Your Environment

STAGE 1: DESKTOP STUDY AND WALKOVER SURVEY REPORT AT 30 LEIGHTON ROAD, KENTISH TOWN, LONDON, NW5 2QE

for The Trustees of W. David and Sons Ltd 1991 Trust

Your Environment
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Report Number: YE2140, June 2015

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For and on behalf of *Your*Environment				

Issue	Date	Description	Prepared	Reviewed	Approved
01	02.06.15	Draft for Client Comment	KB	KB	CH

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1.0 Introduction

*Your*Environment (YE) was instructed by The Trustees of the W. David and Sons Ltd 1991 Trust (Quote No: 557, Dated April 29th 2015 to produce a Stage 1: Desktop Study and Walkover Report for a site which is located at 30 Leighton Road, Kentish Town, London, NW5 2QE.

We understand current plans for the redevelopment of the site include;

- Refurbishment of listed building for offices (northern portion of site).
- Redevelopment of rear site to provide two (2no.) live-work and seven (7no.) residential units (southern portion of site).
- Creation of bin storage and incorporation of discrete areas of soft landscaping within proposed residential area.

The purpose of this report is to accompany an application for prior approval for change of use and redevelopment of the rear of the site into residential usage to Camden Council under reference 2014/2197/PRE.

The proposed redevelopment plans for the site can be reviewed within Appendix A.

Objectives

The objectives of this Stage 1 report are to:

- Establish the environmental setting, including sensitivity in relation to human health, surface water, groundwater and ecological receptors;
- Review historical and recent uses to assess the potential for contamination to be present from past and current land-use;
- Assess by qualitative means the potential nature and extent of contamination from those uses and the environmental risk that which may affected the site redevelopment;
- Identify the prevalent source-pathway-receptor linkages present on site by means of a Tier 1 contamination risk assessment which incorporates the formulation of a Conceptual Site Model.

Information Sources

During the production of this report the following information sources have been utilised:

- A review of Historical Ordnance Survey Maps, EnviroInsight and GeoInsight information obtained from Groundsure (4C Group Ltd).

2.0 Site Location

The following table outlines the details of the site:

Site address	30 Leighton Road, Kentish Road, London, NW5 2QE
Grid reference	529168, 185154
Total area	0.12ha
Topography	The site is generally flat and situated at approximately 40mAOD
Site Layout	The site is an irregular shaped plot of land

Table 1: Site Details

3.0 Site Geology & Geological Hazards

Bedrock Geology
London Clay Formation (Clay and Silt). Predominantly argillaceous, slightly calcareous, grey to bluish grey silty to very silty Clay characteristically fissured, and brown where weathered.

Natural Hazards
On site there is a moderate risk from shrink-swell hazards with a low risk from landslides and a very low risk from collapsible rock hazards. In addition, there is a negligible risk from soluble rocks, compressible ground and running sand hazards.

Coal Mining
There are no coal mining areas recorded within 75m.

BGS Non-Coal Mining Hazards
The potential for undermining as a result of underground mineral extraction, excluding coal and minerals extracted as a consequence of coal mining is recorded as being unclassified.

Brine Affected Areas
There are no recorded brine affected areas within 75m of the study site.

Artificial/Made Ground
There are two records of artificial/made ground within 500m, the closest of which is 384m north for an artificial deposit of Made Ground.

Faults
There are no records of faults within 500m of the study site boundary.

Landslips
There are no records of Landslip within 500m of the study site boundary.

Radon
The study site is not located within a Radon Affected Area, as less than 1% of properties are above the action level. Therefore, no radon protective measures are necessary for any new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment.

4.0 Site Hydrogeology and Hydrology

Aquifer within Bedrock Deposits
As a consequence of the bedrock ground the underlying aquifer is recorded as being Unproductive. This is defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Permeability of Bedrock Ground
The minimum permeability of the bedrock ground is recorded as being very low with the maximum permeability recorded as moderate.

Groundwater Abstraction Licences
There a number of recorded groundwater abstraction points within 2000m, the closest of which is located 558m southwest for the purposes of laundry use.

