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DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

BEACHES YARD,
HORTON ROAD,
WEST DRAYTON,
UB7 8HX

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EXECUTIVE SUMMARY

Harvest Land Management Group Ltd Group Limited ('The Client') commissioned Jomas Associates Limited to undertake a desk study and preliminary risk assessment at Beaches Yard, Horton Road, West Drayton, UB7 8HX. The principal objectives of the study were as follows:

- To determine the nature and 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's (EA) guidance document Land Contamination: Risk Management (LCRM) 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	Semi-permanent residential units and storage of vehicles.
Proposed Site Use	The proposed development is understood to comprise the construction of a new warehouse. We understand that the proposed structure will be up to 16.5m high and includes a half-basement. Extensive areas of soft landscaping at ground level are not anticipated. A "green wall" is proposed.
Site History	The earliest available historical map (1866) indicates that the site was undeveloped and devoid of any features. By the 1890s, the site forms part of a large gravel pit, with various associated ground workings and small railway crossing the site. The railway is no longer shown in the maps dated 1913-1914. By 1935 the gravel pit is no longer indicated, however, the ground workings are still evident on the site. A small building is also present adjacent to the western boundary at the time. Since the 1970's significant features or structures have not been identified on the site. The historical mapping indicates that the site surrounds were also used for mineral extraction in the late 1800's and early 1900's with a number of brickfields and gravel pits shown in the area. The gravel pits appear to have largely been infilled by the early 1970's. During the 1960's and 1970's numerous works, depots and warehouses were constructed immediately to the west of the site. This area continues to be occupied by light industrial units, although some of them have since been modernised.
Site Setting	The British Geological Survey indicates that the site is located in an area of infilled ground. This is believed to relate to the historical backfilling of the gravel pit that was previously present on the site. Underlying the infilled ground are superficial deposits of the Lynch Hill Gravel Member, which in turn are underlain by solid deposits of the London Clay

Desk Study	
	Formation. Due to the historical mineral extraction the Lynch Hill Gravel Member may be absent or its thickness significantly reduced beneath the site. Borehole records from approximately 200m east of site indicated topsoil overlying River Terrace Gravels to 4.4mbgl, overlying the London Clay to 41.5mbgl. Beneath, which was the Woolwich and Reading Beds to 64.4mbgl and Chalk beneath this. The superficial deposits underlying the site are identified as a Principal Aquifer with the underlying solid deposits classified as Unproductive. A review of the Enviro+GeoInsight Report indicates that there are no source protection zones within 500m of the site. There are 5No potable abstractions within 2km; the nearest of which is located circa 1.5km north of the site. There are 2No surface water features (ponds) reported within 250m of the site. Grand Union canal is located roughly 300m south of the site. There are no Environment Agency Zone 2 or 3 floodplains reported within 50m of the site. The site is located on a historical landfill known as Stockley Park. The records indicate that the landfill was licensed to accept inert, industrial, commercial, household and special wastes including liquid sludge. Historical landfills are also shown to the south and east of the site.
Potential Sources	• Potential for contaminated ground associated with previous site use – on site (S1) - Brick field (1897) - Railway sidings (1894 – 1898) - Unspecified pit (1894 – 1898) - Gravel pit (1913 – 1932) - Unspecified commercial/ industrial (1935) - Unspecified heap (1938) - Ballast pit (1938) - Unspecified ground workings (1935 – 1970) • Potential infilled ground – on site (S3) - Stockley Park landfill - Gravel pits (1894 – 1935) - Brick field (1897) - Unspecified pit (1894 – 1898) - Water body/pond (1882 – 1938) - Unspecified ground workings (1935 – 1970) - Ballast pit (1938) - Unspecified heap (1938)

