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DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

KNELLER HALL, KNELLER ROAD, RICHMOND



JOMAS ASSOCIATES LTD

6-9 The Square, Stockley Park, Uxbridge, UB11 1FW

www.jomasassociates.com 0843-289-2187 info@jomasassociates.com

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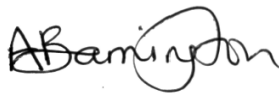
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Prepared by: JOMAS ASSOCIATES LTD For: RADNOR HOUSE SCHOOL

Prepared by
Alice Barrington BSc (Hons)
Geo-environmental Engineer



.....

Reviewed and approved by
Suneel Law BSc (Hons), MSc,
CGeol FGS
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.....	4
2.1 Site Information	4
2.2 Walkover Survey	4
2.3 Historical Mapping Information	5
2.4 Past Land Use	9
2.5 Landfill, Waste and Potentially Infilled Surface Ground Workings	9
2.6 Current Industrial Land Use	10
2.7 Tunnels and Railways	12
2.8 Previous Site Investigations.....	12
2.9 Planning Information	12
3 GEOLOGICAL & ENVIRONMENTAL SETTING	13
3.2 Solid and Drift Geology.....	13
3.3 British Geological Survey (BGS) Borehole Data	13
3.4 Hydrogeology & Hydrology	15
3.5 Sensitive Land Uses	17
3.6 Radon.....	18

4 POSSIBLE GEOLOGICAL HAZARDS..... 19

4.1 Database Information Review19

5 QUALITATIVE RISK ASSESSMENT..... 21

5.1 Legislative Framework.....21

5.2 Conceptual Site Model23

5.3 Qualitative Risk Estimation24

5.4 Outcome of Risk Assessment.....27

5.5 List of Key Contaminants28

6 REFERENCES 29

APPENDICES

APPENDIX 1 – FIGURES

APPENDIX 2 – GROUNDSURE REPORT

APPENDIX 3 – OS HISTORICAL MAPS

APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY

APPENDIX 5 – BGS BOREHOLE RECORDS

EXECUTIVE SUMMARY

Radnor House School ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at Kneller Hall, Kneller Road, Richmond.

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	Disused school.
Proposed Site Use	The proposed development is to comprise the restoration of the existing listed Kneller Hall (a listed building) along with potential removal and replacement of some ancillary structures. The development will deliver a new school and sporting facilities.
Site History	<p>A review of earliest available (1865) historical maps indicates that the site is occupied by 2No Grade II listed buildings, surrounded by 7No smaller buildings one of which is a school. There is a reservoir running along the northern boundary. There is 1No small building towards the south east of the site. The remainder of the site is covered by soft cover. By 1894 the reservoir has extended further along the northern boundary, and some small buildings towards the west are no longer present. By map dated 1934 there are 4No additional buildings towards the west. By 1960-1961 there are 13No buildings in the centre and towards the west of the site. Also on maps dated 1960-1961 and 1961 on the larger mapping scale the buildings are noted to have been reconfigured with 11No buildings present in the western area of the site. There are also 3No above ground tanks noted at this point, and the reservoir along the northern boundary has been infilled. There is an additional building alongside garage structures towards the north of the site on maps dated 1972 and 1972-1973. There is also an electricity substation noted on site at this time. By 1973-1974 there are 15No buildings across the western half of the site, as well as the small buildings towards the south east. The site does not change form this configuration to present.</p> <p>The surrounding area has been utilised predominantly for agricultural followed by residential use, with occasional industrial features. Industrial uses of note include a smithy, sewage works, gravel pits, nurseries, cement works and an electricity substation.</p>
Site Setting	<p>The British Geological Survey indicates that the site is directly underlain by superficial deposits of the Taplow Gravel Formation and Kempton Park Gravel. These superficial deposits are underlain by solid deposits of the London Clay Formation. Artificial deposits are reported on the site.</p> <p>The superficial deposits underlying the site are identified as a principal and secondary undifferentiated Aquifer with the underlying solid deposits identified as Unproductive.</p> <p>A review of the Enviro+Geoinsight Report indicates that there are no source protection zones within 500m of the site.</p> <p>There are no groundwater or potable water abstractions reported within 1km of the site.</p>

