Appendix D: Ground Condition Assessment Report

Ground Conditions Assessment Report

Francis Gardner House, West Hampstead

Jubb

PREPARED BY:	FOR:	DATE:	REFERENCE:
Jubb Consulting Engineers Ltd.	Empiric Properties	January 2020	19366-GCA-1

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PROJECT INFORMATION

Project Information

Client	Empiric Properties

Project Details

Project Name	Francis Gardner House
Location	West Hampstead
Jubb Project Number	19366
Title	Ground Conditions Assessment Report

Report Details

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Prepared By	Job Title	Signature
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Approved By		
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Issue History

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EXECUTIVE SUMMARY

Site Information	
Client	Empiric Properties
Project	Francis Gardner House
OS Co-ordinates	2538 8412
Site Size	Approximately 35m x 25m
Proposals	Demolish existing building and construct eight storey student accommodation building with single storey basement.
Site Description	The site is located around the existing Francis Gardner Apartments comprising a four to five storey brick structure, with part basement level.
Current and Historic Site Uses	Site currently used as a student accommodation block. Historically site was a field with a barn, before the existing building built by 1915 and predominantly used as offices and residential..
Ground Conditions	
Geology	The site is shown to be underlain by the London Clay Formation.
Hydrogeology and Hydrology	Hydrogeology ▪ The London Clay Formation beneath the site is designated as an 'Unproductive strata'. ▪ The site is not located within a groundwater Source Protection Zone. Hydrology ▪ There are no surface water features within 1km of the site therefore the site is not within an area indicated to be at risk from flooding.
Ground Conditions Encountered	▪ At the front of the property there was a minimal pavement thickness over firm becoming stiff and very stiff with depth London Clay. ▪ At the rear of the property there was up to 0.6m of made ground over the London Clay.
Geo-environmental Assessment	
Contamination Assessment	▪ Asbestos was identified in one of the locations within the made ground which pose potential risk to site workers. ▪ Slightly elevated lead in two samples of made ground at rear of property, but material expected to be removed for the construction of the basement thus eliminating risk to the end user. ▪ Ground gas has been determined as Characteristic Situation 1 (very low risk).

Contamination Risk Classification	The contamination classification for the site is considered to be low.
Recommendations for Mitigation	▪ It is understood all of the shallow soils will be removed as part of the construction of the basement. ▪ For waste disposal any fragments of asbestos within made ground should be removed by hand picking prior to disposal. ▪ The picked ACM material will be classed as hazardous waste. ▪ Any works involving ACM should be undertaken in accordance with CAR 2012. ▪ Suitable PPE and working practices are required. ▪ A watching brief should be maintained during site works to ensure any unexpected contamination is dealt with correctly
Geotechnical Assessment	
Foundations and Floor Slabs	▪ Piled foundations will be required to support the proposed loads with piles extending into the very stiff London Clay at least 20m below basement level. ▪ Suspended floor slabs should be used due to the high plasticity clay and the potential of differential heave due to part basement excavation.
Excavations and Retention	▪ Excavations should be achieved using standard mechanical plant. ▪ Use if a breaker may be required to remove existing hard standing, basement walls and foundations of the existing building. ▪ Contiguous pile wall likely to be required to retain basement excavation.
Buried Concrete Classification	▪ Concrete placed within the London Clay Formation should be designed with a DS-4 and AC-4 classification.
Pavement Design	▪ A CBR value of 2% should be used in the pavement design.
Groundwater	▪ Groundwater was not encountered during the ground investigation works and subsequent monitoring visits.
Geotechnical Risk Category	▪ Category 2 - Conventional structures and foundations.

1 Introduction

1.1 Commission

Empiric Properties are proposing to redevelop the existing site at Francis Gardner Apartments, with the construction of a new student accommodation block. To assist with the development of the site proposals, Jubb Consulting Engineers (Jubb) have been appointed to undertake a geotechnical and geo-environmental assessment of the ground conditions.

This report constitutes the Ground Conditions Assessment (GCA) for the proposed development, and provides advice for the geotechnical and geo-environmental design of the development and associated ground contamination or geotechnical hazards.

This report is for the private and confidential use of Empiric Properties (to whom alone is owed a duty of care) and their professional advisors and consultees; it may not be relied upon or reproduced by any third party for any use without the written agreement of Jubb.

1.2 Objectives

The objectives of this assessment are:

- to assess the geo-environmental ground conditions at the site with due regard to any previous investigation, remediation and validation works undertaken as part of the site enabling works. If necessary, to provide outline recommendations for risk mitigation based on the findings;
- to analyse the intrusive ground investigation results to determine ground conditions, obtain representative values for geotechnical analysis, and identify any geotechnical issues which may affect the proposed development;
- to make an evaluation of any potential environmental or geotechnical hazards, risks and liabilities to the planned development of the site on the basis of the foregoing studies, and to provide engineering and environmental recommendations for the site, in view of the potential development of the site.

1.3 Scope, Sources & Limitations

A Phase 1 Geo-environmental desk study report was carried out in December 2019 by Jubb and has been referenced in the production of this report, as detailed in section 3.0.

A Ground Investigation was also commissioned to support and supplement the initial assessment of the site, see section 5.0 for more details.

This report has been carried out in accordance with the following UK legislation and regulatory guidance for site investigations: -

- BS EN 1997-1:2004 +A1:2013 Eurocode 7 Geotechnical design – Part 1 General rules;
- BS EN 1997-2 (2007) Eurocode 7 Geotechnical design – Part 2 Ground Investigation and testing;
- NA+A1:2014 to BS EN 1997-1:2004 +A1:2013 UK National Annex to Eurocode 7: Geotechnical design – Part 1: General rules,
- NA to BS EN 1997-2:2007 UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing;
- BS 5930 (2015) Code of Practice for site investigations;
- BS 8004 (2015) Code of Practice for Foundations;
- BS 10175 (2011) + A2: (2017) Investigation of Potentially Contaminated Sites – Code of Practice;
- CLR 11 (2004) Contaminated Land Research Report, Defra/EA - Model Procedures for the Management of land contamination;

- BS EN 14688 – 1 (2002) + A1 (2013) Geotechnical investigation and testing. Identification and classification of soil. Identification and description.
- BS EN 14688 – 2 (2004) + A1 (2013) Geotechnical investigation and testing. Identification and classification of soil. Principals for a classification.
- BS EN 14689 – 1 (2003) Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

It should be noted that any ground investigation provides only a small sampling of any site and that ground conditions may differ both laterally (across the site) and vertically (with depth) between sample points. Such differing conditions may thus remain undetected by fieldwork. Certain areas may not have been accessible to intrusive survey due to vegetation, live services or other obstructions.

2 Site Setting

2.1 Site Location

The site is located at the existing Francis Gardner Apartments, situated along West End Lane in West Hampstead. The outline of the site is depicted in Figure 1 below.

Figure 1: Site Location

The Ordnance Survey (Landranger) grid reference at the centre of the site is 2538 8412.

A site location plan and aerial photograph are reproduced in **Appendix A.**

2.2 Site Description

The site is located around the existing Francis Gardner Apartments situated on the western side of West End Lane. The existing building comprises a four to five storey brick structure, which covers the majority of the site, with a basement level, which covers part of the building footprint.

An asphalt driveway runs along the eastern boundary of the building with an exit and entrance off the West End Lane. To the rear of the property is a basement level conservatory with steps either side leading up to two ground floor patio slabbed areas to the north and south. The northern area has a water pump and water tank over the northern end.

To the south of the site are residential properties that front the adjacent King Gardens, with the common corner of the buildings adjoined. Beyond the western boundary of the site are gardens of residential properties that front

Smyrna Road, with the gardens appearing to be at basement level. To the north of the site is the neighbouring four-storey property along West End Lane.

2.3 Site Proposals

The current proposals are to demolish the existing building and build an 85 no. bed student accommodation facility comprising a seven to eight storey building including a basement.

A site proposal plan is included in **Appendix B.**

3 Summary of Desk Study Information

3.1 Published Geology

The BGS 1:50,000 Solid and Drift Mapping (North London, Sheet 256) and the online BGS Geology of Britain Viewer identifies site to be underlain by the London Clay Formation, which is described as blue-grey or grey brown silty to very silty clay, with common carbonate concretions.

No superficial deposits are shown to be present beneath the site

3.2 Hydrogeology

The London Clay Formation beneath the site is designated as an 'Unproductive strata'. Unproductive strata are described as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The groundwater vulnerability of the site has the combined classification beneath the site to be unproductive bedrock aquifer with no superficial aquifer, so therefore they are unlikely to represent to groundwater so have not been assigned a vulnerability class.

The site is not located within a groundwater Source Protection Zone.

3.3 Hydrology

There are no surface water features within 1km of the site therefore the site is not within an area indicated to be at risk from flooding.

3.4 Landfill Sites

There is one historic landfill within 1km of the site and that is located 908m to the north east at Canfield Place, no other information is supplied.

3.5 Radon Risks

The property is in a lower probability radon area, where less than 1% of homes are estimated to be at or above the Action Level, therefore, no radon protection measures are necessary in the construction of new dwellings.

3.6 Site History

The site was originally a field and is then shown to be occupied by a single building over the south western corner of the site up until the turn of the 20th century. By 1915 the site is shown to be occupied by the building that has occupied the site up until the present day, with the neighbouring buildings also shown.

In the wider surroundings the main contaminative past uses within 500m of the site are from a saw mill that was present approximately 300m to the north-west of the site in the early 1900s and from the railways situated 500m to the north and south of the site.

3.7 Preliminary Risk Assessment (Contamination)

The following section provides a Preliminary Risk Assessment (PRA) of contamination at the site, and develops an initial Conceptual Site Model (CSM) to establish whether there are any potentially unacceptable risks associated with proposed development at the site.

The CSM provides a method to characterise potential site risks, by outlining potential sources of contamination, identifying potential receptors that may be impacted, and determining potential pathways by which sources may affect receptors.

The following preliminary CSM has been derived from an assessment of the sites environmental setting, site history, and review of previous reports.

The Risk Assessment Methodology and Definitions are set out in **Appendix D** to this report.

3.7.1 Potential Sources of Contamination

The potential contaminants described below have been identified from a study of the site history. The principal contaminative sources are as follows:

On-site

- Heavy Metals and Asbestos within made ground associated with historical site development;
- Ground gas from made ground; and
- Fuels from vehicles.

Off-site

- Asbestos and fuels from adjacent private garages; and
- Heavy metals and organics from railways and historical Saw Mill.

3.7.2 Potential Receptors

The following potential receptors have been identified, based on the proposed development of the site for residential purposes:

- Ground workers and construction workers;
- Future residents;
- Building materials

3.7.3 Preliminary Conceptual Site Model (CSM)

The potential key contaminative substances, potential receptors and possible pathways are set out in the table below, assuming a worst-case scenario.

The preliminary CSM will be used to target the require site investigation and will be developed and refined, based on the results of the site investigation.

Table 1: Preliminary Conceptual Site Model

Preliminary Conceptual Site Model						
Sources	**Receptor**	**Pathway**	**Consequence**	**Probability**	**Risk**	**Recommended Action (to clarify level of risk and assess suitable mitigation measures or to mitigate the risk)**
Heavy metals from on-site sources (made ground)	Future Site Users	Human uptake pathways	Medium	Low likelihood	Moderate/Low risk	Site Investigation will be required to determine contamination potential of site soils, presence of made ground etc. Future mitigation measures to protect human health may be required depending upon results (capping, soil treatment, etc.). Use of suitable PPE and good hygiene practice on the site to mitigate risk.
	Construction workers; Demolition workers.	Human uptake pathways	Medium	Low likelihood	Moderate/Low risk	
	Groundwater	Percolation/ leaching/ migration to groundwater;	Mild	Unlikely	Very Low risk	
Organics/PAH/ Hydrocarbons from vehicles	Future Site Users	Human uptake pathways	Medium	Low likelihood	Moderate /Low risk	Site Investigation will be required to determine contamination potential of site soils, presence of made ground etc. Future mitigation measures to protect human health may be required depending upon results (capping, soil treatment, etc.). Use of suitable PPE and good hygiene practice on the site to mitigate risk.
	Construction workers; Demolition workers	Human uptake pathways	Medium	Low likelihood	Moderate/Low risk	
	Groundwater	Percolation and leaching to groundwater;	Mild	Unlikely	Very Low risk	Groundwater unlikely to be on site.
	Building Materials	Contact with water pipes;	Medium	Unlikely	Low risk	Provide suitable pipe material if necessary.
Sulphates and pH	Building Materials	Contact with subsoil or groundwater	Medium	Likely	Moderate risk	Suitable site investigation to quantify risk, specify concrete classification accordingly; Likely high sulphate levels in London Clay.
Asbestos potentially in made ground	Future Site Users;	Inhalation	Medium	Unlikely	Low risk	Potential source from made ground onsite from demolition of previous building occupying the site. Only source from potential adjacent garages. Testing of site soils to include asbestos screen.
	Construction workers; Demolition workers.	Inhalation	Medium	Low likelihood	Moderate risk/low risk	
Ground Gases	Future Site Users;	Inhalation	Medium	Unlikely	Low risk	Only potential source is from any made ground on site.
	Construction workers.	Inhalation	Medium	Unlikely	Low risk	

4 Ground Investigation Works

4.1 General

A ground investigation was undertaken by Ground Conditions Consultants (GCC) after being scoped by Jubb. The ground investigation comprised window sampling, hand dug trial pits and a cable percussion borehole. The site works were carried out between the dates 2 to 3 January 2020.

