28 HOLLYCROFT AVENUE, NW3 7QL

APPENDIX D

CONTAMINATION TEST REPORT

14 October 2011

Our ref J11180/HD/1

Geotechnical & Environmental Associates

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Mr Phillip Kwan
Sinclair Johnston and Partners
93 Great Suffolk Street
London
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Dear Phillip

Re: 28 HOLLYCROFT AVENUE, LONDON

Further to your instruction, dated 27 September 2011, we have now completed the contamination testing at the above site. This letter comprises the report on our findings and forms an addendum to our Site Investigation Report (ref; J11180, dated 4 October 2011). This previous report should be referred to for information not superseded by this letter.

The conclusions and recommendations made in this letter are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

1.0 Purpose of Work

The plans for the development are currently in the early stages and the scope of the investigation was therefore limited to a preliminary assessment of the ground conditions and a limited number of contamination tests. A desk study will be required, in addition to further investigation and assessment, to finalise the geotechnical advice and additional work will also probably be required to comply with the Local Authority's requirements with respect to assessment of the effects of basement excavations on groundwater and land stability.

The objective of the work carried out was therefore to provide an indication of the degree of soil contamination present and presence of contamination on the site and to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.1 Scope of Work

The scope of the works was specified by the consulting engineers and access was severely limited by the presence of the existing property and services. Four hand-dug trial pits were excavated to depths of between 0.3 m and 1.3 m to expose the foundations of the existing house and a small garden wall and two window sampler boreholes was carried out in the rear garden and extended to depths of 3.0 m and 7.0 m to confirm the ground conditions at depth.

Three samples of the made ground were sent for chemical analyses as a precautionary measure. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH),

total cyanide and monohydric phenols. The soil samples were selected to provide a general view of the chemical conditions of the soils that are likely to be involved in a human exposure or groundwater pathway and to provide advice in respect of re-use or for waste disposal classification.

The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. A summary of the MCERTs accreditation and test methods are included with the attached results and further details are available upon request.

2.0 Soil Contamination

The table below sets out the values measured within three samples analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	BH1: 0.3 m	TP2: 0.9 m	TP4: 0.6 m
Arsenic	13	20	10
Cadmium	0.18	0.26	0.11
Chromium	26	32	29
Copper	17	20	11
Mercury	0.51	0.77	0.80
Nickel	12	18	13
Lead	160	**1100**	200
Selenium	0.39	0.28	<0.20
Zinc	79	200	110
Total Cyanide	<0.50	<0.50	<0.50
Total Phenols	<0.3	<0.3	<0.3
Sulphide	1.1	0.59	0.55
Total PAH	<2	4.8	**67**
Benzo(a)pyrene	<0.1	0.15	**4.1**
Naphthalene	<0.1	<0.1	0.14
TPH	28	13	**640**
Total Organic Carbon %	4.3	2.2	0.74

Notes: Figure in **bold** indicates concentration in excess of risk-based soil guideline values, as discussed in Part 2 of this report

2.2 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end the contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[1] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Version 1.06 software assuming a residential end use.

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1 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.

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

- that groundwater is not a critical risk receptor;
- that the critical receptor for human health will be young female child (aged zero to six years old);
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of homegrown produce, consumption of soil adhering to homegrown produce, skin contact with soils and dust, and inhalation of dust and vapours; and
- that the building type equates to a two-storey terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this site. The tables of generic screening values derived by GEA and an explanation of how each value has been derived are included in the Appendix.

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 these generic screening values 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.

The concentration ranges of the contaminants of concern highlighted by a comparison of the measured concentrations against the generic screening values is tabulated below. This assessment is based upon the potential for risk to human health, which at this site is considered to be the critical risk receptor.

Contaminant of Concern	Maximum concentration recorded (mg/kg)	Location(s) where elevated concentration recorded	Generic Risk-Based Screening Value
Lead	1100	TP2: 0.9 m	450
TPH	640	TP4: 0.6 m	500
Benzo(a)anthracene	6.1	TP4: 0.6 m	5.9
Benzo(a)pyrene	4.1	TP4: 0.6 m	1.00
Indeno(1,2,3-cd)pyrene	4.3	TP4: 0.6 m	4.2
Total PAH	67	TP4: 0.6 m	6.7

**Threshold values marked thus are for compounds with a limited human toxicity hence the threshold values adopted are not derived on a risk based methodology. Justification for all of the values quoted is provided in the appended table of Generic Risk Based Threshold Soil Guideline Values*

The chemical analyses have revealed an elevated concentration of lead in Trial Pit No 2, at a depth of 0.9 m. In Trial Pit No 4 at a depth of 0.6 m elevated concentrations of TPH, total PAH and other constituent PAHs including benzo(a)pyrene, benzo(a)anthracene and indeno(1,2,3-cd)pyrene were measured in excess of the generic risk based screening values for a residential end use with plant uptake. These concentrations could thus pose a potentially unacceptable risk to human health through direct contact, accidental ingestion or inhalation of soil or soil derived dust.