Desk Study	
	<p>There are 6No records of surface water abstraction reported within 2km of the site. The closest record refers to a historical for non-evaporative cooling located 712m north east. The nearest detailed river entry and surface water feature is reported 180m east of the site, identified as the Duke of Northumberland's river.</p> <p>There is an Environment Agency Zone 2 reported 14m east of the site.</p> <p>There are no Environment 3 floodplains reported within 50m of the site.</p>
Potential Sources	<ul style="list-style-type: none"> ● Potential for contaminated ground associated with previous site use (S1) <ul style="list-style-type: none"> ○ electricity substation on site ○ above ground tanks ● Potential infilled land (S3) <ul style="list-style-type: none"> ○ reservoir on site ○ Pond 50m off site
Potential Receptors	<ul style="list-style-type: none"> ● Construction and maintenance workers, ● neighbouring and future site users, ● buried foundations and services, ● controlled waters (Principal and Secondary Undifferentiated Aquifer).
Preliminary Risk Assessment	<p>The risk estimation matrix indicates a moderate risk.</p> <p>It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors, and assess the extent of made ground soils present at the site. It should be noted that significant limited evidence of contaminative uses at the site is sparse. Noting the size of the site, and the extensive areas of it that have not undergone development historically, it is considered that the investigation should be focussed on the identified point sources of contamination only, i.e the electricity substations, tanks and potentially infilled ground; as well as the installation of ground gas monitoring wells in the vicinity of existing and proposed structures.</p> <p>A preliminary investigation may comprise a series of exploratory boreholes or trial pits. Soil gas monitoring should be undertaken due to the potential for infilled land on site. As there is no record on the use of the site as a landfill, it is considered that the potential source generation is very low and a initial screening stage of ground gas monitoring comprising 2no visit should be undertaken.</p>
Potential Geological Hazards	<p>For any new structures that are proposed, a geotechnical investigation is recommended to inform foundation design</p>

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Radnor House School (“The Client”) has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as Kneller Hall, Kneller Road, Richmond, 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 8th December 2021.

1.2 Proposed Development

1.2.1 The proposed development is to comprise the restoration of the existing listed Kneller Hall (a listed building) along with potential removal and replacement of some ancillary structures. The development will deliver a new school and sporting facilities.

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

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as a residential without plant uptake end use scenario.

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 historical Ordnance Survey maps and an environmental database report (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 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 Radnor House School 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	-
Address of Site	Kneller Hall Kneller Road Richmond TW2 7DN
Approx. National Grid Ref.	772 174269
Site Area (Approx)	9.66ha
Site Occupation	Disused school
Local Authority	London Borough of Richmond upon Thames

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 21st January 2021.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	The site is occupied by a Grade II listed building, Kneller Hall, and two curtilage listed buildings as well as other surrounding buildings and a large sports field. There is an amphitheatre, small garages, individual room units, changing rooms and a canteen. The site is currently disused. There is also a biodiversity corridor running along the northern boundary of the site. Waste appears to be well handled around the site.
	Evidence of historic uses:	We have been advised that the Military School of Music occupied the site as residential teaching accommodation until 2021.
	Surfaces:	There are hardstanding car parks, access routes and paths across the site. There is concrete paving in the north of the site surrounding the garages. There are grassy soft cover landscaped areas predominantly towards the east and the north. There are small areas of soft cover in the centre of the site. Inside the buildings are wooden, concrete and tiled hardstanding cover.