The site investigation works comprised:

- One cable percussion borehole drilled to a depth of 30.0m.
- Two window sample boreholes drilled to a depth of 5.0m.
- Three hand dug trial pits excavated to a depth of no greater than 1.0m.

The exploratory hole locations were decided by Jubb, based on the previous investigation exploratory hole locations and the outline of the development proposal, with holes being moved accordingly with regards to site constraints at the time of the siteworks. Originally the ground investigation comprised three window sample holes, but one location was obstructed and the presence of underground services prevented its relocation so it was cancelled.

The exploratory hole locations were checked for buried services prior to excavation and each location was scanned by GCC using a cable avoidance tool (CAT).

The elevation of each exploratory hole has been approximated from the Sumo Services Ltd, Utilities & Topographical Details drawing (Job No. SOR16587, Dwg No. Sheet 01) and is shown in the table below.

Exploratory Hole	Ground Level (mAoD)
BH101	47.6
WS101	47.2
WS102	47.0
TP1	47.65
TP2	47.6
TP3	47.0

Table 2: Approximate Hole Location Elevations

Representative soil sampling of each stratum was undertaken to allow geotechnical and chemical testing.

The factual ground investigation works are detailed in the following report:

- Ground Conditions Consultants. Factual Ground Investigation Report. Report No. J19-073-RO1.

4.1.1 Window Sample Holes

Two window sample holes (WS101 to WS102) were drilled to depths of up to 5m. Disturbed samples were taken at close intervals during boring in order to give a comprehensive record of strata encountered. SPT's were carried out at regular intervals during drilling to allow an assessment of in-situ density or stiffness of the ground. Where strata allowed, undisturbed samples were collected on which to perform geotechnical laboratory tests.

4.1.2 Trial Pits

Three hand excavated trial pits (TP1 to TP3) were excavated using hand tools and extended to depths of between 0.5m to 1.0m below existing ground levels. After detailed examination, measurement and sampling, the excavations were backfilled with arisings and reinstated as found.

4.1.3 Cable Percussion Boreholes

A single cable percussion borehole (BH1) was drilled to a depth of 30.0m below ground level (bgl). Disturbed samples were taken at close intervals during boring in order to give a comprehensive record of strata encountered. SPT's were carried out at regular intervals during drilling to allow an assessment of in-situ density or stiffness of the ground.

4.2 Exploration Sampling Strategy

A site walkover was undertaken by Jubb prior to the site investigation being undertaken, and the existing site conditions were inspected. This walkover, in combination with the review of site history and previous ground investigation that had taken place on the site previously, allowed the investigation to be targeted as follows:

Exploratory Hole	Notes/Rational
WS101 to WS102	Window samples were positioned at regular intervals across the front driveway and sampling of made ground and shallow superficial deposits, and to allow installation of monitoring of groundwater and ground gas.
BH101	Positioned out the front in the only location accessible for a drill rig.
TP1 to TP3	Hand trial pits were positioned at the rear of the property where it was inaccessible by machinery, to sample the shallow surface soils for contamination.

Table 3: Sampling Strategy

The sampling strategy was based on obtaining sufficient samples from across the site. Relevant samples were submitted for a general 'brownfield' suite of testing, determinants as detailed below.

Suite	Determinants
Contamination Suite	As, Cd, Cr, Cu, Pb, Ni, Se, V, Zn, Hg, pH, B, Cr(III), Cr(IV), PAH's and Speciated Hydrocarbons (C10-C40), TOC and Asbestos screening

Table 4: Contamination Suite

4.3 Geotechnical Testing

An initial phase of geotechnical testing was carried out by I2 Analytical Ltd in accordance with *BS1377: Methods of test for soils for civil engineering purposes*, as listed in the table below.

No. of Tests	Test	Test Method
Classification Tests		
8	Liquid and plastic (Atterberg) limits.	BS1377: Part 2.
Consolidation Testing		
1	One-Dimensional Consolidation	BS1377:Part 9
Triaxial Testing Test		

4	Quick Undrained Triaxial Test	BS1377: Part 7
Chemical Test: Soil		
6	Water soluble sulphate, total (acid soluble) sulphate and total sulphur contents and pH value.	BRE SD 1

Table 5: Geotechnical Testing

4.4 Contamination Testing

The geo-environmental testing was carried out by DETS Ltd, a UKAS and MCERTS accredited laboratory. Sub-samples were taken from the exploratory holes and placed in appropriate environmental containers before being sent by courier to the laboratory in cool boxes. The number of soil and leachate samples tested are summarised in the table below:

Exploratory Hole	Depth (mbgl)	Analysis Undertaken
TP1	0.3	General Suite + Asbestos Quantification
TP1	0.9	General Suite
TP2	0.2	General Suite
TP2	0.6	General Suite + WAC
TP3	0.3	General Suite
WS101	0.5	General Suite + WAC
WS102	0.5	General Suite

Table 6: Soil Contamination Testing

5 Ground Conditions

5.1 Ground Conditions Encountered

The ground conditions encountered during the ground investigation works are summarised in the table below:

Description	Stratum	Encountered in	Typical depth to top of stratum (m bgl)	Typical depth to base of stratum (m bgl)	Average thickness (m)
Asphalt over gravel sub-base	PAVEMENT	WS101,WS102, BH101	GL	0.1	0.1
Soft to firm brown sandy gravelly CLAY	MADE GROUND	WS101,BH101, TP1	0.1	0.6	0.5
Firm becoming stiff light brown mottled grey CLAY	LONDON CLAY FORMATION	All Exploratory Holes	0.5	>30.0	-

Table 7: Ground Conditions Summary

5.1.1 Topsoil/Made ground

Out of the front of the building, the made ground comprised of a thin asphalt cover over a minimal thickness of gravel sub-base, which was underlain by a firm brown sandy gravelly clay that contained brick fragments. The clay made ground was encountered down to a maximum of 0.6m and appears to reduce in thickness towards the south.

At the rear of the property the made ground comprised a variable dark brown clayey sand (topsoil) and a brown gravelly clay and extended to a maximum depth of 0.8m. Brick fragments and possible asbestos cement fragments were noted within the made ground of TP1.

5.1.2 London Clay Formation

The London Clay Formation was encountered in every exploratory hole beneath the made ground and generally comprised a firm brown becoming mottled grey and orange brown CLAY which is considered to be the weathered portion of the formation. From around 3m the clay becomes stiff in strength and from 10.5m becomes grey in colour which is taken to represent the unweathered part of the formation. The clay generally increases in strength with depth and becomes very stiff from around 24.0m below ground level.

5.2 Groundwater

Groundwater was not encountered during the site works. Groundwater monitoring standpipes were installed in both of the window sample holes and one in the cable percussion borehole, with three fortnightly monitoring visits undertaken. The installation details and results of the monitoring visits are shown in the tables below.

Borehole ID	Groundwater Depth (mbgl)	Installation depth (mbgl)	Reported response zone (mbgl)
WS101	Dry	5.0	1.0-5.0
WS102	Dry	5.0	1.0-5.0
BH101	Dry	10.0	1.0-10.0

Table 8: Monitoring Well Installation Summary

Exploratory Hole	Groundwater Depth(mbgl)		
	15/1/20	28/1/20	
WS101	0.40m	0.66	
WS102	Dry	Dry	
BH101	Dry	Dry	

Table 9: Groundwater Monitoring Summary

Groundwater was not encountered during the site works and was not encountered in two of the borehole installations during the monitoring period. Groundwater was recorded in the standpipe in WS101, but as the other two were dry this is likely to have occurred from surface water infiltration as is not considered to be actual groundwater levels.

6 Material Properties

6.1 Made Ground

The made ground was of limited thickness and will likely be stripped as part of any works, so the properties of this stratum has been excluded from this analysis.

6.2 London Clay Formation

6.2.1 Classification Properties

Eight plasticity index tests were carried out within the London Clay Formation and the results are shown in the below table and plotted on the A-Line Plot in Figure 3.

	Minimum	Maximum	Average
Natural Moisture Content	25	35	30
Liquid Limit	71	85	78
Plastic Limit	27	32	30
Plasticity Index	43	53	48

Table 10: Atterberg Limit Tests

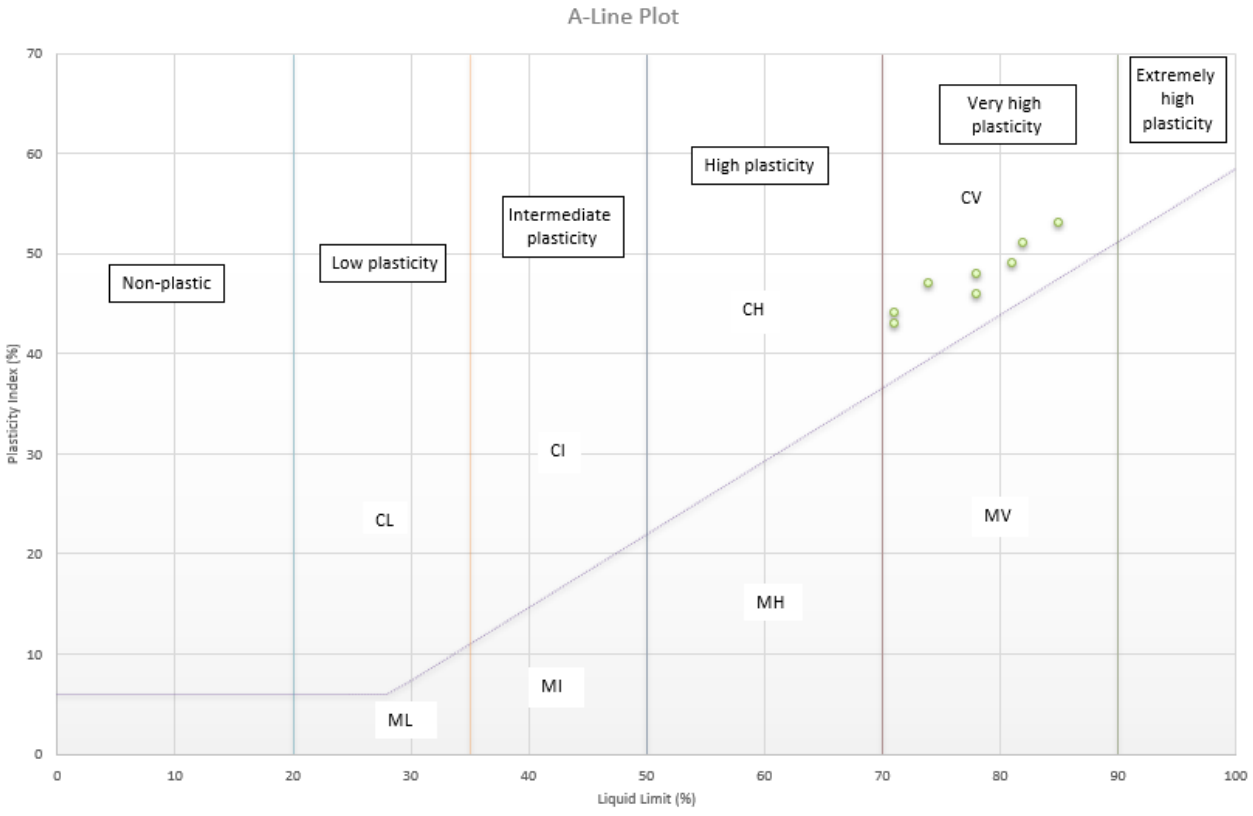

Table 11: Plasticity Chart

The results show that the clay from the London Clay Formation has a very high plasticity and a high volume change potential with changes in moisture content.

