# GEO-ENVIRONMENTAL DESK STUDY

# FOR

# 254 KILBURN HIGH ROAD
# LONDON
# NW6 2BS

Specialists in the investigation & reclamation of brownfield sites

| | |
|---|---|
| **Report Title** | **: Geo-environmental Desk Study for 254 Kilburn High Road, NW6 2BS** |
| **Report Status** | **: Final** |
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**Prepared by: JOMAS ASSOCIATES LTD For: AITCH GROUP**


Prepared by George Glancy BEng (hons)
Geo-environmental Engineer

Approved by Roni Savage BEng (hons), MSc, SiLC, CGeol, MCIWM, FGS
Technical Director



**Should you have any queries relating to this report, please contact**

**Roni Savage**

**Jomas Associates Ltd**

**www.jomasassociates.com**

**☎ 0843 289 2187**

**✉ info@jomasassociates.com**

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## EXECUTIVE SUMMARY

Aitch Group ('The client') commissioned Jomas Associates Ltd ('JAL') to undertake a geo-environmental desk study at 254 Kilburn High Road, NW6 2BS. The principle objectives of the study were as follows:

- To determine the nature and where possible the extent of contaminants potentially present at the site;
- To establish the presence of significant pollutant linkages, in accordance with the procedures set out within the Environment Agency (EA) report R&D CLR11 and relevant guidance within the National Planning Policy Framework (NPPF);
- To obtain documentary or other information to assess whether the land appears to be contaminated land, under the definition set out in Part IIA of the Environmental Protection Act 1990;
- To assess whether the site is safe and suitable for the purpose for which it is intended, or can be made so by remedial action.

*It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.*

| Desk Study | |
|---|---|
| **Site History** | A review of historical maps indicates that the site was originally (1866) occupied by gardens to the rear of a row of properties on Edgware Road, with a building noted as Stanmore terrace encroaching on the south-eastern edge of the site. A further building is present in the north-eastern part of the site in 1866. Further buildings are constructed on site by 1893. The structures on site are subsequently modified over the years, with the site appearing similar to the present day by 1995. The site is labelled as a Timber yard in 1935, a Motor Units Factory in 1953, and a Warehouse from 1976.<br><br>Historically, the surrounding area has been utilised for a variety of uses, with several industrial uses noted from 1871. Notable industrial uses within the surrounding area include railway lines, garage (60m SE and 220m NW), engineering works (150m N, 175m E, gas works (125m NW), etc. |
| **Current Site Use** | 2 storey offices building used as an administration centre with a warehouse and parking areas. |
| **Proposed Site Use** | Residential development proposed. No further information has been provided at the time of this report. |
| **Site Setting** | Information provided by the British Geological Survey indicates that the site is underlain by solid deposits of the London Clay Formation.<br><br>No artificial deposits and superficial deposits reported on the site.<br><br>The underlying solid deposits are identified as Unproductive.<br><br>There is no groundwater abstraction license within 500m. The nearest borehole is reported 1794m east of the site for spray irrigation sourced from Thames Groundwater.<br><br>There are no surface water abstractions reported within 2km of the site. |

| | |
|---|---|
| | The site is not within a Zone 2 or Zone 3 floodplain.<br><br>The Groundsure report indicates that 'no radon protective measures are necessary' at the site. |
| **Potential Sources** | • Potential Made Ground associated with previous developments – on and off-site (S1)<br>• Potential for asbestos in soil from demolition of previous buildings (S2)<br>• Former timber yard – on site (S3)<br>• Former Motor Units Factory – on site (S4)<br>• Current industrial site use – on site (S5)<br>• Current and previous industrial sites and consents/depot/works – off site (S6) |
| **Potential Receptors** | Construction and maintenance workers, neighbouring and future site users, buried foundations and services |
| **Preliminary Risk Assessment** | Residential development proposed. No further information has been provided at the time of this report. The risk estimation matrix indicates a moderate to low risk as shown in Table 4.3.<br><br>It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors. The investigation should assess the thickness of any made ground soils, and allow samples of made ground and natural soils to be taken for laboratory analysis.<br><br>Depending on ground conditions encountered i.e., thickness of made ground and depth to London clay deposits, a programme of soil gas monitoring may be required in accordance with CIRIA C665:2007.<br><br>No controlled water receptors have been identified.<br><br>The possible contamination implications for both on-site and off-site sources have been assessed based on the information presented in the report. This has been achieved using guidance publications by the Environment Agency, together with other sources.<br><br>• *Metals*: cadmium, chromium, copper, lead, mercury, nickel, zinc;<br>• *Semi-metals and non-metals*: arsenic, boron, sulphur;<br>• *Inorganic chemicals*: cyanide, nitrate, sulphate and sulphide;<br>• *Organic chemicals*: aromatic hydrocarbons, aliphatic hydrocarbons, petroleum hydrocarbons, phenol, polyaromatic hydrocarbon;<br>• *Others*: pH, Asbestos |