Desk Study	
	Potential for contaminated ground associated with current and previous site use – off site (S2) - Unspecified dock, 6m south (1897) - Unspecified works, 7m north-west (1970 – present) - Unspecified depot, 9m west (1970 – present) - Stockley Trident Landfill, 17m south (until 1993) - Rico Logistics (distribution and haulage), 41m west - Unspecified tank, 44m south (1980)
Potential Receptors	• Construction workers (R1) • Maintenance workers (R2) • Neighbouring site users (R3) • Future commercial site users (R4) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled waters (R6) - Principal aquifer, on site - Surface water features (ponds) within 250m of site - Grand Junction Canal, ~300m south
Preliminary Risk Assessment	The risk estimation matrix indicates a moderate to high risk. Given the site history contamination including presence of ground gases is expected, which have potential to pose a risk to the human health and the environment. It is therefore recommended that a site investigation is undertaken to confirm the ground conditions including the nature and extent of the contamination present.
Potential Geological Hazards	The Groundsure data identifies negligible to moderate risks – for full details see Section 4. Existing hardstanding and foundations (if present) will need to be removed and grubbed out ahead of the development. This may require the use of hydraulic breaking. The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site. Foundations should not be formed within Made Ground, infilled ground or organic rich material (e.g. topsoil) due to the unacceptable risk of total and differential settlement. Foundations must be designed so as not to load nor undermine adjacent boundary walls and buildings. The potential presence of Made Ground derived from demolition material and waste deposits associated with this historical infilling of the gravel pits may act as sources of elevated sulphate. In addition, the BGS notes disseminated pyrite within the London Clay Formation, which may also be a source of elevated sulphate. If such levels are noted, then sulphate resistant concrete may be required. The resultant thickness of Made Ground/ Infilled Ground and the potential for clays beneath the proposed footprint may mean that a suspended floor slab would be required.

Desk Study	
Recommended Further Work	An intrusive investigation is recommended to confirm the preliminary geo-environmental risks identified and to provide geotechnical information for use in design. The investigation should assess the thickness of infilled ground, and allow samples of infilled ground and natural soils to be taken for laboratory analysis. A preliminary investigation may comprise a series of windowless sampler and cable percussive boreholes. Soil gas monitoring should be undertaken due to the presence of a historical landfill on the site. This should be undertaken in accordance with CIRIA C665.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Harvest Land Management Group Ltd Group Limited ("The Client") has commissioned Jomas Associates Limited, to assess the risk of contamination posed by the ground conditions at a site referred to as Beaches Yard, Horton Road, West Drayton, UB7 8HX, 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 proposal dated 28 April 2022.

1.2 Proposed Development

1.2.1 The proposed development is understood to comprise the construction of a new warehouse. We understand that the proposed structure will be up to 16.5m high and includes a half-basement. Extensive areas of soft landscaping at ground level are not anticipated. A "green wall" is proposed.

1.2.2 A plan of the proposed development is included in Figure 4.

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as 'Commercial'.

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 assessment 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 information (i.e., Ordnance Survey historical maps and environmental 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's Land Contamination: Risk Management.
- 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 an environmental database report and historical Ordnance Survey maps and (attached in Appendices 2 and 3 respectively);
- 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 have not been 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 Harvest Land Management Group Ltd 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.

1.6.6 *Our investigations exclude surveys to identify the presence of injurious and invasive weeds.*

1.6.7 ***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 Figure 1, Appendix 1.

Table 2.1: Site Information

Name of Site	Beaches Yard
Address of Site	Horton Road, West Drayton, UB7 8HX
Approx. National Grid Ref.	507136 180376
Site Area (Approx)	0.44ha
Site Occupation	Residential, and caravan and vehicle storage
Local Authority	London Borough of Hillingdon

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 13 May 2022.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	The site has been split into 5No separate plots, which each have gated access. The 5No sections are utilised for residential housing, and storage of cars, caravans and a carnival ride. The residential housing appears to be a combination of one-storey, semi-permanent and temporary structures.
	Evidence of historic uses:	There was no evidence of historic uses of the site.
	Surfaces:	The ground cover on site consists of exposed ground including small areas of gravel, areas of concrete and asphalt hardstanding, and minimal soft landscaping grass.
	Vegetation:	The only vegetation observed on site was a small tree in the west, and weeds across the site. Trees roughly 15m in height are located to the north and east of the site. None of the vegetation appeared to be exhibiting any evidence of distress.
	Topography/Slope Stability:	Overall, the site appears to be level.
	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 some, if not all, normal services. An electricity cable is reported to run from the road into the west of the site (anecdotal information).
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	Propane gas cylinders were identified in a number of the sections of site. It is understood that there is a below ground tank associated with storm water drainage, which is roughly 6m wide, in the south of the site (anecdotal information).
Neighbouring land:	**North:**	Car storage, Uxbridge Football Club and Stockley Country Park.
	East:	Golf course.
	South:	Horton Road, commercial building and Weston Walk.
	West:	Unnamed access road and commercial units

2.2.2 Key features noted during the walkover are shown on a Site Constraints Plan in Figure 2, together with site photos, in Figure 3.