In Trial No 4 at a depth of 0.6 m, TPH exceeded the 500 mg/kg criteria and is currently being tested for the TPH aro/ali split. The results will be available in approximately one week.

No elevated concentrations of any contaminants were measured in the sample of made ground / topsoil from Borehole No 1 at a depth of 0.3 m.

The significance of these results is considered further in Section 3.0.

3.0 Site Specific Risk Assessment

A desk study has not been carried out at this stage of the project and the history of the site is not known.

Analysis of the speciated PAH results indicate the elevated PAH concentrations to be of pyrogenic origin. The likely source of this contamination is, therefore, fragments of burnt coal and ash within the made ground. In addition, elevated concentrations of lead were measured in Trial Pit No 2 at a depth of 0.9 m. This metal contamination is likely to be attributable to fragments of ash noted in the made ground.

The metal and PAH compounds are considered to be non-volatile or of a low volatility and of a low solubility and they do not thus present a significant vapour risk or a significant risk of leaching and migration within groundwater. These contaminants could, however, pose an unacceptable risk to human health through direct contact, accidental ingestion or inhalation of soil or soil derived dust.

The source of petroleum hydrocarbon contamination may have resulted from a localised spillage or leak of fuel oil. It is recommended that the need for further contamination is reviewed following completion of the desk study.

The made ground will be removed as part of the basement construction and there will therefore be no risk to end users unless any of the excavated material is to be re-used in a reinstated garden above the basement. If this is proposed there is likely to be a requirement for testing of the retained soil.

Although end users will be effectively isolated from any contamination, the elevated contaminants could pose a potential risk to ground workers in the short term.

3.1 Site Workers

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. The method of site working should be in accordance with guidelines set out by HSE[2] and CIRIA[3] and the requirements of the Local Authority Environmental Health Officer. If any suspicious substances are encountered during site work, these should be assessed by a geoenvironmental engineer.

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

3 *A guide for safe working on contaminated sites*, Report 132, Construction Industry Research and Information Association

3.2 Plastic Services

Elevated concentrations of PAH have been measured in the made ground and consideration will, therefore, 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 the EHO and the relevant service authority prior to the adoption of any scheme. It is possible that barrier pipe will be required or additional testing will need to be carried out.

3.3 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip. Under the European Waste Directive landfills are classified as accepting inert, non-hazardous or hazardous wastes in accordance with the EU waste Directive.

Based upon on the technical guidance provided by the Environment Agency[4] it is considered likely that the made ground from this site, as represented by the three chemical analyses carried out, would be generally classified as a NON-HAZARDOUS waste, whilst the natural soils may be classified as an INERT waste.

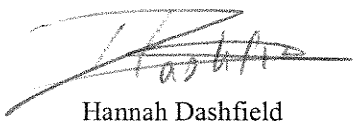
Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, 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[5] 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.

We trust that this information is sufficient for your present requirements, but please do not hesitate to contact us if we can be of any further assistance.

Yours sincerely
GEOTECHNICAL & ENVIRONMENTAL ASSOCIATES



Hannah Dashfield

Encs

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4 Environment Agency May 2008. Hazardous Waste: Interpretation of the definition and classification of hazardous waste. Technical Guidance WM2 Second Edition Version 2.2

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

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Generic Risk-Based Soil Guideline Values

Site	28 Hollycroft Avenue, London, NW3 7QL	**Job Number** J11180
Client	Mr Andrew Millward	**Sheet** 1 / 1
Engineer	Sinclair Johnston and Partners	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 6.0