Area	Item	Details
	Vegetation:	Large trees, up to 25m tall, along the site boundaries and through the centre of the site. There are areas of thick vegetation and grass in the middle of the site. None of the vegetation seen appeared to be exhibiting any evidence of distress.
	Topography/Slope Stability:	Overall, the site is flat and level. There is stepped access to some areas of the site.
	Drainage:	The site appears to be connected to normal drainage facilities. Drain covers are situated around the site. No ponding or marshy ground.
	Services:	Services are connected and working. Possible electricity substations were noted.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks were noted on site.
Neighbouring land:	North:	Whitton tennis alongside residential properties.
	East:	Whitton vale stadium village followed by Chase Bridge Primary School and Twickenham Stadium.
	South:	Residential properties.
	West:	Duke of Cambridge Public House alongside residential properties.

2.2.2 Key features noted during the walkover are shown on a site walkover 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 a number of Ordnance Survey historic maps, procured from GroundSure, and provided in Appendix 3 of this report.

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 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
1865 1:10,560 1865 1:2,500 1865 1:2,500	<p>There is a reservoir in the north eastern corner of the site running along the northern boundary.</p> <p>Kneller Hall is present towards the south west of the site.</p> <p>There is also a school in the south western corner of the site.</p> <p>There are 7No small buildings along the south western boundary.</p> <p>The remaining western areas of the site is covered by vegetation and trees.</p> <p>The eastern half of the site is a large grassy area.</p> <p>There is a lodge along the southern boundary.</p>	<p>There are agricultural fields directly north, east, south and west of the site.</p> <p>There are clusters of buildings close by to the south western corner and western boundary.</p> <p>There is a road running along the southern and western boundaries.</p> <p>The Duke of Northumberland's River is present 180m east.</p> <p>There is a railway present 625m south running east to west.</p> <p>There are ponds present 250m north west and 675m west.</p>
1894 1:10,560 1896 1:10,560 1894-1897 1:10,560 1894-1898 1:10,560 1896 1:2,500	<p>The reservoir in the north eastern corner of the site has extended along the northern boundary.</p> <p>The small buildings towards the south west of the site are no longer present.</p>	<p>There is a smithy 150m west.</p> <p>There is a small pond 250m west.</p> <p>There is a tramway 250m south west, 450m south east and 515m east of the site.</p> <p>There is a sewage treatment works 575m south east.</p>
1912 1:10,560	<p>There is now a bandstand on site.</p>	<p>A gravel pit is 200m north.</p> <p>There is a nursery 250m east.</p> <p>There is a sports ground 300m east.</p> <p>Filter beds are 550m and 625m south east.</p> <p>There is a sewage treatment works and tanks 750m north east</p>
1912 1:10,560 1912 1:10,560 1915 1:2,500 1932-1933 1:10,560	<p>The site remains unchanged.</p>	<p>There are small gravel pits 350m north west and 480m south west.</p> <p>There is a nursery 500m north west.</p>
1934 1:2,500	<p>There are 4No additional buildings towards the west of the site.</p> <p>Note only western half of the site covered by mapping.</p>	<p>There are residential properties directly north and west.</p> <p>The smithy 150m west is no longer present.</p> <p>Pond 250m west is no longer present.</p>
1935 1:2,500	<p>Note only eastern half of the site covered by mapping.</p> <p>The site remains unchanged.</p>	<p>Note only eastern areas are shown.</p> <p>There are tennis courts directly north of the site.</p> <p>There is a cement works 230m north east.</p>