# 1 INTRODUCTION

## 1.1 Terms of Reference

1.1.1 Aitch Group ("The Client") has commissioned Jomas Associates Ltd ('JAL'), to assess the risk of contamination posed by the ground conditions at a site referred to as 254 Kilburn High Road, NW6 2BS.

1.1.2 To this end, a desk based review has been undertaken in accordance with JAL's email proposal dated 16 September 2013.

## 1.2 Objectives

1.2.1 The objectives of JAL's investigation were as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;
- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas, with respect to potentially contaminative land uses;
- To provide an assessment of the environmental sensitivity at the site and the surrounding area, in relation to any suspected or known contamination which may significantly affect the site and the proposed development;
- To assess the potential presence of significant pollutant linkages, in accordance with the procedures set out within Part IIA of the Environmental Protection Act 1990, associated statutory guidance and current best practice including the EA report R&D CLR 11.

## 1.3 Scope of Works

1.3.1 The following tasks were undertaken to achieve the objectives listed above:

- A walkover survey of the site;
- A desk study, which included the review of a database search report (EnviroInsight Report, attached in Appendix 2) and historical Ordnance Survey maps (attached in Appendix 3);
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

## 1.4 Limitations

1.4.1 Jomas Associates Ltd ('JAL') has prepared this report for the sole use of Aitch Group in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of JAL. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.4.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless JAL has actual knowledge to the contrary, information obtained from public sources or provided to

JAL by site personnel and other information sources, have been assumed to be correct. JAL does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.

1.4.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.

# 2 SITE SETTING

## 2.1 Site Information

2.1.1 The site location plan is appended to this report as Figure 1.

**Table 2.1: Site Information**

| | |
|---|---|
| **Name of Site** | - |
| **Address of Site** | 254 Kilburn High Road, NW6 2BS |
| **Approx. National Grid Ref.** | 524975,184276 |
| **Site Ownership** | Unknown |
| **Site Occupation** | Office building with associated Warehouse and parking areas. |
| **Local Authority** | Camden London Borough Council |
| **Proposed Site Use** | Residential development proposed. No further information has been provided at the time of this report. |

## 2.2 Walkover Survey

2.2.1 A site walkover survey was conducted by JAL on 16 September 2013.

2.2.2 At the time of the walkover, the site comprised several one storey brick warehouses and an office building of 2 No. storey red brick construction. The warehouse comprised storage accommodation and the 2 storey building was utilised as an office administration centre. Access was only possible to a limited part of the building.

2.2.3 The interior of the building (where viewed) was underlain by a concrete floor which was observed to be in generally good condition, with no significant cracking or staining observed.

2.2.4 The Interior of the warehouses (where viewed) was underlain by a concrete floor which was observed to be in poor condition, with cracking apparent in certain areas.

2.2.5 The remainder of the site was occupied by made ground; concrete hardstanding that appeared to be in poor condition, with significant cracking, uneven surfaces with holes in various parts.

2.2.6 There is very limited vegetation; some places have spots that have overgrown. Along the east corner, there was overgrown vegetation protruding around the warehouses. A storage unit was present at the end of the east side, an unknown barrel with a possible vent pipe attached was noted. The barrel was observed from a distance owing to stored material – see photos 15 and 1.