Contaminant	Guideline Value mg/kg	Data Source
Metals		
Arsenic	32	SGV
Cadmium	10	SGV
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	4.3	LQM/CIEH
Copper	2,330	LQM/CIEH
Lead	450	withdrawn SGV
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	130	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.33	SGV
Toluene	610	SGV
Ethyl Benzene	350	SGV
Xylene	230	SGV
Aliphatic C5-C6	110	LQM/CIEH
Aliphatic C6-C8	370	LQM/CIEH
Aliphatic C8-C10	110	LQM/CIEH
Aliphatic C10-C12	540	LQM/CIEH
Aliphatic C12-C16	3000	LQM/CIEH
Aliphatic C16-C35	76,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	151	LQM/CIEH
Aromatic C10-C12	346	LQM/CIEH
Aromatic C12-C16	593	LQM/CIEH
Aromatic C16-C21	770	LQM/CIEH
Aromatic C21-C35	1230	LQM/CIEH
PRO (C_5 –C_{10})	1351	Calc
DRO (C_{12} –C_{28})	80,363	Calc
Lube Oil (C_{28} –C_{44})	77,230	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	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	420	SGV
PAH		
Naphthalene	8.70	LQM/CIEH
Acenaphthylene	850	LQM/CIEH
Acenaphthene	1,000	LQM/CIEH
Fluorene	780	LQM/CIEH
Phenanthrene	380	LQM/CIEH
Anthracene	9,200	LQM/CIEH
Fluoranthene	670	LQM/CIEH
Pyrene	1,600	LQM/CIEH
Benzo(a) Anthracene	5.9	LQM/CIEH
Chrysene	9	LQM/CIEH
Benzo(b) Fluoranthene	7.0	LQM/CIEH
Benzo(k) Fluoranthene	10.0	LQM/CIEH
Benzo(a) pyrene	1.00	LQM/CIEH
Indeno(1 2 3 cd) Pyrene	4.2	LQM/CIEH
Dibenzo(a h) Anthracene	0.90	LQM/CIEH
Benzo (g h i) Perylene	47	LQM/CIEH
Total PAH	**6.7**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	28	LQM/CIEH
tetrachloroethane (PCA)	4.8	LQM/CIEH
tetrachloroethene (PCE)	4.8	LQM/CIEH
trichloroethene (TCE)	0.49	LQM/CIEH
1,2-dichloroethane (DCA)	0.014	LQM/CIEH
vinyl chloride (Chloroethene)	0.00099	LQM/CIEH
tetrachloromethane (Carbon tetra	0.089	LQM/CIEH
trichloromethane (Chloroform)	2.7	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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FAO Hannah Dashfield

LABORATORY TEST REPORT

Results of analysis of 3 samples received 28 September 2011

J11180, 28 Hollycroft Avenue

Chemtest
The right chemistry to deliver results

Report Date 06 October 2011

Login Batch No					139994		
Chemtest LIMS ID					AG51883	AG51884	AG51885
Sample ID					BH1	TP2	TP4
Sample No							
Sampling Date					27/09/2011	27/09/2011	27/09/2011
Depth					0.3m	0.9m	0.6m
Matrix					*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*			
2300	Cyanide (total)	57125	mg kg^{-1}	M	<0.50	<0.50	<0.50
2325	Sulfide	18496258	mg kg^{-1}	M	1.1	0.59	0.55
2625	Total Organic Carbon		%	M	4.3	2.2	0.74
2220	Chloride (extractable)	16887006	g l^{-1}	M	0.037	<0.010	<0.010
2430	Sulfate (total) as SO4		mg kg^{-1}		500	400	600
2450	Arsenic	7440382	mg kg^{-1}	M	13	20	10
	Cadmium	7440439	mg kg^{-1}	M	0.18	0.26	0.11
	Chromium	7440473	mg kg^{-1}	M	26	32	29
	Copper	7440508	mg kg^{-1}	M	17	20	11
	Mercury	7439976	mg kg^{-1}	M	0.51	0.77	0.80
	Nickel	7440020	mg kg^{-1}	M	12	18	13
	Lead	7439921	mg kg^{-1}	M	160	1100	200
	Selenium	7782492	mg kg^{-1}	M	0.39	0.28	<0.20
	Zinc	7440666	mg kg^{-1}	M	79	200	110
2676	TPH >C5-C6		mg kg^{-1}	U	< 0.1	< 0.1	< 0.1
	TPH >C6-C7		mg kg^{-1}	U	< 0.1	< 0.1	< 0.1
	TPH >C7-C8		mg kg^{-1}	M	< 0.1	< 0.1	< 0.1
	TPH >C8-C10		mg kg^{-1}	M	< 0.1	< 0.1	< 0.1
	TPH >C10-C12		mg kg^{-1}	M	< 0.1	< 0.1	1.6
	TPH >C12-C16		mg kg^{-1}	M	3.9	1.0	30
	TPH >C16-C21		mg kg^{-1}	M	7.9	3.9	270
	TPH >C21-C35		mg kg^{-1}	M	16	8.3	330
	Total Petroleum Hydrocarbons		mg kg^{-1}	U	28	13	640
2700	Naphthalene	91203	mg kg^{-1}	M	< 0.1	< 0.1	0.14
	Acenaphthylene	208968	mg kg^{-1}	M	< 0.1	< 0.1	0.59
	Acenaphthene	83329	mg kg^{-1}	M	< 0.1	< 0.1	0.22
	Fluorene	86737	mg kg^{-1}	M	< 0.1	< 0.1	0.43

All tests undertaken between 29/09/2011 and 06/10/2011

* Accreditation status

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

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FAO Hannah Dashfield

LABORATORY TEST REPORT

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Chemtest
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Report Date 06 October 2011