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1935-1938 1:10,560	The site remains unchanged.	Gravel pit 200m north is no longer present. There is a nursery 350m north west. The sewage works 575m south east are now 500m south east. Sand and ballast works 675m east.
1938 1:10,560 1938 1:10,560 1934-1938 1:10,560	The site remains unchanged.	Nursery 350m north no longer present. Gravel pits are no longer present.
1948 1:10,560	Site not covered by mapping.	No significant change.
1960-1961 1:10,560	13No buildings in the centre/western areas of the site.	No significant change.
1960-1961 1:1,250 1961 1:1,250 1961-1966 1:1,250 1962 1:2,500 1962 1:2,500 1966 1:10,560	Buildings on site have been reconfigured. There are 11No buildings present towards the west of the site. There are 3No tanks present on site. 2No are towards the south west, and 1No are towards the centre of the site The reservoir running along the northern boundary has been potentially infilled.	There are residential properties along the eastern boundary. There is a pond 50m east of the site. There is a school 75m east. There is a works 120m north east. There is a college 450m south east. There is a large works 480m north east extending north eastwards. The sand and ballast works to the east are no longer present. There is a works 625m east. There is a depot 625m south . There is a nursery 700m north east. The sewage works to the south are no longer present.
1972 1:1,250 1972-1973 1:1,250	There are 1No additional building alongside garage structures towards the northern boundary. There is an electrical substation along the south western boundary.	There is an electricity substation located 10m north. The pond 50m east is no longer present. The works 120m east is no longer present.

Dates and Scale of Map	Relevant Historical Information			
	On Site	Off Site		
1973-1974 1:10,000	There are now 15No buildings across the western half of the site.	The works 230m north east are no longer present. School to the east has increased in size. There are industrial buildings 600m east. Works 625m east are no longer present.		
1973-1978 1:1,250				
1979 1:1,250				
1979-1981 1:1,250				
1982 1:1,250				
1980-1982 1:1,250				
1980-1983 1:1,250				
1985 1:1,250				
1983-1987 1:10,000				
1985-1988 1:1,250				
1988-1991 1:1,250				
1991 1:1,250				
1991-1993 1:1,250				
1991-1994 1:10,000			Site not covered by mapping.	No significant changes.
1992-1994 1:1,250				
1993-1994 1:1,250				
1994 1:1,250				
1994 1:1,250 1994 1:1,250				
2001 1:10,000 2003 1:1,250 2010 1:10,000	The site remains unchanged.	No significant changes.		
2022 1:10,000	The site remains unchanged.		Works 480m north east are no longer present.	

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 2019. These generally show buildings covering the majority of the western section of the site with a grassy sports field over the eastern section. The site is surrounded by residential properties to the north, south and west. To the east are residential properties and a school. There are no noticeable differences between these photographs and the OS maps provided.

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 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	9No records. Unspecified pit – 1865, 1894, 1898, 1912, 1933, 1935, 1938. Unspecified Ground Workings – 1912, 1938	64No records. Closest record is unspecified pit 52m east – 1894.	✓
Historical Tanks	3No records. Unspecified tanks – 1960 Tanks – 1960-1972	6No records. Closest record is unspecified tank - 117m east – 1988-1996.	✓
Historical Energy Features	1No record. Electricity substation - 1972	18No records. Closest record is electricity Substation 5m north - 1972	✓
Historical Petrol Stations	None reported	None reported	X
Historical Garages	None reported	3No records. Closest record is a garage 94m west.	✓
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	None reported	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Waste Sites	None reported	None reported	X
Licensed Waste Sites	None reported	1No record. Record is a metal recycling site (vehicle dismantler) 51m west.	✓
Waste Exemptions	10No records. Using waste exemption – spreading waste in non-agricultural land to confer benefit, use of mulch Treating waste exemption - Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising, Aerobic composting and associated prior treatment	3No records. Treating waste exemption - Sorting and de-naturing of controlled drugs for disposal Using waste exemption – Use of waste in construction	✓
Potentially Infilled Surface Ground Workings	23No records. Ponds – 1896, 1898, 1986, 1912, 1938, 1959 Water body – 1894, 1912, 1933, 1938 Unspecified pit – 1865, 1894, 1898, 1912, 1933, 1938 Unspecified ground workings – 1912, 1938 Unspecified Heap – 1898, 1935	17No records. Closes record refers to unspecified pit 52m east - 1894.	✓

