STM environmental

ENVIRONMENTAL CONSULTING , SOFTWARE & TRAINING

CONTAMINATED LAND RISK ASSESSMENT

Phase 2 Environmental Site Investigation Report

Site
18 Acton Street
London
WC1X 9ND

Client
Kofo Kuforiji
London Property Acquisition

Report Reference
PH2-2018-001032

Prepared by
STM Environmental Consultants Ltd

Date
09/11/2018

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1 DOCUMENT CONTROL

CONTAMINATED LAND RISK ASSESSMENT
PHASE 2 ENVIRONMENTAL SITE INVESTIGATION REPORT

Site Address:	18 Acton Street London WC1X 9ND
Site Coordinates:	530731, 182777
Report Reference:	PH2-2018-001032
Version No:	1.0
Prepared for:	Kofo Kuforiji London Property Acquisition
Date:	09/11/2018
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2 DISCLAIMERS

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It should be noted that this report has been produced for environmental purposes only. It should not in any way be construed to be or used to replace a geotechnical survey, structural survey, asbestos survey, buried services survey, unexploded ordnance survey or invasive plant survey.

3 EXECUTIVE SUMMARY

SECTION	SUMMARY
Site Location and Description	The site is located at 18 Acton Street, London, WC1X 9ND and is centred at national grid reference 530731, 182777. The site has an area of approximately 0.018 ha.
Proposed Development	The development proposal is for the change of use of the ground floor to a commercial office space and the first floor to a residential flat. It is understood that there are no proposals to include soft landscaping in the development.
Summary of Phase 1 Desk Study	An analysis of Ordnance Survey historical maps indicated that the site and its vicinity has been subject to past potentially contaminative uses including garages, filling stations and railway land. A conceptual risk site model was constructed and a qualitative risk assessment carried out. This identified potentially significant potential pollutant linkages with respect to human health and property receptors. The Desk Study recommended that an intrusive site investigation be carried out is undertaken with the objective of determining the presence and extent of any soil contamination.
Summary of Site Investigation	Site investigation works were carried out on the 08/10/18. 4no. soil samples were taken from 3no. boreholes at depths ranging from 0.3 - 2mbgl. The samples were submitted to an UKAS/MCERTS accredited laboratory for analysis of heavy metals, TPH, BTEX and PAHs and Asbestos.
Updated Contamination Assessment	A generic quantitative risk assessment was carried using the results of the soil sample analysis. Elevated concentrations above the adopted GAC (for the residential without plant uptake land use scenario) were identified for Lead as well as PAHs (Benzo(a)pyrene and Dibenzo(ah)anthracene) in soils from 1no. of the borehole locations.
Recommendations	The Conceptual Risk Model for the site was reassessed incorporating the results of the site investigation. Given that the proposed development will not introduce any soft landscaping, it was concluded that none of the potential pollutant linkages identified by the desk study have the potential to be significant. Therefore, no remedial action is considered to be required.

4 INTRODUCTION

STM Environmental Consultants Limited were commissioned by London Property Acquisition Ltd to undertake a preliminary risk assessment at 18 Acton Street, London, WC1X 9ND (the site).

The report is required to support planning application for the "change of use of the ground floor and first floor from B1c to C3". The proposed development plans are available in Appendix 1.

4.1 Objectives

The main objectives of the study were to:

- Provide information for a generic quantitative risk assessment (GQRA) to be undertaken;
- Refine the Conceptual Site Risk Model using the findings of the GQRA;
- Inform the need for and scope of any remedial works that may be required.

A summary of the findings of the site investigation and GQRA are detailed within this report.

This report should be read in conjunction with the Desk Study Report (Ref: PH1-2018-001050) produced for the site by STM Environmental Consultants in October 2018 which is summarised below.

5 SUMMARY OF DESK STUDY FINDINGS

5.1 Site History

An analysis of historic Ordnance Survey maps was undertaken in order to identify significant Potentially Contaminative Land Uses (PCLs) on and in the vicinity of the site. PCLs identified within a 50m radius of the site as well as any PCLs with high pollution migration potential within 250m of the site were considered to be of concern are summarised in Table 1 below. The site was most recently used as a Motorcycle Workshop. The site at present is being used as storage for cycles.

Table 1: Summary of potential contamination sources, period of operation and distance from site.

Site Name	Industrial Profile	Approx. Year Use Established	Approx. Year Use Ended	Direction	Approx. Distance from Site (m)
Motor Repair Garage (Motopsycho)	Road Vehicles: Garages & Filling Stations	Unknown	Current (2018)	Onsite	0
Underground Railway Line	Railway Land	c. 1874	Current (2018)	E	Adjacent
Lock Up Garages	Road Vehicles: Garages & Filling Stations	Unknown	Current (2018)	E	31

5.2 Geology

The site is located on bedrock of London Clay Formation. No superficial deposits were identified in the search.

5.3 Hydrogeology

The site is underlain by a Secondary A Aquifer.

5.4 Previous Site Investigations

A search of relevant information on Camden London Borough Council's planning portal did not identify any records of previous contaminated land site investigations at or in vicinity of the site.

5.5 Qualitative Risk Assessment

A preliminary conceptual site risk model (CSM) was constructed in order to assess potential pollutant linkages.

Potentially significant potential pollutant linkages (PPSLs) were identified with respect to:

- Human health receptors (PPL1)
- Property (PPL5)

Potential human health receptors included future site users; construction workers and onsite property receptors including onsite buildings and services.

The desk study recommended that an intrusive site investigation be carried out is undertaken with the objective of determining the presence and extent of any soil contamination.

6 ENVIRONMENTAL SITE INVESTIGATION

The site investigation works were carried out on the 8th of October 2018 and were undertaken in accordance with the following guidance:

- CLR 11: Model procedures for the management of land contamination – DEFRA & Environment Agency;
- BS 10175 - Code of practice for the Investigation of potentially contaminated sites British Standard Institution;
- BS5930:2015 Code of Practice for Ground Investigation
- BS 8485: 2015 - Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution;
- BS8576:2013, Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).
- C665, 2007 - Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA.

6.1 Strategy and Scope of the Site Investigation and Risk Assessment

6.1.1 Soil Sampling Strategy

A non-targeted sampling strategy was used to select the locations of the exploratory boreholes which were generally spaced out across the site.

3no. sampling locations were excavated at the site and as the investigation was primarily focused on assessing the quality of near surface soils, environmental soil samples were collected at relatively shallow depths between 0.3 – 2 mbgl.

A map showing the locations of boreholes and the borehole logs are available in Appendix 2.

6.1.2 On-site Screening of Volatile Organic Compounds

Soil from each borehole was screened on site for volatile organic compounds (VOCs) using a hand held Minirae photo-ionisation detector (PID) which has a detection limit of 0.1 parts per billion (ppb). The PID was calibrated in the field prior to use using a gas of known concentration (isobutylene gas – 100ppm).

Soil vapour readings were taken using the headspace method, which involved placing the soil sample into a sealed plastic bag and then taking a reading by placing the PID filter into the bag. Samples were taken from each borehole core within the made ground between 0.3 - 2 mbgl.

6.1.3 Sample Collection and Transport

All samples were put into sample containers (jars and tubs) that were tightly sealed with minimal headspace. The sample containers were put into a cooler box immediately on collection and kept cool until analysis was undertaken at the laboratory.

6.1.4 Laboratory Analysis

A total of 4no. soil samples were submitted to an UKAS\MCERTs accredited laboratory for analysis of the following:

- Heavy Metals – Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc
- Petroleum Hydrocarbons (TPHCWG)
- Total Phenols - Total Phenols (monohydric)
- Monoaromatics – Benzene, Toluene, Ethylbenzene, p & m-xylene, o-xylene, MTBE (Methyl Tertiary Butyl Ether)
- Speciated PAHs – Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene
- Total PAHs - Speciated Total EPA-16 PAHs
- Asbestos Screening and Quantification
- Inorganics - pH – Automated, Total Cyanide, Water Soluble Sulphate, Sulphide, Total Organic Carbon (TOC)

6.2 Site Investigation Findings

6.2.1 Ground Conditions

Boreholes were advanced to a maximum depth of 2.2 mbgl. The strata encountered in each borehole consisted of a concrete hardstanding and made ground comprising of dark brown silty clay and fragments of debris (i.e., brick, chalk, concrete, glass and plastic).

Photographs from some of the soils extracted from the boreholes are presented in Appendix 3.

6.2.2 Visual and Olfactory Signs of Contamination

Visual indications of contamination of the made ground to depths of 2.2 mbgl were observed (i.e. building rubble and brick) across the site. No significant odours or PID readings were recorded during the investigation.

6.3 Laboratory Sample Analysis Results

The full results of the laboratory sample analysis can be seen in Appendix 4.

7 GENERIC QUANTITATIVE RISK ASSESSMENT

A GQRA was conducted using the soil analytical results in order to further evaluate the significance of the potential pollutant linkages identified in the PRA.

7.1 Generic Assessment Criteria for Soils

The GAC used for the screening of the soils and their sources are outlined in the table in Appendix 5. The GAC used are a combination of the Category 4 Screening Levels and the CIEH\LQM GAC for residential without plant uptake.

7.1.1 Soil Organic Matter Content

Sample results indicated that soils on the site have an average total organic carbon (TOC) content of 1.1%, which based on a conversion factor of 1.72, indicates a Soil Organic Matter (SOM) of around 1.89%. For reasons of conservatism, a soil organic matter content of 1% was assumed.

7.2 Statistical Test Methodology

The statistical analysis was carried out in accordance with the methodology laid out in the document "Guidance on comparing soil contamination data with a critical concentration" published by the Chartered Institute of Environmental Health and CLAIRE.