2.3 Historical Mapping Information

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

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 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 1:2,500 **1868** 1:10,560	The site is undeveloped and devoid of any features.	2No large **ponds** are located ~10m south and 150m south-west. A **brick field** is indicated to be approximately 120m south-west of site. **Grand Junction Canal** runs roughly east to west and is located roughly 300m south of the site. Also running roughly east to west, and located approximately 400m south of site, is a **Great Western Railway line**.
1881 1:10,560	No significant changes noted.	No significant changes noted.

Dates and Scale of Map	Relevant Historical Information	
	On Site	**Off Site**
1894 – 1897 1:10,560 **1895** 1:2,500	The site is now located within **gravel pits** with associated **ground workings** extending in the immediate surrounding areas. A small **railway** is shown to cross the site from south-west to north-east.	The **gravel pits** extend to the north, east and west of site, with associated buildings roughly 50m west of site. **Liddall's Dock**, which branches off the Grand Junction Canal, extends to approximately 80m south-west of site. **Small railways** are shown to connect the dock with the **brick fields** 220m east and 250 north-east. The **ponds** and **brick field** to the south and south-west are no longer present. Approximately 350m south of site is **Hillingdon Varnish Works**.
1898 – 1900 1:10,560	No significant changes noted.	No significant changes noted.
1913 1:10,560 **1914** 1:2,500	The site appears to still be located within the **gravel pit**, but it has been reconfigured. The railway is no longer present.	The **gravel pit** surrounding the site has increased in size, extending further to the north and east. Another large **gravel pit** is shown approximately 10m south of site. The **brick fields** to the east and north-west are no longer shown. The **railways** are no longer present.
1932 1:10,560	No significant changes noted.	No significant changes noted.
1935 1:2,500 1:10,560	The **gravel pit** is no longer labelled. However, various **ground workings** are still evident on site. A small building is now shown adjacent to the western boundary of site.	Both **gravel pits** in the vicinity of site are no longer labelled. However, **ground workings** are still shown to the north, east and south of the site. A **tramway** and associated buildings are located approximately 5m west of the site. Roughly 150m south of site is a **white lead works**. Various **works including concrete works** are located between 250m and 500m south-west of the site. A large **ballast pit** and **gravel pit** are located roughly 350m north-east of site.
1938 1:10,560	No significant changes noted.	No significant changes noted.
1960 1:10,560	Some **ground workings** and roadways have been reconfigured and removed. The small building on the western site boundary is no longer present.	The majority of the **ground workings** in the site vicinity are no longer present. The **gravel pit** is no longer annotated and the **ballast pit** has been reconfigured.
1964 1:10,560 **1965** 1:1,250 **1966** 1:2,500	There are no longer roadways present in site, and a just 1No **ground working feature** (possible slope) running north from the south-east corner.	*Incomplete map data.* **Liddall's Dock** is no longer present indicating that it has been **potentially infilled**. The **tramway** also is no longer shown. A **depot** is located 40m west of site, a number of buildings labelled as a **works** 40m north-west, and another couple of **works** buildings 40m south-west of the site.

Dates and Scale of Map	Relevant Historical Information	
	On Site	**Off Site**
1970 1:10,560	No significant changes noted.	The land to the west and south-west of the site within 500m is now more densely populated by **works** and **depots**. A number of large **waterbodies** are present from 250m to 1km north and east of the site.
1974 – 1975 1:10,000 **1975** 1:1,250	The site is devoid of any features.	Further development of the **works**, **depots** and now **warehouses** in the site vicinity to the west of the site. A number of the large **waterbodies** previously identified to the north of the site are no longer present.
1978 – 1980 1:1,250	A small building is located in the north-east corner of the site, with a potential roadway running from south to north.	No significant changes noted.
1986 – 1992 1:1,250 **1987 – 1990** 1:10,000	No significant changes noted.	Some redevelopment of the **works**, **depots** and/or **warehouses** in the site vicinity, the closest being 10m west of site. The last of the largest **waterbodies** in the site vicinity to the east is no longer present (potentially infilled).
1993 1:1,250	The site is devoid of any features.	A golf course is now present from approximately 20m east of site.
2001 1:10,000 **2003** 1:1,250	No significant changes noted.	A large **waterbody** is located roughly 300m east of site.
2010 1:10,000 **2022** 1:10,000	No significant changes noted.	No significant changes noted.