SPT tests were carried out throughout the London Clay profile, with the results shown in the below depth v SPT N value plot. As can be seen the SPT results show a marked increase in strength with depth.

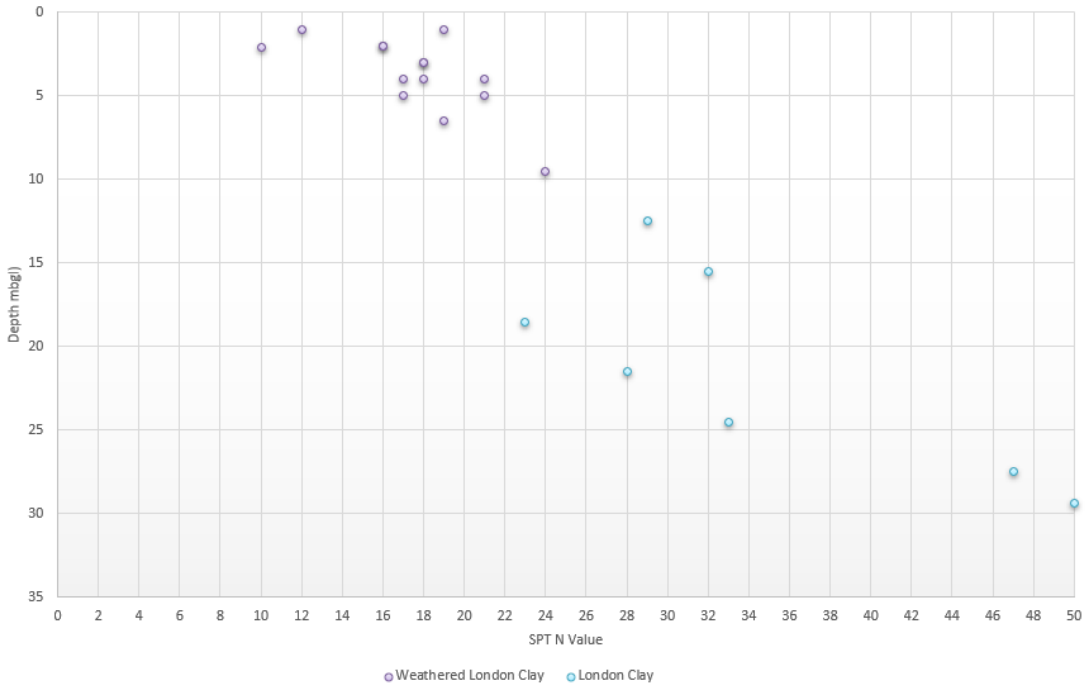

Table 12 SPT v Depth Plot

Using Stroud and Butlers (1975) correlation, the SPT N value can be correlated to an undrained shear strength value using the formula Cu = SP N value * 4.5.

The correlated values together with the laboratory undrained shear strength test results are shown on the below plot.

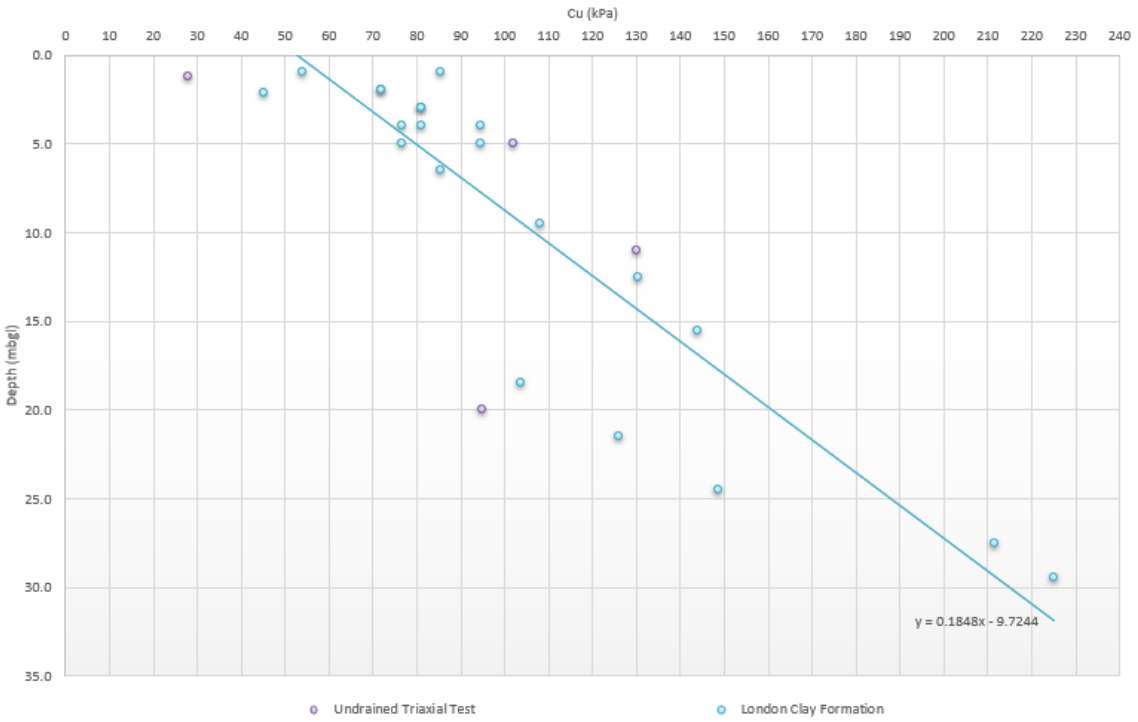

Table 13: Undrained Shear Strength v Depth

The below table represents the characteristic properties for the London Clay Formation.

Table 14: Geotechnical Characteristics

Characteristic Property	Symbol	Units	Characteristic Values	Source
Angle of Shearing Resistance	ø	Degrees	22	1
Undrained shear strength	Cu	kPa	Cu = 5.5z +55	2
Drained Modulus of Elasticity	*E'v*	*MPa*	(Cu *300)/1000	3
Undrained Modulus of Elasticity	E_{uv}	*MPa*	(Cu *500)/1000	3
Coefficient of Compressibility	M_v	M^2/MN	0.135	2

1. Gibson, Experimental Determination of the True Cohesion and True Angle of Internal Friction in Clays, Proc. of the Third Int. Conf. on Soil Mechanics and Foundation Engineering, Zurich, 1953.:
2. S Stroud M. A The standard penetration test in insensitive clays and soft rocks, Proc. Europ. Symp. Pen. Testing, Stockholm, 1974 Cu = N*4.5 (Based on average PI and SPT values
3. Common London Clay relationships
4. Based on LQ N of 17 and PI of 48.
5. Z = depth below ground level.

7 Generic Quantitative Risk Assessment (Contamination)

7.1 General

The following comprises a Generic Quantitative Risk Assessment (GQRA) of contamination risk, in accordance with the methodology set out in **Appendix D**.

The following updated conceptual model information has been taken from the information obtained in **section 4.0 - 5.0** and from the site walkover**.** Contamination testing carried out during the ground investigation has been used to supplement the preliminary conceptual model presented in **Section 4.0.**

7.2 Risks to Human Health

7.2.1 Soils

A summary of the chemical test results and a comparison against the relevant assessment criteria used in this case, are given in the tables below.

The generic assessment criteria used in this case are generally the LQM/CIEH Suitable 4 Use Levels (S4ULs), based on minimal or tolerable risk and are intended to be protective of human health. Different criteria are provided for a variety of land use, and the criteria for "Residential without plant uptake" has been adopted here.

The exception to this is use of the C4SL levels for Lead, as S4UL are not provided for this substance.

Both the C4SL and S4UL are based on current best practice and reflect the most up to date guidance and legislation.

In accordance with best practice, individual exceedances of the relevant assessment criteria have been identified and comment provided where necessary.

The table below summarises the chemical results for metals and semi-metals on site from both phases of investigation:

Table 15: Summary of Soil Contamination – Metals and Semi Metals

Contaminant	**C4SL/ S4UL mg/kg**	**Source**	**Measured concentrations mg/kg**		**95% UCL*** **	**Number of individual exceedances**
			Minimum	Maximum		
Arsenic (mg/kg)	40	C4SL	<1	10	-	0/7
Cadmium (mg/kg)	85	S4UL	0.9	1.3	-	0/7
Chromium (mg/kg)	910	S4UL	29	63	-	0/7
Lead (mg/kg)	310	C4SL	16	629	355	2/7 (TP1 0.3m & TP2 0.2m)
Mercury (mg/kg)	56	S4UL	<0.17	0.41	-	0/7
Selenium (mg/kg)	430	S4UL	<1	2		0/7

Copper (mg/kg)	7100	S4UL	16	45	-	0/7
Nickel (mg/kg)	180	S4UL	17	52	-	0/7
Zinc (mg/kg)	40000	CIEH	39	330	-	0/7
Total PAH (mg/kg)	-	-	<0.08	13.7	-	0/7
Total Cyanide (mg/kg)	480	CLEA	<1	<1	-	0/7
Phenol (mg/kg)	3200	CLEA	<0.2	<0.2	-	0/7
Organic Matter (%)	-	-	0.3	7.8	-	0/7
pH	6-9	-	5.17	8.46	-	0/7

- CLEA – Soil guideline values for commercial/industrial development
- CIEH – Chartered Institute of Environmental Health Land Quality Management Generic
- Assessment Criteria (based upon worse-case 1% SOM content) for commercial development
- GAC – generic assessment criteria calculated using the CLEA model
- PAH – Poly-Aromatic Hydrocarbons
- * 95% Upper Confidence Limit (UCL) statistical analysis not undertaken where there are no contaminant exceedances and/or insufficient number of samples
- - No comparable target concentration / guideline value
- A total of seven representative soil samples were tested for these substances

With the exception of lead, no metal or semi-metal exceedances were encountered on site. Lead was found to be elevated in two samples:

TP1 at 0.3m = 629mg/kg

TP2 at 0.2m = 318mg/kg

A 95% upper confidence limit (UCL) is used to estimate the average distribution of the contaminant concentration across the site. In this case, 95% UCL value for lead was calculated at 355mg/kg, which slightly exceeds the human health threshold value of 310mg/kg, therefore lead can be considered to elevated across the site, in the context of residential assessment thresholds. The elevated lead was within the made ground/topsoil of the near surface soils at the rear of the existing building, so it is likely that the elevated lead levels were likely to have occurred through ash and clinker within this layer.

Table 16 below summarises the results for speciated PAHs on site.

Table 16: Summary of Soil Contamination – PAHs

Contaminant	**SGV/ GAC (mg/kg)**	**Source**	**Measured concentrations (mg/kg)**		**95% UCL*** **	**Number of individual exceedances**
			Minimum	Maximum		
Acenaphthene	300	S4UL	<0.1	<0.12		
Acenaphthylene	2900	S4UL	0.01	0.01		
Anthracene	3100	S4UL	<0.02	0.08		
Benz[a]anthracene	11	S4UL	<0.04	1.09		

Benzo[a]pyrene	3.2	S4UL	<0.04	1.02		
Benzo[b]fluoranthene	3.9	S4UL	<0.05	1.38		
Benzo[ghi]perylene	360	S4UL	<0.05	0.56		
Benzo[k]fluoranthene	110	S4UL	<0.05	1.38		
Chrysene	30	S4UL	<0.06	1.3		
Dibenz[ah]anthracene	0.31	S4UL	<0.04	0.13		
Fluoranthene	1500	S4UL	<0.08	0.9		
Fluorene	2800	S4UL	<0.01	0.05		
Indeno[123-cd]pyrene	27	S4UL	<0.03	0.68		
Naphthalene	23	S4UL	<0.03	<0.03		
Phenathrene	1300	S4UL	<0.03	1.25		
Pyrene	3700	S4UL	<0.07	2.57		

Notes:

- CIEH – Chartered Institute of Environmental Health Land Quality Management Generic
- Assessment Criteria (based upon worse-case 1% SOM content)
- *** 95% Upper Confidence Limit (UCL) statistical analysis not undertaken where there are no contaminant exceedances and/or insufficient number of samples
- - 95% Upper Confidence Limit (UCL) statistical analysis not undertaken on contaminants with o exceedances and/or insufficient number of samples
- A total of seven samples were tested for these substances.

All tested samples were below their respectable guideline values and therefore not considered to pose a risk to human health.