7.2.1 Test Scenario

The "Planning" scenario was used to undertake the statistical tests. Under this scenario, the Alternative Hypothesis is that "the true mean is lower than the critical concentration" and the Null hypothesis is that "the true mean is equal to or greater than the critical concentration". The critical concentration was taken as the relevant GAC for each contaminant.

7.2.2 Non-Detects

For the purpose of the statistical tests, sample results where the contaminant concentrations were below the limit of detection were set to zero. Statistical tests were only carried out on datasets where at least one of the samples returned a contaminant concentration above the limit of detection.

7.2.3 Data Distribution

The Shapiro-Wilk normality test was used to assess whether datasets were normally or non-normally distributed.

7.3 Results of Statistical Analysis

7.3.1 Contaminants exceeding Generic Assessment Criteria

A summary of contaminants that were found to be present in concentrations that exceeded the mean GAC is shown Table 2 below.

Elevated concentrations exceeding the adopted GAC include Lead, Benzo(a)pyrene and Dibenzo(ah)anthracene. However, the only contaminant found to have exceeded its mean GAC was Lead.

Table 2: Contaminants exceeding GAC

Contaminant	GAC (mg/kg)	No. of Exceedances	Measured Concentrations (mg/kg)		Exceedance Borehole Locations
			Mean	Maximum	
Lead	310	3	582.5	760	BH01
Benzo(a)pyrene	2.5	1	0.83	2.9	BH01
Dibenzo(ah)anthracene	0.31	1	0.15	0.6	BH01

7.3.2 Statistical Analysis

The results of statistical analysis are presented in Appendix 6.

7.3.3 Asbestos Containing Materials

Screening did not identify Asbestos containing materials in any of the samples.

8 RE-ASSESSMENT OF POTENTIAL POLLUTANT LINKAGES

The Potential Pollutant Linkages (PPLs) identified as being plausible in the Desk Study are concerned with the following risks:

- Direct contact and inhalation risks to on-site human health receptors (PPL1a);
- Injury/Death of on-site human health receptors related to explosion due to accumulation of ground gas from on and off-site sources in confined spaces within dwellings (PPL1b);
- Direct contact and inhalation risks to off-site human health receptors as a result of contaminants migrating from the site (PPL2a);
- Injury/Death of off-site human health receptors related to explosion due to accumulation of ground gas from on-site sources in confined spaces within dwellings. (PPL2b);
- Derogation of groundwater quality resulting from the migration of contaminants into the aquifer (PPL3);
- Derogation of surface water quality resulting from the migration of contaminants into surface water receptor (PPL4);
- Damage to buildings and services resulting from on-site contaminants (PPL5a);
- Damage to property related to explosion due to accumulation of ground gas from on and off-site sources in confined spaces within buildings (PPL5b).

The Desk Study concluded that PPL1, and PPL5 had the potential to be significant. All of the PPLs were re-assessed for the residential land use without plant uptake scenario considering the soil analytical results obtained from site investigation. The table below presents the results of the re-assessment.

A detailed explanation of the risk assessment methodology is available in Appendix 7.

Table 3: Results of Qualitative Risk Assessment.

CRITERIA	POTENTIAL POLLUTANT LINKAGES							
	PPL1a	PPL1b	PPL2a	PPL2b	PPL3	PPL4	PPL5a	PPL5b
SEVERITY	Major (4)	Major (4)	Major (4)	Moderate (4)	Moderate (3)	Moderate (3)	Moderate (3)	Major (4)
LIKELIHOOD	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)
RISK	Low (4)	Low (4)	Low (4)	Low (4)	Very Low (3)	Very Low (3)	Very Low (3)	Low (4)
POTENTIALLY SIGNIFCANT?	NO	NO	NO	NO	NO	NO	NO	NO

8.1.1 Potential Risks to On-Site Human Health

PPL1a was considered unlikely to have the potential to be significant. Although exceedances of the GAC were identified for Lead, Benzo(a)pyrene and Dibenzo(ah)anthracene, it is understood that the proposal does not include gardens or soft landscaping (i.e. the entire site will be completely encapsulated by hardstanding). Therefore, there will be no direct contact pathways present in relation to the future occupiers. Additionally, with regard to inhalation related risks, although made ground was identified at the site, no significant PID readings or olfactory evidence of vapours were observed.

With regard to construction workers, given the levels of contamination encountered, the use of general health and safety measures should be sufficient to ensure that they are not subjected to any significant risks.

PPL1b was considered unlikely to have the potential to be significant as no significant PID readings or olfactory evidence of vapours were observed during the site investigation.

8.1.2 Potential Risks to Off-Site Human Health

PPL2a was considered unlikely to have the potential to be significant. The concentrations of contaminants identified in soils are not considered to be sufficient to migrate off site and impact upon off-site human health receptors.

PPL2b was considered unlikely to have the potential to be significant as no potential sources of explosive ground gases (i.e. landfills) were identified in the vicinity of the site.

8.1.3 Potential Risks to Groundwater Receptors

PPL3 was considered unlikely to have the potential to be significant. Although the site is underlain by a Secondary A Aquifer, it is considered unlikely that any contaminants present at the site would be of sufficient magnitude to significantly impact groundwater receptors.

8.1.4 Potential Risks to Surface Water Receptors

PPL4 was considered unlikely to have the potential to be significant as no surface water bodies were identified within 250m of the site.

8.1.5 Potential Risks to Property Receptors

PPL5a was considered unlikely to have the potential to be significant as no significantly elevated concentrations of aggressive chemicals (i.e. Sulphates) that can attack building materials and services were identified in the soil samples.

PPL5b was considered unlikely to have the potential to be significant no significant PID readings or olfactory evidence of vapours were observed.

9 CONCLUSIONS

In response to the findings of the Desk Study carried out for the site by STM Environmental Consultants, an environmental site investigation was carried out on the 8th of October 2018. The objective of the investigation was to determine the presence and extent of potential contamination at the site in order to further inform the risk assessment process.

A total of 3no. boreholes were excavated of which 1no. was advanced to a maximum depth of 2.2 mbgl. A total of 4no. samples from varying depths were collected and sent to a UKAS/MCERTS accredited laboratory for analysis of a suite of commonly found contaminants including heavy metals, TPH, BTEX and PAHs and Asbestos. No significant PID readings or olfactory evidence of vapours were observed during the site investigation.

A generic quantitative risk assessment was carried using the results of the soil sample analysis. Elevated concentrations (i.e. above the adopted GAC) were identified for Lead as well as PAHs in soils from 1no. of the borehole locations.

The Conceptual Risk Model for the site was reassessed incorporating the results of the site investigation. Given that the proposed development will not introduce any soft landscaping, it was concluded that none of the potential pollutant linkages identified by the desk study have the potential to be significant. Therefore, no remedial action is considered to be required.

10 RECOMMENDATIONS

10.1 Watching Brief and Discovery Strategy

It is recommended that a “watching brief” is kept at all times during the development. Should any unexpected contamination be encountered then the discovery strategy outlined below should be followed.

- Works should be halted if any suspicious ground conditions are identified by groundworkers;
- The Contractor should assess the need for any immediate health and safety or environmental management control measures. If control measures are considered to be required, they should be implemented;
- The Contractor should notify the Client’s Environmental Consultant and the Local Planning Authority;
- The Environmental Consultant should attend the site to record the extent of ‘contamination’ and if necessary to collect samples.
- If remedial action is considered necessary then the proposed works should be agreed with the Local Planning Authority prior to implementation;

- Once remediation is complete, the Environmental Consultant should collate evidence of work carried out for inclusion in a Remediation Verification Report which should be submitted to the Local Planning Authority.

10.2 Health and Safety

Given that contaminants have been identified on the site, measures will be necessary to protect the health and safety of site workers during the site works. The following measures are suggested to provide a minimum level of protection.

- Provision of appropriate Personal Protective Equipment (PPE) including protective clothing, footwear, gloves and dust masks to all groundworkers on-site. These should not be removed from site, and advice should be given on when and how they are to be used.
- Great care should be taken to minimise the amount of dust and mud generated on-site.
- Good practices relating to personal hygiene (i.e. washing and changing procedures) should be adhered to on-site, i.e. food and drink should only be consumed within designated areas on the site and smoking should be prohibited in all working areas.
- Availability of site welfare;
- Daily safety briefings

All site works should be carried out in accordance with Health and Safety Executive regulations and guidelines and the Contractor's Construction Health and Safety Plan. Particular should be made to the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Development of Contaminated Land".

10.3 Waste Disposal

Groundworks at the site are likely to give rise to waste soils. These will require classification before removal from site. The Environment Agency's Hazardous Waste Technical Guidance document (WM3) outlines the methodology for classifying wastes. Once classified the waste can be removed to an appropriately licensed facility for treatment or final disposal. The contractor will need to keep a full documentary record of these works in line with Duty of Care requirements. The record will include waste transfer notes and details of the receiving site. Copies of all relevant documents should be provided to the Client's Environmental Consultant for inclusion in the remediation verification report.

10.4 Services

The Statutory Water Undertaker for the area should be contacted in relation to new services that are to be installed as part of the proposed development in order to determine their specification for the type of pipework/conduits that should be used on this site.

It is recommended that all services, and in particular potable water, should be supplied using materials that are resistant to attack and degradation to chemical attack. Reference should be made to the document '*Selection of Water Supply Pipes to be used in Brownfield Sites'*, issued in January 2011 by the UK Water Industry Research.