Surface Water Abstraction Licences

There are a number of recorded surface water abstractions within 2000m, the closest of which is located 1288m southwest for the purposes of non-evaporative cooling.

Potable Water Abstraction Licences

There are two recorded potable water abstraction points within 2000m, these are both located 558m southwest.

River Quality

There is biological quality data for a point located 1025m south which is the Grand Union Canal.

Detailed River Network

There is one network entry within 500m which is 431m southwest for a culvert.

Surface Water Features

There are no surface water features located within 250m.

5.0 Site Flood Information

The risk of flooding at the centre of the study site is recorded as being very low, with the highest risk of flooding within 25m of the centre of the study site also recorded as being very low. There are no flood defences, areas benefitting from flood storage within 250m or areas benefiting from flood defences within 250m.

There are no British Geological Survey (BGS) groundwater flooding susceptibility areas within 50m of the boundary of the study site. The highest susceptibility to groundwater flooding based on the underlying geological conditions is recorded as being not prone.

The BGS confidence rating in respect of this this result is recorded as being not applicable.

6.0 Site Environmental and Industrial Setting

Environmental Permits, Incidents and Registers

Records of Part A(2) and Part B Activities and Enforcements

There are four current Part B Activities within 500m, the closest of which is for a dry cleaners located 152m west.

Sites Determined as Contaminated Land under Part IIA EPA 1990

There is one site listed as being within 500m and is for a former metal plating works located 129m north. The contaminants involved lead and cadmium, the site is recorded as being remediated.

Landfill and Other Waste Sites

Records of Waste Treatment, Transfer or Disposal Sites

There are four sites within 500m, two of which are listed as being on site for a car breakers yard with the other sites located 409m and 414m west.

Records of Environment Agency Licensed Waste Sites

There are a number of recorded sites within 1500m, the closest of which is located 407m west for a household waste recycling centre.

Ground Workings, Mining & Railway Features

Historical Surface Ground Working Features

The is one recorded historical surface ground features within 250m, which is located 241m west for a cutting (1869).

Historical Underground Working Features

There are a number of historical underground working features within 1000m, the closest of which is located 579m southeast for a tunnel (1938 and 1914).

Historical Mining

There are three historical mining areas within 1000m, these are all located 709m northwest for an unspecified shaft (1995, 1974 and 1965).

Johnson Poole and Bloomer

There are JPB Mining areas within 1000m of the study site boundary, and therefore this information should be obtained to ascertain what the potential risks this may pose to the study site.

Tunnels

There is an underground railway line within 250m of the study site boundary, which is 135m west (London underground - Northern Line).

Historical Railway and Tunnel Features

There are a significant number of historical railway and/or tunnel features within 250m of the study site boundary. A railway is recorded as being on site (1916), in addition, the closest off site is an railway 21m southwest (1896).

Active Railways

There are a number of active railway lines within 250m of study site boundary, the closest of which is 10m southwest for a rail and multi-track.

Railway Projects

The study site is located within 5km of the route of the High Speed 2 Rail project.

Current Land Uses

Records of Potentially Contaminative Industrial Sites

There are twenty four records of potentially contaminative industrial sites within 250m, the closest of which is a civil engineers 36m northwest. Of other notable interest are a rail station 41m west, works 88m, 96m, 115m east and 139m east respectively.

National Grid Voltage Underground Electricity Transmission Cables

There are a significant number of underground electricity transmission cables within 500m, the closest of which is located 205m east.

Designated Environmentally Sensitive Sites

The study site is not located within any Environmentally Sensitive Sites.

Information on the environmental and geological setting of the site is presented in a Groundsure EnvironInsight and GeoInsight Report prepared for the site, a copy of this report is reproduced in Appendix B.

7.0 Historical Mapping Information

The object of this search was to report on the evidence of site history and redevelopment of the site and its environs from available County Series and Ordnance Survey Maps dating from the mid to late 19th Century to the present day as downloaded from Groundsure.

Maps only represent a "snap shot" of the site and its environs at the date of the survey. Changes that had occurred either to the site and/or the environs may well not have been recorded on the maps and could represent a hazard to the site.

The information reported might not represent all pertinent information that could be obtained.