2.2.7 The site was generally level with a number of pot holes throughout the concrete.

2.2.8 The front entrance on the northern side (main road) has been subject to fly tipping.

2.2.9 There were no visible tanks above ground noted.

2.2.10 The presence of asbestos within the building footprint could not be discounted.

2.2.11 The surrounding buildings comprised;

North - Main road with shops and residential flats;

East - Small unidentifiable building a car park and entrance to the park;

South- Large park area, with a few overhanging trees;

West - Shops.

2.2.12 Photos taken during the site walkover are provided in Appendix 1.

## 2.3 Historical Mapping Information

2.3.1 The historical development of the site and its surrounding areas was evaluated following the review of a number of Ordnance Survey historic maps, procured from GroundSure, and provided in Appendix 3 of this report.

2.3.2 A summary produced from the review of the historical map is given in Table 2.2 below. Distances are taken from the site boundary.

**Table 2.2: Historical Development**

| Dates and Scale of Map | Relevant Historical Information | |
|---|---|---|
| | **On Site** | **Off Site** |
| 1866 1:1,056 | The site appears to comprise residential gardens to the rear of a row of properties on Edgware Road.<br>One of the properties encroaches on the south-eastern edge of the site.<br><br>A further building is present in the north-eastern part of the site | The surrounding area generally comprises agricultural and residential use, with some industry such as Edgware Road Station railway (approx 125m North West) and Brewery (approx 125m West)<br>A nursery is present on the eastern boundary.<br>A road (Edgware Road) runs North West to South East approximately 25m west of the site. |
| 1871 1:2,500 | No significant development noted | Edgware road labelled as Watling street<br><br>Railway cuttings apparent 250m North West of the site. |
| 1893 1:1,056 | Further buildings are present on the site | No significant development discernible |
| 1896 1:2,500 | No significant development discernible | Further development apparent within 250m. Watling Street is now labelled High road. The Brewery is now Kilburn Brewery. The station is still labelled<br><br>A saw mill is visible (approx 175m) East. |
| 1915 1:2,500 | A large building has been erected on site; A Picture Theatre is shown on the south western boundary has and may encroach on the site. | The saw mill is now a school.<br><br>Palmerton works is visible (approx 225m) South. |

**Table 2.2: Historical Development**

| Dates and Scale of Map | Relevant Historical Information | |
|---|---|---|
| | On Site | Off Site |
| 1935 1:2,500 | A further building is present in the centre of the site. The site is now labelled - Timber Yard. | Kilburn Grange Park is present on eastern boundary. A timber yard is shown west (approx 90m) a cinema south (approx 100m) and engineering works north west (approx 200m). Picture theatre is now shown as a hall. |
| 1953-55 1:2,500 | The site is now labelled Motor Units Factory. | A gas works depot is visible north west (approx 125m) A pond (approx 50m southeast) and paddling pool is visible north east (150m), garage (approx 60m south east and approx 220m northwest), Engineering works approx 175m east, with another approx 150m north. Electricity sub-station approx 150m southeast Edgware Road Station is now called Brondesbury Station (approx 250m) |
| 1970 1:2,500 | No map coverage | No map coverage |
| 1976 1:2,500 | The building within the site has been extended and is now identified as Warehouse. | No Significant changes noted. |
| 1981 1:2,500 | No significant changes noted to the site. | Partial map coverage – no changes discernible. |
| 1985 1:2,500 | No map coverage | Partial map coverage – no changes discernible. |
| 1991 1:1,250 | No significant changes noted to the site. | No significant changes noted. The gas works depot is no longer shown. |
| 1992 1:1,250 | No map coverage | Partial map coverage – no changes discernible. |
| 1994 1:1,250 | No map coverage | Partial map coverage – no changes discernible. |
| 1995 1:1,250 | A further building is apparent, appearing to connect the central warehouse building to one of the buildings to the west of the site. | Gas works, timber yard and engineering works are no longer visible. |
| 2012 1:1,250 | No significant changes noted to the site. | Partial map coverage – no changes discernible. |

## 2.4 Previous Site Investigations

2.4.1 No previous site investigation reports were made available for review.

## 2.5 Local Authority Information

2.5.1 Any consultation with the local authority was outside the scope of this report.

## 2.6 Proposed Development

2.6.1 It is understood that the site is to be redeveloped to provide residential development proposed. No further information has been provided at the time of this report.

