduled	10/07/09	10/07/09	10/07/09	10/07/09	10/07/09			
Laboratory Reference No	389218	389219	389220	389221	389222			
Analysis								
Moisture Content (Dry Weight)	18.7	17.6	24.2	19.2	29.4	021	%	0.1
Moisture Content (Wet Weight)	15.7	15.0	19.5	16.1	22.7	021	%	0.1
** VPH/BTEX/BUTB **								
MTBE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	068S[IM]	mg/kg	0.01
Benzene	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	068S[IM]	mg/kg	0.01
Toluene	< 0.01	0.028	< 0.01	< 0.01	0.017	068S[IM]	mg/kg	0.01
Ethylbenzene	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	068S[IM]	mg/kg	0.01
m,p-Xylenes	< 0.01	0.027	< 0.01	< 0.01	0.011	068S[IM]	mg/kg	0.01
o-Xylene	< 0.01	0.064	< 0.01	< 0.01	< 0.01	068S[IM]	mg/kg	0.01
1,3,5-Trimethylbenzene	< 0.01	0.15	< 0.01	< 0.01	< 0.01	068S[IM]	mg/kg	0.01
1,2,4-Trimethylbenzene	< 0.01	0.14	< 0.01	< 0.01	< 0.01	068S[IM]	mg/kg	0.01
VPH Compounds (C5-C10)	0.045	0.76	0.032	0.046	0.15	068S[IM]	mg/kg	0.01
VPH Compounds (C10-C12)	< 0.01	0.74	< 0.01	< 0.01	< 0.01	068S	mg/kg	0.01
VPH Compounds (C5-C12)	0.049	1.5	0.034	0.047	0.15	068S	mg/kg	0.01

[I] ISO 17025 accredited.
[M] MCERTS accredited for sand, loam and clay.

ALcontrol Laboratories
Table Of Results

Job Number : 09-65365
Matrix : Soil
Project Code: UK2014451

Project Name: Tavistock Place
Client : Environ UK Ltd

Sample Reference	VAL-FL					Method	Units	LOD
Sample Depth (m)	0.4							
Date Sampled	01/07/09							
Date Scheduled	10/07/09							
Laboratory Reference No	389223							
Analytical								
Moisture Content (Dry Weight)	10.1					021	%	0.1
Moisture Content (Wet Weight)	9.2					021	%	0.1
VPH/BTEX SUITE								
MTBE	< 0.01					068S[IM]	mg/kg	0.01
Benzene	< 0.01					068S[IM]	mg/kg	0.01
Toluene	< 0.01					068S[IM]	mg/kg	0.01
Ethylbenzene	< 0.01					068S[IM]	mg/kg	0.01
m,p-Xylenes	< 0.01					068S[IM]	mg/kg	0.01
o-Xylene	< 0.01					068S[IM]	mg/kg	0.01
1,3,5-Trimethylbenzene	< 0.01					068S[IM]	mg/kg	0.01
1,2,4-Trimethylbenzene	< 0.01					068S[IM]	mg/kg	0.01
VPH Compounds (C5-C10)	0.071					068S[IM]	mg/kg	0.01
VPH Compounds (C10-C12)	< 0.01					068S	mg/kg	0.01
VPH Compounds (C5-C12)	0.080					068S	mg/kg	0.01

[I] ISO 17025 accredited.
[M] MCERTS accredited for sand, loam and clay.

ALcontrol Laboratories
Table Of Results - Appendix

Job Number : 09-65365

Project Code: UK2014451

Project Name: Tavistock Place
Client : Environ UK Ltd

Summary of methods contained within report :

Method No.	Reference	Description	Matrix
068S	In-house method	Determination of Total Gasoline Range Organics Hydrocarbons (GRO) including BTEX and MTBE compounds by Headspace GC-FID (VPH).	W

Soil results are expressed on a dry weight basis. Where the test uses as-received sample, a moisture correction factor is applied to the wet weight result. This factor is determined gravimetrically using weight loss on drying at 30º (+/-5) C.

Appendix

Code	Description
[redacted]	
*	Detection limit(s) raised due to matrix interference
¥	Detection limit(s) raised due to reduced amount of sample available for analysis
‡	Dilution factor applied due to nature of sample
NSM	No suspect material detected This must not be interpreted as a statement that there is no asbestos in the sample as loose fibres may not be found during visual screening
$	Analysis sub-contracted
U/S	Analysis unsuitable for sample due to its matrix or properties
I/S	Insufficient sample
M/S	Sample cannot be located within the laboratory
ND	Not detected (below relevant analytical detection limit)
ç	Sample filtered prior to analysis
§	Please note product present, therefore this result is for indicative purpose only
[redacted]	
†	Sample type outside the scope of our MCERTS accreditation since matrix not included in method validation
¢	Unsuitable for analysis due to asbestos content
[redacted]	
æ	Please note TOC's & LOI's have been repeated and the apparently anomalous results confirmed
¶	UKAS and/or MCERTS accreditation removed due to duration of sample in laboratory prior to testing
¤	The BOD analysis was carried out prior to the COD analysis and included an oily layer, which is the likely cause of the anomalous results
Note:	Analysis carried out for organic compounds on water samples containing free product is on a "best endeavour" basis
Note:	All results calculated from organic carbon on a dry weight basis
Note:	Fe(II) and dissolved Fe are analysed by different methods, sometimes leading to slight discrepancy between results
Note:	"Total" results calculated by summing individual components are not rounded
Note:	The reporting limit stated in the LOD column is the standard method reporting limit, derived statistically from validation data, however it is occasionally necessary to raise reporting limits due to matrix interference or limited sample availability
Note:	During soil preparation, best efforts are made to produce analytical subsamples representative of the entire submitted sample, without exclusion of stones

