DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

FOR

1200 UXBRIDGE ROAD
HAYES
UB4 8JD





JOMAS ASSOCIATES LTD

SITE INVESTIGATION & SURVEYS
LAND DEVELOPMENT SUPPORT

Tel: 0843-289-2187

www.jomasassociates.com info@jomasassociates.com

Report Title: Desk Study/Preliminary Risk Assessment Report for 1200 Uxbridge Road, Hayes, UB4 8JD

Report Status: Final v1.1

Job No: P1608J1437/AJH

Date of Issue: 17 August 2018

QUALITY CONTROL - REVISIONS

Version	*Date*	*Issued By*
Final v1.0	16 July 2018	S. Law

Prepared by: JOMAS ASSOCIATES LTD For: DIAMOND CORPORATION

Prepared by	Reviewed by	Approved by
Alex Marcelo BSc (Hons)	Peter Swettenham BSc (Hons), MSc PgCert CEnv MIEnvSc	Suneel Law BSc (Hons), MSc, FGS
Geotechnical Engineer	Principal Geotechnical Engineer	Principal Geo-environmental Engineer
.....	.....	.....

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

Jomas Associates Ltd

www.jomasassociates.com

☎ 0843 289 2187

✉ info@jomasassociates.com

CONTENTS

Page

EXECUTIVE SUMMARY IV

1 INTRODUCTION 1

1.1 Terms of Reference 1

1.2 Proposed Development 1

1.3 Objectives 1

1.4 Scope of Works 2

1.5 Supplied Documentation 2

1.6 Limitations 2

2 SITE SETTING 3

2.1 Site Information 3

2.2 Walkover Survey 3

2.3 Anecdotal Information 4

2.4 Historical Mapping Information 4

2.5 Historical Industrial Sites 6

2.6 Industrial and Statutory Consents 6

2.7 Previous Site Investigations 7

2.8 Local Authority Information 7

2.9 Planning Information 8

2.10 Unexploded Ordnance 8

3 GEOLOGICAL & ENVIRONMENTAL SETTING 9

3.2 Solid and Drift Geology 9

3.3 British Geological Survey (BGS) Borehole Data 9

3.4 Hydrogeology & Hydrology 9

3.5 Sensitive Land Uses 12
3.6 Radon 12
4 POSSIBLE GEOLOGICAL HAZARDS 13
4.1 Database Information Review 13
5 QUALITATIVE RISK ASSESSMENT 15
5.1 Legislative Framework 15
5.2 Conceptual Site Model 16
5.3 Qualitative Risk Estimation 17
5.4 Outcome of Risk Assessment 20
5.5 List of Key Contaminants 20
6 REFERENCES 22
APPENDICES
APPENDIX 1 – FIGURES
APPENDIX 2 – GROUNDSURE REPORTS
APPENDIX 3 – OS HISTORICAL MAPS
APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

EXECUTIVE SUMMARY

Diamond Corporation ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at 1200 Uxbridge Road, Hayes, UB4 8JD. The principal 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 contaminant 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 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	
Current Site Use	Commercial units on ground floor, with office space above.
Proposed Site Use	Conversion of the existing building into residential end use.
Site History	A review of earliest available historical maps (1870) indicates that the site comprised residential terraced houses along the southern border of site. No significant changes are noted until 1913/14 when the site consists of private gardens for the terraced buildings to the south of the site. Complete redevelopment of the site is noted in 1965 comprising of 1No large building in present day configuration. The site vicinity on the earliest available historical map comprised predominately of undeveloped land with minor residential developments noted. Significant building development is noted on the plan dated 1935 comprising of residential terraced buildings with private gardens. Industrial land use it noted within the vicinity from 1965 identified as a garage to the east of site, and numerous warehouses and an ignition equipment factory are noted on the 1975 plan. The site vicinity on the 1992 plan is noted as predominately terraced residential buildings within the 'Hayes End' area.
Site Setting	The British Geological Survey indicates that the site is directly underlain by superficial deposits of Boyn Hill Gravel Member underlain by solid deposits of the London Clay Formation. No artificial deposits are reported on site. The superficial deposits underlying the site are identified as a secondary (A) aquifer with the underlying solid deposits identified as unproductive. A review of the EnviroInsight Report indicates that there are no source protection zones within 500m of the site. There are no groundwater, surface water or potable water abstractions reported within 500m of the site. There are no surface water features reported within 250m of the site. There are no Environment Agency Zone 2 or 3 floodplains reported within 250m of the site.
Potential Sources	• Potential for Made Ground associated with previous development operations – on site (S1) • Potential hydrocarbon impacted ground from previous industrial use – garage and depot off site (S2)