2.6.2 For the purpose of the contamination risk assessment, the proposed development is classified as 'Residential with plant uptake'.

# 3 ENVIRONMENTAL SETTING

3.1.1 The following section summarises the principal environmental resources (geological, hydrogeological and hydrological) of the site and its surroundings. The data discussed herein is generally based on the information given within the EnviroInsight Report (reproduced as Appendix 2) and published information provided by the Environment Agency and British Geological Survey.

## 3.2 Solid and Drift Geology

3.2.1 Information provided by the British Geological Survey indicates that the site is underlain by solid deposits of the London Clay Formation.

3.2.2 No artificial deposits and superficial deposits reported on the site.

## 3.3 Hydrogeology

3.3.1 General information about the hydrogeology of the site was obtained from the EnviroInsight Report.

Groundwater Vulnerability

3.3.2 The EA operates a classification system to categorise the importance of groundwater resources (aquifers) and their sensitivity to contamination. Aquifers were formerly classified as major, minor and non-aquifers, based on the amenity value of the resource. A major aquifer is a significant resource capable of producing large quantities of water suitable for potable supply. Minor aquifers produce water in varying quantities or qualities, and if utilised are of local importance. Non aquifers are low permeability strata, which contain no significant exploitable groundwater and have very limited capacity to transmit contaminants.

3.3.3 Since 1 April 2010, the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. This comprises;

- **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
- **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Principal Aquifer** – this is a formation with a high primary permeability, supplying large quantities of water for public supply abstraction.

- **Unproductive Strata** - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

3.3.4 The underlying solid deposits are identified as Unproductive.

Source Protection Zones (SPZ)

3.3.5 In terms of aquifer protection, the EA generally adopts a three-fold classification of SPZs for public water supply abstraction wells.

- Zone I - or 'Inner Protection Zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source.
- Zone II - or 'Outer Protection Zone' is defined by a 400-day travel time to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants.
- Zone III - or 'Total Catchment' is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

3.3.6 A review of the EnviroInsight Report indicates that the site is within the inner catchment (Zone 1) of a Source Protection Zone.

## 3.4 Hydrology

3.4.1 There are no groundwater abstraction licenses reported within 500m. The nearest borehole is reported 1794m east of the site for spray irrigation sourced from Thames Groundwater.

3.4.2 There are no surface water abstractions reported within 2km of the site.

3.4.3 There are no detailed river entries reported within 500m of the site. There are no surface water features within 250m of the site.

3.4.4 The site is not within a Zone 2 or Zone 3 floodplain.

## 3.5 Sensitive Land Uses

3.5.1 There are no sensitive land uses within 1km of the site. The nearest record relates to a Local Nature Reserve 1071m North West of the site named Westbere Copse.

## 3.6 Industrial and Statutory Consents

3.6.1 The Groundsure EnviroInsight Report also provides information on various statutory and industrial consents on and in the vicinity of the site. The following section summarises the information collected from the available sources.