The interpretation of the maps and/or other data commented on in this report is subjective.

Year	Information
1870 (L)	The site appears to comprise of several plots including housing, Hope Cottages (at the rear) and gardens. The site is situated adjacent to the main road. The surrounding area comprises terraced housing with rear gardens. Additionally, there is a railway line running north west to south east approximately 30m from the southern boundary.
1873	The site itself appears to remain unchanged. There is a large railway sidings and sheds located approximately 200m to the west. The areas to the north of the site is largely occupied by assumed fields and residential properties.
1875 (L)	The site itself appears to remain unchanged. Platforms are now visible on the adjacent railway line and labelled Kentish Town Station. A National School is present approximately 80m to the south west.
1894	The site itself appears to remain unchanged. There is a brick works and coal yard located approximately 750m to the north west. The area to the north of the site is now largely assumed residential labelled St Johns College Park. Highgate Road Station is visible approximately 750m to the north west.
1894 (L)	The site itself appears to remain unchanged. There is a fountain labelled on the border to the adjacent (easterly) property.
1896 (L)	The site and surrounding area appear to remain unchanged.
1911	The mapping is incomplete however the site and surroundings appear to remain unchanged.
1920	The site itself appears to remain unchanged. The railway to the south west has been extended laterally and includes new tracks to the north so that they now bound the site. A tank is located approximately 10m to the west of the boundary. An electric station is located approximately 110m to the west. There is a Road vehicle works located approximately 550m to the west. A Colour works is located approximately 600m to the west. An electric generation station is also present approximately 700m to the north west.
1938	The site is now occupied by a larger building. The surrounding area appears to remain unchanged.
1952	The site itself appears to remain unchanged. There is a hospital located opposite the site, approximately 30m away. A coal depot is located approximately 400m to the west.
1952 (L)	The site is now labelled Sorting Office. A builder's yard is present adjacent to the site to the west. A garage is located approximately 20m to the east. An organ factory is located approximately 120m to the east, adjacent to a vehicle repair depot. A corporation yard is located approximately 180m to the east.
1954 (L)	The site and surrounding area appear to remain unchanged.

1962	The site and surrounding area appear to remain unchanged.
1968	The site and surrounding area appear to remain unchanged.
1968 (L)	The site itself appears to remain unchanged. The organ factory is now labelled factory.
1968 (L)	The site and surrounding area appear to remain unchanged.
1975	The site itself appears to remain unchanged. The railway yard to the west is now smaller and a depot is in its place.
1982 (L)	The site itself appears to remain unchanged. There are several works approximately 100m to the east.
1991 (L)	The site and surrounding area appear to remain unchanged.
1994	The mapping is incomplete. The surrounding area appear to remain unchanged.
1995 (L)	The building appears to have been extended laterally to the west. The garage now appears to be open space.
2002	The site itself appears to remain unchanged. The railway sidings to the west have now been replaced with a Depot.
2010	The site and surrounding area appear to remain unchanged.
2014	The site and surrounding area appear to remain unchanged.

Table 2: Historical Mapping Review

Therefore, from the historical maps we can consider the following:

On site sources of possible contamination;

- Made Ground (as a result of historical development).
- Various structures.
- Postal Sorting Office.

Off-site sources of possible contamination;

- Railway Line (immediately bordering the site).
- Ancillary Railway Infrastructure (200m west).
- Brick Works (750m northwest).
- Coal Yard (750m northwest).
- Tank, unknown contents (10m west).
- Electrical Substation (110m west).
- Road Vehicle Works (550m west).
- Colour Works (600m west).
- Electric Generation Station (700m northwest).
- Builders Yard (immediately adjacent to the site).
- Organ Factory (120m east).
- Garage (20m west).
- Corporation yard (180m east).
- Various works (100m east).

The Historical Ordnance Survey Maps were obtained from Groundsure and are available for review within Appendix C.

8.0 Walkover Survey

The site was attended on 19th May 2015. The weather was fine and dry with occasional showers

Access
The site is accessed directly from the main road. Access to the rear garden area is through the building.

Topography
The site is generally flat.

Vegetation
There is vegetation in the garden, which is a mixture of shrubs, grasses and small mature trees.