Desk Study	
	• Potential asbestos impacted soils from demolition of previous buildings – on site (S3)
Potential Receptors	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled waters - secondary A aquifer (R6)
Preliminary Risk Assessment	The risk estimation matrix indicates a moderate risk. It is recommended that an intrusive investigation is undertaken. This investigation will clarify potential risks to the identified receptors and assess the extent of made ground soils present at the site. A preliminary investigation may comprise a series of window sampler holes or cable percussive boreholes. Due to the potential for off-site sources of contamination, groundwater and ground gas monitoring wells should be installed, with ground gas monitoring undertaken in accordance with CIRIA C665. It is considered unlikely that the site could be designated as Contaminated Land under the Environmental Protection Act 1990 Part IIA. Consideration could be given to installation of pre-emptive vapour and gas protection measures without further assessment, subject to approval of the scope of such measures with the planning authority.
Potential Geological Hazards	The Groundsure data identifies low to negligible risks – for full details see Section 4 In addition, the GeoInsight reports 3No historical surface ground working features within 250m of the site. The nearest entry is located 54m north identified as a water body dated 1865. No historical underground or BGS current working features are reported within 1km of the site.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Diamond Corporation ("The Client") has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site located at 1200 Uxbridge Road, Hayes, UB4 8JD, prior to redevelopment of the site.

1.1.2 To this end a desk-based assessment has been undertaken in accordance with Jomas Associates Limited's email proposal dated 28 June 2018.

1.2 Proposed Development

1.2.1 The proposed development is to comprise the conversion from commercial office space to a three-storey residential end use. As part of this redevelopment, no extensive areas of soft landscaping and/or private gardens are anticipated.

1.2.2 A plan of the proposed development is included in Appendix 1.

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as 'Residential without plant uptake'.

1.2.4 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1. GC 2 projects are defined as involving:

- Conventional structures.
- Quantitative investigation and analysis.
- Normal risk.
- No difficult soil and site conditions.
- No difficult loading conditions.
- Routine design and construction methods.

1.2.5 This will be reviewed at each stage of the project

1.3 Objectives

1.3.1 The objectives of Jomas Associates Limited'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;

- To identify and assess geotechnical issues that may affect the site.

1.4 Scope of Works

1.4.1 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 third party environmental database reports (attached in Appendix 2 and 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.

1.5 Supplied Documentation

1.5.1 Jomas Associates were not supplied with any previously produced reports at the time of writing this report.

1.6 Limitations

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Diamond Corporation 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 Jomas Associates Limited. 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.

1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas Associates Limited has actual knowledge to the contrary, information obtained from public sources or provided to Jomas Associates Limited by site personnel and other information sources, have been assumed to be correct. Jomas Associates Limited 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.

1.6.3 Whilst effort has been made to ensure the accuracy of the data supplied, and 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.

1.6.4 Any reports provided to Jomas Associates Limited have been reviewed in good faith. Jomas Associates Limited cannot be held liable for any errors or omissions in these reports, or for any incorrect interpretation contained within them.

1.6.5 This investigation and report has been carried out in accordance with the relevant standards and guidance in place at the time of the works. Future changes to these may require a re-assessment of the recommendations made within this report.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.