ENVIRON

APPENDIX 1: Figures

Key

Site Boundary

Title
Figure 1
Site Plan & Tank Location

Site
Tavistock Place

Client
LSHTM

Date	Drawn by
July 2009	RB
Project No. UK2014451	Issue 01

Scale **See Scale Bar**

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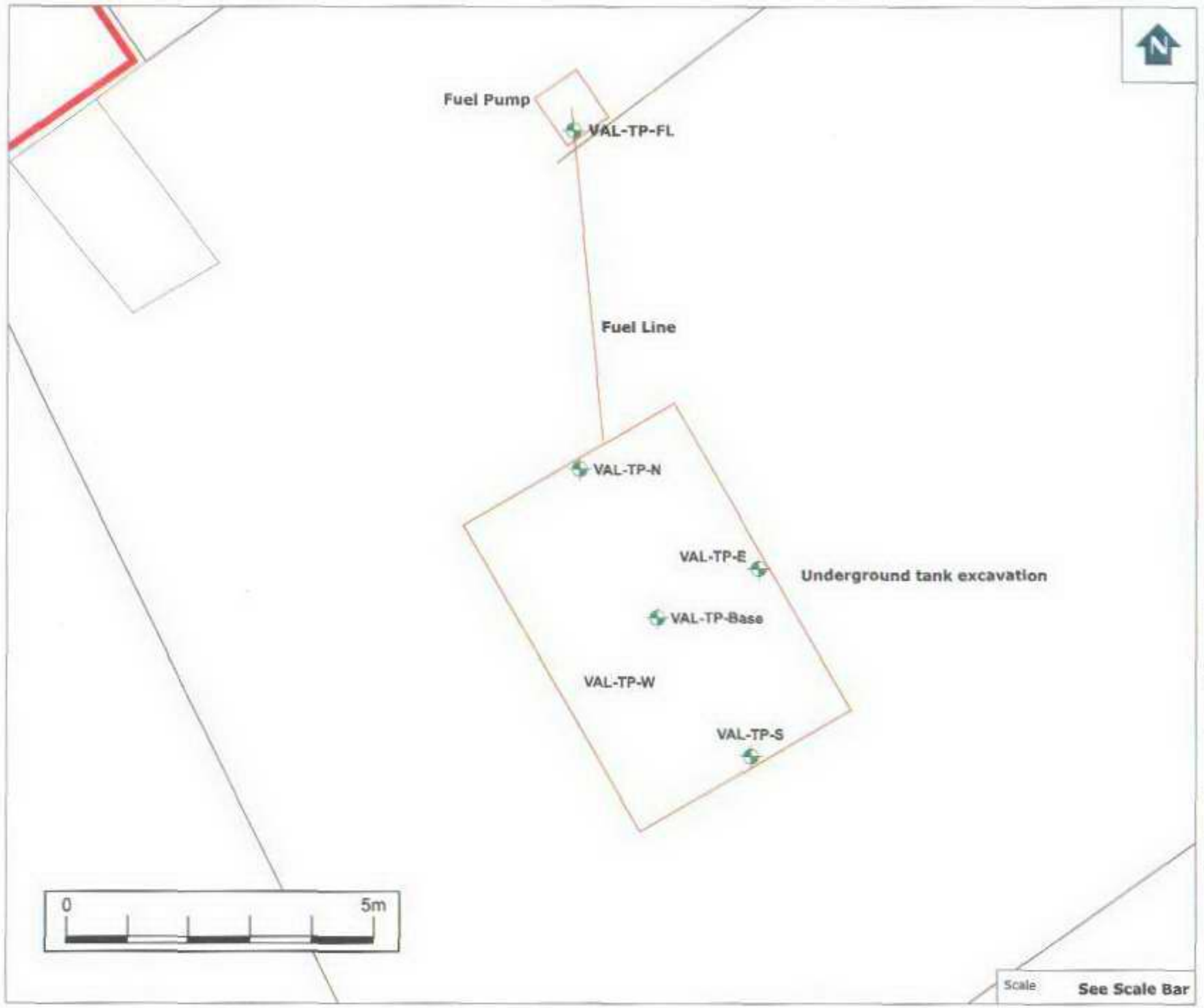

Key

- Site Boundary
- Former Underground Tank, Associated Fuel Line & Pump
- Validation Sampling Point

Scale: See Scale Bar

Title: **Figure 2 Validation Sampling**

Site: **Tavistock Place**

Client: **LSHTM**

Date	Drawn by
July 2009	RB
Project No. UK2014451	Issue 01

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APPENDIX 2: Photo plates

Photo 1. Face of excavation looking north

Photo 2. Western face and base of excavation

Site:	Tavistock Place	**Date:**	July 2009
Client:	LSHTM	**Document Version:**	01

Photo 3. Material dug from the base of the excavation

Photo 4. Pipework from under the re-fuelling point

Site:	Tavistock Place	**Date:**	July 2009
Client:	LSHTM	**Document Version:**	01