Buildings
The building is set back from the pavement by 3 metres which is hardstanding. There is a single building on site that is split into several parts. The main, old part of the building is of steel frame construction with brick cladding and a tiled roof. To the rear of the property are several adjoining buildings, which are of new construction, certainly within the last 20 years. They are all single storey and interspersed with garden and patio areas.

Surface Permeability
The ground is approximately 50% permeable in the garden area with the block paved areas draining into the permeable areas.

Drainage Features
The site has several foul sewer access points adjacent to it in the basement area.

Other Services
Electricity, gas and telecoms were visible on site.

Potentially Contaminative Land Uses
On site sources;

- None identified.

Off site sources;

- Adjacent builder's yard.
- Railway line at rear of property.

Photographs taken during the walkover of the site and surrounds can be reviewed within Appendix D.

9.0 Summary of Possible Contamination Sources

The earliest mapping (c.1870) indicates the site to be developed and is comprised of a number of several plots of irregular shaped buildings which include residential dwellings. This remains to be the case until mapping of 1938 at which point the northern portion of the site is developed with a large rectangular structure which becomes labelled in subsequent mapping as a sorting office. From mapping of 1995 the building is noted to have been extended laterally to the west.

Historically, the surrounding environs were largely urban in nature, with development occurring mainly in the form of residential dwellings and associate garden areas associated with the urban expansion of London.

Observations made during the walkover of the site has revealed that the large on site building is set back from the pavement by 3 metres which is hardstanding. In addition, there is a single building on site that is split into several parts. The main, old part of the building is of steel frame construction with brick cladding and a tiled roof. To the rear of the property are several adjoining buildings, which are of new construction, certainly within the last 20 years. They are all single storey and interspersed with garden and patio areas.

In respect of potential off site historical and current risks, a number of land uses have been identified, the majority of which are located a distances which would negate their potential impact to the study site. However, more of a potential concern would be made ground, as a result of on site historical development. In respect of off site it would be the railway line immediately bordering the site, tank (10m west), builders yard immediately border the site and garage (20m west).

The site is underlain by bedrock geology of London Clay Formation. The nearest record of artificial/made ground is located 384m north, there are no landfills within 750m, the nearest licensed waste site is 407m west for a household recycling centre with a car breakers yard located immediately off site. There is one historic surface ground working feature within 250m, which is located 241m west for a cutting (1869). In respect of historical mining areas the closest is located 709m northwest for an unspecified shaft.

There are a significant number of historical railway and/or tunnel features within 250m of the study site boundary. A railway is recorded as being on site (1916), in addition, the closest off site is an railway 21m southwest (1896).

The nearest potentially contaminative industrial site is a civil engineers 36m northwest. Of other notable interest are a rail station 41m west, works 88m, 96m, 115m east and 139m east respectively.

The hydrogeological and hydrological setting of the site is considered to be relatively low given the presence of an Unproductive Aquifer within the underlying bedrock. The nearest potable water abstraction is located 558m southwest. There are no surface water features within 250m, however a river network entry for a culvert is located 431m southwest.

In summary, we could consider that the most prevalent risk from potential contamination that may pose a risk to pertinent receptors would be from on site historical development and off site railway line immediately bordering the site, tank (10m west), builders yard immediately border the site and garage (20m west).

There are JPB Mining areas within 1000m of the study site boundary, and therefore this information should be obtained to ascertain what the potential risks this may pose to the study site.

10.0 Framework for Assessment of Contamination

Environmental risks are assessed within the risk management framework established in Part IIA of the Environmental Protection Act (EPA) 1990 introduced by Section 57 of the Environment Act 1995 which provides a statutory definition of contaminated land. To fall within this

definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused;

or

(b) *Pollution of controlled water is being, or is likely to be caused.*

Risk from contamination is assessed by consideration of possible linkages between contaminant sources and potential receptors, which could be harmed or polluted.

The key aspect of the framework is the development of a Conceptual Site Model (CSM) which illustrates the spatial interaction between the potential sources and receptors on site.

The information presented in this report was collated and evaluated to develop an initial CSM to assess ground contamination issues at the site.