Total hydrocarbon testing (EPH C_{6-36}) was also undertaken on all seven soil samples, with results ranging from <1mg/kg and 337mg/kg, all of which were below the relevant guidelines so are not considered to be of significance or pose a risk to human health.

7.2.2 Ground Gas

Gas monitoring wells were installed in three of the boreholes and three fortnightly monitoring visits were carried out, the results of which are shown in the below table:

Table 17: Gas Monitoring Results

Date	Hole Position	Atmos. Press. (mb)	Max Gas Flow (l/hr)	Water Depth (mbgl)	Max Carbon Dioxide (%/vol)	Max Methane (%/vol)	Max Oxygen (%/vol)	Max Hydrogen Sulphide (%/vol)	Max Carbon Monoxide (%/vol)
15/1/20	BH1	1004	0.0	dry	1.8	0.0	19.7	0	0
	WS1	1004	0.0	0.4	0.2	0.0	19.7	0	0
	WS2	1004	0.0	dry	1.5	0.0	19.7	0	0

Date	Hole Position	Atmos. Press. (mb)	Max Gas Flow (l/hr)	Water Depth (mbgl)	Max Carbon Dioxide (%/vol)	Max Methane (%/vol)	Max Oxygen (%/vol)	Max Hydrogen Sulphide (%/vol)	Max Carbon Monoxide (%/vol)
28/1/20	BH1	987	0.0	dry	0.6	0.0	20.0	0	0
	WS1	987	-0.2	0.66	0.6	0.0	20.5	0	0
	WS2	987	0.0	dry	1.6	0.0	20.0	0	0
20/20									

A maximum Carbon Dioxide concentration of 1.8% with a flow rate of 0.2l/hr has been identified in BH1

These values equate to a maximum gas screening value of 0.0036 l/hr which is in Characteristic Situation 1 from CIRIA R149 with a **very low risk** classification.

Based on this classification, there are no specific precautions required for ground gas on site.

7.2.3 Radon

The property is in a lower probability radon area, where less than 1% of homes are estimated to be at or above the Action Level, therefore, no radon protection measures are necessary in the construction of new dwellings.

7.2.4 Asbestos

Asbestos testing was carried out all the samples with a fragment of asbestos cement being identified within the made ground of TP1. The asbestos was identified as 'Chrysotile' contained within a cement matrix and will likely be removed to facilitate the construction of the basement, thus removing the risk to future site residents.

7.3 Risk to Controlled Waters

Groundwater was not encountered during the investigation and subsequent monitoring visits, with the exception of one of the window sample holes, but this is likely to have come from surface run off, and given no contamination was encountered in the near surface soils and no potential receptor near the site, then the risk to controlled water is not considered to be a risk and is not considered further.

7.4 Risks to Flora and Fauna

No significant risk to flora or fauna, in terms of contamination, have been identified at the site.

Appropriate measures will need to be adopted to ensure any proposed soft landscaping areas are suitable for plant growth, including provision of a suitable topsoil layer, suitable importation and testing of topsoil (if required), and testing and validating of any site soils to be re-used to ensure they are fit for plant growth.

7.5 Risk to Building Materials

The principal risk to building materials include the potential for corrosive conditions within the site soils, which could impact concrete and below ground structures.

BRE SD1 testing was carried out on the six samples of site soils, and classification for the site is outlined in section 8.5.

7.6 Risks to Adjacent Land and Third Parties

No significant risk to neighbouring occupiers has been identified.

7.7 Potential Geo-Environmental Liabilities

Potential geo-environmental liabilities under Part 2A of the Environmental Protection Act 1990 (as amended) and the Groundwater Regulations (GWR) 2009, relating to the site in its current condition is not considered likely based on the tests data available.

7.8 Off Site Disposal

A waste assessment of the soils in accordance with WM3 has been undertaken in order to support further decisions regarding material movement at the site. All of the samples tested were classified as 'Non Hazardous'. The waste classification reports for each sample tested are contained in **Appendix E**.

Two Waste Acceptance Criteria (WAC) tests were carried out on two samples one from the topsoil material at the rear of the building and one from the natural London Clay material from the front. The natural clay sample is suitable for acceptance into an inert landfill. From the results it shows that the topsoil sample had an elevated loss on ignition result which means that it would be accepted as inert and would likely have to go to a stable non-reactive hazardous landfill.

For waste disposal purposes (assuming off-site disposal), should any visible asbestos fragments be encountered within the made ground, then all the associated made ground would be classified as Hazardous Waste (with potential cost implications). Therefore, it may be necessary to process the made ground, and remove any visible ACM fragments by hand picking, prior to disposal. Handpicked ACM materials are to be disposed of separately as Hazardous Waste.

7.9 Updated Conceptual Site Model

Table 18 below shows the updated conceptual site model, which has been formulated based on the information obtained in the ground investigation and historic data.

Table 18 Updated Conceptual Site Model

Sources	Receptor	Pathway	Consequence	Probability	Risk	Recommended Action (to clarify level of risk and assess suitable mitigation measures or to mitigate the risk)
Heavy metals from made ground	Human Health - Site end users (residents)	Human uptake pathways	Medium	Low likelihood	Moderate/Low risk	▪ Elevated lead present in some site soils. Material is likely to be removed as part of the basement construction. ▪ If not within area of basement then should be removed or capped if in area of soft landscaping.
	Human Health - Groundworkers		Mild	Low likelihood	Low risk	▪ Use of suitable PPE and good hygiene practice on the site to mitigate risk
Organics/PAH/ Hydrocarbons from made ground .	Human Health	Human uptake pathways	Medium	Unlikely	Low Risk	▪ Use of suitable PPE and good hygiene practice on the site to mitigate risk.
Sulphates and pH	Building Materials	Contact with subsoil or groundwater	Medium	Low likelihood	Low risk	▪ Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Class AC-1s
Asbestos potentially in made ground	Human Health;	Inhalation	Medium	Likely	Moderate risk	▪ Asbestos found in one sample in made ground. ▪ This material expected to be removed to form basement thus removing source. ▪ Asbestos fragments should be handpicked and separated from bulk of made ground. ▪ Watching brief to be maintained during site works. ▪ Use of suitable PPE and good hygiene practice on the site to mitigate risk.
Ground Gases	Future Site Users;	Inhalation	Medium	Unlikely	Very Low risk	▪ Very Low risk classification
	Construction workers.	Inhalation	Medium	Unlikely	Very Low risk	
Radon	Future Site Users;	Inhalation	Medium	Unlikely	Very low risk	▪ The site is not in a Radon affected area, therefore no radon protection measures are necessary.

7.10 Contamination Risk Summary and Mitigation

Exceedances of lead were encountered in two of the samples, when assessed against generic assessment criteria for residential development (without gardens). Statistical analysis indicates that lead is likely to be elevated site wide in the made ground, although made ground, other than in the pavement construction, was only encountered at the rear of the property.

An asbestos fragment (chrysotile cement sheet) was found in one sample taken from within the made ground.

It is understood that as part of the development that a basement will be created over most of the existing building footprint and shallow soils will therefore be removed from site (including potentially contaminated materials), thus removing any risk to potential future site residents.

However, should the design change and areas of made ground are to be left in place and used as soft landscaping areas then a strategy of removal or capping of the made ground will need to be adopted to prevent human contact with the site soils.

An initial ground gas assessment indicates the site should be classified as Characteristic Situation 1 very low risk, with no special precaution measures required.

Asbestos in the form of a chrysotile cement fragment was found in one sample, again this material will likely be removed to form the basement. If left in place a removal or capping strategy will also be sufficient to mitigate any risk from asbestos.

For waste disposal purposes (assuming off-site disposal), should any visible asbestos fragments be encountered within the made ground, then all the associated made ground would be classified as Hazardous Waste (with potential cost implications). Therefore, it may be necessary to process the made ground, and remove any visible ACM fragments by hand picking, prior to disposal. Handpicked ACM materials are to be disposed of separately as Hazardous Waste.

Any works involving ACM should be undertaken in accordance with The Control of Asbestos Regulations 2012 (CAR 2012). Should hand picking of ACMS be undertaken, this is likely to be undertaken in accordance with an asbestos risk assessment (regulation 6 CAR 2012) and a plan of work (regulation 7 CAR 2012), including provision of suitable PPE for personnel, along with good hygiene and site management practices will be required (i.e. provision of hand washing and welfare facilities, dust suppression, tool box talk etc).

A watching brief should be maintained during site works to ensure any unexpected contamination is dealt with correctly.

8 GEOTECHNICAL ASSESSMENT

8.1 Introduction

It is understood that the proposed building will comprise a seven to eight storey building with a single storey basement covering much of the building footprint. Estimated unfactored column loads are not thought to be greater than 1580kN.

8.2 Excavations and Retention

The proposed basement is expected to have a floor level of around 44.05mAOD, which will result in an excavation depth of up to 3.35m in areas that do not form part of the existing building basement level.

Policy A5 of the Local Plan and Camden Planning Guidance for Basements state that basement development must not cause harm to neighbouring properties and that a Basement Impact Assessment should be submitted with any planning. Given the close proximity to the neighbouring buildings, any excavations created to form the basement will need to be permanently retained.

A contiguous pile wall will likely be the most suitable retention system, with embedment depths of up 10m required to support retained walls of the proposed basement. If the basement walls are to be used to support column loads then the depth of these piles will need to be extended and should be designed accordingly. Excavation should not commence until the retention system has been suitably designed and installed.

An active earth pressure coefficient, K_a, of 0.45 should be used in the design of the retaining wall and the CIRIA C760 Guidance on Embedded Retaining Wall Design should be followed and designed in accordance with the BS 8002 Code of Practice for Earth Retaining Structures.

Excavations should be readily achievable using standard construction plant such as tracked excavators with toothed buckets. The use of a breaker will be required to breakthrough any concrete hardstanding such as any floor slab or foundations that are left in place after demolition of the existing building and in any concrete covered yard areas.

Excavations within the clay strata are likely to be stable at gradients of no greater than 1:1 (45°). Groundwater was not encountered during the site works, but some groundwater should be expected from the infiltration of surface water especially where there is granular made ground overlying natural clays. Perched groundwater could also occur along any historical drainage runs that have granular surrounds, so groundwater control measures should be in place should perched groundwater be encountered.

8.3 Foundation Options

Due to the likely high loads for the proposed new building, shallow footings will unlikely be able to support the proposed loads and so the most suitable option would be to pile the structure.

Given the location of the site within a built area, the close proximity of neighbouring properties and the likely pile depths, then the most suitable piling method will be continuous flight auger (CFA), although a piling contractor should be consulted with regards to best method of installation.

Given that part of the site contains an existing basement, it is likely that this will have to be infilled in order to create a level platform for the piling rig to site to install the perimeter pile wall. The infilled material will need to be suitable and compacted to a set standard in order to form a suitable piling mat, which will need to be designed in accordance with BRE 470.

The highest pile load will be in the order of 1580kN, so preliminary piling analysis has been carried out based on the ground conditions encountered. The pile has been modelled using the following parameters:

The undrained shear strength has been determined from plotting a line of best fit through the undrained strength v depth plot to give an average value Cu = 5.5z +50, where z is depth below ground level. An α value of 0.5 has been used in the skin friction calculation and an Nc value of 9 has been used in the base resistance calculation.

The properties and parameters used in this assessment have been factored in accordance with BS EN 1997 – 1:2004+A1:2013, with the characteristic resistance values for the base and shaft having been factored by the partial factors of γb = 1.7 and γs = 1.4, which have been used presuming serviceability is verified by load tests carried out on more than 1% of constructed piles. A model factor of 1.4 has also been used on the ultimate compressive resistance.

The table below outlines the allowable working load for a single 600mm diameter pile at respective depths and is based on the London Clay formation occurring from 3m below ground level, which is taken as basement level. The toe level is taken as the depth below ground level.

Toe Level (mbgl)	**Pile Embedment Length in Bearing Stratum (m)**	**Ultimate Shaft Resistance (Rs;d) (kN)**	**Ultimate Base Resistance (Rb;d) (kN)**	**Ultimate Compressive Resistance (Rc;d) (kN)**
5	2	80	80	160
10	7	310	110	420
15	12	610	140	750
20	17	970	170	1140
25	22	1400	200	1600

Table 19: 600mm diameter CFA Pile Analysis

From the above it is likely that an embedment depth for a single 600mm diameter pile embedded 22m into the London Clay would be required to support a load of 1580kN.