					139994		
					AG51883	AG51884	AG51885
					BH1	TP2	TP4
					27/09/2011	27/09/2011	27/09/2011
					0.3m	0.9m	0.6m
					SOIL	*SOIL*	*SOIL*
2700	Phenanthrene	85018	mg kg-1	M	0.24	0.34	6.6
	Anthracene	120127	mg kg-1	M	< 0.1	< 0.1	1.9
	Fluoranthene	206440	mg kg-1	M	0.4	0.73	14
	Pyrene	129000	mg kg-1	M	0.45	0.69	11
	Benzo[a]anthracene	56553	mg kg-1	M	< 0.1	0.34	6.1
	Chrysene	218019	mg kg-1	M	< 0.1	0.44	6.1
	Benzo[b]fluoranthene	205992	mg kg-1	M	< 0.1	0.55	4.3
	Benzo[k]fluoranthene	207089	mg kg-1	M	< 0.1	0.3	2.8
	Benzo[a]pyrene	50328	mg kg-1	M	< 0.1	0.15	4.1
	Dibenzo[a,h]anthracene	53703	mg kg-1	M	< 0.1	0.75	3.6
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M	< 0.1	0.46	4.3
	Benzo[g,h,i]perylene	191242	mg kg-1	M	< 0.1	< 0.1	0.55
	Total (of 16) PAHs		mg kg-1	M	< 2	4.8	67
2920	Phenols (total)		mg kg-1	N	<0.3	<0.3	<0.3
2010	pH			M	6.7	7.9	8.2
2030	Moisture		%	n/a	17.6	20.5	19
	Stones content (>50mm)		%	n/a	<0.02	<0.02	<0.02
2040	Soil colour			n/a	brown	brown	brown
	Soil texture			n/a	sand	sand	sand
	Other material			n/a	stones	stones	stones

All tests undertaken between 29/09/2011 and 06/10/2011

* Accreditation status

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

GEA Geotechnical & Environmental Associates

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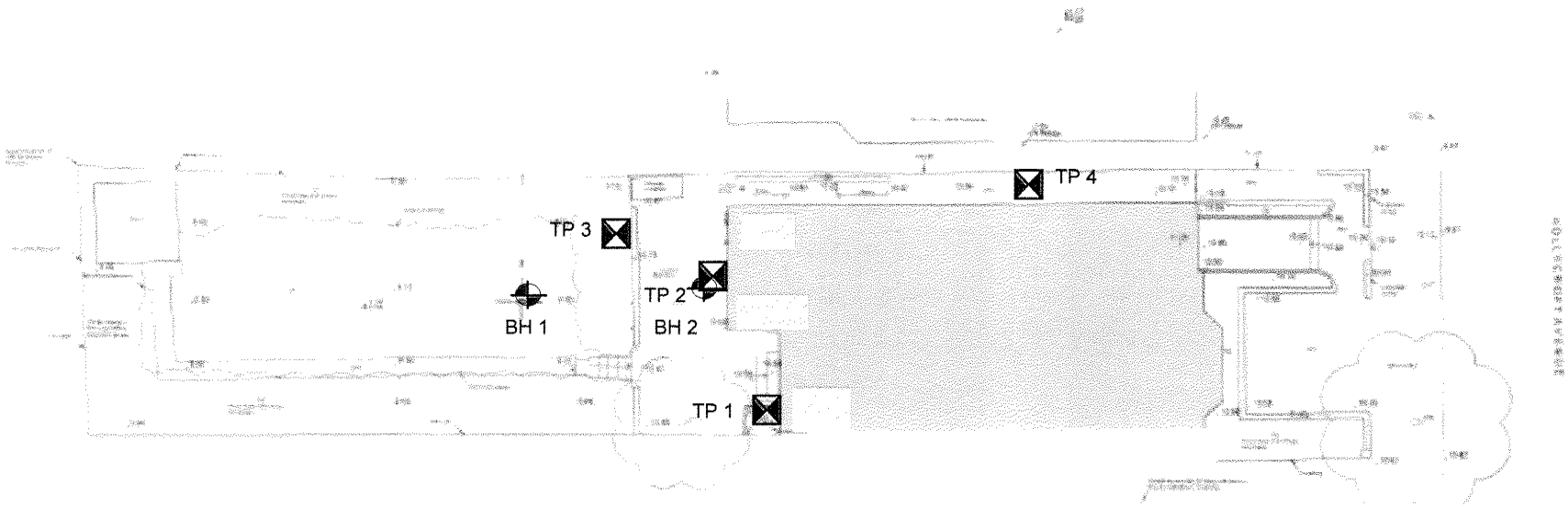
Site Plan

Site	28 Hollycroft Avenue, London, NW3 7QL
Client	Mr Andrew Millward
Engineer	Sinclair Johnston and Partners

Job Number J11180

Sheet 1 / 1



Approximate Scale in metres 0 2 4 6