* 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	3No records. Royal military school of music, electricity substation, tanks	15No. records, including electricity substations, recycling services, recycling centre, motoring, engineering services, electronic equipment, published goods, tanks, construction services, vehicle hire and rental.	✓
Current or Recent Petrol Stations	None reported	1No record.	✓

**SECTION 2
SITE SETTING**

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
		Record refers to an obsolete petrol station 145m south west.	
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	1No record. Record refers to a COMAH lower tier operator 349m north east.	X
Regulated Explosive Sites	None reported	None reported	X
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	1No record. Record refers to a dry cleaners 472m south west with a current part B permit.	X
Radioactive Substance Authorisations	None reported	None reported	X
Licensed Discharge to Controlled Waters	None reported	1No record. Record is for miscellaneous discharges to surface water 460m north east. License revoked in 2005.	✓ X
Pollutant Release to Surface Waters (Red List)	None reported	None reported	X
Pollutant Release to Public Sewer	None reported	None reported	X
List 1 and List 2 Dangerous Substances	None reported	None reported	X
Pollution Incidents	None reported	2No records. Closest record refers to an incident dated 2003 which had a Category 3 (minor) impacted on land and Category 4 (no impact) on water and air.	✓
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+Geosight 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
Historical Railway and Tunnel Features	None reported	11No records. Closest record refers to railway sidings 116m north east – 1935.	✓
Royal Mail Tunnels	None reported	None reported	X
Railways, Crossrail and HS2	None reported	None reported	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 21st January 2022 at <https://www.richmond.gov.uk/services/planning>.

2.9.2 There were 42No planning applications referring to the site submitted between 1991 and 2018.

2.9.3 A planning application (15/1419/FUL) was received on 7th April 2015. The application was for the erection of temporary structures and temporary use as an Operations and Logistics compound and associated parking for 110 vehicles for the purposes of supporting the Rugby World Cup 2015 Tournament from 5th August 2015 to 16th November 2015. Permission was granted on 11th August 2015. As part of this application a flood risk assessment was undertaken which concluded the site is within a Flood Zone 1 with less than 1 in 1000 annual probability of fluvial flooding.

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+Geosight Report and published information provided by the Environment Agency and British Geological Survey.

3.2 Solid and Drift Geology

3.2.1 The British Geological Survey indicates that the site is directly underlain by superficial deposits of the Taplow Gravel Formation in the south eastern area of the site, the Kempton Park Gravel Formation across the eastern half of the site and Head deposits along the northern and western boundaries of the site.

3.2.2 The Taplow Gravel Formation deposits have an average thickness of 5m and are described as:

“Sand and gravel, locally with lenses of silt, clay or peat “

3.2.3 The Kempton Park Gravel deposits have an average thickness of 6m, but can be much thicker where infilling deep hollows and are described as:

“Sand and gravel, locally with lenses of silt, clay or peat “

3.2.4 The Head deposits are described as:

“poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep “

3.2.5 These superficial deposits overlie solid deposits of the London Clay Formation. These are 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.”

3.2.6 Artificial deposits of made ground are reported the northern boundary of the site.

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. The local records obtained are presented in Appendix 5.

3.3.2 There are 13 No records of BGS boreholes located on site.

3.3.3 Borehole with BGS reference TQ17SW120 showed groundwater seepage at 4.75 and the underlying ground conditions to comprise of;

- Topsoil to 0.60m bgl

- Clayey sand to 1.75m bgl
- Firm to stiff silty clay to 4.25m bgl
- Claystone to 4.60m bgl
- Stiff becoming hard laminated clay to 8.50m bgl

3.3.4 Borehole with BGS reference TQ17SW118 showed the underlying ground conditions to comprise of;

- Topsoil to 0.50m bgl
- Very sandy clay to 1.85m bgl
- Medium dense very clayey sand to 2.10m bgl
- Medium dense sand to 3.25m bgl
- Medium dense sandy gravel to 5.50m bgl
- Stiff to very stiff laminated silty clay to 11.50m bgl