11 INFORMATION GAPS AND UNCERTAINTIES

Assumptions have been made regarding the nature and scale of the activities that took place on the site and the types of potential contaminants that may have resulted. There are therefore a number of uncertainties associated with the investigation which include, but are not limited to, the following:

- This report is based on data obtained from the chosen sampling locations only. Although efforts have been made to ensure adequate coverage of the site when designing the

- investigation, it is nonetheless possible that (as with any site investigation) there may be locations which were not sampled where localised pockets of contamination exist.
- The site investigation and risk assessment were designed to investigate only the most likely contaminants associated with the former industrial use. The presence of additional unknown contaminants cannot be discounted.

These uncertainties will need to be reviewed along with the Conceptual Site Risk Model should further information come to light in the future.

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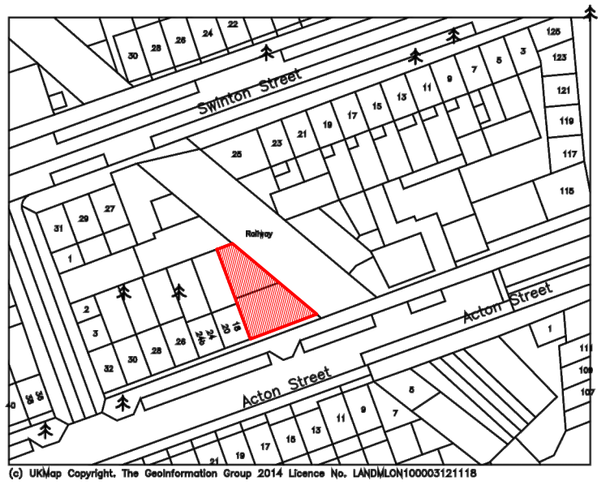
12 APPENDICES

12.1 Appendix 1 – Proposed Development Plans



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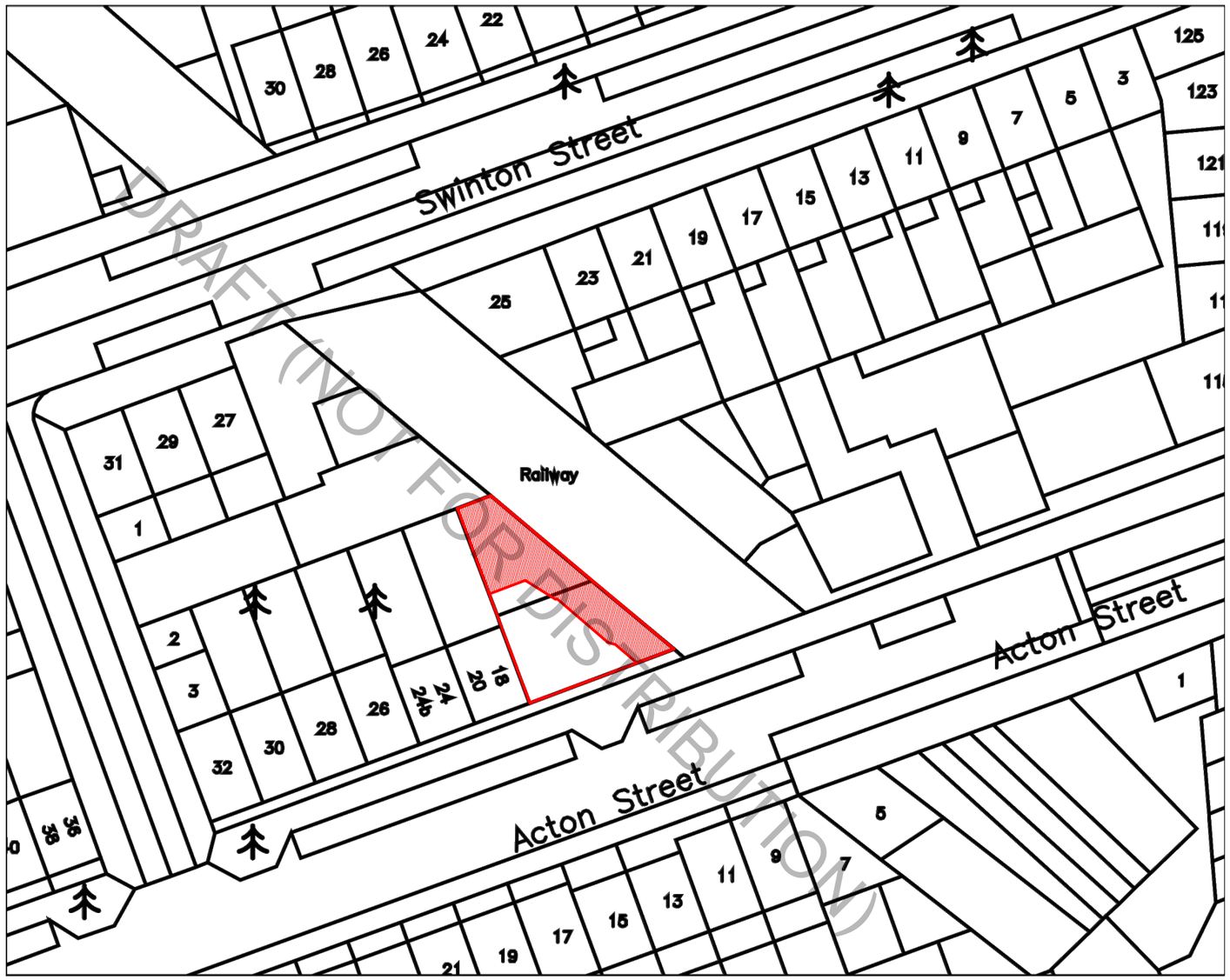
Location Plan
Scale 1:1250

1. Ordnance Survey Map
Scale 1/1250



2. Site map
Scale 1/500

N

W E

S

REV.	DESCRIPTION	REVISED BY AND DATE	APPROVED BY AND DATE

CONTRACTOR

OMEGA CONSULTANCY
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Status
Planning Permission

Contract
Proposed development at
18 Acton Street, London WC1X9ND

Title
Ordnance Survey Plan

JOB No.	SCALE	DRG. INITIATED BY	REVISIONS
1-AS	VARIES@A3	AMV	0
DRAWING No.	DATE	DRG. CHECKED BY	
PP-101	SEP_2014	EA	

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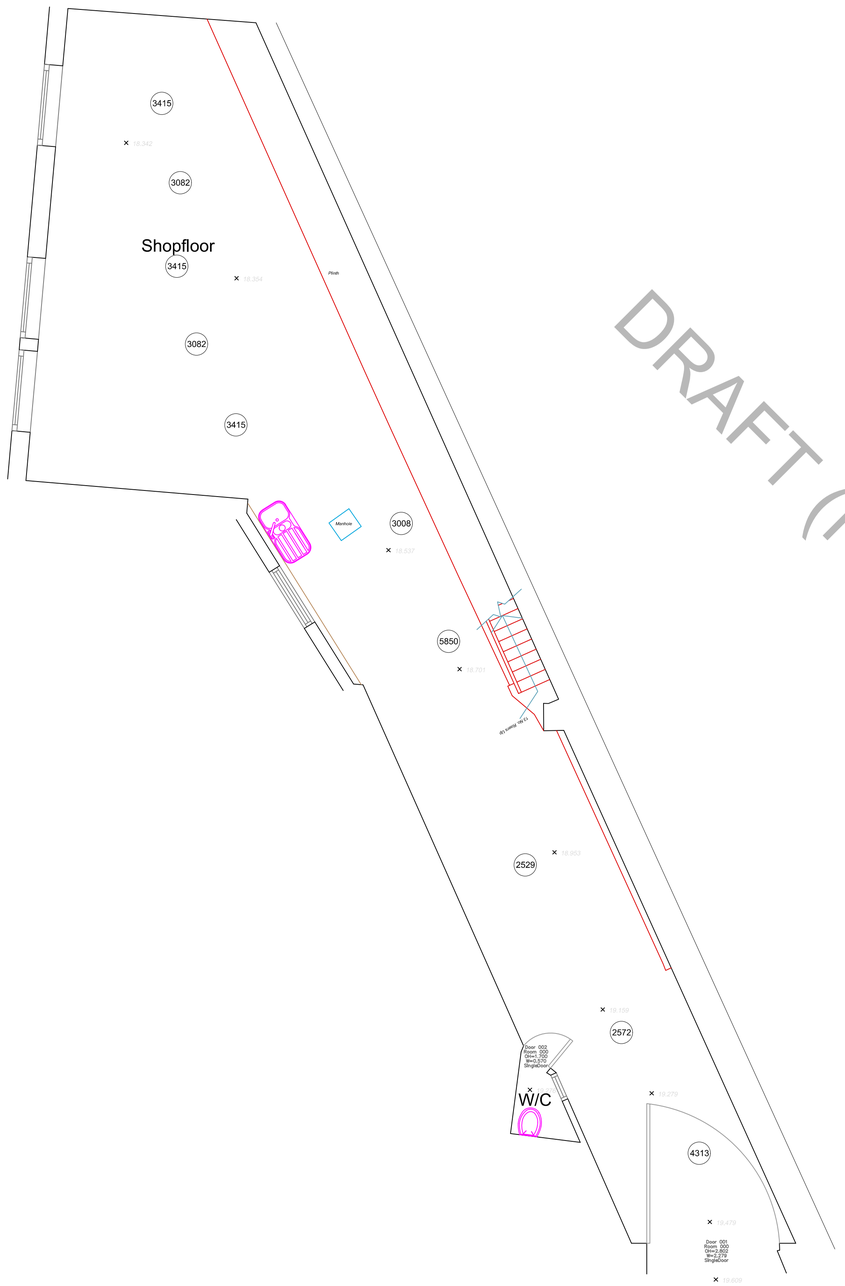
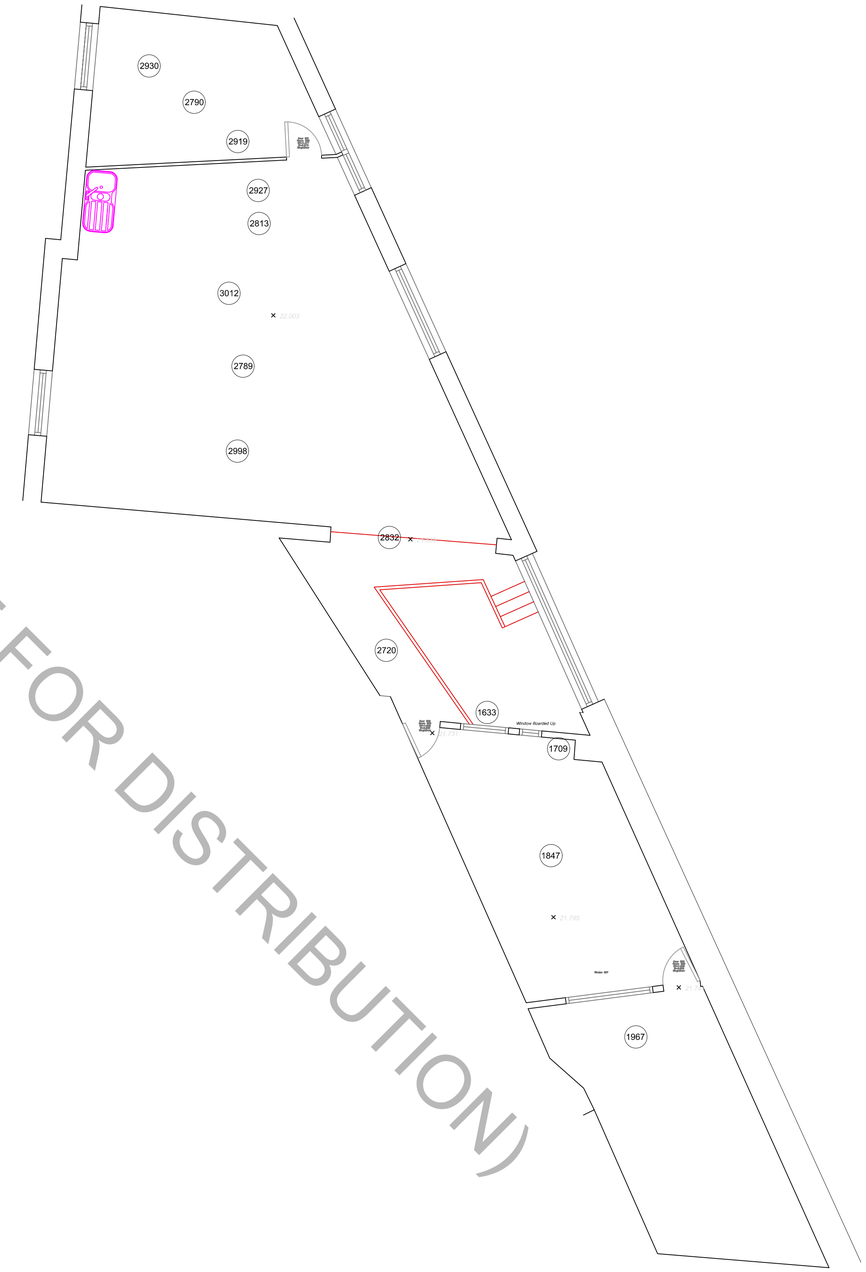


