

Site Analytical Services Ltd.



Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons). MSc
Consultants: G. Evans, BSc., M.Sc., PG. Dip., FGS., MEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Tel: 020 8594 8134

Fax: 020 8594 8072

E-Mail: services@siteanalytical.co.uk

Your Ref:

Our Ref:

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March 2015

THE OLD DAIRY,
WAKEFIELD STREET, LONDON, WC1N 1PG

REPORT ON A PROPOSED REMEDIATION STRATEGY

Prepared for
Alan Baxter & Associates LLP
Acting on behalf of
WX Investments Limited



Reg Office: Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA
Business Reg. No. 2255616





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Report on a Proposed Remediation Strategy
At
The Old Dairy, 7a Wakefield Street, London, WC1N 1PG
For
WX Investments Limited

1.0 INTRODUCTION

At the request of Alan Baxter & Associates working on behalf of WX Investments Limited, a proposed remediation strategy was prepared in connection with a proposed redevelopment at the above site. A Phase 1 Preliminary Risk Assessment and previous geotechnical and geo-environmental report are presented under separate cover in Site Analytical Services Limited reports (Project Nos. 14/22974 and 14/22974-1) both dated February 2015.

The information was required to assess the remediation required for the protection of the end-user from the presence of potential contamination within the soils encountered for the proposed development which includes the construction of a mixed residential/commercial development.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.



2.0 SITE DETAILS

(National Grid Reference: 530348, 182548)

2.1 Site Location

The site is located at the end of Wakefield Street within the London Borough of Camden at approximate postcode WC1N 1PG. The site comprises of several pitched-roof warehouse buildings, a front car parking area and small garden and occupies an area of approximately 0.2 hectares.

The site is bound by a church and the rear of a five-storey Georgian terrace that fronts onto Regent Square to the north, by a Buddhist Centre of three storeys and Wakefield Street to the west and by a listed wall and St George's Gardens to the south.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain by the Lynch Hill Gravel Member with the London Clay Formation at depth.

3.0 SCOPE OF WORK

3.1 General

The scope of the investigation was generally agreed with the Consulting Engineer and comprised:

- The identification of a suitable approach to remediation in order to reduce contamination risks to acceptable levels for residential use. Recommendations will be provided on further actions that may be required.

3.2 Report Limitations

For the work, reliance has been placed on publicly available data from the sources identified and the sources are not exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed that it is correct and no attempt has been made to verify the information. In addition to the above, SAS Limited note that when investigating or developing potentially contaminated land, it is important to recognise that sub-surface conditions may vary spatially and over time. The exploratory holes undertaken are of very small diameter and as such variation in ground conditions, level of contamination and ground gases may vary. Therefore SAS Limited cannot guarantee that conditions other than those discussed in the report do not occur elsewhere on the site.



4.0 REVIEW OF PREVIOUS REPORTS

A Phase 1 Preliminary Risk Assessment (PRA) (SAS Report Ref: 14/22974-1 dated February 2015) was undertaken across the site by Site Analytical Services Limited. The Phase 1 PRA should be read in full in conjunction with this Phase 2 report.

Potential sources of contamination, sensitive receptors and plausible pathways were identified within the Phase 1 PRA, the overall risk attributed to the potential for contamination at the site to have a detrimental impact on the sensitive receptors was considered to be high. This was and is based on commercial historical use and the planned change to residential housing in a local area of mixed residential housing and commercial uses.

A Phase 2 Site Investigation (SAS Report Ref: 14/22974 dated February 2015) was undertaken across the site by Site Analytical Services Limited.

The report concluded that in the context of a residential use of the site with private gardens, the contaminants of concern with respect to end-user protection were a 'hot-spot' of Asbestos in the BHB location on-site and elevated Lead across the site with the critical receptors being the end-users / residents (0-6 year old child) of the site and site construction workers. Ground gas was encountered on-site and precautions should be taken within all site buildings.

The potential risks identified at the site were as follows:

1. Human health risks:

- a) End-users of the site – residents, pupils, site staff: direct contact, inhalation of dust, ingestion of dust, ingestion of soils. (potential risk from Asbestos, Lead and ground gas encountered on-site)
- b) Workforce (potential risk from Asbestos, Lead and ground gas encountered on-site).

2. Buildings / Service materials.

Potential risk from ground gas encountered on-site and a potential risk to water supply pipes

5.0 CONCEPTUAL SITE MODEL

In accordance with current UK guidance on contaminated land risk assessment (CLR7, CLR11 and BS10175), the following Conceptual Site Model has been generated to summarise the primary sources, receptors and migration and exposure pathways present on the site and to aid in the decision making process.