The above estimates are for initial appraisal purposes only, and not be used for final design purposes. It is recommended that definitive values of bearing capacity be obtained from specialist piling contractors, for their specific piles, and that the piles are designed in accordance with Eurocode 7.

It is recommended that maintained static load testing be carried out on sacrificial piles before the design is finalised, with the testing ideally proving the ULS design assumptions.

8.4 Floor Slabs

Given that the proposed basement covers areas of existing basement and areas that are to be excavated to form the new building footprint, then an uneven amount of heave will likely occur across the proposed basement floor area. Based on this and that at basement level will be the London Clay Formation which has a very high plasticity and high volume change potential with changes in moisture content, then a suspended floor slab should be adopted to accommodate any differential movement that may occur.

8.5 Protection of Buried Concrete

The site is classed as brownfield and the groundwater is assumed to be static. Soil pH values vary between 7.2-7.6. In order to establish a design concrete class, BRE SD1 testing was undertaken.

Exploratory Hole No.	Depth (m)	Total Sulphur (%)	Total Potential Sulphate (%)	Acid Soluble Sulphate (%SO_4)	Water Soluble Sulphate mg/l	Oxidisable Sulphides (%)	pH
BH1	3.5	0.251	0.753	0.57	3390	0.183	7.6
BH1	1.00	0.05	0.15	0.122	560	0.028	7.2
BH1	6	0.448	1.344	0.931	3460	0.413	7.4
BH1	9.5	0.248	0.744	0.733	3110	0.011	7.6
BH1	3	0.087	0.261	0.25	1040	0.011	7.4
BH1	4	0.855	2.565	1.56	3920	1.005	7.3

Table 20: BRE Sulphate Test Results

From the results, several of the samples have oxidizable sulphides over 0.3% indicating that pyrite is probably present, and should the ground be disturbed might oxidise to sulphates. Based on the characteristic values, taken as the average of the highest two values obtained from samples tested within the London Clay, a Design Sulphate Class of **DS-4** and Aggressive Chemical Environment for Concrete (ACEC) Class of **AC-4** should be adopted, and the designer should utilise this class in order to produce the concrete specification.

8.6 Pavement Design

No CBR testing was carried out on site, but based on the plasticity index of the near surface clay, and assuming a low water table, thin layered construction and average construction conditions, based on Table 13/2 of Part 1 HA 44/91, a CBR value of 2% should be used in the pavement design.

8.7 Soakaway Design

Soakaways or SUDS systems will not be suitable on the site due to the underlying clay material having a low permeability.

9 GEOTECHNICAL RISK REGISTER

A Geotechnical Risk Register is a method of identifying hazards which may arise during the construction phase of works based on the data currently obtained for the site. The register is a work in progress and as further information arises, it should be updated in order to quantify the risk. At this stage, the aspects covered by the register are attributed to Cost and Health and Safety, although as site works commence, programme may become a prominent factor.

A Ground Risk Register that was started at the commencement of the ground investigation is contained within **Appendix F.**

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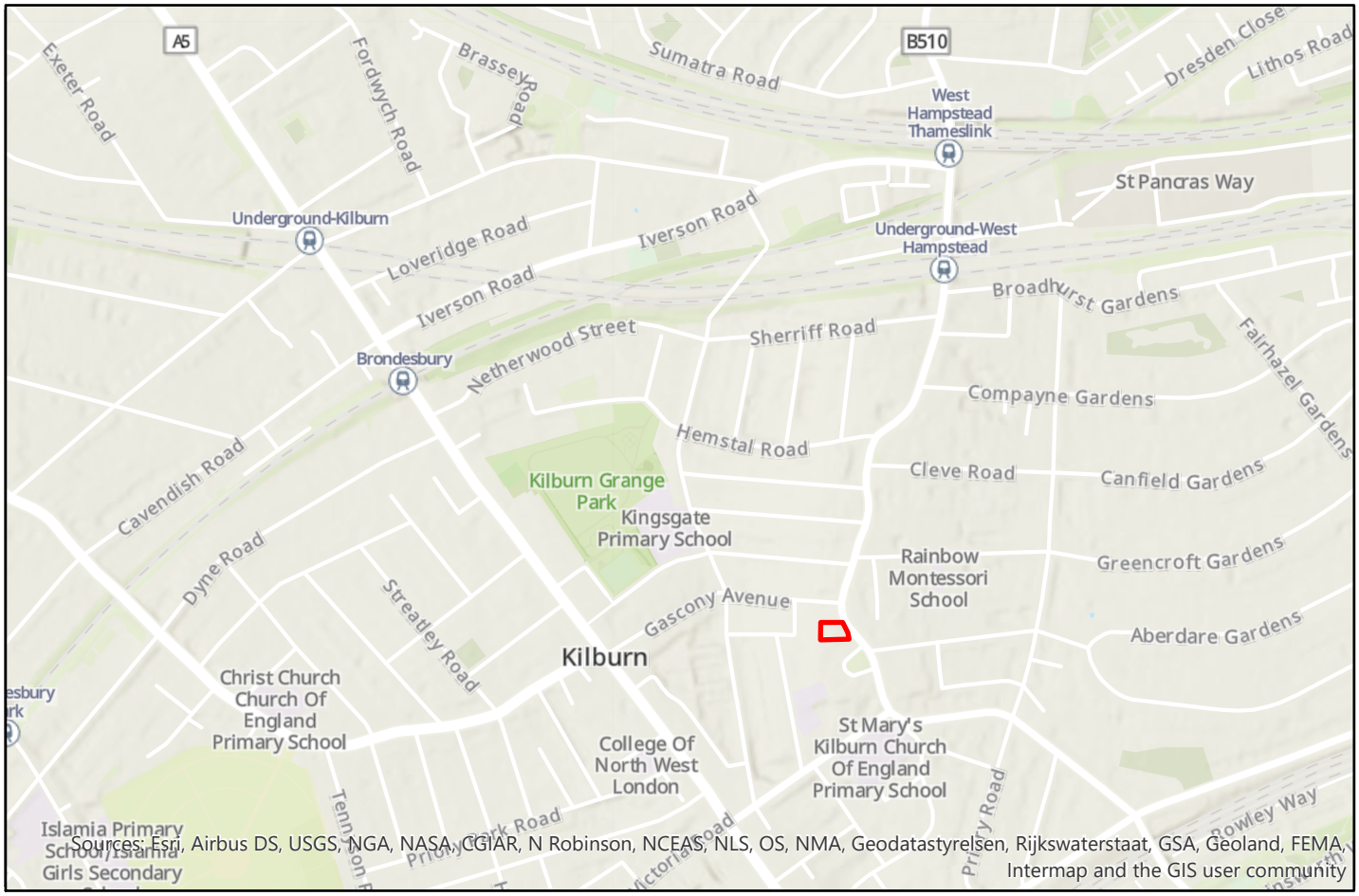
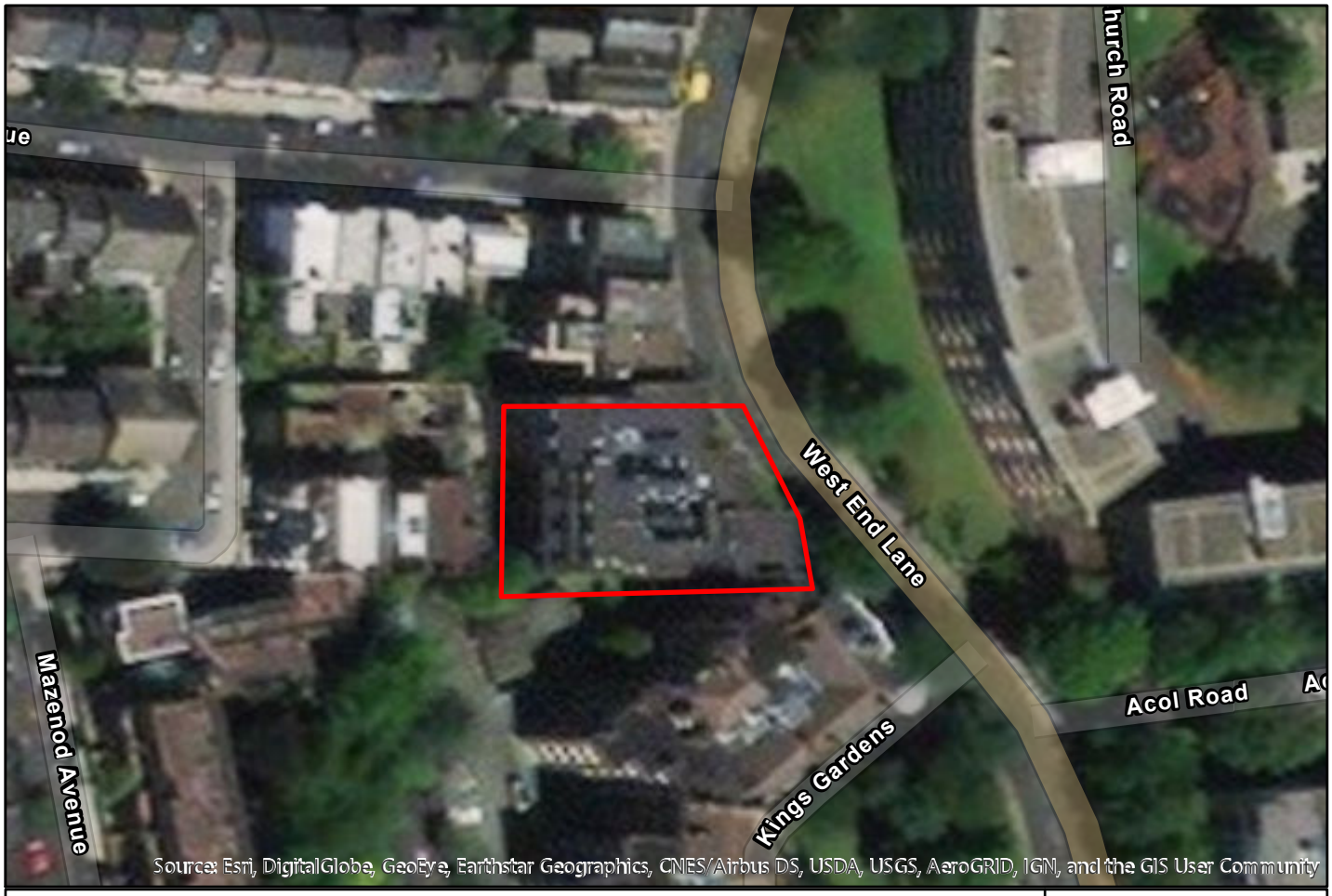
APPENDIX A: SITE LOCATION PLAN