2 SITE SETTING

2.1 Site Information

2.1.1 The site location plan is appended to this report in Appendix 1.

Table 2.1: Site Information

Name of Site	Uxbridge Road
Address of Site	1200 Uxbridge Road Hayes UB4 8JD
Approx. National Grid Ref.	508805 181886
Site Area (Approx)	0.12ha
Site Occupation	Commercial offices
Local Authority	London Borough of Hillingdon

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 11 July 2018.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	The site consists of a three-storey building with car parking area occupied by a law firm (E.D.C. Lord & Co.). The whole building is utilised as office space. The internal areas of the main building are furnished with carpet and office equipment/supplies. There is also a single storey warehouse to the north of the main building currently being utilised as storage space. The roof material within the warehouse contains asbestos in the form of chrysotile, as informed by personnel on site.
	Evidence of historic uses:	There was no evidence of historic uses of the site.
	Surfaces:	The hard cover on site comprises the outdoor car parking area and the footprint of the main building and warehouse. The hard cover is a mixture of asphalt and concrete.
	Vegetation:	Much of the vegetation around site is either small shrubs/bushes or trees. None of the vegetation seen appeared to be exhibiting and evidence of distress.
	Topography/Slope Stability:	Overall the site is flat with no major slopes observed.
	Drainage:	The site appears to be connected to normal drainage facilities. Drain covers are situated around the site.

Area	Item	Details
	Services:	The site is connected to normal water and electrical services. The site is assumed to be connected to other communication services as well.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks were noted on site.
Neighbouring land:	**North:**	Commercial buildings.
	East:	2No Motor repair garages.
	South:	Commercial high street.
	West:	Commercial high street.

2.2.2 Key features noted during the walkover are shown on a site walkover plan, together with site photos, in Appendix 1.

2.3 Anecdotal Information

2.3.1 During Jomas' site visit, anecdotal evidence was provided that asbestos containing materials were present within the warehouse to the rear of the site.

2.4 Historical Mapping Information

2.4.1 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.

2.4.2 A summary produced from the review of the historical map is given in Table 2.3 below. Distances are taken from the site boundary.

Table 2.3: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	**Off Site**
1866/68 – 1:2,500 1:10,560	Site consists of residential terraced houses along the southern border with a woodland and garden area towards the north.	Site vicinity consists of residential/commercial terraced buildings within 250m and large areas of undeveloped and/or agricultural land. Within 750m the surrounding area predominately consists of undeveloped and/or agricultural land.
1881 – 1:10,560	No significant changes.	No significant changes.
1895/97 – 1:2,500 1:10,560	No significant changes.	Minor residential development noted within 250m. No other significant changes.

Dates and Scale of Map	Relevant Historical Information	
	On Site	**Off Site**
1913/14 – 1:10,560 1:1,250	Buildings along the southern border of site have been demolished. This area now consists of private gardens for the terraced buildings off site towards the south.	Continued minor residential developed noted within 250m. No other significant changes.
1935 – 1:2,500	No significant changes.	Significant building development noted within 250m predominately consisting of residential terraced buildings with private gardens. A **nursery** is located within the site vicinity 120m towards the east.
1940 – 1:2,500	The private gardens along the southern border of site are no longer present.	The row of houses along the southern border of site have been removed with the private gardens. Continued residential development noted within 250m consisting of semi-detached buildings with private gardens.
1965 – 1:1,250	Site consists of 1No large building. This construction is in its present-day configuration with a yard area towards the north west corner.	A small **garage** is located 20m towards the east, there are also other large unidentified buildings within 100m. The site vicinity also shows continued building development within 250m.
1975 – 1:1,250	No significant changes.	The building directly north of site is identified as a **depot**. The 3No large buildings identified within 100m are **warehouses**, 1No other building within 100m is identified as an **ignition equipment factory**. The site vicinity shows continued building development within 250m with expansion of the bursary towards the east.
1992 – 1:1,250	No significant changes.	Expansion of the **garage** noted directly east of site. No other significant changes within 250m. The site vicinity within 750m predominately consists of terraced residential buildings within the Hayes End area. The area of Hayes is identified 750m towards the south east of site.
2002/10/14 – 1:10,000	No significant changes.	No significant changes.

Potentially polluting/contaminating uses/activities shown in **bold**

2.4.3 An aerial photograph supplied as part of the GroundSure EnviroInsight report and taken in 2015 generally shows that the site consists of 1No large building with a yard / car parking area towards the north west corner. This information coincides with the plan dated 1965 and the 2018 Jomas walkover.