For an environmental risk to exist there has to be a source of contamination, receptor or receptors at risk from the contamination and one or more pathway which links the two. Such contaminant – pathway – receptor relationships are termed pollutant linkages.

The above subject site has been assessed within the source – pathway – receptor methodology as described above in the framework of a conceptual site model. A conceptual site model can be defined as a testable representation of environmental processes on a site and its vicinity. Its purpose is to identify potential contaminants, pathways and receptors with a view to, initially identifying potential and eventually, quantifying significant pollutant linkages. It should highlight any limitation and uncertainties present in the risk assessment and be able to communicate the results of the risk assessment to all stakeholders.

The following conceptual site model is based on the proposed use of the site as a school building.

5.1 Identified Source(s) of Ground Contamination

The primary sources of ground contamination identified during the previous SAS site investigations on the subject site were:

- Potential risk from Asbestos, Lead and ground gas encountered on-site.

5.2 Potentially Sensitive Receptor(s)

During and upon redevelopment the potentially sensitive receptors could include;

- Construction workers
- Future site residents
- Building materials and services



5.3 Potential Migration & Exposure Pathway(s)

The future site residents/staff/pupils are potentially exposed to the residual contamination via the following exposure pathways;

- Dermal contact with soil and fugitive dust
- Inhalation and ingestion of fugitive dust
- Ingestion of soils
- Inhalation of ground gases

The site construction / ground workers will also be exposed to any residual contamination via the following exposure pathways;

- Dermal contact with soil and fugitive dust
- Inhalation and ingestion of fugitive dust

The building materials and services may be exposed to residual contamination via the following exposure pathways;

- Dermal contact with soil and fugitive dust
- Accumulation of ground gases within buildings



6.0 PROPOSED REMEDIAL / RISK MANAGEMENT STRATEGY

6.1 Summary of Soil Contamination

Elevated concentrations of Asbestos, Lead and ground gas encountered on-site.

6.2 Remediation Strategy (Soil) – Options Considered

Potential options for the management of the identified soil contamination included;

- Development of the site exclusive of soft standing areas.
- Removal of at least the top 600mm of material from garden and landscape areas in areas of identified contamination and replacement with a 600mm cover layer of clean soils.
- Use of a 1m thick clay cover / barrier layer preventing contact between the site residents and the residual ground in garden / landscape areas in areas of identified contamination.
- Use of a coloured warning / marker membrane below any imported topsoil / sub-soil cover.
- Localised excavation of 'hot-spots' with backfilling.
- Gas protection measures on all site buildings as described in Ciria Report C665

6.3 Remediation Strategy (Soil) – Justification of Selected Methodology

The aim of the remedial strategy is to render ground conditions at the site 'suitable for use' from an environmental risk perspective taking into account the proposed redevelopment of the site for residential housing. A pathway control risk management strategy has been applied to the development.

The options outlined below will prevent any contact with the residual ground by the final site residents and prevent any intake via ingestion, inhalation and / or dermal contact.

Proposed Remedial Strategy (Soil); Risk Management

The proposed risk management / remedial strategy to be adopted at the site is one of managing the pathway between the source of contamination and the critical receptors on-site.



Due to the areas of elevated concentrations of Asbestos, Lead and ground gas encountered on-site, there remains the potential for some level of end-user risk posed by the concentrations of contaminants encountered.

Remedial measures to protect human health are considered necessary as part of the development at the site to break exposure pathways.

There remains the potential for some level of end-user risk posed by the concentrations of contaminants encountered. It is anticipated that the protection of the end-user may be achieved by the following:

Areas of proposed hardstanding (e.g. building footprint, roadways etc.)

In areas of permanent hardstanding such as the building footprint and roadways etc., the development itself would adequately break exposure pathways to human health and therefore further remedial measures may not be required in these areas.

Sensitive end use areas (soft-landscaping etc.)

In areas of sensitive end use such as soft-landscaping etc. soils should be removed from the site to mitigate the risks to end-users and break exposure pathways. It would be recommended that the soils be excavated down to at least 600mm and replaced with a clean cohesive fill material of at least 600mm.

Any materials brought onto the site (soils and / or clay) should be validated either at source or once laid at site. Given the nature of the ground conditions, appropriate health and safety practices should be adhered to in order to protect site workers. Any waste material leaving site for off-site disposal (soil and / or water) should be handled in accordance with the current Waste Management and Duty of Care Regulations.

A plan of the proposed soft landscaped areas of the site is included as Appendix A

Site worker exposure is acute in nature, i.e. high level exposure over a short time span. Appropriate Health and Safety procedures and provision of PPE should mitigate such risks.