For a risk of pollution or environmental harm to occur as a result of ground contamination, ***all*** of the following elements must be present:

- A source, i.e., a substance that is capable of causing pollution or harm;
- A receptor, i.e., something which could be adversely affected by the contaminant;
- A pathway, i.e., a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

Potential sources, pathways and receptors are identified in the sections below and the risks associated with possible pollutant linkages outlined.

11.0 Source / Pathway / Receptor

Sources

The *main **sources*** of potential contamination that have been identified at the site or in the vicinity of the site are summarised above and below:

Source	Location	Description
Made Ground	On site	Made ground is likely to exist on the site as a result of historical development of the site. The chemical quality of the Made Ground is unknown.
Hydrocarbons, heavy metals, phenols cyanide, PCBs, asbestos, SVOCs and VOCs.	Immediately off site	Potential for localised contamination from historical and current land uses in immediate proximity to the site, such as railway line, builders yard, garage and tank (unknown contents).

Table 3: Sources

Receptors

The site specific ***receptors*** that could be potentially affected by the contamination hazards identified during this preliminary appraisal are summarised below:

Category	Receptor	Properties
Humans	Future end users and visitors	Potential contact with impacted soils in presumed proposed soft landscaping areas.
	Construction workers	Reworking of potentially impacted materials in soils during remodelling works can expose workers to contamination.
Property	Materials and site structures	Foundations and site services may be damaged by potentially aggressive compounds present in soils.
Controlled Waters	Surface Water and underlying bedrock aquifer	The site is recorded as having an Unproductive Aquifer within the underlying bedrock. The nearest potable water abstraction is located 558m southwest. There are no surface water features within 250m.
Plant (species and uptake) and Wildlife	Various	Attributes will be influenced by factors such as relative quality, scale, rarity and substitutability.

Table 4: Receptors

Pathways

In order for contaminants to reach potential receptors, there has to be a viable ***pathway*** for the contaminant. Potential pathways that may affect the migration of contaminants are listed below:

Pathway	Medium	Properties
Direct soil and dust ingestion, Dermal contact with soil (indoor and outdoor). Inhalation or indoor and outdoor soil dust	Dust, solid and liquid phase	There may be direct contact with potentially contaminated soils underlying the site. There is a possibility of dust fumes being produced during earthworks in the construction phase, with a latent risk from dermal contact and ingestion of potentially contaminated soils during construction or operational phase of the site.
Migration of Ground Gas	Gaseous flow	Made Ground is known to be highly variable in composition. Migration through granular material in Made Ground and alongside buried utility pipes / cables or along preferential flow paths.
Leaching of contaminants through soils and/or via surface off	Saturated flow	Limited potential for leaching and migration through bedrock geology from off site current and historical land uses in proximity to the site.

Table 5: Pathways

12.0 Qualitative Risk Assessment

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed above. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways.

This qualitative risk assessment has been undertaken in accordance with CIRIA C552: Contaminated Land Risk Assessment, A Guide to Good Practice (Rudland et al., 2001)

An assessment of the likelihood of the risk being realised and the magnitude of potential risk is presented below to give an estimation of the significance of each potential pollutant linkage identified.

The assessment is undertaken based on the current proposals for the site, at the time of issuing this report, which for the purposes of the Conceptual Site Model has been split in two, 'Residential' for southern portion of the site with 'Commercial/Industrial' in respect of the northern portion.