2.5 Historical Industrial Sites

2.5.1 Groundsure have provided some information on historical industrial sites on and in the vicinity of the site. Table 2.4 below summarises the information provided, which is presented in further detail in the Enviroinsight in Appendix 2. Where the identified features have appeared on more than one map they have been counted multiple times and therefore the reported numbers are higher than the actual count.

Table 2.4: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Potentially Contaminative Uses identified from 1:10,000 scale mapping	None	27No reported; nearest entry, police station located 17m SE. Other entries include nursery located 53m east.	X
Historical Tank Database	None	8No reported; all entries identified as unspecified tanks, nearest located 96m NE.	X
Historical Energy Features Database	None	19No reported; all entries identified as electricity substations, nearest located 73m south.	X
Historical Petrol & Fuel Site Database	None	None	X
Historical Garage & Motor Vehicle Repair Database	3No reports of a garage; dated 1972, 1964 and 1965. 1No report of depot and destructor works dated 1992.	6No reported; nearest entry, garage located 7m SE. Other entries include garage located 189m NW.	✓
Potentially infilled land	None	20No reported; nearest entry, water body located 54m north. Other entries include ponds located 141m NE.	X
Tunnels	None	None reported within 250m of site.	X

2.5.2 It should be noted that Jomas' review of historical OS maps identified a depot and garage directly north and east respectively. Although the EnviroInsight reports these features on site (Table 2.4), it is considered likely that this is due to the buffer used by EnviroInsight report and these features were not a historic land use for the site.

2.6 Industrial and Statutory Consents

2.6.1 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 2.5: Industrial and Statutory Consents

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Discharge Consents.	None	None	X
Water Industry Act Referrals	None	None	X
Red List Discharges	None	None	X
List 1 and List 2 Dangerous Substances	None	None	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites.	None	None	X
Planning Hazardous Substance Consents	None	None	X
Category 3 or 4 Radioactive substances Authorisations	None	None	X
Pollution Incidents (List 2).	None	2No reported; nearest entry, sewage materials pollutant located 379m NW. Water and land impact category 3 (minor), air impact category 4 (no impact).	X
Pollution Incidents (List 1)	None	None	X
Contaminated Land Register Entries and Notices.	None	None	X
Registered Landfill Sites.	None	7No reported; all entries identified as historical, nearest located 1017m SW.	X
Waste Treatment and/or Transfer Sites.	None	None	X
Fuel Station Entries	None	Garage adjacent to site.	✓
Current Industrial Site Data.	None	24No reported; nearest entry, vehicle hire and rental located 5m SE. Other entries include lifting and handling equipment located 18m NE and vehicle parts and accessories located 23m SE.	✓

***** *From a land contamination perspective*

2.7 Previous Site Investigations

2.7.1 Jomas Associates are not aware of any previous site investigation undertaken at this site.

2.8 Local Authority Information

2.8.1 Jomas have made a request to London Borough of Hillingdon for information relating to contamination on the site and surrounding areas.

2.8.2 A response is pending.

2.9 Planning Information

2.9.1 A review of the local authority's planning portal was undertaken on 11 July 2018 at 'https://planning.hillingdon.gov.uk/OcellaWeb/planningSearch'.

2.9.2 An application was identified at the adjacent site at 1190 Uxbridge Road for the change of use from a former petrol station to a hand car wash and valeting business. The status for this application is presently 'undecided'.

2.9.3 As part of an appeal associated with the above application a contamination investigation was produced by Risk Management Limited and issued in August 2017. This investigation was situated within the forecourt area and consisted of 3No percussion boreholes to a maximum depth of 4.00m bgl. A total of 6No return gas and groundwater monitoring visits were also undertaken as park of this investigation.

2.9.4 The underlying ground conditions comprised Made Ground (including concrete hardstanding) to a maximum depth of 1.70m bgl, underlain by Boyn Hill Gravel deposits to 4.00m bgl. Groundwater strikes noted during return groundwater monitoring were reported at 2.92m and 3.05m bgl.

2.9.5 Soil sample analysis identified elevated levels of Chrysene within 2No samples of Made Ground and Benzo(b)fluoranthene within 1No sample when screened against the proposed commercial end-use.