1. Existing Ground Floor
Scale 1/50



2. Existing First Floor
Scale 1/50

REV.	DESCRIPTION	REVISED BY AND DATE	APPROVED BY AND DATE

CONTRACTOR

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Status
Planning Permission

Contract
Proposed development at
18 Acton Street, London WC1X9ND

Title
Existing Floor Plans

JOB No.	SCALE	DRG. INITIATED BY	REVISIONS
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DRAWING No.	DATE	DRG. CHECKED BY	
PP-102	SEP_2014	EA	

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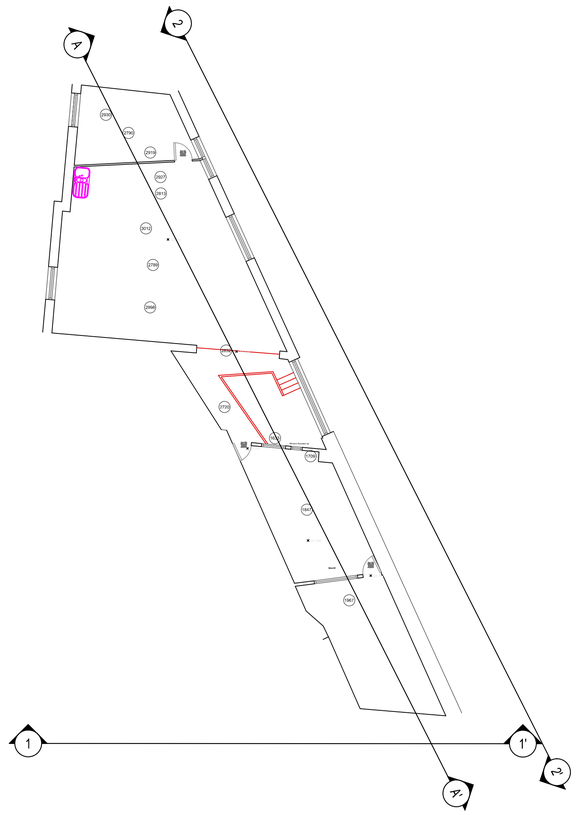
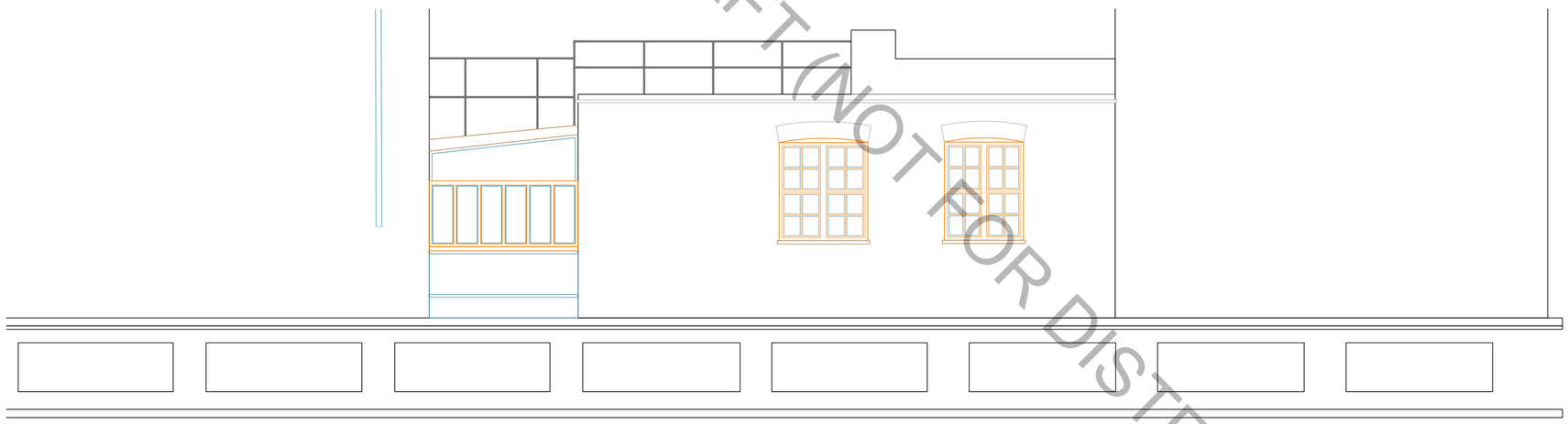
Scale 1/50