3.3.5 Borehole with BGS reference TQ17SW64 showed the underlying ground conditions to comprise of;

- Made ground to 0.50m bgl
- Sandy gravel to 3.35m bgl
- Firm silty clay to 3.60m bgl
- Firm becoming stiff silty clay to 9.00m bgl

3.3.6 Borehole with BGS reference TQ17SW119 showed groundwater seepage 3.2m bgl and the underlying ground conditions to comprise of;

- Topsoil to 0.75m bgl
- Loose slightly clayey sand to 1.40m bgl
- Medium dense sand to 2.20m bgl
- Medium dense sand to 3.75m bgl
- Medium dense slightly clayey gravel to 6.60m bgl
- Stiff becoming very stiff grey clay to 11.00m bgl.

3.3.7 All depths and measurements should be viewed as approximate, due to the age of the borehole and corresponding use of imperial measurements.

3.3.8 On the basis of the above, the site is expected to be underlain by some made ground over River Terrace Deposits to a maximum depth of 6.60m, over the London Clay Formation.

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:	Principal and Secondary Undifferentiated	Principal and Unproductive	✓
	Solid:	Unproductive	Unproductive	✓
Abstractions	Ground water	None	4No records within 2km. Closest record refers to a historical abstraction for commercial/industrial/public services located 1.15km north west.	X
	Surface water	None	6No records within 2km. Closest refers to a historical for non-evaporative cooling located 712m north east.	X
	Potable	None	1No records within 2km. Record refers to a historical abstraction for commercial/industrial/public services located 1.15km north west.	X
Source Protection Zone	-	-	-	X
Surface Water Features	None	3No records. Closest refers to the Duke Of Northumberland's river 180m east of the site.	-	X
Flood Risk	EA Flood Zone 2	None	Yes – 14m east	-
	EA Flood Zone 3	None within 50m	-	-
	RoFRaS	Low	-	-
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site.		-
	BGS	The highest risk on site of surface water flooding is 1 in 30 years, 0.3-1.00m. The risk of groundwater flooding is high.		-

3.5 Sensitive Land Uses

3.5.1 There are 2No local nature reserves (LNR) within 2km of the site. The closest record refers to Hounslow Heath 1.64km west of the site.

3.5.2 There are 2No Green Belts within 2km of the site. The closest record refers to the London greenbelt in Hounslow located 1.41km west of the site.

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 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+Geosight 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	Moderate	Ground conditions are both plastic and non-plastic. No special actions are thought to be required to avoid problems due to shrink-swell clays.	No
Running sands	Very low	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.	No
Compressible deposits	Very low	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.	No
Collapsible Deposits	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.	No
Landslides	Very low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.	No
Ground dissolution soluble rocks	Negligible	Significant soluble rocks are not present. Problems unlikely except with considerable surface or subsurface water flow. No special actions required to avoid problems due to soluble rocks.	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 GeoInsight report notes the following:
- 6No historical underground working features are reported within 1km of the site. The closest record refers to a tunnel 738m to the north east of the site between 1966-1987.
 - 1No BGS Current Ground Working Features are reported within 500m of the site. The nearest is reported 1.7km north of the site, identified as producing Sand and Gravel. The operational status is given as Ceased.
- 4.1.3 For any new structures that are proposed, 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 below:

Table 5.1: Potential Sources, Pathways and Receptors

Source(s)	Pathway(s)	Receptor(s)
<ul style="list-style-type: none"> • Potential for contaminated ground associated with previous site use (S1) <ul style="list-style-type: none"> - electricity substation on site - above ground tanks • Potential infilled land (S2) <ul style="list-style-type: none"> - reservoir on site - Pond 50m off site 	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> - principal aquifer - secondary undifferentiated aquifer - Duke of Northumberland’s River 180m off site

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.