2.9.6 Although not discussed within the body of the ground investigation report; soil gas monitoring records over the 6No week period showed oxygen concentrations between 20.0 and 21.0%, carbon dioxide and methane concentrations were recorded as 0.00%. The highest level of volatile organic compounds (VOC) was noted within BH3 with a maximum reading of 53.3ppm.

2.9.7 In addition, a petrol tank decommission certificate was submitted. This predates the above report and was undertaken in December 2014. This detailed that a total of 3No tanks were decommissioned by foam filling.

2.10 Unexploded Ordnance

2.10.1 Publicly available information has been assessed regarding the risk of Unexploded Ordnance affecting the site.

2.10.2 The initial data indicates that there is a low risk.

2.10.3 Low-risk regions are those that show a bomb density of up to 10 bombs per 1000 acres and that may contain potential WWII targets.

2.10.4 This does not comprise a full UXO risk assessment.

3 GEOLOGICAL & ENVIRONMENTAL SETTING

3.1.1 The following section summarises the principal environmental resources (geological, hydrogeological and hydrological) of the site and its surroundings.

3.1.2 The data discussed herein is generally based on the information given within the EnviroInsight Report 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 directly underlain by superficial deposits of Boyn Hill Gravel Member underlain by solid deposits of the London Clay Formation. No artificial deposits are reported on site.

3.2.2 The BGS describes the Boyn Hill Gravel Member as consisting of

> *"Sand and gravel, with possible lenses of silt, clay or peat."*

3.2.3 The BGS describes the London Clay Formation as consisting of

> *"bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels."*

3.2.4 No artificial deposits are reported within 250m of the site boundary.

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were reviewed from the surrounding area.

3.3.2 No BGS historical records were identified within 500m providing information on underlying ground conditions.

3.3.3 Historical borehole records were obtained as part of the Planning Review and these logs are discussed in Section 2.83 to Section 2.8.6.

3.4 Hydrogeology & Hydrology

3.4.1 General information about the hydrogeology of the site was obtained from the EnviroInsight and / or the DEFRA "MAGIC" website.

Groundwater Vulnerability

3.4.2 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.

3.4.3 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.

Source Protection Zones (SPZ)

3.4.4 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.

Hydrology

3.4.5 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.

3.4.6 The Environment Agency defines a floodplain as the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.

3.4.7 There are two different kinds of area shown on the Flood Map for Planning. They can be described as follows:

Areas that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year;
- or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

(For planning and development purposes, this is the same as Flood Zone 3, in England only.)

- The additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

(For planning and development purposes, this is the same as Flood Zone 2, in England only.)

3.4.8 These two areas show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

3.4.9 Outside of these areas flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. (For planning and development purposes, this is the same as Flood Zone 1, in England only.)

3.4.10 Some areas benefit from flood defences and these are detailed on Environment Agency mapping.

3.4.11 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

Table 3.1: Summary of Hydrogeology & Hydrology

Feature		On Site	Off Site	Potential Receptor?
Aquifer	**Superficial:**	Secondary (A)	Secondary (A) within 200m.	✓
	Solid:	Unproductive	Unproductive within 500m.	**X**
Source Protection Zone		None	None reported within 500m of site.	**X**
Abstractions	**Ground water**	None	21No reported; nearest historical entry located 71m east, nearest active entry located 1047m west.	**X**
	Surface water	None	None reported within 2km of site.	**X**
	Potable	None	5No reported; nearest historical entry located 1853m west.	**X**

Feature		On Site	Off Site	Potential Receptor?
Surface Waters		None	None reported within 250m of site.	**X**
Flood Risk	**EA Flood Zone 2**	None	None reported within 250m of site.	-
	EA Flood Zone 3	None	None reported within 250m of site.	-
	RoFRaS	Very low	-	-
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site.		-
	BGS	BGS has a "Moderate" confidence that there is the potential for surface superficial deposits flooding		-

3.5 Sensitive Land Uses

3.5.1 1No Nitrate Vulnerable Zone is located within 1km of the site, located 596m west.

3.5.2 1No Records of Green Belt land are reported within 1km of the site, located 63m east identified as London Area Greenbelt.