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

2.3.3 Aerial photographs supplied as part of the Groundsure Enviro+GeoInsight report range from 1999 to 2021. These generally show the surrounding area in a similar configuration to the historical maps from around the same time. The site appears to have been used from vehicle storage since at least 1999, with some structures present from this date and more by at least 2013.

2.4 Past Land Use

2.4.1 Groundsure provide some information on past land use on and in the vicinity of the site. Table 2.4 below summarises the information provided, which is presented in further detail in the Enviro+Geoinsight report 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 may be higher than the actual count.

Table 2.4: Past Land Use

Type of Use	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Industrial Land Uses	13No reported; recorded as brick field (1897), unspecified commercial/industrial (1935), unspecified ground workings (1935 – 1970), railway sidings (1894 – 1898), unspecified pit (1894 – 1898), gravel pit (1913 – 1932), ballast pit (1938) and unspecified heap (1938)	151No reported; the nearest entry is recorded as gravel pit (1913 – 1932) located 5m south. Other entries include unspecified dock (1897) located 6m south, unspecified works (1970 – 1975) located 7m north-west, and unspecified depot (1970 – 1975) located 9m west	✓
Historical Tanks	None reported	16No reported; the nearest entry is recorded as unspecified tank (1980) located 44m south	✓
Historical Energy Features	None reported	20No reported; the nearest entry is recorded as electricity substation (1978 – 1980) located 94m south-west	X
Historical Petrol Stations	None reported	None reported	X
Historical Garages	None reported	2No reported; the nearest entry is recorded as repairing yard (1935) located 185m south-west	X
Historical Military Land	None reported	None reported	X

* *From a land contamination/site development perspective*

2.5 Landfill, Waste and Potentially Infilled Surface Ground Workings

2.5.1 The Groundsure Enviro+Geoinsight Report provides information on active and historical landfills and waste sites. It also provides information on historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface; these features may or may not have been subsequently infilled. The following section summarises the information collected from the available sources.

Table 2.5: Landfill, Waste and Potentially Infilled Ground Surface Workings

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Active or Recent Landfill	None reported	None reported	X
Historical Landfill	None reported by BGS 1No reported by EA/NRW; recorded as Stockley Park, licence surrender recorded as 15/03/1993. Waste type is inert, industrial, commercial, household, special and liquid sludge. This landfill extends off-site	1No reported by BGS; recorded as Stockley Road Tip located 498m north-east. Waste type is not given, and it is noted as risk to minor aquifer 2No reported by EA/NRW; the nearest is recorded as Stockley Trident, located 17m south, licence surrender date recorded as 15/03/1993. Waste type is inert	✓

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Waste Sites	None reported	4No reported; the nearest entry is recorded as scrap metal works (1978) located 419m south-east	X
Licensed Waste Sites	None reported	None reported	X
Waste Exemptions	None reported	18No reported; the nearest entry is recorded as storage of waste in a secure place, located 43m south	X
Potentially Infilled Surface Ground Workings	17No reported; recorded as brick field (1897) unspecified pit (1894 – 1898), gravel pit (1913 – 1932), water body/pond (1882 – 1938), unspecified ground workings (1935 – 1970), ballast pit (1938) and unspecified heap (1938)	61No reported; the nearest entry is recorded as gravel pit (1913) located 5m south. Other entries include unspecified dock (1897) located 6m south, unspecified heaps (1938) 11m south, and gravel pit (1932) located 11m south	✓

* *From a land contamination/site development perspective*

2.6 Current Industrial Land Use

2.6.1 The Groundsure Enviro+Geoinsight Report also provides information on various records relating to current industrial land use on and in the vicinity of the site. The following section summarises the information collected from the available sources.