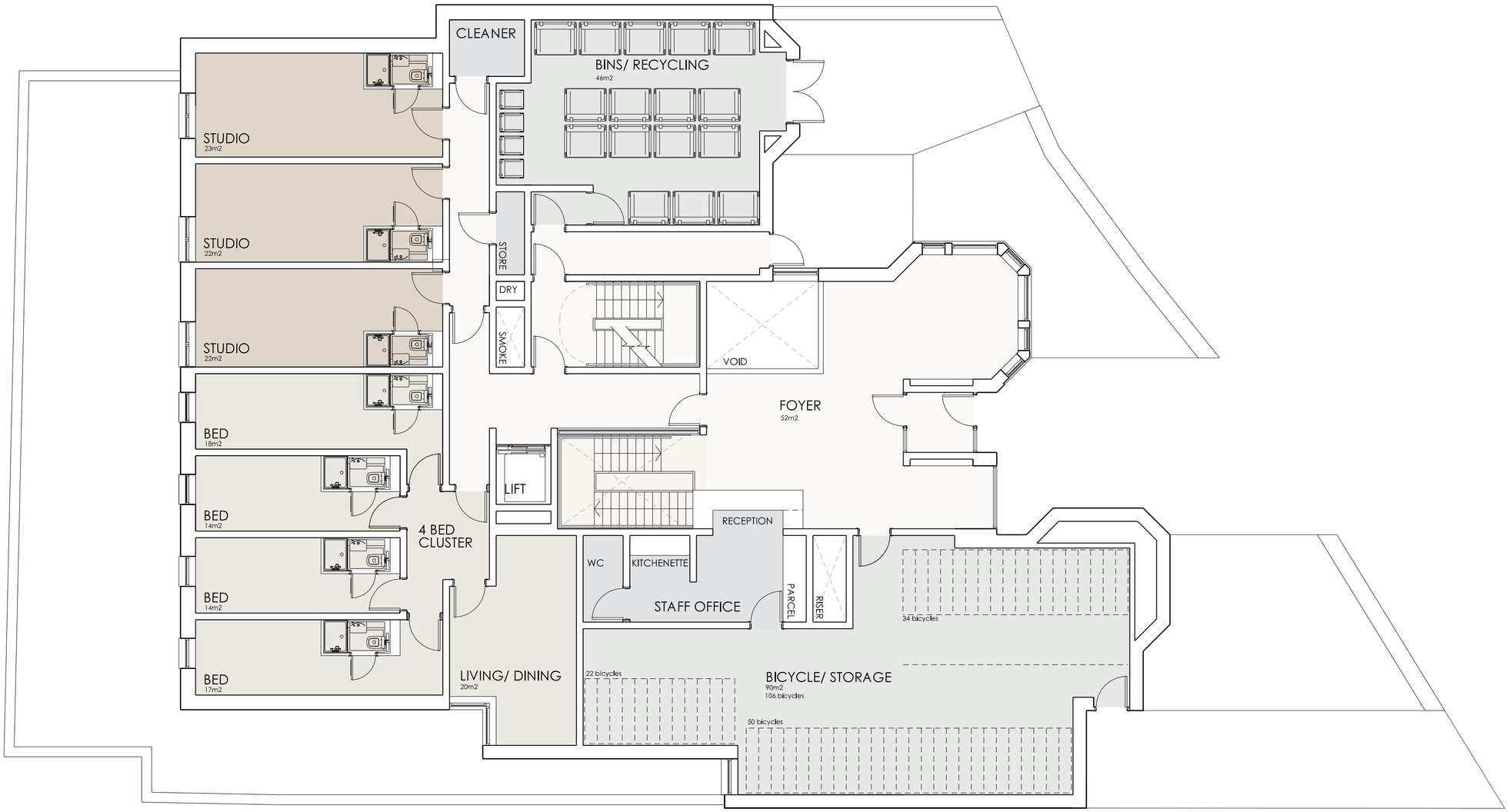


Appendix A: Site Location Plan

Francis Gardener Apartments, West Hampstead

APPENDIX B: PROPOSED SITE DEVELOPMENT PLAN

ESP | Empiric Student Property



SITE BOUNDARY LINE

scale of metres

0 1 2 3 4 5 10

susan stephen architects

project	17060 Francis Gardner Hall, London		
client	Empiric (London, Francis Gardner Hall) Limited		
drawing	Proposed Ground Floor Plan		
dwg no.	pl(23)02	revision	.
scale	1 : 100 @ A2	drawn	.

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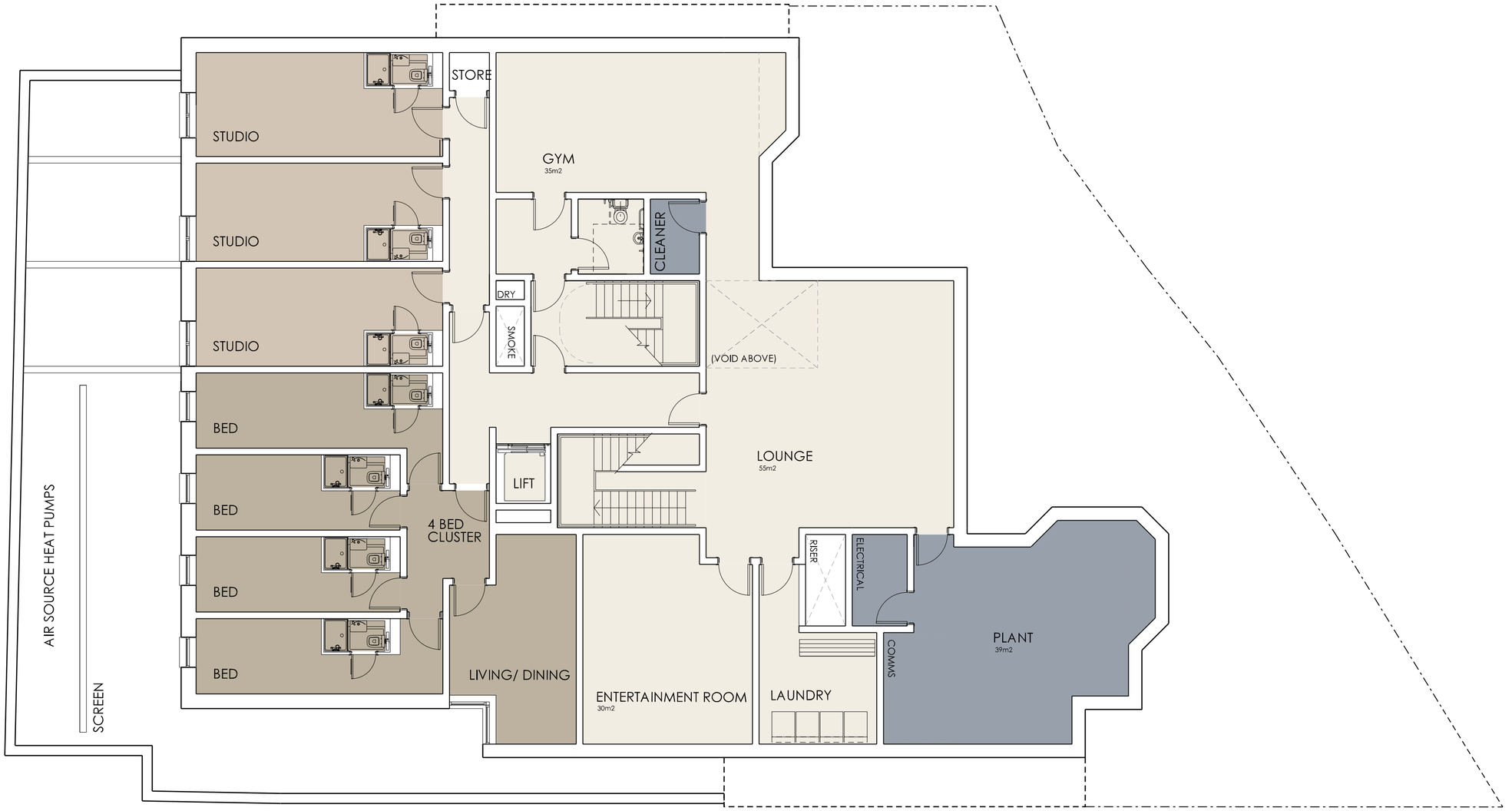

SITE BOUNDARY LINE

scale of metres

0 1 2 3 4 5 10

susan stephen architects

project	17060 Francis Gardner Hall, London		
client	Empiric (London, Francis Gardner Hall) Limited		
drawing	Proposed Basement Floor Plan		
dwg no.	pl(23)01	revision	.
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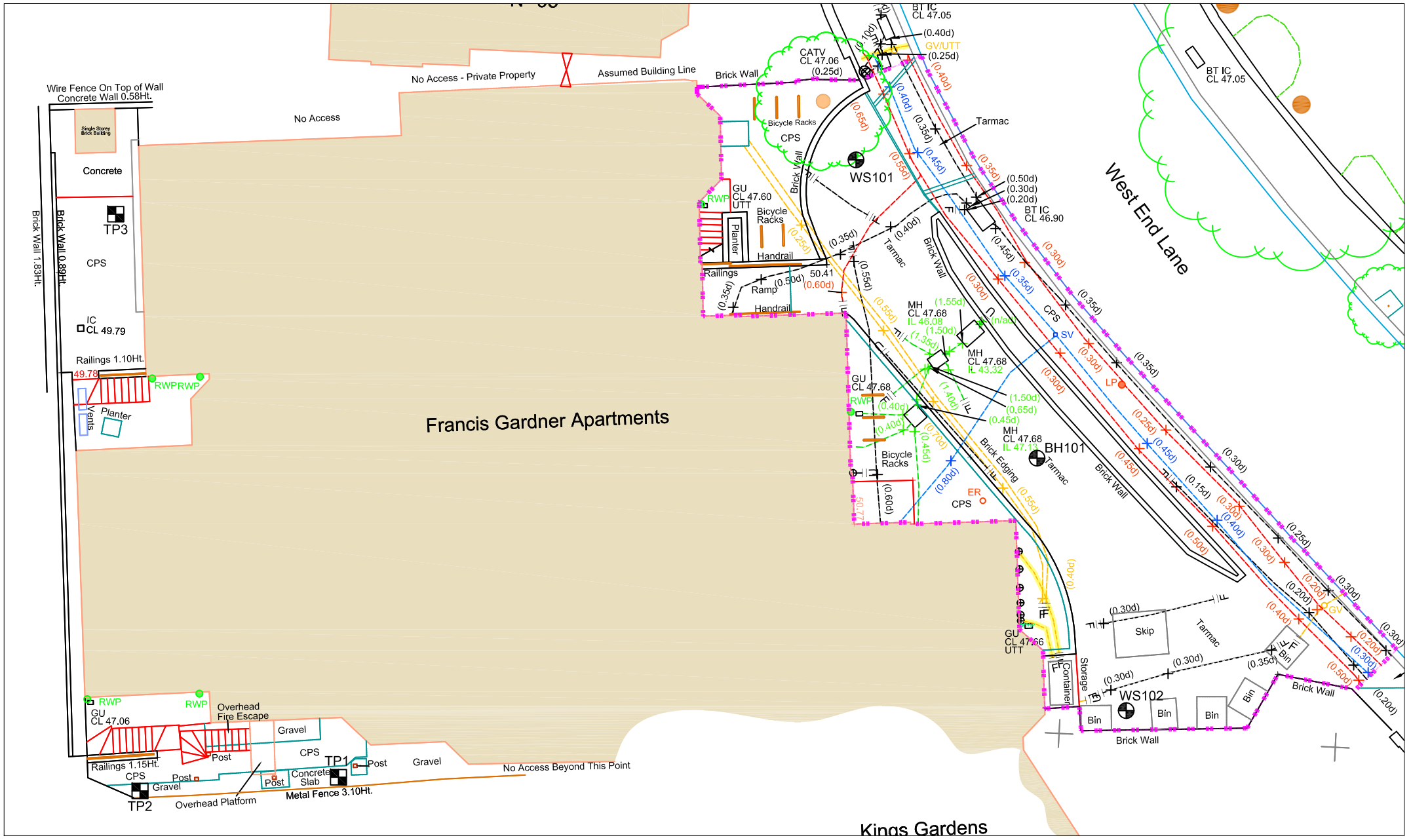
APPENDIX C: EXPLORATORY HOLE LOCATION PLAN



GCC

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client
EMPIRIC STUDENT PROPERTY PLC

project
FRANCIS GARDENER HOUSE, WEST HAMPSTEAD

title
INVESTIGATION LOCATION PLAN

scale	NTS	drawn by	AP	checked by	RP
date	08 JAN 2020	cad file	J19-073		
drawing number	FIGURE 1	rev.	0		

APPENDIX D: CONTAMINATION RISK ASSESSMENT METHODOLOGY AND DEFINITIONS

CONTAMINATION ASSESSMENT METHODOLOGY

The DEFRA and Environment Agency Contaminated Land Report 11 (CLR11) 'Model Procedures for the Management of Land Contamination' provides a technical framework for structured decision making about land contamination.

A1. Definition of Risk

CLR11 defines risk as "a combination of probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence".

A2. The Concept of the 'Pollutant Linkage'

In the context of contaminated land, there are three essential elements to any risk:

- a **contaminant (or source)** – a substance that is in, on or under land and has the potential to cause harm or cause pollution of controlled waters.
- a **receptor** - humans, ecological system, water body or property.
- a **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist separately; however, they create a risk only where they are linked together forming a **pollutant linkage**.

A3. Conceptual Site Models

A conceptual site model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

For all potential pollutant linkages identified, the *consequence* and *probability* of occurrence is qualitatively assessed, and a *risk* assigned.

A4. The Tiered Risk Assessment Approach

CLR11 presents a tiered approach to risk:

Tier 1 *Preliminary risk assessment (PRA)*
The purpose of the preliminary risk assessment is to develop an initial conceptual model of the site and to establish whether or not there are potentially unacceptable risks. If potential risks are identified the initial conceptual model is developed in subsequent tiers of the risk assessment process.

Tier 2 *Generic quantitative risk assessment (GQRA)*
The purpose of the generic quantitative risk assessment is to establish whether generic assessment criteria and assumptions are appropriate for assessing the risks and, if so, to apply them to establish whether there are actual or potential unacceptable risks. It also determines whether further detailed quantitative risk assessment is required.