**Table 3.1: Industrial and Statutory Consents**

| Type of Consent/Authorisation | On site | Off-site (within 500m of site, unless stated otherwise) | Potential to Impact on Site from a land contamination perspective |
|---|---|---|---|
| Industrial Sites holding licences and/or authorisations. | None | 7 Nr. records of Part A(2) and Part B activities and enforcements reported within 500m of the site. Closest at 136m south and 155m south relating to respraying process and cement processing respectively. A record at 431m North West relates to a petrol station | ✓ |
| Discharge Consents. | None | None reported within 500m of the site. | X |
| Water Industry Act Referrals | None | None reported within 500m of the site. | X |
| List 1 Dangerous Substances Inventory Sites | None | None reported within 500m of the site. | X |
| List 2 Dangerous Substances Inventory Sites | None | None reported within 500m of the site. | X |
| Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites. | None | None reported within 500m of the site | X |
| Category 3 or 4 Radioactive substances Authorisations | None | None reported within 500m of the site. | X |
| Planning Hazardous Substance Consents and Enforcements | None | None reported within 500m of the site | X |
| List 1 Pollution Incidents | None | None reported within 500m of the site. | X |
| List 2 Pollution Incidents | None | None reported within 500m of the site. | X |
| Contaminated Land Register Entries and Notices. | None | None reported within 500m of the site. | X |
| Registered Landfill Sites. | None | None reported within 500m of the site. EA historic landfill reported at 1152m northeast | X |
| Waste Treatment and/or Transfer Sites. | None | None reported within 500m of the site. | X |
| Fuel Station Entries | None | 3 No. reported 331m south of the site, identified as Obsolete. | X |
| Current Industrial Site Data. | 1 No. Warehouse for container and storage | 21 No. reported within 250m of the site. Nearest reported 8m South East for stone quarrying and preparation. Other uses include waste storage, unspecified works or factories and electrical features. | ✓ |
| Underground high pressure oil and gas pipelines | None | None reported within 500m of the site. | X |

## 3.7 Radon

3.7.1 As shown in the GeoInsight Report, the site is not in a Radon affected area, as less than 1% of properties are above the Action level.

3.7.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2007).

## 3.8 British GeologicalSurvey (BGS) Borehole Records

3.8.1 As part of the desk study, a number of BGS borehole records from the surrounding area were obtained and reviewed.

3.8.2 The nearest available borehole record is located 37m west of the site. Dated 1845, the borehole record indicated the presence of blue London clay to 235ft (71.6m bgl) underlain by mottled clay, pebbles and sand exposed for 45ft (13.7m).

3.8.3 The BGS borehole records are presented as Appendix 5.

## 3.9 Geological Hazards

3.9.1 The following are brief findings extracted from the EnviroInsight Report that relate to factors that may have a potential impact upon the engineering of the proposed development.

**Table 3.2 – Geological Hazards**

| Potential Hazard | GroundSure Hazard Rating |
|---|---|
| Shrink swell | Moderate |
| Landslides | Very Low |
| Ground dissolution soluble rocks | Null |
| Compressible deposits | Negligible |
| Collapsible Rock | Very Low |
| Running sand | Negligible |
| Coal mining | None |
| Shallow mine workings | Negligible |
| Brine affected areas | No |

3.9.2 In addition, the GeoInsight Report notes the following:

- 6 No. historical surface ground workings are reported within 250m of the site. These relate to the same feature 105m north east of the site, identified as a pond (1920 to 1973)
- No historical underground workings are reported within 1km of the site.
- No BGS current ground workings are reported within 1km of the site.

# 4 QUALITATIVE RISK ASSESSMENT

## 4.1 Legislative Framework

4.1.1 A qualitative risk assessment has been prepared for the site, based on the information collated. This highlights the potential sources, pathways and receptors. Intrusive investigations will be required to confirm the actual site conditions and risks.

4.1.2 Under Part IIA of the Environmental Protection Act 1990, the statutory definition of contaminated land is:

"*land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*

*(a) significant harm is being caused or there is a significant possibility of such harm being caused; or*
*(b) pollution of controlled waters is being, or is likely to be, caused.*"

4.1.3 The Statutory Guidance provided in the DEFRA Circular 01/2006 lists the following categories of significant harm:

- death, disease, serious injury, genetic mutation, birth defects or the impairment of reproduction functions in human beings;
- irreversible adverse change, or threat to endangered species, affecting an ecosystem in a protected area (i.e. site of special scientific interest);
- death, serious disease or serious physical damage to pets, livestock, game animals or fish;
- a substantial loss in yield or value of crops, timber or produce; and
- structural failure, substantial damage or substantial interference with right of occupation to any building.

4.1.4 Contaminated land will only be identified when a 'pollutant linkage' has been established.

4.1.5 A 'pollutant linkage' is defined in Part IIA as:

*"A linkage between a contaminant Source and a Receptor by means of a Pathway".*

4.1.6 Therefore, this report presents an assessment of the potential pollutant linkages that may be associated with the site, in order to determine whether additional investigations are required to assess their significance.