Table 2.6: Current Industrial Land Use

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Recent Industrial Land Uses	None reported	26No reported within 250m; the nearest entry is recorded as electricity substation located 32m west. Other entries include Rico Logistics (distribution and haulage) located 41m west, Tristar Worldwire Ltd (vehicle hire and rental) located 42m north, and unspecified works or factories located 54m north-west	✓
Current or Recent Petrol Stations	None reported	None reported	X
High Voltage Electricity Cables	None reported	None reported	X
High Pressure Gas Pipelines	None reported	None reported	X
Sites Determined as Contaminated Land	None reported	None reported	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites	None reported	None reported	X
Regulated Explosive Sites	None reported	None reported	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Hazardous Substance Storage/Usage	None reported	None reported	X
Historical Licensed Industrial Activities	None reported	None reported	X
Licensed Industrial Activities	None reported	None reported	X
Licensed Pollutant Release	None reported	6No reported; the nearest entry is recorded as respraying of road vehicles located 152m west	X
Radioactive Substance Authorisations	None reported	None reported	X
Licensed Discharge to Controlled Waters	None reported	2No reported; the nearest entry is recorded as sewage and trade combined – unspecified, located 352m south	X
Pollutant Release to Surface Waters (Red List)	None reported	None reported	X
Pollutant Release to Public Sewer	None reported	1No reported; recorded as being located as RR Sidwell Ltd, 176m south-west	X
List 1 and List 2 Dangerous Substances	None reported	None reported	X
Pollution Incidents	None reported	3No reported; the nearest entry is recorded as being located 286m east – pollutant not identified Water impact: Category 3 (minor) Land and air impact: Category 4 (no impact)	X
Pollution Inventory Substances	None reported	None reported	X
Pollution Inventory Waste Transfers	None reported	None reported	X
Pollution Inventory Radioactive Waste	None reported	None reported	X

***** *From a land contamination/site development perspective*

2.7 Tunnels and Railways

2.7.1 The Groundsure Enviro+Geoinsight Report provides information on railway tunnels and railways on and within the vicinity of the site, as summarised in the table below.

Table 2.7: Tunnels and Railways

Feature	On site	Off-site (within 250m of site, unless stated otherwise)	Potential to Impact Site*
Underground Railways (London)	None reported	None reported	X
Underground Railways (Non-London)	None reported	None reported	X
Railway Tunnels	None reported	None reported	X

Feature	On site	Off-site (within 250m of site, unless stated otherwise)	Potential to Impact Site*
Historical Railway and Tunnel Features	4No reported; recorded as railway sidings (1894 – 1898)	16No reported; the nearest entry is recorded as railway sidings (1913) located 5m west	✓
Royal Mail Tunnels	None reported	None reported	X
Railways, Crossrail and HS2	None reported	None reported for railways 1No reported for Crossrail 1 within 500m; recorded as surface alignment located 351m south None report for Crossrail 2 or HS2 within 500m	X

* *From a land contamination/site development perspective*

2.8 Previous Site Investigations

2.8.1 Jomas Associates are not aware of any previous site investigations undertaken at the site prior to the writing of this report.

2.9 Planning Information

2.9.1 A review of the local authority's planning portal was undertaken on 25 May 2022 at https://planning.hillingdon.gov.uk/OcellaWeb/planningSearch.

2.9.2 A planning application for Stockley Park Golf Course, which is adjacent to the east of the site, was identified; planning application number 37850/APP/2011/46. The application includes an Environmental Assessment (report ref: 29710ICVG, by Faber Maunsell/Aecom, dated February 2007), which includes a summary of previous works undertaken in the wider area. The reader is referred to the report for full details, however, a summary of the key information is provided below.

Environmental Assessment (Faber Maunsell/Aecom, February 2007)

2.9.3 The wider Stockley Park area is approximately 450 acres in size, and was opened in 1993 as a restoration of a wasteland of the former gravel pits and refuse tips. The landfill was reclaimed, and redeveloped to comprise a business park, leisure complex and golf course. The works included the removal and transfer of four million cubic metres of refuse, clay and gravel. Biodegradable refuse, that is likely to produce landfill gas, was removed from the area designated for business premises, and replaced with inert fill. This biodegradable material was re-deposited beneath the golf course area, and covered using less active fill material, and capped with clay reclaimed from the original landfill. The topsoil across the golf course was created by mixing clay with "sewage sludge cake", and met the ICRCL guidelines with respect to contaminant levels. It was stipulated by the London Borough of Hillingdon that continued monitoring would be necessary to ensure that the site did not pose significant environmental risk. The Stockley Park site contains 40 kilometres of underground drainage and landfill gas collection pipes.

2.9.4 Previous reports indicate that the natural groundwater flow direction in the area was from north to south across the Stockley Park Golf Course site. However, a cut-off drain and bund were constructed along the northern boundary of the landfill site, and groundwater collected by the drain is discharged directly to the Grand Union Canal to the south of the site. It is indicated that the groundwater flow through the sands and gravels in the area is in a south-easterly direction.

2.9.5 Shallow groundwater is present in the landfill area, but at deeper levels than the groundwater in the natural ground. The groundwater within the former landfill is likely to be leachate generated in-situ.