Upon redevelopment, building and service materials will all be introduced onto the site. Underground service and building materials can be at potential risk via chemical attack from potentially aggressive compounds within the ground, such as PAHs. Concentrations of such contaminants have been encountered on-site. As such, any incoming water services within the remediation areas will be provided by a barrier water pipe as precaution.

Upon redevelopment, new receptors and pathways will be introduced onto the site and the potential therefore exists that pollutant linkages may be created. In order to sever / prevent such linkages from occurring SAS propose the following remedial / risk management strategy.



6.4 Excavated materials intended for re-use

Where possible any natural materials excavated on-site for foundation purposes will be re-used in order to reduce the volumes of material reporting to landfill.

6.5 Validation Testing

It is believed that soils are to be imported to the site for the construction of the cover layer in garden and soft landscaped areas on-site. Any imported sub-soil / topsoil and material for backfilling should be sampled (preferably at source) at a rate of 1 test per 200m³ of soil.

All soil testing must be conducted by a UKAS accredited laboratory and subject to appropriate sampling protocols.

The results must be supplied to / collated by a suitably qualified environmental consultant for compilation within a site completion report, which is to be submitted to the Local Authority upon completion of the development.

As with all brownfield developments there is the potential for additional suspect ground conditions to be encountered during the redevelopment of the site. In the event that ground staining, odours or deleterious materials are encountered then development will stop immediately and a suitably experienced environmental consultant and the Local Authority Pollution Section will be contacted and a suitable remediation strategy devised and implemented. Suspect material will be segregated and stockpiled on hardstanding (under a plastic sheeting cover) within a 'dirty' area of the site and sampled to confirm its chemical status.

A verification report will be provided as soon as all groundworks at the site are completed and foundations / surface coverings are down. Verification details of the completed development, any agreed remedial measures completed, materials imported onto or off the site with waste management and/or appropriate analysis to demonstrate chemical suitability/absence of asbestos, written statements clearly identifying whether or not any contamination was identified at the site during works will be provided.

Clear conclusions regarding the suitability for use of the site, the likelihood of residual contamination being present beneath the site, the likelihood of residual contamination impacting upon site and off-site uses/environment (including groundwater), the likelihood of off-site contamination impacting significantly upon the site in the future and any other relevant information shall be provided.

Proposed Remedial Strategy (Gas); Risk Management

In accordance with Ciria report C665, The site has been classified as Characteristic Situation 2 which requires the following precautions:

- a) Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM and underfloor venting
- b) Beam and block or pre-cast concrete and 2000 g DPM / reinforced gas membrane and underfloor venting

All joints and penetrations sealed.

Employing the NHBC 'traffic light' characterisation system, the site would be classified as Amber 1 in accordance with CIRIA Report C665. Table 8.7 using the maximum gas concentration for carbon dioxide and which require the following precautions:

Low to intermediate gas regime identified, which requires low-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to limit the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414 (Johnson, 2001). Ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours.

For further information on design and construction details, discussions should be sought with a specialist contractor. Guidance may also be obtained from the BRE Report BR212 'Construction of New Buildings on Gas-Contaminated Land' and CIRIA Report C665 (2007). It may also be prudent to contact the local Environmental Health Officer in order to comply with the Local Authority requirements.

6.6 CSM After development

In terms of human health, upon redevelopment of the site there will be zero exposure via the dermal contact, inhalation and ingestion exposure pathways to the contaminants encountered during the site investigation and therefore zero risk to the end-users of the site.

If required in areas containing residual contamination, services will be placed in trenches backfilled with clean fill materials, with protective water pipes used and consequently risks to service materials should be minimal.



In conclusion, upon redevelopment and with the proposed risk management measures detailed in the following sections, SAS do not consider that the site will pose a significant risk to human health, controlled waters, buildings or service materials.

p.p. SITE ANALYTICAL SERVICES LIMITED

A M Davidson BSc. (Hons), MSc. DIC.
Environmental Engineer




Site Analytical Services Ltd.

A P P E N D I X ' A '

P L A N O F P R O P O S E D S O F T L A N D S C A P E D A R E A S

Project:	1230
The Old Dairy	
Drawing Title:	Lower Ground Floor
-01-	
Stage:	Planning
Drawing No:	1230-11-002-P-A01
Date:	08.02.2015
Scale:	1:100
Format:	A0
Subject:	INFORMATION
Drawn by:	AMZ
Revision:	-



SEBS
 SUSTAINABLE ENVIRONMENTAL BUILDING SYSTEMS
 CONSULTANTS LTD.
 100, WILSON ROAD, #04-01, SINGAPORE 123093
 TEL: +65 6349 0999 FAX: +65 6349 0998
 WWW.SEBSSYSTEMS.COM