4.1.7 In accordance with the National Planning Policy Framework, where development is proposed, the developer is responsible for ensuring that the development is safe and suitable for use for the purpose for which it is intended, or can be made so by remedial action. In particular, the developer should carry out an adequate investigation to inform a risk assessment to determine:

- whether the land in question is already affected by contamination through source – pathway – receptor pollutant linkages and how those linkages are represented in a conceptual model;
- whether the development proposed will create new linkages, e.g. new pathways by which existing contaminants might reach existing or proposed receptors and whether it will introduce new vulnerable receptors; and
- what action is needed to break those linkages and avoid new ones, deal with any unacceptable risks and enable development and future occupancy of the site and neighbouring land.

4.1.8 A potential developer will need to satisfy the Local Authority that unacceptable risk from contamination will be successfully addressed through remediation without undue environmental impact during and following the development.

## 4.2 Conceptual Site Model

4.2.1 On the basis of the information summarised above, a conceptual site model (CSM) has been developed for the site. The CSM is used to guide the investigation activities at the site and identifies potential contamination sources, receptors (both on and off-site) and exposure pathways that may be present. The identification of such potential "pollutant linkages" is a key aspect of the evaluation of potentially contaminated land.

4.2.2 The site investigation is then undertaken in order to prove or disprove the presence of these potential source-pathway-receptor linkages. Under current legislation an environmental risk is only deemed to exist if there are proven linkages between all three elements (source, pathway and receptor).

4.2.3 This part of the report lists the potential sources, pathways and receptors at the site, and assesses based on current and future land use, whether pollution linkages are possible.

4.2.4 Potential pollutant linkages identified at the site are detailed below:

**Table 4.1: Potential Sources, Pathways and Receptors**

| Source(s) | Pathway(s) | Receptor(s) |
|---|---|---|
| • Potential Made Ground associated with previous developments – on and off-site (S1)<br>• Potential for asbestos in soil from demolition of previous buildings (S2)<br>• Former timber yard – on site (S3)<br>• Former Motor Units Factory – on site (S4)<br>• Current industrial site use – on site (S5)<br>• Current and previous industrial sites and consents/depot/works – off site (S6) | • Ingestion and dermal contact with contaminated soil (P1)<br>• Inhalation or contact with potentially contaminated dust and vapours (P2)<br>• Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3)<br>• Horizontal and vertical migration of contaminants within groundwater (P4)<br>• Accumulation and Migration of Soil Gases (P5) | • Construction workers (R1)<br>• Maintenance workers (R2)<br>• Neighbouring site users (R3)<br>• Future site users (R4)<br>• Building foundations and on site buried services (water mains, electricity and sewer) (R5) |

## 4.3 Qualitative Risk Estimation

4.3.1 Based on information previously presented in this report, a qualitative risk estimation was undertaken.

4.3.2 For each potential pollutant linkage identified in the conceptual model, the potential risk can be evaluated, based on the following principle:

Overall contamination risk = Probability of event occurring x Consequence of event occurring

4.3.3 In accordance with CIRIA C552, the consequence of a risk occurring has been classified into the following categories:

- Severe
- Medium
- Mild
- Minor

4.3.4 The probability of a risk occurring has been classified into the following categories:

- High Likelihood
- Medium/Likely
- Low Likelihood
- Unlikely

4.3.5 This relationship can be represented graphically as a matrix (Table 4.2).

**Table 4.2: Overall Contamination Risk Matrix**

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

4.3.6 The risk assessment process is based on guidance provided in CIRIA C552 (2001) *Contaminated Land Risk Assessment – A Guide to Good Practice*. Further information including definitions of descriptive terms used in the risk assessment process is included in Appendix 4.

4.3.7 The degree of risk is based on a combination of the potential sources and the sensitivity of the environment. The risk classifications can be cross checked with reference to Table A4.4 in Appendix 4.