2.9.6 Samples of both soil and water were scheduled for testing at various times between 1993 and 2006. In addition, landfill gases were monitored across the area, including along the perimeters of the entire golf course. No significant exceedances of contaminants that generally pose a risk to human health were recorded in the shallow soil samples taken across the site between 1993 and 2006. However, all the samples taken were shallow, and are not indicative of the conditions at depth within the landfill materials beneath the site. Within groundwater samples obtained in March 2004, chloride was found to be slightly elevated, but no significant evidence of contamination was identified. The test results from surface water sampling revealed slightly elevated concentrations of ammonium, sulphate and major ions such as potassium and magnesium, but these concentrations are not considered to pose a significant risk to the surface water quality.

2.9.7 Landfill leachate is collected in 4No pumping stations across Stockley Park and pumped off-site to the public foul sewer.

2.9.8 The report indicates that the site still produces elevated concentrations of landfill gases (methane and carbon dioxide), however, the flow rates are generally low. The results generally indicate that significant off-site migration is limited, and since active gas extraction and flaring is still in place, it was considered that the potential risks associated with landfill gases are being mitigated.

Stockley Park Golf Club – December Monitoring (Aecom, January 2010)

2.9.9 Also included within planning application 37850/APP/2011/46 is a letter report addressed to Stockley Park Golf Club, containing details of a groundwater, surface water and leachate quality monitoring programme conducted by Aecom on 02 December 2009. The report indicates that monitoring has been taking place on a monthly or quarterly basis at the site since September 2008.

2.9.10 The report concludes that locally elevated contaminant levels continue to be recorded within the filled parts of the site, with the results generally being consistent with those from previous monitoring. While the report concludes that re-profiling works conducted at Stockley Park Golf Course do not appear to have had significant impact on the groundwater and surface water quality in the vicinity of the site, elevated concentrations of contaminants have been reported within groundwater, surface water and leachate samples.

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 Enviro+GeoInsight Report and published information provided by the Environment Agency and British Geological Survey (BGS).

3.2 Solid and Drift Geology

3.2.1 The BGS indicates that the site is located within an area of "infilled ground", with a strip of "worked ground" also crossing onto the southern part of the site. This is likely to relate to the historical gravel extraction that took place at the site and its immediate vicinity and subsequent infilling of the pits. Therefore, a significant thickness of Made Ground is potentially present beneath the site.

3.2.2 These deposits are underlain by superficial deposits of the Lynch Hill Gravel Member. Based on the BGS records the thickness of the Lynch Hill Gravel Member ranges from 1m to 12m with an average of 7m and consists of:

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

3.2.3 Due to the historical mineral extraction, the Lynch Hill Gravel Member may be either absent or its thickness significantly reduced beneath the site.

3.2.4 These superficial deposits overlie solid deposits of the London Clay Formation which is indicated by the BGS to consist 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"*

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were obtained and reviewed from the surrounding area. Copies of the local records obtained are presented in Appendix 5.

3.3.2 A nearby record from roughly 200m east of the site and dated April 2000 has been reviewed.

3.3.3 This showed the underlying ground conditions to comprise topsoil to a depth of 0.15m bgl (metres below ground level), overlying River Terrace Gravels to 4.4mbgl. Beneath this is the London Clay to 41.5mbgl, which is overlying Woolwich and Reading Beds [Lambeth Group] to 64.4mbgl and the Upper Chalk to the base of the borehole at 95.5mbgl. The resting water level was reported at 8.16mbgl.

3.4 Hydrogeology & Hydrology

3.4.1 General information about the hydrogeology of the site was obtained from the Enviro+GeoInsight Report 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:**	Principal	Unproductive – 21m west	✓
	Solid:	Unproductive	-	**X**
Abstractions	**Groundwater**	None reported	26No within 2km; the nearest is reported as being located 335m east, source is Thames groundwater, status is historical. The nearest active record is located 374m south-east	**X**
	Surface water	None reported	2No reported; the nearest entry is recorded as being located 774m south-east, source is Thames surface water – non tidal, status is active	**X**
	Potable	None reported	5No reported; the nearest entry is recorded as being located 1513m north, source is Thames groundwater, status is active	**X**
Source Protection Zone		-	-	**X**
Surface Water Features		None reported	2No surface water features reported within 250m Ponds 220m E & 250m NW Also Grand Union Canal 315m S No Water Network (OS MasterMap) records within 250m	✓
Flood Risk	**EA Flood Zone 2**	No	-	-
	EA Flood Zone 3	No	-	-
	RoFRaS	None	-	-
	Flood Defences	There are no areas benefiting from flood defences within 250m of the study site		-
	BGS	The risk of groundwater flooding on the site is reported as being "moderate"		-

3.5 Sensitive Land Uses

3.5.1 The site is reported to be located within the London Green Belt.

3.5.2 No other sensitive land uses were identified within 2km 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 measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2015).