Tier 3 *Detailed quantitative risk assessment (DQRA)*
The purpose of the detailed quantitative risk assessment is to establish and use more detailed site specific information and criteria to decide whether there are unacceptable risks. It may be used as the sole method of quantitative assessments of risks, or it may be used to refine earlier assessments using generic assessment criteria.

B. RISK ASSESSMENT DEFINITIONS

B1. General

The following classification and definition of risk assessment has been based on that set out in NHBC and EA Publication R&D 66 – Guidance on the Safe Development of Housing on Land Affected by Contamination (2008).

The key to the classification is that the designation of risk is based upon the consideration of both:

a) **the magnitude of the potential consequence (i.e. severity)**, which considers both the potential severity of the hazard, and the sensitivity of the receptor**.**

b) **the magnitude of probability (i.e. likelihood)**, which considers both the presence of the hazard, the receptor, and the integrity of the pathway.

B2. Classification of Consequence

Classification	Definition	Examples
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of List I and II substances present in groundwater close to small potable abstraction (high sensitivity). Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.	Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.
Mild	Exposure to human health unlikely to lead to "significant harm". Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.	Exposure could lead to slight short-term effects (e.g. mild skin rash). Surface spalling of concrete.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.	The loss of plants in a landscaping scheme. Discoloration of concrete.

** For these purposes, disease is to be taken to mean an unhealthy condition of the body or a part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included only insofar as it is attributable to the effects of a pollutant on the body of the person concerned.*

B3. Classification of Probability

Only applies if there is a possibility of a pollutant linkage being present.

Classification	Definition	Examples
High likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.	*a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.* *b) Ground/groundwater contamination could be present from chemical works, containing a number of USTs, having been in operation on the same site for over 50*
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.	*a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.* *b) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.*
Low likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.	*a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space.* *b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.*
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.	*a) Elevated concentrations of toxic contaminants are present below hard standing.* *b) Light industrial unit <10 yrs. old containing a double-skinned UST with annual integrity testing results available.*

Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage, then there is no potential risk. If there is no pollution linkage, then there is no need to apply tests for probability and consequence.

For example, if there is surface contamination and a major aquifer is present at depth, but this major aquifer is overlain by an aquiclude of significant thickness then there is no pollution linkage and the risks to the major aquifer are not assessed. The report should identify both the source and the receptor but state that because there is no linkage there are no potential risks.

B4. The Classification of Risk

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High likelihood**	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

B5. Description of the Classified Risks

Very high risk
There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

High risk
Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

Moderate risk
It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

Low risk
It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

Very low risk
It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

No potential risk
There is no potential risk if no pollution linkage has been established.

B6. Definitions

Term	Definition
Hazard	A property or situation which in certain circumstances could lead to harm. The properties of different hazards must be assessed in relation to their potential to affect the various receptors.
Risk	A combination of the probability or frequency of the occurrences of a defined hazard AND the magnitude of the consequences of that occurrence.
Probability	The mathematical expression of the chance of a particular event in a given period of time [e.g. probability of 0.2 is equivalent to 20% or a 1 in 5 chance].
Impact	The adverse effects (or harm) arising from a defined hazard which impairs the quality of the environment or human health in the short or longer term.
Pollution linkage	An identified pathway is capable of exposing a receptor to a contaminant and that contaminant is capable of harming the receptor.

APPENDIX E: HAZWASTE ONLINE WASTE CLASSIFICATION REPORTS

Waste Classification Report

WQMKV-E7ZB9-8XWKH

Job name

Francis Gardner House

Description/Comments

Project

Site

Related Documents

#	Name	Description
None		

Waste Stream Template

Waste Stream Template for Contaminated Soils

Classified by

Name:
Ian Squibbs
Date:
24 Jan 2020 15:49 GMT
Telephone:
07919 522 985

Company:
Jubb Consulting Engineers Ltd
Suite B, Ground Floor West
St James Court, St James Parade
Bristol
BS1 3LH

Report

Created by: Ian Squibbs
Created date: 24 Jan 2020 15:49 GMT

Job summary

Classification of sample: TP1

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP1
Sample Depth:
0.30 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		2 mg/kg	1.32	2.641 mg/kg	0.000264 %		
2	barium { barium chromate }		233-660-5	10294-40-3		198 mg/kg	1.845	365.241 mg/kg	0.0365 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		<1 mg/kg	3.22	<3.22 mg/kg	<0.000322 %		<LOD
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.1 mg/kg	1.285	1.414 mg/kg	0.00011 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		38 mg/kg	1.462	55.539 mg/kg	0.00555 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		36 mg/kg	3.929	141.446 mg/kg	0.0141 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	629 mg/kg	1.56	981.124 mg/kg	0.0629 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<LOD
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28 mg/kg	2.976	83.335 mg/kg	0.00833 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		46 mg/kg	1.785	82.119 mg/kg	0.00821 %		
13	zinc { zinc chromate }	024-007-00-3				215 mg/kg	2.774	596.442 mg/kg	0.0596 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		0.01 mg/kg		0.01 mg/kg	0.000001 %		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
			201-469-6	83-32-9									
17		fluorene				0.05	mg/kg		0.05	mg/kg	0.000005 %		
			201-695-5	86-73-7									
18		phenanthrene				1.25	mg/kg		1.25	mg/kg	0.000125 %		
			201-581-5	85-01-8									
19		anthracene				0.08	mg/kg		0.08	mg/kg	0.000008 %		
			204-371-1	120-12-7									
20		fluoranthene				2.94	mg/kg		2.94	mg/kg	0.000294 %		
			205-912-4	206-44-0									
21		pyrene				2.57	mg/kg		2.57	mg/kg	0.000257 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				1.09	mg/kg		1.09	mg/kg	0.000109 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				1.3	mg/kg		1.3	mg/kg	0.00013 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				0.5	mg/kg		0.5	mg/kg	0.00005 %		
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				1.02	mg/kg		1.02	mg/kg	0.000102 %		
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				0.13	mg/kg		0.13	mg/kg	0.000013 %		
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				0.56	mg/kg		0.56	mg/kg	0.000056 %		
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				0.68	mg/kg		0.68	mg/kg	0.000068 %		
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				33	mg/kg		33	mg/kg	0.0033 %		
				TPH									
										Total:	0.201 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.0365%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Material not likely to be flammable within ground

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0033%)

Classification of sample: TP1[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP1[2]
Sample Depth:
0.90 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<1 mg/kg	1.32	<1.32 mg/kg	<0.000132 %		<LOD
2	barium { barium chromate }		233-660-5	10294-40-3		57 mg/kg	1.845	105.145 mg/kg	0.0105 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.2 mg/kg	3.22	3.864 mg/kg	0.000386 %		
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.3 mg/kg	1.285	1.671 mg/kg	0.00013 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		52 mg/kg	1.462	76.001 mg/kg	0.0076 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		19 mg/kg	3.929	74.652 mg/kg	0.00747 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	18 mg/kg	1.56	28.077 mg/kg	0.0018 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<LOD
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		52 mg/kg	2.976	154.766 mg/kg	0.0155 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		73 mg/kg	1.785	130.319 mg/kg	0.013 %		
13	zinc { zinc chromate }	024-007-00-3				60 mg/kg	2.774	166.449 mg/kg	0.0166 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
				TPH									
										Total:	0.0738 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.0105%)

Classification of sample: TP2

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP2
Sample Depth:
0.20 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10 mg/kg	1.32	13.203 mg/kg	0.00132 %		
2	barium { barium chromate }		233-660-5	10294-40-3		244 mg/kg	1.845	450.095 mg/kg	0.045 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.1 mg/kg	3.22	3.542 mg/kg	0.000354 %		
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.3 mg/kg	1.285	1.671 mg/kg	0.00013 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		39 mg/kg	1.462	57.001 mg/kg	0.0057 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		43 mg/kg	3.929	168.949 mg/kg	0.0169 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	318 mg/kg	1.56	496.021 mg/kg	0.0318 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.24 mg/kg	1.353	0.325 mg/kg	0.0000325 %		
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		29 mg/kg	2.976	86.312 mg/kg	0.00863 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		55 mg/kg	1.785	98.185 mg/kg	0.00982 %		
13	zinc { zinc chromate }	024-007-00-3				330 mg/kg	2.774	915.468 mg/kg	0.0915 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				0.03	mg/kg		0.03	mg/kg	0.000003 %		
			201-469-6	83-32-9									
17		fluorene				0.02	mg/kg		0.02	mg/kg	0.000002 %		
			201-695-5	86-73-7									
18		phenanthrene				0.43	mg/kg		0.43	mg/kg	0.000043 %		
			201-581-5	85-01-8									
19		anthracene				0.07	mg/kg		0.07	mg/kg	0.000007 %		
			204-371-1	120-12-7									
20		fluoranthene				0.9	mg/kg		0.9	mg/kg	0.00009 %		
			205-912-4	206-44-0									
21		pyrene				0.79	mg/kg		0.79	mg/kg	0.000079 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.37	mg/kg		0.37	mg/kg	0.000037 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				0.09	mg/kg		0.09	mg/kg	0.000009 %		
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				0.21	mg/kg		0.21	mg/kg	0.000021 %		
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				0.14	mg/kg		0.14	mg/kg	0.000014 %		
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				0.15	mg/kg		0.15	mg/kg	0.000015 %		
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				80	mg/kg		80	mg/kg	0.008 %		
				TPH									
										Total:	0.22 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.045%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Material not likely to be flammable within ground

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.008%)

Classification of sample: TP2[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP2[2]
Sample Depth:
0.60 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6 mg/kg	1.32	7.922 mg/kg	0.000792 %		
2	barium { barium chromate }		233-660-5	10294-40-3		124 mg/kg	1.845	228.737 mg/kg	0.0229 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.5 mg/kg	3.22	4.83 mg/kg	0.000483 %		
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.1 mg/kg	1.285	1.414 mg/kg	0.00011 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		38 mg/kg	1.462	55.539 mg/kg	0.00555 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		45 mg/kg	3.929	176.807 mg/kg	0.0177 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	235 mg/kg	1.56	366.557 mg/kg	0.0235 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.41 mg/kg	1.353	0.555 mg/kg	0.0000555 %		
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		23 mg/kg	2.976	68.454 mg/kg	0.00685 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		65 mg/kg	1.785	116.037 mg/kg	0.0116 %		
13	zinc { zinc chromate }	024-007-00-3				100 mg/kg	2.774	277.415 mg/kg	0.0277 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-695-5	86-73-7									
18		phenanthrene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
			201-581-5	85-01-8									
19		anthracene				0.02	mg/kg		0.02	mg/kg	0.000002 %		
			204-371-1	120-12-7									
20		fluoranthene				0.28	mg/kg		0.28	mg/kg	0.000028 %		
			205-912-4	206-44-0									
21		pyrene				0.27	mg/kg		0.27	mg/kg	0.000027 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.15	mg/kg		0.15	mg/kg	0.000015 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.23	mg/kg		0.23	mg/kg	0.000023 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				0.14	mg/kg		0.14	mg/kg	0.000014 %		
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				0.12	mg/kg		0.12	mg/kg	0.000012 %		
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				0.15	mg/kg		0.15	mg/kg	0.000015 %		
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				337	mg/kg		337	mg/kg	0.0337 %		
				TPH									
										Total:	0.152 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.0229%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Material not likely to be flammable within ground

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0337%)

Classification of sample: TP3

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP3
Sample Depth:
0.30 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<1 mg/kg	1.32	<1.32 mg/kg	<0.000132 %		<LOD
2	barium { barium chromate }		233-660-5	10294-40-3		74 mg/kg	1.845	136.504 mg/kg	0.0137 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.6 mg/kg	3.22	5.152 mg/kg	0.000515 %		
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.3 mg/kg	1.285	1.671 mg/kg	0.00013 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		55 mg/kg	1.462	80.386 mg/kg	0.00804 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		18 mg/kg	3.929	70.723 mg/kg	0.00707 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	16 mg/kg	1.56	24.957 mg/kg	0.0016 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<LOD
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		45 mg/kg	2.976	133.932 mg/kg	0.0134 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		74 mg/kg	1.785	132.104 mg/kg	0.0132 %		
13	zinc { zinc chromate }	024-007-00-3				59 mg/kg	2.774	163.675 mg/kg	0.0164 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		**<LOD**
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		**<LOD**
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		**<LOD**
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		**<LOD**
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				<1	mg/kg		<1	mg/kg	<0.0001 %		**<LOD**
				TPH									
										Total:	0.0747 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"
Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.0137%)