2. East Facade 2-2'
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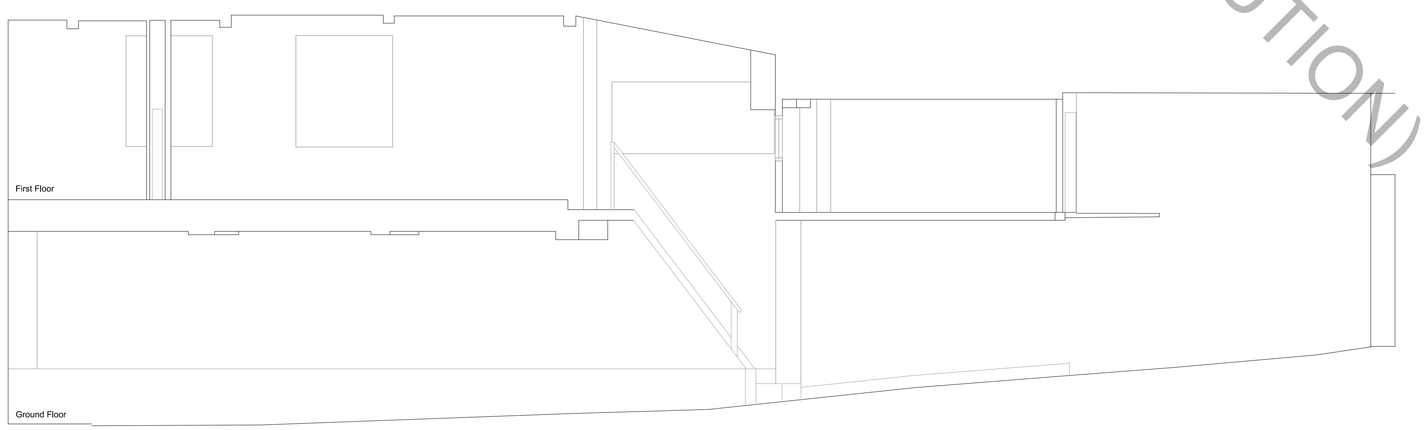

3.Section A-A'
Scale 1/50

REV.	DESCRIPTION	REVISED BY AND DATE	APPROVED BY AND DATE

CONTRACTOR

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Status
Planning Permission

Contract
Proposed development at
18 Acton Street, London WC1X9ND

Title
Existing Facade & Sections

JOB No.	SCALE	DRG. INITIATED BY	REVISIONS
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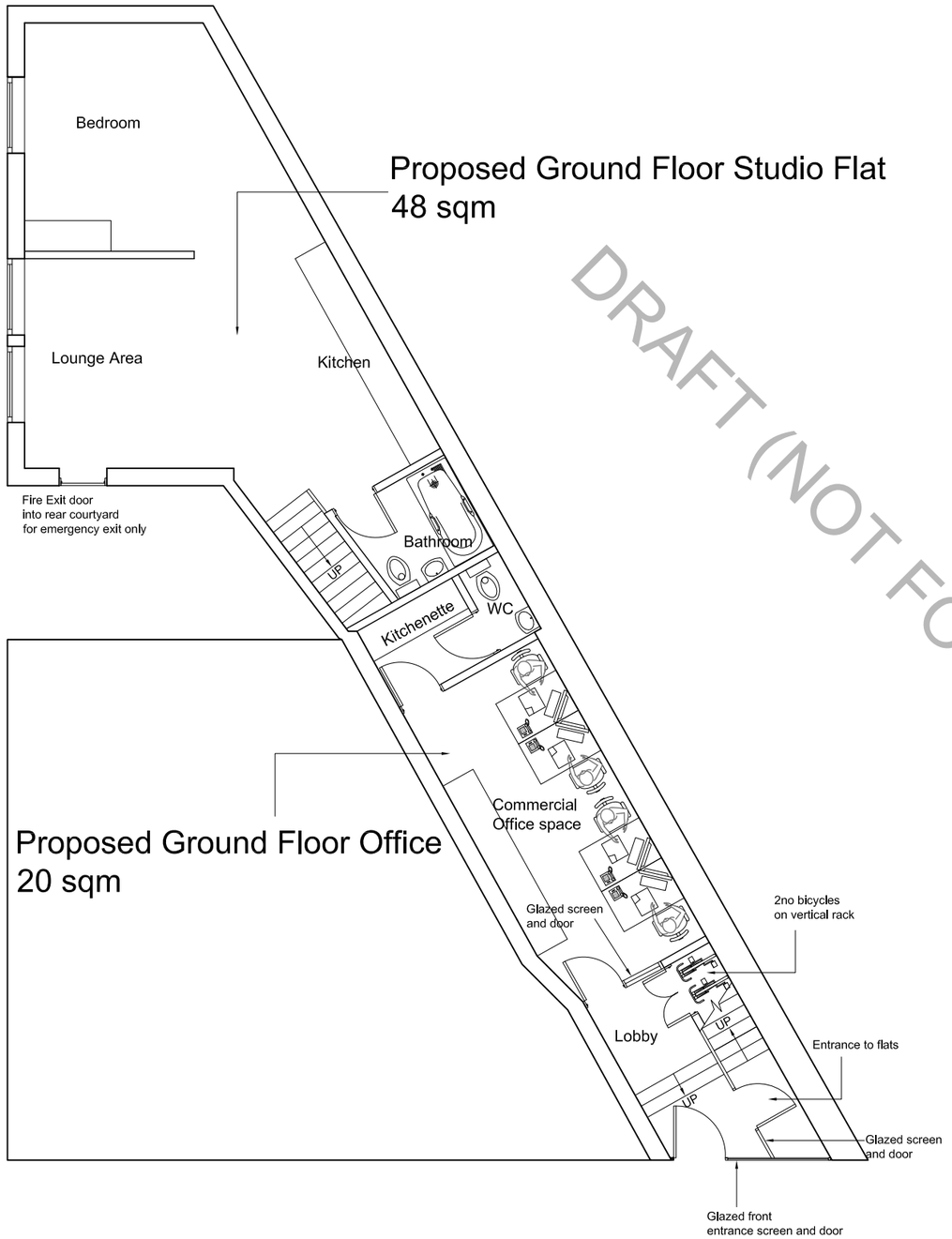
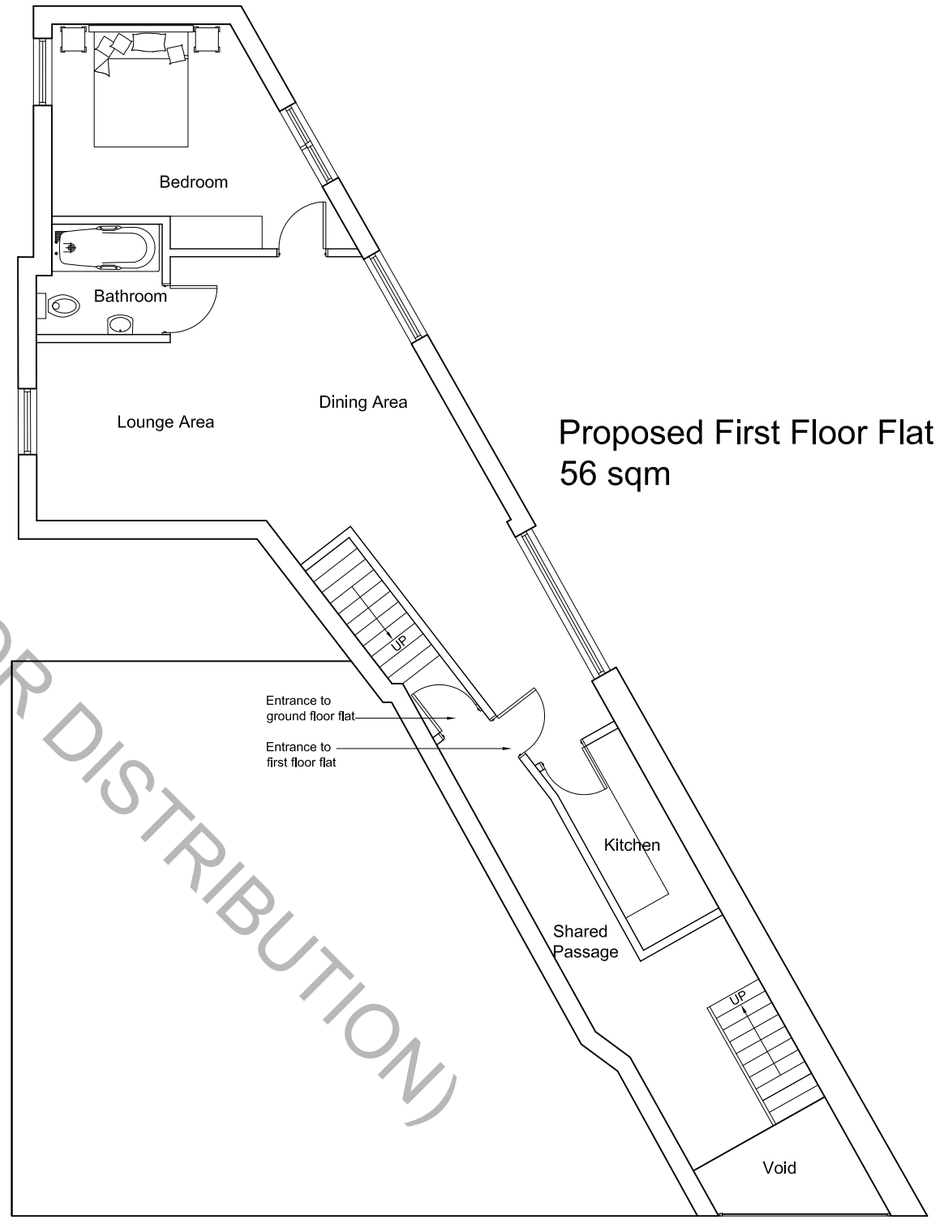
PP-103	SEP_2014	EA	

Revisions		
Rev	Detail	Date

Proposed Ground Floor Plan - 1:100



Proposed First Floor Plan - 1:100



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1:50 scale	0				1				2				3				4				5

Purpose of Issue
- Preliminary ☒
- Information ☐
- Approval ☐
- Tender ☐
- Construction ☐

Project
18 Acton Street
London
WC1X 9ND

Drawing
Proposed Ground and First Floor Plan

LINEAR INSIGHT Ltd
Architectural Design and Development Solutions
info@linearinsight.com - www.linearinsight.com