4.3.8 Hazard assessment was also carried out, the outcome of which could be:

- Urgent Action (UA) required to break existing source-pathway-receptor link.
- Ground Investigation (GI) required to gather more information
- No action required (NA)

4.3.9 The preliminary risk assessment for the site is presented in Table 4.3 below.

**Table 4.3: Preliminary Risk Assessment for the Site**

| Sources | Pathways (P) | Receptors | Consequence | Probability of pollutant linkage | Risk Estimation | Hazard Assessment |
|---|---|---|---|---|---|---|
| • Potential Made Ground associated with previous developments – on and off-site (S1)<br>• Potential for asbestos in soil from demolition of previous buildings (S2)<br>• Former timber yard – on site (S3)<br>• Former Motor Units Factory – on site (S4)<br>• Current industrial site use – on site (S5)<br>• Current and previous industrial sites and consents/depot/works – off site (S6) | • Ingestion and dermal contact with contaminated soil (P1)<br>• Inhalation or contact with potentially contaminated dust and vapours (P2) | • Construction workers (R1)<br>• Maintenance workers (R2)<br>• Future site users (R4) | Medium | Likely | Moderate | GI – ground investigation<br>Depending on ground conditions encountered i.e., thickness of made ground and depth to London clay deposits, a programme of soil gas monitoring in accordance with CIRIA C665 may be required. |
| | • Accumulation and migration of soil gases (P5) | • Construction workers (R1)<br>• Maintenance workers (R2)<br>• Neighbouring site users (R3)<br>• Future site users (R4) | Medium | Likely | Moderate | |
| | • Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3)<br>• Horizontal and vertical migration of contaminants within groundwater (P4) | • Building foundations and on site buried services (water mains, electricity and sewer) (R5)<br>• Neighbouring site users (R3) | Medium | Unlikely (unproductive strata anticipated) | Low | |

4.3.10 It should be noted that the identification of potential pollutant linkages does not necessarily signify that the site is unsuitable for its current or proposed land use. It does however act as a way of focussing data collection at the site in accordance with regulatory guidance in CLR 11.

## 4.4 Outcome of Risk Assessment

4.4.1 Residential development proposed. No further information has been provided at the time of this report. The risk estimation matrix indicates a moderate to low risk as shown in Table 4.3.

4.4.2 It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors. The investigation should assess the thickness of any made ground soils, and allow samples of made ground and natural soils to be taken for laboratory analysis.

4.4.3 Depending on ground conditions encountered i.e., thickness of made ground and depth to London clay deposits, a programme of soil gas monitoring may be required in accordance with CIRIA C665:2007.

4.4.4 No controlled water receptors have been identified.

## 4.5 List of Key Contaminants

4.5.1 The possible contamination implications for both on-site and off-site sources have been assessed based on the information presented in the report. This has been achieved using guidance publications by the Environment Agency, together with other sources.

4.5.2 Based on recommendations within the guidance publications, an initial soil chemical testing suite would need to consider a range of contaminants as follows:

- *Metals*: cadmium, chromium, copper, lead, mercury, nickel, zinc;
- *Semi-metals and non-metals*: arsenic, boron, sulphur;
- *Inorganic chemicals*: cyanide, nitrate, sulphate and sulphide;
- *Organic chemicals*: aromatic hydrocarbons, aliphatic hydrocarbons, petroleum hydrocarbons, phenol, polyaromatic hydrocarbon;
- *Others*: pH, Asbestos

# 5 REFERENCES

BRE Report BR211 ;Radon: Protective measures for new dwellings, 2007

Code of Practice for Site Investigations BS5930: 1999

Groundsure EnviroInsight HMD-377 – 1073606 – 13 September 2013

Groundsure GeoInsight HMD-377-1073607 – 13 September 2013

Groundsure HMD-377-1073605 – Small Scale OS Historical Maps

Groundsure HMD-377-1073605 – Large Scale OS Historical Maps

Investigation of Potentially Contaminated Sites – Code of Practice BS10175: 2011

Model Procedures for the Management of Contaminated Land, Contaminated Land Report 11, (CLR11) Environment Agency, September 2004

# APPENDICES

## APPENDIX 1 – FIGURES

## APPENDIX 2 – GROUNDSURE REPORTS

## APPENDIX 3 – OS HISTORICAL MAPS

# APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

## APPENDIX 5 – BGS BOREHOLE RECORDS