3.5.3 No other sensitive land use was identified within 1km of the site.

3.6 Radon

3.6.1 As reported, the site is not within a Radon affected area, as less than 1% of properties are above the action level.

3.6.2 Consequently, no radon protective measure are necessary in the construction of new dwelling or extensions as described in publication BR211 (BRE, 2007).

4 POSSIBLE GEOLOGICAL HAZARDS

4.1 Database Information Review

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

Table 4.1: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE).	No
Landslides	Very low	Slope instability problems are unlikely to be present.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions.	No
Compressible deposits	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits.	No
Collapsible Rock	Very low	Deposits with the potential to collapse when loaded and saturated are unlikely to be present	No
Running sand	Very low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand.	No
Coal mining	No	No coal mining areas are located within 1km of the site.	No
Shallow mine workings	Negligible	No shallow mine workings are located within 1km of the site.	No
Brine affected areas	No	No brine affected areas are located within 1km of the site.	No

4.1.2 In addition, the GeoInsight report notes the following:

- 3No historical surface ground working features are reported within 250m of the site. Nearest entry reported 54m north, identified as water body dated 1865. Other entries include ponds located 141m north east dated 1865.
- No historical underground working features are reported within 1km of the site.
- No BGS Current Ground Working Features are reported within 1km of the site.

4.1.3 With regards to the proposed development, if an increase of load is anticipated a foundation inspection is recommended to inform foundation design. Similarly, a geotechnical investigation is also recommended to inform any new foundation design.

5 QUALITATIVE RISK ASSESSMENT

5.1 Legislative Framework

5.1.1 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.

5.1.2 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) significant pollution of controlled waters is being caused, or there is significant possibility of such pollution being caused."

5.1.3 The Statutory Guidance provided in the DEFRA Circular 04/2012 lists the following categories of significant harm to **human health**:

- death; life threatening diseases (e.g. cancers); other diseases likely to have serious impacts on health; serious injury; birth defects; and impairment of reproductive functions.

5.1.4 Other health effects may also be considered by the local authority to constitute significant harm with a wide range of conditions that may or may not constitute significant harm (alone or in combination) including: physical injury; gastrointestinal disturbances; respiratory tract effects; cardio-vascular effects; central nervous system effects; skin ailments; effects on organs such as the liver or kidneys; or a wide range of other health impacts.

5.1.5 In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health there are four categories to be considered. Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.

5.1.6 For non-human receptors the following types of harm should be considered to be significant harm:

Ecological System Effects

- Harm which results in an irreversible adverse change, or in some other substantial adverse change, in the functioning of the ecological system within any substantial part of that location; or
- Harm which significantly affects any species of special interest within that location and which endangers the long-term maintenance of the population of that species at that location.
- In the case of European sites, harm should also be considered to be significant harm if it endangers the favourable conservation status of natural habitats at such locations or species typically found there. In deciding what constitutes such harm, the local authority should have regard to the advice of Natural England and to the requirements of the Conservation of Habitats and Species Regulations 2010.

Property Effects

- Crops: A substantial diminution in yield or other substantial loss in their value resulting from death, disease or other physical damage. For domestic pets, death, serious disease or serious physical damage. For other property in this category, a substantial loss in its value resulting from death, disease or other serious physical damage.
- Buildings: Structural failure, substantial damage or substantial interference with any right of occupation. The local authority should regard substantial damage or substantial interference as occurring when any part of the building ceases to be capable of being used for the purpose for which it is or was intended. In the case of a scheduled Ancient Monument, substantial damage should also be regarded as occurring when the damage significantly impairs the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument was scheduled.

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

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

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

5.1.9 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.

5.1.10 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.

5.1.11 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.

5.2 Conceptual Site Model

5.2.1 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.

5.2.2 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).

5.2.3 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.

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

Table 5.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
• Potential for Made Ground associated with previous development operations – on site (S1) • Potential hydrocarbon impacted ground from previous industrial use – garage and depot off site (S2) • Potential asbestos impacted soils from demolition of previous buildings – on site (S3)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • 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) • Horizontal and vertical migration of contaminants within groundwater (P4) • Accumulation and Migration of Soil Gases (P5) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled waters - secondary A aquifer (R6)

5.3 Qualitative Risk Estimation

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

5.3.2 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

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

- Severe
- Medium
- Mild
- Minor

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

- High Likelihood
- Likely
- Low Likelihood
- Unlikely

5.3.5 This relationship can be represented graphically as a matrix (Table 5.2).

Table 5.2: Overall Contamination Risk Matrix

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Low Risk
	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

5.3.6 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.