Client
Daniel Ford Co Ltd

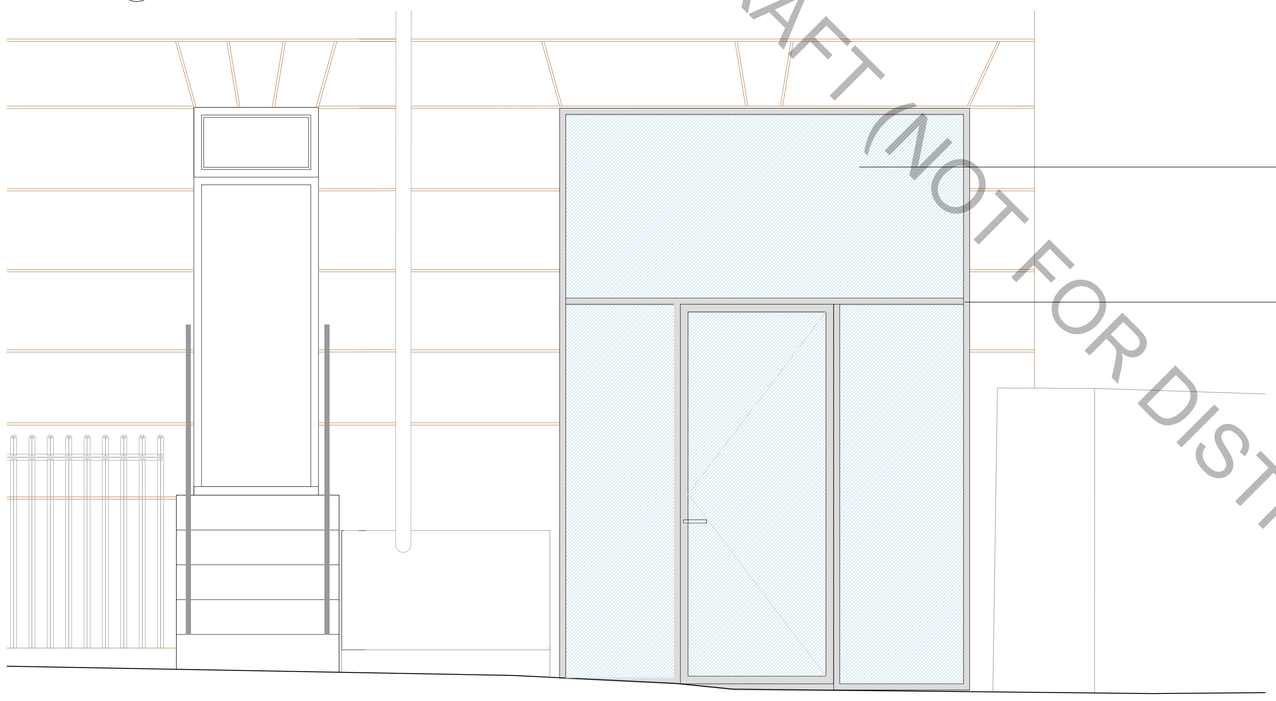
Drawing Scale
1:100@A3

Date
Nov 2017

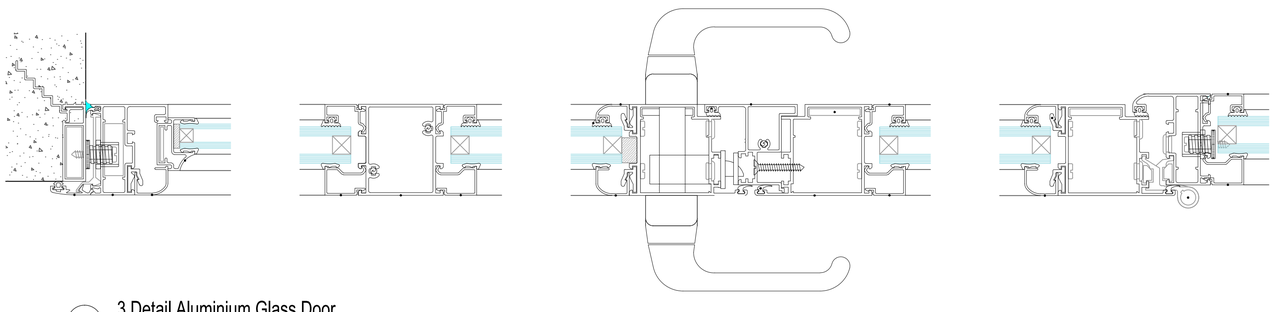
Drawing No.
1106-004-PL

Rev.
SK1

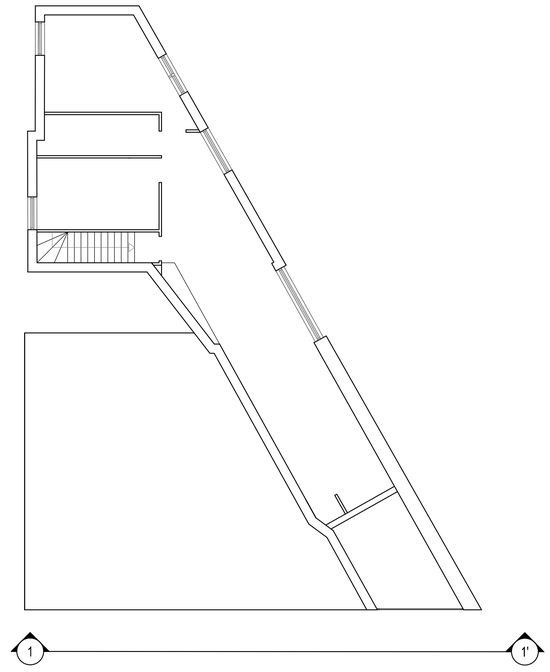
1. Front Facade 1-1'
Scale 1/100



2. Front Door
Scale 1/50



3.Detail Aluminium Glass Door
Scale 1/2



REV.	DESCRIPTION	REVISED BY AND DATE	APPROVED BY AND DATE

CONTRACTOR

OMEGA CONSULTANCY
241A Kingston Vale
London SW15 3PT
United Kingdom
T: +44 (0) 20 8547 1776
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E: omegagoldgroup@gmail.com
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Status
Planning Permission

Contract
Proposed development at
18 Acton Street, London WC1X9ND

Title
Proposed Front Facade

JOB No.	SCALE	DRG. INITIATED BY	REVISIONS
1-AS	1/100@A1	AMV	0
DRAWING No.	DATE	DRG. CHECKED BY	
PP-106	SEP_2014	EA	

12.2 Appendix 2 - Borehole Location Plan and Borehole Logs

Borehole Log

Borehole No. **BH01**

Sheet 1 of 1

Project Name: 18 Acton Street	Project No. 18 Acton Street	Co-ords: 530721.00 - 182784.00	Hole Type HA
Location: 18 Acton Street London WC1X 9ND		Level:	Scale 1:50
Client: Kofo Kuforiji		Dates: 08/10/2018 - 08/10/2018	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			CONCRETE.
		0.30	ES					Dark brown silty clay with an abundance of small brick rubble, with fragments of chalk and rare glass and plastic - MADE GROUND.
		1.20	ES					
					1.50			Whole brick - MADE GROUND.
					1.60			Dark brown clayey soil mixed with brick rubble and small fragments of chalk - MADE GROUND.
		2.00	ES		2.00			Light brown mottled white silty clayey soil with small fragments of chalk and brick - MADE GROUND.
					2.20			End of borehole at 2.20 m

Remarks
Borehole left open for potential gas monitoring.

Borehole Log

STM environmental			Borehole No. **BH02** Sheet 1 of 1
Project Name: 18 Acton Street	Project No. 18 Acton Street	Co-ords: 530728.00 - 182781.00	Hole Type WS
Location: 18 Acton Street London WC1X 9ND		Level:	Scale 1:50
Client: Kofo Kuforiji		Dates: 08/10/2018 - 08/10/2018	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30 - 0.50	ES		0.10			CONCRETE.
					0.50			Light brown sandy silty made ground with fragments of brick and concrete with occasional sub-angular pebbles - MADE GROUND.
								End of borehole at 0.50 m

Remarks
Unable to penetrate deeper due to made ground material.

AGS

Borehole Log

STM environmental			Borehole No. **BH03** Sheet 1 of 1
Project Name: 18 Acton Street	Project No. 18 Acton Street	Co-ords: 530733.00 - 182778.00	Hole Type WS
Location: 18 Acton Street London WC1X 9ND		Level:	Scale 1:50
Client: Kofo Kuforiji		Dates: 08/10/2018 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			CONCRETE.
					0.50			Light brown pink sandy silty made ground with fragments of brick and concrete with sub-angular to rounded pebbles - MADE GROUND.
								End of borehole at 0.50 m

Remarks
Unable to penetrate deeper due to made ground material.

AGS

12.3 Appendix 3 – Photographs

Image 1: Front view of site facing north.

Image 2: Excavations at BH01.

Image 3. BH01 - 1st mbgl.

Image 3. BH1 - 2nd mbgl.

Image 4. BH1 - 2nd mbgl.

Image 5. Excavations at BH02.

Image 5. Excavations at BH03.

12.4 Appendix 4 – Laboratory Certification

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f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-13602

Project / Site name:	18 Acton Street	**Samples received on:**	10/10/2018
Your job number:		**Samples instructed on:**	10/10/2018
Your order number:		**Analysis completed by:**	18/10/2018
Report Issue Number:	1	**Report issued on:**	18/10/2018
Samples Analysed:	4 soil samples		

Signed

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

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

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

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

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

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

Analytical Report Number: 18-13602

Project / Site name: 18 Acton Street

Lab Sample Number				1064312	1064313	1064314	1064315	
Sample Reference				BH01	BH01	BH01	BH02	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.30	1.20	2.00	0.30-0.50	
Date Sampled				08/10/2018	08/10/2018	08/10/2018	08/10/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Moisture Content	%	N/A	NONE	11	13	14	7.3	
Total mass of sample received	kg	0.001	NONE	1.2	1.1	1.1	1.3	
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.3	8.3	8.5	9.7	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	3400	810	3300	3500	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.7	0.41	1.7	1.8	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	1680	407	1650	1750	
Sulphide	mg/kg	1	MCERTS	3.4	9.7	6.4	7.7	
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.0	1.3	1.6	0.5	
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.34	
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.24	
Fluorene	mg/kg	0.05	MCERTS	0.22	< 0.05	< 0.05	< 0.05	
Phenanthrene	mg/kg	0.05	MCERTS	2.2	< 0.05	< 0.05	1.5	
Anthracene	mg/kg	0.05	MCERTS	0.76	< 0.05	< 0.05	< 0.05	
Fluoranthene	mg/kg	0.05	MCERTS	2.9	< 0.05	< 0.05	1.2	
Pyrene	mg/kg	0.05	MCERTS	2.4	< 0.05	< 0.05	1.0	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.9	< 0.05	< 0.05	0.55	
Chrysene	mg/kg	0.05	MCERTS	2.1	< 0.05	< 0.05	0.46	
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.3	< 0.05	< 0.05	0.54	
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.1	< 0.05	< 0.05	0.26	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.9	< 0.05	< 0.05	0.41	
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.4	< 0.05	< 0.05	0.21	
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.60	< 0.05	< 0.05	< 0.05	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.5	< 0.05	< 0.05	0.27	
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	24.3	< 0.80	< 0.80	6.97	