13.0 Preliminary Conceptual Site Model - Northern Portion (Commercial/Industrial)

Hazard / Pollutant	Pathways	Receptor	Potential Severity	Probability of Risk	Level of Risk	Justification
Hydrocarbons, (TPH, PAH, BTEX & MTBE). Heavy metals, cyanide, phenols, PCBs, SVOCs, VOCs and asbestos.	Ingestion, dermal contact, inhalation	Future end users and site visitors	Medium	Likely	Moderate	A moderate risk is considered as the composition of potential Made Ground is largely unknown, furthermore off site sources of potential contamination have been identified in close proximity and could be a source of contaminants through direct contact e.g. in soft landscaped areas.
		Construction Workers	Medium	Likely	Low	Construction workers may come into direct contact with soils therefore the use of appropriate PPE should be adopted to mitigate against any potential risks.
	Leaching through soils and migration via groundwater or soil pore moisture	Controlled Waters	Medium	Low Likelihood	Low	The hydrogeological and hydrological setting of the site is considered to be low given the historic/current setting of the site and surrounding environs. The site is situated upon an Unproductive Aquifer. There are no surface, groundwater or potable abstraction points within 500m. Furthermore, there are no surface water features within 250m.
	Uptake	Plant and Wildlife	Mild	Low Likelihood	Moderate	A moderate risk is considered as the composition of potential Made Ground is largely unknown and could be a source of contaminants.
Ground Gases.	Gas generation, migration and build up within properties	Future end users, site workers and existing site structure.	Medium	Low Likelihood	Low	A low risk is considered given the historic/current setting of the site and immediate surrounds. It is assumed that historical Made Ground would be present on site, however, we believe its depth will be largely limited.
Water soluble sulphates.	Migration via groundwater or soil pore moisture	Proposed (staircase foundations)	Medium	Likely	Low	Low risk owing to the propensity of sulphates to migrate and react with tricalcium aluminate in cement.
Identified Mining Area	Gas generation and leaching through soils and migration via groundwater or soil pore moisture	Future end users, site workers and Existing site structure	Medium	Likely	Low	The site is located within 1000m of a possible mining area and we would recommend that this information be obtained to ascertain the potential risks this may pose to the various receptors.

Table 6: Preliminary Conceptual Site Model

The risk posed to future end users, site visitors and plant and wildlife has been estimated as MODERATE with the estimated risks to construction works, controlled waters, proposed site structures estimated as LOW.

14.0 Preliminary Conceptual Site Model - Southern Portion (Residential)

Hazard / Pollutant	Pathways	Receptor	Potential Severity	Probability of Risk	Level of Risk	Justification
Hydrocarbons, (TPH, PAH, BTEX & MTBE). Heavy metals, cyanide, phenols, PCBs, SVOCs, VOCs and asbestos.	Ingestion, dermal contact, inhalation	Future end users and site visitors	Medium	Likely	Moderate	A moderate risk is considered as the composition of potential Made Ground is largely unknown, furthermore off site sources of potential contamination have been identified in close proximity and could be a source of contaminants through direct contact e.g. in soft landscaped areas.
		Construction Workers	Medium	Likely	Low	Construction workers may come into direct contact with soils therefore the use of appropriate PPE should be adopted to mitigate against any potential risks.
	Leaching through soils and migration via groundwater or soil pore moisture	Controlled Waters	Medium	Low Likelihood	Low	The hydrogeological and hydrological setting of the site is considered to be low given the historic/current setting of the site and surrounding environs. The site is situated upon an Unproductive Aquifer. There are no surface, groundwater or potable abstraction points within 500m. Furthermore, there are no surface water features within 250m.
	Uptake	Plant and Wildlife	Mild	Low Likelihood	Moderate	A moderate risk is considered as the composition of potential Made Ground is largely unknown and could be a source of contaminants.
Ground Gases.	Gas generation, migration and build up within properties	Future end users, site workers and proposed site structures.	Medium	Low Likelihood	Low	A low risk is considered given the historic/current setting of the site and immediate surrounds. It is assumed that historical Made Ground would be present on site, however, we believe its depth will be largely limited.
Water soluble sulphates.	Migration via groundwater or soil pore moisture	Proposed Dwellings (foundations).	Medium	Likely	Low	Low risk owing to the propensity of sulphates to migrate and react with tricalcium aluminate in cement.
Identified Mining Area	Gas generation and leaching through soils and migration via groundwater or soil pore moisture	Future end users, site workers and proposed site structures	Medium	Likely	Low	The site is located within 1000m of a possible mining area and we would recommend that this information be obtained to ascertain the potential risks this may pose to the various receptors.

Table 7: Preliminary Conceptual Site Model

The risk posed to future end users, site visitors and plant and wildlife has been estimated as MODERATE with the estimated risks to construction works, controlled waters, proposed site structures estimated as LOW.