5.3.7 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.

5.3.8 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
- Watching Brief there is no evidence of potential contamination but the possibility of it exists and so the site should be monitored for local and olfactory evidence of contamination.
- No action required (NA)

5.3.9 The preliminary risk assessment for the site is presented in Table 5.3 below.

Table 5.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
• Potential for Made Ground associated with previous development operations – on site (S1) • Potential hydrocarbon impacted ground from previous industrial use – garage and depot off site (S2) • Potential asbestos impacted soils from demolition of previous buildings – on site (S3)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust and vapours (P2) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low	Moderate	GI – Ground Investigation
			Severe for Asbestos	Low for Asbestos	Moderate for Asbestos	
	• Accumulation and migration of soil gases (P5)		Severe	Low	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) • Horizontal and vertical migration of contaminants within groundwater (P4)	• Neighbouring site users (R3) • Controlled Waters (Aquifer) (R6) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low	Low	

5.3.10 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.

5.4 Outcome of Risk Assessment

5.4.1 The risk estimation matrix indicates a moderate risk as defined above.

5.4.2 It is understood that the proposed development is to comprise the conversion from commercial office space to a three-storey residential end use. No extensive areas of soft landscaping and/or private gardens are anticipated as part of this redevelopment.

5.4.3 A review of earliest available (1870) historical maps indicates that the site comprised residential terraced houses along the southern border of site. No significant changes are noted until 1913/14 when the buildings are demolished, the site on this plan consists of private gardens for the terraced buildings to the south off site. Complete redevelopment of the site is noted in 1965 comprising of 1No large building in present day configuration.

5.4.4 The site vicinity on the earliest available historical map comprised predominately of undeveloped land with minor residential developments noted. Significant building development is noted on the plan dated 1935 comprising of residential terraced buildings with private gardens. Industrial land use it noted within the vicinity from 1965 identified as a garage to the east of site, and numerous warehouses and an ignition equipment factory are noted on the 1975 plan. The site vicinity on the 1992 plan is noted as predominately terraced residential buildings within the 'Hayes End' area.

5.4.5 It is considered unlikely that the site could be designated as Contaminated Land under the Environmental Protection Act 1990 Part IIA.

5.4.6 It is recommended that an intrusive investigation is undertaken. This investigation will clarify potential risks to the identified receptors and assess the extent of made ground soils present at the site.

5.4.7 A preliminary investigation may comprise a series of window sampler holes or cable percussive boreholes.

5.4.8 Due to the potential for off-site sources of contamination, groundwater and ground gas monitoring wells should be installed, with ground gas monitoring undertaken in accordance with CIRIA C665.

5.4.9 However, given the limited areas of soft landscaping within the proposed development, consideration could be given to installation of pre-emptive vapour and gas protection measures without further assessment, subject to approval of the scope of such measures with the planning authority.

5.5 List of Key Contaminants

5.5.1 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.

5.5.2 In the case of the site uses identified as part of the desk study research, reference to DoE industry profiles would not indicate a specific use reference, although reference has been made to the miscellaneous industries profile

5.5.3 The DoE industry profile for “Road Vehicle Fuelling Service and Repair – garages and filling stations” has been consulted due to this being present next door.

5.5.4 Based on recommendations within the guidance publications, an initial soil and water 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; volatile organic compounds.
- *Others*: pH, Asbestos

6 REFERENCES

Groundsure EnviroInsight Report Ref HMD-377-5203806 July 2018

Groundsure GeoInsight Report Ref HMD-377-5203807 July 2018

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

Environment Agency (2004) *Model procedures for the management of land contamination*. CLR11. Bristol: Environment Agency

National Planning Policy Framework. Department for Communities and Local Government, March 2012

Code of Practice for Site Investigations BS5930: 2015

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

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORTS

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – LOCAL AUTHORITY INFORMATION