4 POSSIBLE GEOLOGICAL HAZARDS

4.1 Database Information Review

4.1.1 The following are brief findings extracted from the Groundsure Enviro+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 clays	On site – Negligible	Ground conditions predominantly non-plastic	No
	21m west – Very low	Ground conditions predominantly low plasticity	
Running sands	On site – Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly	No
	21m west – Negligible	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions	
Compressible deposits	On site – Moderate	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site	Yes
	21m west – Negligible	Compressible strata are not though to occur	
Collapsible Deposits	On site – Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present	No
	21m west – Low	Deposits with potential to collapse when loaded and saturated are possibly present in places	
Landslides	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present	No
Coal mining	None	The study site is not located within the specified search distance of an identified coal mining area	No
Non-coal mining	None	The study site is not located within the specified search distance of an identified non-coal mining area	No

4.1.2 In addition, the Enviro+GeoInsight Report notes the following:

- No natural cavities are reported within 500m of the site;
- 8No BritPits within 500m of the site; the nearest is reported as Yiewsley Gravel Pit located 28m north. BritPits (British Pits) is a BGS database of currently active and closed surface and underground mineral workings;

- 78No historical surface ground working features within 250m of the site; 17No of which are reported as being located on the site (see Table 2.5 above);
- No historical underground working features within 1km of the site.

4.1.3 Existing hardstanding and foundations (if present) will need to be removed and grubbed out ahead of the development. This may require the use of hydraulic breaking.

4.1.4 The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site.

4.1.5 Foundations should not be formed within Made Ground or organic rich material (e.g. topsoil) due to the unacceptable risk of total and differential settlement.

4.1.6 The presence of Made Ground derived from demolition material and potential waste deposits from the historical infilling of the gravel pits may be sources of elevated sulphate. In addition, the BGS notes disseminated pyrite within the London Clay Formation, which may also be a source of elevated sulphate. If such levels are noted, then sulphate resistant concrete may be required.

4.1.7 The resultant thickness of Made Ground/infilled ground and the potential for clays beneath the proposed footprint means that a suspended floor slab may be required.

4.1.8 A geotechnical investigation is recommended to inform 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 in Table 5.1 overleaf.

Table 5.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
• Potential for contaminated ground associated with previous site use – on site (S1) - Brick field (1897) - Railway sidings (1894 – 1898) - Unspecified pit (1894 – 1898) - Gravel pit (1913 – 1932) - Ballast pit (1938) - Unspecified heap (1938) - Unspecified commercial/ industrial (1935) - Unspecified ground workings (1935 – 1970) • Potential infilled ground – on site (S2) - Stockley Park landfill (until 1993) - Gravel pits (1894 – 1935) - Brick field (1897) - Unspecified pit (1894 – 1898) - Water body/pond (1882 – 1938) - Unspecified ground workings (1935 – 1970) - Ballast pit (1938) - Unspecified heap (1938) • Potential for contaminated ground associated with current and previous site use – off site (S3) - Unspecified dock, 6m south (1897) - Unspecified works, 7m north-west (1970 – present) - Unspecified depot, 9m west (1970 – present) - Stockley Trident Landfill, 17m south (until 1993) - Rico Logistics (distribution and haulage), 41m west - Unspecified tank, 44m south (1980)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust, fibres 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 (R6) - Principal aquifer, on site - Surface water features within 250m of site - Grand Junction Canal, ~300m south