15.0 Proposed Site Investigation

Based on the information obtained for formation of this report, we would recommend that an intrusive contaminated land investigation is undertaken to determine the actual pollution linkages and to quantify the risk to the receptors as outlined with the Preliminary Conceptual Site Model. It may also be prudent to undertake geotechnical assessment at the same time as the contamination assessment, for the proposed developments to prevent additional mobilisation costs being incurred.

The intrusive investigation may reveal on-site sources of contamination that were not established by the Phase I Desk Study and Site Walkover and thus require modification of the conceptual site model.

15.1 Testing Regime

The testing regime has been devised in accordance with BS10175:2011 Guidelines for the Code of Practice for Contaminated Land and CLR Report No. 4 Sampling Strategies. The objective at this stage of the report is to attempt to delineate the extent of any possible contamination that may exist at the site by using intrusive soil sampling and testing techniques.

15.2 Sampling Strategy

A service search should be completed prior to any subsequent investigation to determine the service locations by lifting up any manhole/drain covers and the use of a Cable Avoidance Tool (CAT), therefore locations may be subject to change depending upon these results.

The SI should incorporate the drilling of 8no. window sampler boreholes in order to gain a suitable spread of the site and enable adequate analysis of the soil conditions. This will be completed to a maximum depth of 4-5 metres below ground level (mbgl) or refusal or where groundwater is encountered.

All positions should be logged and samples removed in accordance with current protocol. In addition, groundwater conditions, if encountered, shall be logged and visual/olfactory observations noted.

We would recommend that four (4no.) of the windowless sample holes are installed with gas monitoring standpipes in order to quantify potential gas risks. Given the low risks identified to and from controlled waters we would not proposed to monitor or test any groundwater underlying the site.

We would recommend that the test locations be based on the findings contained with this report and that the sample locations have been located to provide a broad coverage of the site as feasibly possible.

An indicative plan has been provided within Appendix E showing proposed and existing locations of testing positions for the proposed layout for the site.

15.3 Monitoring Regime

The installed positions should be monitored for ground gases and groundwater, monitoring will commence approximately 7-10 days after completion of the holes to enable

equilibration of the underlying soils and groundwater. Monitoring will be completed on a weekly basis on three (3no.) occasions.

Gas monitoring should be completed in accordance with CIRIA C665 *Assessing Risks Posed by Hazardous Ground Gases to Buildings*, when atmospheric pressure is either falling and/or below 1005 millibars (mb).

A portable Gas Analyser (GA2000+) should be used to monitor soil gases (Oxygen, Carbon Dioxide, Methane and Hydrogen Sulphide) within the positions. A Photo Ionisation Detector (PID- MiniRae 2000 lamp 10.6eV) meter should also be used during monitoring rounds to analyse the presence of Volatile Organic Compounds (VOCs) as a matter of course.

Once gas monitoring has been completed, a dip meter will be used to test for groundwater depth.

15.4 Laboratory Analysis

An appropriate and consistent analytical suite of contaminants should be applied to any soil samples retrieved from the site.

Based on the findings contained within this report, we would recommend that a comprehensive range of testing should be undertaken to comprise of heavy metals, speciated Total Petroleum Hydrocarbons (TPH CWG Aromatic/aliphatic split) and speciated Polycyclic Aromatic Hydrocarbons (PAH) including the more carcinogenic benzo(a)pyrene (BaP) and naphthalene, BTEX, MTBE, SVOCs, VOCs, phenols, cyanide, soil organic matter (SOM) content, pH and sulphates.

In addition, selected samples retrieved from the Made Ground, if encountered, will also be submitted for a screen to determine the presence, or otherwise, of asbestos.

Given the low risks identified to and from controlled waters we would not proposed to monitor or test any groundwater underlying the site.

A UKAS and MCERTS accredited laboratory testing organisation will carry out all analysis.

15.5 Guidance

The results from the proposed SI shall be compared against standards, such as, Soil Guideline Values (SGVs) and LQM 'CIEH' Generic Assessment Criteria for the land use classification appropriate to the end use, namely; 'residential' in the southern portion with 'commercial/industrial' to the northern portion.