Analytical Report Number: 18-13602

Project / Site name: 18 Acton Street

Lab Sample Number				1064312	1064313	1064314	1064315	
Sample Reference				BH01	BH01	BH01	BH02	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.30	1.20	2.00	0.30-0.50	
Date Sampled				08/10/2018	08/10/2018	08/10/2018	08/10/2018	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	16	19	19	15	
Boron (water soluble)	mg/kg	0.2	MCERTS	2.2	1.7	2.8	1.7	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	16	20	19	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	170	170	180	47	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	760	700	700	170	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	2.7	3.1	3.1	0.9	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20	18	18	15	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.8	1.3	1.4	1.2	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	130	130	230	
Monoaromatics								
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	9.0	< 8.0	< 8.0	< 8.0	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	250	< 8.0	300	46	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	260	< 10	310	50	
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	12	< 10	< 10	< 10	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	110	< 10	59	17	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	130	< 10	65	22	

Analytical Report Number : 18-13602

Project / Site name: 18 Acton Street

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1064312	BH01	None Supplied	0.30	Brown loam and clay with rubble and brick.
1064313	BH01	None Supplied	1.20	Brown clay and sand with rubble and brick.
1064314	BH01	None Supplied	2.00	Brown clay and sand with rubble and brick.
1064315	BH02	None Supplied	0.30-0.50	Brown sand with brick and rubble.

Analytical Report Number : 18-13602

Project / Site name: 18 Acton Street

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

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

12.5 Appendix 5 – Adopted Generic Assessment Criteria

Contaminant	Concentration (mg/kg)	GAC Literature Source
Arsenic	40	Category 4 Screening Levels - Residential (with homegrown produce)
Cadmium	85	LQM SULs - RWOPU
Chromium	910	LQM SULs - RWOPU
Chromium - Hexavalent	6	LQM SULs - RWOPU
Copper	7100	LQM SULs - RWOPU
Cyanide	800	LQM SULs - RWOPU
Lead	310	LQM SULs - RWOPU
Mercury	56	LQM SULs - RWOPU
Nickel	180	LQM SULs - RWOPU
Selenium	430	LQM SULs - RWOPU
Zinc	40000	LQM SULs - RWOPU
Toluene	860	LQM SULs - RWOPU (1% OM)
Benzene	1.4	Category 4 Screening Levels - Residential (with homegrown produce)
Ethylbenzene	83	LQM SULs - RWOPU (1% OM)
m,p xylenes	79	LQM SULs - RWOPU (1% OM)
Acenaphthylene	2900	LQM SULs - RWOPU (1% OM)
Acenaphthene	3000	LQM SULs - RWOPU (1% OM)
Fluorene	2800	LQM SULs - RWOPU (1% OM)
Phenanthrene	1300	LQM SULs - RWOPU (1% OM)
Anthracene	31000	LQM SULs - RWOPU (1% OM)
Fluoranthene	1500	LQM SULs - RWOPU (1% OM)
Pyrene	3700	LQM SULs - RWOPU (1% OM)
Benzo(a)anthracene	11	LQM SULs - RWOPU (1% OM)
Chrysene	30	LQM SULs - RWOPU (1% OM)
Benzo (b) fluoranthene	3.9	LQM SULs - RWOPU (1% OM)
Benzo(k)fluoranthene	110	LQM SULs - RWOPU (1% OM)
Benzo(a)pyrene	2.5	LQM SULs - RWOPU (1% OM)
Dibenz-a-h-anthracene	0.31	LQM SULs - RWOPU (1% OM)
Indeno(1,2,3-cd)pyrene	45	LQM SULs - RWOPU (1% OM)
Benzo (g,h,i) perylene	360	LQM SULs - RWOPU (1% OM)
Aliphatics >C5-6	42	LQM SULs - RWOPU (1% OM)
Aliphatics >C6-8	100	LQM SULs - RWOPU (1% OM)
Aliphatics >C8-10	27	LQM SULs - RWOPU (1% OM)
Aliphatics >C10-12	130	LQM SULs - RWOPU (1% OM)
Aliphatics >C12-16	1100	LQM SULs - RWOPU (1% OM)
Aliphatics >C16-C35	65000	LQM SULs - RWOPU (1% OM)
Aliphatics >C21-35	1900	LQM SULs - RWOPU (1% OM)
Aliphatics >C35-44	65000	LQM SULs - RWOPU (1% OM)

Contaminant	Concentration (mg/kg)	GAC Literature Source
Aromatics >C5-7	0.38	LQM SULs - RWOPU (1% OM)
Aromatics >C8-10	47	LQM SULs - RWOPU (1% OM)
Aromatics >C10-12	250	LQM SULs - RWOPU (1% OM)
Aromatics >C12-16	1800	LQM SULs - RWOPU (1% OM)
Aromatics >C16-21	1900	LQM SULs - RWOPU (1% OM)
Aromatics >C35-44	1900	LQM SULs - RWOPU (1% OM)
Napthalene	2.3	LQM SULs - RWOPU (1% OM)
Phenol	440	LQM SULs - RWOPU (1% OM)

LQM SULs – RWOPU: LQM Suitable for Use Levels - Residential (Without Plant Uptake - 1% Organic Matter)
LQM SULs - RWOPU (1% OM): LQM Suitable for Use Levels - Residential (Without Plant Uptake - 1% Organic Matter)