Classification of sample: WS101

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS101
Sample Depth:
0.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		5 mg/kg	1.32	6.602 mg/kg	0.00066 %		
2	barium { barium chromate }		233-660-5	10294-40-3		36 mg/kg	1.845	66.408 mg/kg	0.00664 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		<1 mg/kg	3.22	<3.22 mg/kg	<0.000322 %		<LOD
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	0.9 mg/kg	1.285	1.157 mg/kg	0.00009 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		29 mg/kg	1.462	42.385 mg/kg	0.00424 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		20 mg/kg	3.929	78.581 mg/kg	0.00786 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	74 mg/kg	1.56	115.426 mg/kg	0.0074 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<LOD
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		17 mg/kg	2.976	50.597 mg/kg	0.00506 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		45 mg/kg	1.785	80.333 mg/kg	0.00803 %		
13	zinc { zinc chromate }	024-007-00-3				39 mg/kg	2.774	108.192 mg/kg	0.0108 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		**<LOD**
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		**<LOD**
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		**<LOD**
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		**<LOD**
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				3	mg/kg		3	mg/kg	0.0003 %		
				TPH									
										Total:	0.052 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.00664%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Material not likely to be flammable within ground

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0003%)

Classification of sample: WS102

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS102
Sample Depth:
0.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		<1 mg/kg	1.32	<1.32 mg/kg	<0.000132 %		<LOD
2	barium { barium chromate }		233-660-5	10294-40-3		47 mg/kg	1.845	86.699 mg/kg	0.00867 %		
3	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.1 mg/kg	3.22	3.542 mg/kg	0.000354 %		
4	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	1.2 mg/kg	1.285	1.542 mg/kg	0.00012 %		
5	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		63 mg/kg	1.462	92.078 mg/kg	0.00921 %		
6	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
7	copper { copper sulphate pentahydrate }	029-023-00-4	231-847-6	7758-99-8		16 mg/kg	3.929	62.865 mg/kg	0.00629 %		
8	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	25 mg/kg	1.56	38.995 mg/kg	0.0025 %		
9	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.17 mg/kg	1.353	<0.23 mg/kg	<0.000023 %		<LOD
10	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28 mg/kg	2.976	83.335 mg/kg	0.00833 %		
11	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				2 mg/kg	2.554	5.107 mg/kg	0.000511 %		
12	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		91 mg/kg	1.785	162.452 mg/kg	0.0162 %		
13	zinc { zinc chromate }	024-007-00-3				66 mg/kg	2.774	183.094 mg/kg	0.0183 %		
14	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.03 mg/kg		<0.03 mg/kg	<0.000003 %		<LOD
15	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
16		acenaphthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-469-6	83-32-9									
17		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		**<LOD**
			201-695-5	86-73-7									
18		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		**<LOD**
			201-581-5	85-01-8									
19		anthracene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		**<LOD**
			204-371-1	120-12-7									
20		fluoranthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		**<LOD**
			205-912-4	206-44-0									
21		pyrene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		**<LOD**
		601-048-00-0	205-923-4	218-01-9									
24		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		**<LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-032-00-3	200-028-5	50-32-8									
26		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			205-883-8	191-24-2									
28		indeno[123-cd]pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		**<LOD**
			205-893-2	193-39-5									
29		TPH (C6 to C40) petroleum group				8	mg/kg		8	mg/kg	0.0008 %		
				TPH									
										Total:	0.0717 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 2: Oxidizing "waste which may, generally by providing oxygen, cause or contribute to the combustion of other materials"

Force this Hazardous property to non hazardous because Chromium not present to form Barium Chromate

Hazard Statements hit:

Ox. Sol. 2; H272 "May intensify fire; oxidiser."

Because of determinand:

barium chromate: (compound conc.: 0.00867%)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Material not likely to be flammable within ground

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0008%)

Appendix A: Classifier defined and non CLP determinands

- **barium chromate** (EC Number: 233-660-5, CAS Number: 10294-40-3)

Conversion factor: 1.845
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 28 Sep 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Carc. 1B H350 , Skin Sens. 1 H317 , Ox. Sol. 2 H272 , Muta. 2 H341 , Resp. Sens. 1 H334 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315 , Acute Tox. 3 H301 , Acute Tox. 4 H332 , Acute Tox. 4 H302

- **chromium(III) oxide** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 1 H310 , Acute Tox. 1 H330 , Acute Tox. 4 H302

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 2 H411 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Acute Tox. 4 H302

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Aquatic Chronic 2 H411 , Repr. 2 H361d , Carc. 1B H350 , Muta. 1B H340 , STOT RE 2 H373 , Asp. Tox. 1 H304 , Flam. Liq. 3 H226

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

(enter justification for selecting this species)

barium {barium chromate}

(enter justification for selecting this species)

boron {diboron trioxide; boric oxide}

(enter justification for selecting this species)

cadmium {cadmium sulfide}

(enter justification for selecting this species)

chromium in chromium(III) compounds {chromium(III) oxide}

(enter justification for selecting this species)

chromium in chromium(VI) compounds {chromium(VI) oxide}

(enter justification for selecting this species)

copper {copper sulphate pentahydrate}

(enter justification for selecting this species)

lead {lead chromate}

(enter justification for selecting this species)

mercury {mercury dichloride}

(enter justification for selecting this species)

nickel {nickel chromate}

(enter justification for selecting this species)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

(enter justification for selecting this species)

vanadium {divanadium pentaoxide; vanadium pentoxide}

(enter justification for selecting this species)

zinc {zinc chromate}

(enter justification for selecting this species)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.23.4149.8274 (23 Jan 2020)
HazWasteOnline Database: 2020.23.4149.8274 (23 Jan 2020)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

APPENDIX F: GROUND RISK REGISTER

INTEGRATED PROJECT RISK REGISTER
FRANCIS GARDENER HOUSE

Client: Empiric Properties
Principal Designer: TBC
Principal Contractor: TBC

CATEGORY			RISK ASSESSMENT							CONTROL MEASURES				
REFERENCE No.	CDM	PROJECT	HAZARD *Record the nature of the hazard.*	CAUSE *Note the conditions that may lead to a hazard causing harm or disruption.*	CONSEQUENCE *List the consequences, should the hazard come into effect*	PROJECT STAGE: PRE-CONSTRUCTION	PROJECT STAGE: CONSTRUCTION	PROJECT STAGE: OPERATION & MAINTENANCE	PROJECT STAGE: DECOMMISSIONING	CONTROL MEASURES *List those measures that you consider may be put in place to mitigate (reduce) both the likelihood and effect of the risk identified.*	RESIDUAL RISK RATING: LIKELIHOOD	RESIDUAL RISK RATING: EFFECT	RESIDUAL RISK RATING: RISK RATING	METHOD OF COMMUNICATION *List risk communication media additional to this document e.g. drawings.*
1	x		Excavations - Collapse/Instability	Excessive Groundwater/ Rainfall Soft Ground Conditions Cuttings too steep/insufficient support. Suitably designed retention system	Damage to Plant and Equipment Death or Serious Injury		x			Review ground investigation report for specific locality excavated. Provide briefing and method of safe working practice Ensure pumping and slope support equipment are readily available Temporary 1:1 batter slopes in clay	L	H	M	Ground Conditions Assessment Report
2			Excavations – Surface water flooding	Excessive Rainfall event Prolonged periods of steady rainfall	Collapse/ instability of excavations Delays to program		x			Forecast to be checked a week in advance and changes to works made to suit. Seasonal working. Provision of pumping equipment. Drains around upslope of any excavations.	L	M	M	Ground Conditions Assessment Report
3		x	Contamination – Site Soils	Potential for made ground on site	Human Health Issues Increased Disposal Costs		x			Carry out Phase 2 ground investigation with contamination testing.	L	M	M	Phase 1 Desk Study Report. Ground Conditions Assessment Report
4		x	Aggressive Chemicals (Sulphates)	Sulphate Levels	Degradation of concrete used in the ground Failure of foundations to meet required standards			x		BRE SD1 testing required as part of any GI.	M	M	M	Sulphate section of Ground Conditions Assessment Report
5	x		Ground Gases	Build-up of ground gasses in excavations and sub floor voids from natural soils	Risk of explosion		x	x		Install gas monitoring wells and carry out monitoring visit.	L	H	M	Ground gas section of Ground Conditions Assessment Report
6		x	Silt Run Off	Excessive rainfall	Silt run off into adjacent roadway and drains		x			Silt control measures should be in place on site, especially along lower southern boundary, and around pond.	M	L	M	Construction management plan
7	x		Foundation - Ultimate limit state failure (Bearing Capacity)	Unknown loadings Degradation of concrete Insufficient depth of foundations	Building collapse/ need to rebuild			x		Determine strength of underlying soils in order to obtain bearing capacity. Likely piled solution	L	H	M	Foundation section of Ground Conditions Assessment Report
8	x		Serviceability limit state failure (settlement)	High Plasticity Clays	Cracking/deformation of slabs			x		PI testing of any clays.	M	M	M	Ground Conditions Assessment Report
9		x	Obstructions in made ground/ natural soils	Historical foundations. Basement structure. Buried obstructions.	Unable to excavate through. Increased cost of disposal and earthworks.		x			The use of a breaker attachment may be required to excavate bedrock. Provision should be made in advance for dealing with cobbles and boulders, and exploratory logs inspected.	H	L	M	Ground Conditions Assessment Report

				Possible concretions within London Clay.										
10	x		Buried Services	Exploratory holes located over buried services noticed to run through site	Damage to services, plant and personnel.		x			Obtain underground survey search prior to breaking ground. CAT scan each hole location.	M	M	M	Service drawings. Constraints plan. Service survey to be carried out prior to site works.
11	x		Groundwater	Shallow perched groundwater within made ground.	Require the use of de-watering techniques. Discharge consents.		x			Monitor groundwater levels during ground investigation.	L	L	L	Groundwater monitoring.
12			Unexploded Ordnance	Striking underground UXO	Damage/death to plant and personnel		x			Carry out UXO risk assessment.	L	H	M	Detailed UXO Assessment
13			Inadequately designed retention system	Basement Structure	Damage to neighbouring properties due to ground deflection.		x			Detailed design of retention system. Basement impact assessment on neighbouring properties	L	M	M	Basement impact assessment
14		x	Heave of basement floor	High plasticity clay, removal of overburden. Part existing basement so differential heave	Damage to slab			x		Suspended floor slab	H	M	M	Ground Conditions Report

APPENDIX G: LIMITATIONS AND EXCEPTIONS

Limitations and Exceptions

1. The advice given in this report is based on the guidelines available at the time of writing.

2. This investigation was conducted so as to generally comply with the relevant principles and requirements of BS10175: 2011 "Investigation of potentially contaminated sites - Code of Practice" and BS 5930:2015 “Code of Practice for Site Investigations”.

3. The Client is advised that the conditions observed on site by Jubb Consulting Engineers Ltd (JCE) at the time of the investigation or assessment are subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance or investigation and they may subsequently have become observable. Ground conditions, including geotechnical properties may vary between points of observation, sampling and testing.

4. Certain areas of site had restricted access or were inaccessible due to the presence of in-use buildings, facilities and live services, as identified in this report. These may require further investigation outside the scope of this present investigation.

5. Comments made relating to land gas or groundwater conditions are based on observations made at the time of an investigation unless otherwise stated. Land gas and groundwater conditions may vary as a result of seasonal or other effects.

6. Ground contamination often exists as small discrete areas of contamination and there can be no certainty that any or all such areas have been located, sampled and/or identified.

7. The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from previous site investigations and chemical and geotechnical testing laboratories, and which JCE has assumed are correct. Nevertheless, JCE cannot and does not guarantee the authenticity or reliability of the information it has used or cited. JCE can accept no responsibility for inaccuracies within the data supplied by other parties.

8. This report is written in the context of an agreed scope of work between JCE and the Client and should not be used in a different context. In the light of additional information becoming available, improved practices and changes in legislation, amendment or re-interpretation of the assessment or report in whole or part may be necessary after its original submission.

9. This report is provided for sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of the report will be accepted to anyone other than the Client.

10. This report is not a specification for works.

11. JCE believes that providing information about limitations is essential to help the Client identify and thereby manage risks.

12. JCE does not provide legal advice and the advice of the Clients' legal advisors may also be required.

13. JCE retain the copyright in this report and all drawings reproduced in it.