Results from gas monitoring shall be used to calculate a Gas Screening Value (GSV) in accordance with CIRIA C665 *'Assessing Risks Posed by Hazardous Ground Gases to Buildings'*.

16.0 Recommendations

16.1 Consultees

We would recommend that this report be forwarded to the relevant Statutory Consultees including the Environment Agency (EA) and the relevant Local Authority Environmental Health and Planning Department to seek their comments and subsequent approval.

16.2 Site Investigation Scope

YE would recommend that a Stage 2: Site investigation be undertaken to further assess the potential risks as outlined in the preliminary CSM.

The SI should incorporate the drilling of 8no. window sampler boreholes in order to gain a suitable spread of the site and enable adequate analysis of the soil conditions. This will be completed to a maximum depth of 4-5 metres below ground level (mbgl) or refusal or where groundwater is encountered.

We would recommend that four (4no.) of the windowless sample holes are installed with gas monitoring standpipes in order to quantify potential gas risks.

Samples will be submitted for a focused suite of testing to check that the soils are suitable for the intended end use of the site. This will comprise of heavy metals, TPH (CWG Aromatic/aliphatic split), PAH, BTEX, MTBE, SVOCs, VOCs, phenols, cyanide, soil organic matter (SOM) content, pH and sulphates.

In addition, selected samples retrieved from the Made Ground, if encountered, will also be submitted for a screen to determine the presence, or otherwise, of asbestos.

Given the low risks identified to and from controlled waters we would not proposed to monitor or test any groundwater underlying the site.

The installed positions will be monitored for ground gases and groundwater, monitoring will commence approximately 7-10 days after completion of the holes to enable equilibration of the underlying soils and groundwater. Monitoring will be completed on a weekly basis on three (3no.) occasions.

Gas monitoring shall be completed in accordance with CIRIA C665 *Assessing Risks Posed by Hazardous Ground Gases to Buildings*, when atmospheric pressure is either falling and/or below 1005 millibars (mb).

A portable Gas Analyser (GA2000+) will be used to monitor soil gases (Oxygen, Carbon Dioxide, Methane and Hydrogen Sulphide) within the positions. A Photo Ionisation Detector (PID- MiniRae 2000 lamp 10.6eV) meter will also be used during monitoring rounds to analyse the presence of Volatile Organic Compounds (VOCs) as a matter of course.

Once gas monitoring has been completed, a dip meter will be used to test for groundwater depth.

16.3 Groundworks Watching Brief

During construction works visual and olfactory appraisal of the underlying soils should be made. If during construction works any material is noted to show visual and/or olfactory signs of contamination an environmental consultant should be contacted to supervise/guide further works. This material should be stockpiled separately and tested prior to its appropriate removal off site or re-use as necessary.

If any landscaping materials are to be imported on site they should be tested to check that they are suitable for the intended use. Clean, uncontaminated rock, subsoil brick rubble, crushed concrete, ceramics and topsoil only should be permitted as infill material.

16.4 Soakaways

Soakaways are for the disposal of clean uncontaminated surface water only and must not be constructed in contaminated land, or land suspected of having contamination present.

16.5 Flood Risk Assessment

This report does not replace a full hydrogeological survey and specialist studies may need to be undertaken to ascertain the risks posed from flooding.

16.6 Johnson Poole and Bloomer Mining

It is noted that the study site is located within 1000m of a Johnson Poole and Bloomer mining area and we would recommend that this information should be obtained to ascertain the potential risks this may pose to the site.

17.0 Limitations

This report has been prepared by YE with all reasonable skill, care and diligence. The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources.

The opinions given in this report have been dictated by the finite data on which are they based and are relevant only to the purpose for which the report was commissioned.

Information reviewed should not be considered exhaustive and has accepted in good faith as providing true and representative data with respect to site conditions. Should additional information become available which may influence the opinion expressed in this report, YE reserves the right to review such information and, if warranted, to alter the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed.

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted industry practices at this time and as such are not guarantee that the sites are free of hazardous conditions.

This report has been prepared solely for the use of the named client, and may not be relied upon by other parties without written consent from YE. YE disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.