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 contaminated ground associated with previous site use – on site (S1) - Brick field (1897) - Railway sidings (1894 – 1898) - Unspecified pit (1894 – 1898) - Gravel pit (1913 – 1932) - Ballast pit (1938) - Unspecified heap (1938) - Unspecified commercial/ industrial (1935) - Unspecified ground workings (1935 – 1970) • Potential infilled ground – on site (S2) - Stockley Park landfill (until 1993) - Gravel pits (1894 – 1935) - Brick field (1897) - Unspecified pit (1894 – 1898) - Water body/pond (1882 – 1938) - Unspecified ground workings (1935 – 1970) - Ballast pit (1938) - Unspecified heap (1938) • Potential for contaminated ground associated with current and previous site use – off site (S3) - Unspecified dock, 6m south (1897) - Unspecified works, 7m north-west (1970 – present) - Unspecified depot, 9m west (1970 – present) - Stockley Trident Landfill, 17m south (until 1993) - Rico Logistics (distribution and haulage), 41m west - Unspecified tank, 44m south (1980)	• Ingestion and dermal contact with contaminated soil (P1) • Inhalation or contact with potentially contaminated dust, fibres 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	High	High	GI – Ground Investigation
			Medium for Asbestos	Likely	Moderate	
	• Accumulation and migration of soil gases (P5)		Severe	Likely	High	
	• 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) • Building foundations and on site buried services (water mains, electricity and sewer) (R5) • Controlled waters (R6) - Principal aquifer, on site - Surface water features within 250m of site - Grand Junction Canal, ~300m south	Medium	High	High	

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 EA's Land Contamination: Risk Management.

5.4 Outcome of Risk Assessment

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

5.4.2 The proposed development is understood to comprise the construction of a new warehouse. We understand that the proposed structure will be up to 16.5m high and includes a half-basement. Extensive areas of soft landscaping at ground level are not anticipated. A "green wall" is proposed.

5.4.3 The earliest available historical map (1866) indicates that the site was undeveloped and devoid of any features at that time. By the 1890s, the site forms part of a large gravel pit, with various associated ground workings and small railway crossing the site. The railway is no longer shown in the maps dated 1913-1914. By 1935 the gravel pit is no longer indicated, however, the ground workings are still evident on the site. A small building is also present adjacent to the western boundary at the time. Since the 1970's significant features or structures have not been identified on the site.

5.4.4 From the earliest available historical map (1866) it can be seen that the land in the site vicinity was largely undeveloped. By the late 1800s a number of gravel pits and brick fields are identified close to the site, with some industrial uses identified to the south of the site. During the 1960's and 1970's numerous works, depots and warehouses were constructed immediately to the west of the site. This area continues to be occupied by light industrial units although some of them have since been modernised.

5.4.5 According to the Enviro+GeoInsight Report the site is located on a historic landfill. The landfill, known as Stockley Park, extends beyond the site boundaries to the north and east and is believed to relate to the infilling of the former gravel pits in the area. The records available indicate that the landfill was licensed to receive inert, industrial, commercial, household, special and liquid wastes.

5.4.6 A review historical planning records indicates that the main part of the Stockley Park landfill (not including the site) was reclaimed and redeveloped into business park, leisure complex and golf course in the early 1990's. The records available suggest that significant fill material remains in the area of the golf course. The records also indicate that leachate from the site is pumped and discharged into a foul sewer. Groundwater is intercepted at the northern boundary of the former landfill and discharged directly into the Grand Union Canal in the south. Active gas extraction and flaring is also being undertaken to mitigate elevated concentrations of landfill gases. It is understood that environmental monitoring continues at the site to ensure that risk to the environment remains low. Monitoring report from 2010 indicates that elevated contaminant concentrations continue to be present in the leachate, groundwater and surface water samples obtained from the gold course part of the development.

5.4.7 It is noted another landfill, Stockley Trident, is located to the south and east of the site.

5.4.8 The site is currently used for storage of caravans and vehicles with semi-permanent residential structures also present at the site. During the site walkover, a number of propane gas cylinders were identified in various areas of the site.

5.4.9 Given the site history contamination including presence of ground gases is expected, which have potential to pose a risk to the human health and the environment. It is therefore recommended that a site investigation be undertaken to confirm the ground conditions including the nature and extent of the contamination present.

5.4.10 A preliminary investigation may comprise a series of windowless sampler and cable percussive boreholes. Soil gas monitoring should be undertaken due to the potential for the site to be underlain by infilled ground. This should be undertaken in accordance with CIRIA C665.

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 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, polycyclic aromatic hydrocarbons;
- *Others*: pH, asbestos, soil organic matter;
- *Major ions (groundwater only)*: ammoniacal nitrogen, free ammonia, calcium, magnesium, potassium, sodium, chloride, sulphate, nitrate, nitrite, iron II, iron III, manganese II, manganese IV.

6 REFERENCES

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

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APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORT

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS

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