12.6 Appendix 6 – Statistical Analysis Summary

Parameter	GAC	No. Samples	Mean	Maximum	Outliers Excluded	Max. Value Location	Mean Exceedence	Std Deviation	Non-Detects	W_Shapiro-Wilk	W_Critical	Distribution	T Statistic	Upper 95th percentile (US95)	Mean Value Test Result	Max Value Test Result	One Sample T Test - T0	One Sample T Test - Tn	One Sample T Test Result	One Sample T Test - Evidence Level (%)	Kcrit-Chebychev	UCL95-Chebychev	K0-Chebychev	Chebychev Test Result	Chebychev - Evidence Level (%)
Arsenic	40	4	17.25	19	0	BH01	No	2.06	0	0.8295	0.748	Normal	2.353	19.6754	PASSED	Max. Value NOT Outlier	-22.071	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	21.7441851	-22.07074188	Reject H0 (k0 < kcrit)	99
Cadmium	85	4	0	0	0	N/A	No	0	4	0.8599	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-22.07074188	Reject H0 (k0 < kcrit)	99
Chromium	910	4	18.5	20	0	BH01	No	1.73	0	0.8391	0.748	Normal	2.353	20.5378	PASSED	Max. Value NOT Outlier	-1029.416	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	22.2758708	-1029.41553	Reject H0 (k0 < kcrit)	99
Copper	7100	4	141.8	180	0	BH01	No	63.34	0	0.6936	0.748	Non-Normal	2.353	216.2722	PASSED	Max. Value NOT Outlier	-219.703	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	279.836266	-219.7030222	Reject H0 (k0 < kcrit)	99
Mercury	56	4	2.45	3.1	0	BH01	No	1.05	0	0.7529	0.748	Normal	2.353	3.6858	PASSED	Max. Value NOT Outlier	-101.961	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	4.73986492	-101.9614731	Reject H0 (k0 < kcrit)	99
Nickel	180	4	17.75	20	0	BH01	No	2.06	0	0.9254	0.748	Normal	2.353	20.1754	PASSED	Max. Value NOT Outlier	-157.406	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	22.2441851	-157.4056206	Reject H0 (k0 < kcrit)	99
Lead	310	4	582.5	760	0	BH01	YES	276.45	0	0.7166	0.748	Non-Normal	2.353	907.7443	FAILED	Max. Value NOT Outlier	1.971	-2.132	DO NOT reject H0 (t0 > t(n -1, 0.95)	51	4.36	1185.16257	1.971418277	DO NOT Reject H0 (k0 > kcrit)	0
Selenium	430	4	1.43	1.8	0	BH01	No	0.26	0	0.8869	0.748	Normal	2.353	1.7344	PASSED	Max. Value is Outlier	-3259.18	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	1.99833033	-3259.180448	Reject H0 (k0 < kcrit)	99
Cyanide	800	4	0	0	0	N/A	No	0	4	0.6885	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-3259.180448	Reject H0 (k0 < kcrit)	99
Zinc	40000	4	150	230	0	BH02	No	54.16	0	0.7723	0.748	Normal	2.353	213.7195	PASSED	Max. Value is Outlier	-1471.559	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	268.069358	-1471.558775	Reject H0 (k0 < kcrit)	99
Benzene	1.4	4	0	0	0	N/A	No	0	4	0.7723	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-1471.558775	Reject H0 (k0 < kcrit)	99
Ethylbenzene	83	4	0	0	0	N/A	No	0	4	0.7723	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-1471.558775	Reject H0 (k0 < kcrit)	99
m & p - Xylene	79	4	0	0	0	N/A	No	0	4	0.7723	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-1471.558775	Reject H0 (k0 < kcrit)	99
Toluene	860	4	0	0	0	N/A	No	0	4	0.7723	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-1471.558775	Reject H0 (k0 < kcrit)	99
Naphthalene	2.3	4	0.09	0.34	0	BH02	No	0.17	3	0.6293	0.748	Non-Normal	2.353	0.285	PASSED	Max. Value is Outlier	-26.059	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	0.4556	-26.05882353	Reject H0 (k0 < kcrit)	99
Phenanthrene	1300	4	0.93	2.2	0	BH01	No	1.11	2	0.8479	0.748	Normal	2.353	2.2258	PASSED	Max. Value NOT Outlier	-2349.848	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	3.33535454	-2349.848087	Reject H0 (k0 < kcrit)	99
Anthracene	31000	4	0.19	0.76	0	BH01	No	0.38	3	0.6293	0.748	Non-Normal	2.353	0.6371	PASSED	Max. Value is Outlier	-163156.9	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	1.0184	-163156.8947	Reject H0 (k0 < kcrit)	99
Fluoranthene	1500	4	1.03	2.9	0	BH01	No	1.37	2	0.8523	0.748	Normal	2.353	2.6392	PASSED	Max. Value NOT Outlier	-2185.027	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	4.01605216	-2185.027428	Reject H0 (k0 < kcrit)	99
Benzo (a) anthracene	11	4	0.86	2.9	0	BH01	No	1.38	2	0.7576	0.748	Normal	2.353	2.4894	PASSED	Max. Value is Outlier	-14.662	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	3.87712683	-14.66168203	Reject H0 (k0 < kcrit)	99
Chrysene	30	4	0.64	2.1	0	BH01	No	1	2	0.7744	0.748	Normal	2.353	1.8132	PASSED	Max. Value is Outlier	-58.885	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	2.81388743	-58.88510979	Reject H0 (k0 < kcrit)	99
Benzo (k) fluoranthene	110	4	0.34	1.1	0	BH01	No	0.52	2	0.7839	0.748	Normal	2.353	0.9533	PASSED	Max. Value is Outlier	-420.733	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	1.47639143	-420.7331957	Reject H0 (k0 < kcrit)	99
Benzo (a) pyrene	2.5	4	0.83	2.9	0	BH01	No	1.4	2	0.7276	0.748	Non-Normal	2.353	2.4689	PASSED	Max. Value is Outlier	-2.398	-2.132	Reject H0 t0 < t(n -1, 0.95)	95	4.36	3.86886044	-2.397644126	DO NOT Reject H0 (k0 > kcrit)	85
Indeno (1,2,3 - cd) pyrene	45	4	0.4	1.4	0	BH01	No	0.67	2	0.7331	0.748	Non-Normal	2.353	1.1935	PASSED	Max. Value is Outlier	-132.666	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	1.86817514	-132.6658923	Reject H0 (k0 < kcrit)	99
Benzo (ghi) perylene	360	4	0.44	1.5	0	BH01	No	0.72	2	0.7518	0.748	Normal	2.353	1.2853	PASSED	Max. Value is Outlier	-1003.794	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	2.00424597	-1003.793655	Reject H0 (k0 < kcrit)	99
Acenaphthylene	2900	4	0	0	0	N/A	No	0	4	0.7518	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-1003.793655	Reject H0 (k0 < kcrit)	99
Acenaphthene	3000	4	0.06	0.24	0	BH02	No	0.12	3	0.6293	0.748	Non-Normal	2.353	0.2012	PASSED	Max. Value is Outlier	-49999	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	0.3216	-49999	Reject H0 (k0 < kcrit)	99
Fluorene	2800	4	0.06	0.22	0	BH01	No	0.11	3	0.6293	0.748	Non-Normal	2.353	0.1844	PASSED	Max. Value is Outlier	-50908.091	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	0.2948	-50908.09091	Reject H0 (k0 < kcrit)	99
Pyrene	3700	4	0.85	2.4	0	BH01	No	1.14	2	0.8529	0.748	Normal	2.353	2.1862	PASSED	Max. Value NOT Outlier	-6513.84	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	3.32600404	-6513.83994	Reject H0 (k0 < kcrit)	99

Benzo (b) fluoranthene	3.9	4	0.96	3.3	0	BH01	No	1.58	2	0.7417	0.748	Non-Normal	2.353	2.8196	PASSED	Max. Value is Outlier	-3.72	-2.132	Reject H0 t0 < t(n -1, 0.95)	99	4.36	4.40577947	-3.720029128	DO NOT Reject H0 (k0 > kcrit)	93
Dibenzo (ah) anthracene	0.31	4	0.15	0.6	0	BH01	No	0.3	3	0.6293	0.748	Non-Normal	2.353	0.503	FAILED	Max. Value is Outlier	-1.067	-2.132	DO NOT reject H0 (t0 > t(n -1, 0.95)	85	4.36	0.804	-1.066666667	DO NOT Reject H0 (k0 > kcrit)	53
Aliphatic C5-C6	42	4	0	0	0	N/A	No	0	4	0.6293	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	85	4.36	0	-1.066666667	DO NOT Reject H0 (k0 > kcrit)	53
Aliphatic >C6-C8	100	4	0	0	0	N/A	No	0	4	0.6293	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	85	4.36	0	-1.066666667	DO NOT Reject H0 (k0 > kcrit)	53
Aliphatic >C8-C10	27	4	0	0	0	N/A	No	0	4	0.6293	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	85	4.36	0	-1.066666667	DO NOT Reject H0 (k0 > kcrit)	53
Aliphatic >C10-C12	130	4	0	0	0	N/A	No	0	4	0.6293	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	85	4.36	0	-1.066666667	DO NOT Reject H0 (k0 > kcrit)	53
Aliphatic >C12-C16	1100	4	0	0	0	N/A	No	0	4	0.6293	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	85	4.36	0	-1.066666667	DO NOT Reject H0 (k0 > kcrit)	53
Aliphatic >C21-C35	1900	4	149	300	0	BH01	No	148.11	1	0.8779	0.748	Normal	2.353	323.2544	PASSED	Max. Value NOT Outlier	-23.644	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	471.885402	-23.64417824	Reject H0 (k0 < kcrit)	99
Aromatic >C8-C10	47	4	0	0	0	N/A	No	0	4	0.8791	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-23.64417824	Reject H0 (k0 < kcrit)	99
Aromatic >C10-C12	250	4	0	0	0	N/A	No	0	4	0.8791	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-23.64417824	Reject H0 (k0 < kcrit)	99
Aromatic >C12-C16	1800	4	0	0	0	N/A	No	0	4	0.8791	0.748	N/A	2.353	0	N/A	N/A	N/A	N/A	N/A	99.5	4.36	0	-23.64417824	Reject H0 (k0 < kcrit)	99
Aromatic >C16-C21	1900	4	3	12	0	BH01	No	6	3	0.6293	0.748	Non-Normal	2.353	10.059	PASSED	Max. Value is Outlier	-632.333	-2.132	Reject H0 t0 < t(n -1, 0.95)	99.5	4.36	16.08	-632.3333333	Reject H0 (k0 < kcrit)	99

12.7 Appendix 7 - Risk Assessment Methodology

- Severity considers the potential impact of the linkage on the receptors if the linkage was active. Categories range from slight/superficial to fatal.
- Likelihood considers the chances of the linkage occurring and is classified into categories from improbable to frequent.

By assigning scores with each of the above categories, the risk assessment can be undertaken using the formula:

RISK = LIKELIHOOD × SEVERITY

The matrix given in Table 6 provides a means of calculating the overall risk; while Table 7 provides the qualitative assessment based on the risk score.

Table 4: Contamination Risk Matrix

		Potential Severity				
		Fatal = 5	Major = 4	Moderate = 3	Minor = 2	Slight = 1
Probable Likelihood	Frequent = 5	Very High	High	Moderate	Low	Very Low
	Probable = 4	High	High	Moderate	Low	Very Low
	Possible = 3	Moderate	Moderate	Moderate	Low	Very Low
	Remote = 2	Low	Low	Low	Low	Very Low
	Improbable = 1	Very Low	Very Low	Very Low	Very Low	Very Low

Table 5: Assessment description for risk scores

Risk Score	Risk Assessment
1-5	Very Low to Low
6-10	Low to Moderate
11-15	Moderate
16-20	High
21-25	Very High

Table 6: Risk Classification System

Risk Term	Description
Very Low to Low	The presence of an identified hazard does not give rise to the potential to cause significant harm to a designated receptor. In the event of such harm being realized, it is not likely to be Severe.
Low to Moderate	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realized, would at worst normally be mild.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action. Investigation is required and remedial works may be necessary in the short term and are likely over the longer term.
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is an evidence that severe harm to a designated receptor is currently happening. Urgent investigation and remediation are likely to be required.

13 ABBREVIATIONS

Abbreviation	Description
BTEX	Benzene, Tolulene, Ethylene and Xylene
c.	Circa
CLRA	Contaminated Land Risk Assessment
CSM	Conceptual Site Risk Model
EA	Environment Agency
GAC	Generic Assessment Criteria
IPC	Integrated Pollution Control
LAPC	Local Authority Pollution Control
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PAHs	Polycyclic aromatic hydrocarbons
Part IIA	Part IIA of the Environmental Protection. Act 1990
PID	Photoionization Detector
PCB	Polychlorinated Biphenyl
PCL	Potentially Contaminative Land Use
PPL	Potential Pollutant Linkage
PSPPL	Potentially Significant Potential Pollutant Linkage
SI	Site Investigation
SOM	Soil Organic Matter
SPOSH	Significant Possibility of Significant Harm
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
UXO	Unexploded Ordnance

14 REFERENCES

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