**SECTION 5
QUALITATIVE RISK ASSESSMENT**

Table 5.3: Preliminary Risk Assessment for the Site

Sources	Pathways (P)	Receptors	Consequence of Impact	Probability of Impact	Risk Estimation	Hazard Assessment
<ul style="list-style-type: none"> Potential for contaminated ground associated with previous site use (S1) <ul style="list-style-type: none"> electricity substation on site above ground tanks Potential infilled land (S2) <ul style="list-style-type: none"> reservoir on site Pond 50m off site 	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> 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 likelihood	Moderate/Low	GI – Ground Investigation
	<ul style="list-style-type: none"> Accumulation and migration of soil gases (P5) 		Severe	Low likelihood	Moderate/Low	
	<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> Neighbouring site users (R3) Controlled Waters (Aquifer) (R6) <ul style="list-style-type: none"> Principal aquifer Secondary undifferentiated aquifer Duke of Northumberland’s River 180m off site Building foundations and on site buried services (water mains, electricity and sewer) (R5) 	Medium	Unlikely	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/low as defined above.

5.4.2 A review of earliest available (1865) historical maps indicates that the site is occupied by 2 No Grade II listed buildings, surrounded by 7 No smaller buildings one of which is a school. There is a reservoir running along the northern boundary. There is 1 No small building towards the south east of the site. The remainder of the site is covered by soft cover. By 1894 the reservoir has extended further along the northern boundary, and some small buildings towards the west are no longer present. By map dated 1934 there are 4 No additional buildings towards the west. By 1960-1961 there are 13 No buildings in the centre and towards the west of the site. Also on maps dated 1960-1961 and 1961 on the larger mapping scale the buildings are noted to have been reconfigured with 11 No buildings present in the western area of the site. There are also 3 No above ground tanks noted at this point, and the reservoir along the northern boundary has been potentially infilled. There is an additional building alongside garage structures towards the north of the site on maps dated 1972 and 1972-1973. There is also an electricity substation noted on site at this time. By 1973-1974 there are 15 No buildings across the western half of the site, as well as the small buildings towards the south east. The site does not change from this configuration to present. The site is currently a disused school.

5.4.3 The site is predominately surrounded by agricultural fields on the earliest mapping available. There are some nearby residential properties. There is also a river running nearby. There is a small amount of industrial activity nearby by 1894, including a smithy and a sewage treatment works. Close by the site are also multiple ponds. By 1912 there are gravel pits and nurseries nearby alongside a large sports ground. In mapping dated 1912 there are further gravel pits and nurseries noted. Throughout this the number of residential properties in the area is increasing. There is a cement works nearby in 1935. Gravel pits and nurseries previously noted are no longer present by 1938. By the maps from 1960-1960 and 1961 the site is surrounded by residential properties, with a pond, schools and works close by to the site. In 1971 and 1971-1973 mapping an electricity substation is noted just north of the site. The nearby work and pond are no longer present. Overall the site is currently surrounded by residential properties.

5.4.4 It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors, and assess the extent of made ground soils present at the site. It should be noted that significant limited evidence of contaminative uses at the site is sparse. Noting the size of the site, and the extensive areas of it that have not undergone development historically, it is considered that the investigation should be focussed on the identified point sources of contamination only, i.e the electricity substations, tanks and potentially infilled ground; as well as the installation of ground gas monitoring wells in the vicinity of existing and proposed structures.

5.4.5 A preliminary investigation may comprise a series of exploratory boreholes or trial pits.

5.4.6 Soil gas monitoring should be undertaken due to the potential for infilled land on site. As there is no record on the use of the site as a landfill, it is considered that the potential source generation is very low and a initial screening stage of ground gas monitoring comprising 2no visit should be undertaken.

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, polyaromatic hydrocarbons;
- *Others*: pH, Asbestos, Polychlorinated biphenyls (PCBs)

6 REFERENCES

BRE Report BR211; Radon: Guidance on protective measures for new buildings, 2015

Code of Practice for Ground Investigations BS5930: 2015

CL:AIRE; Petroleum Hydrocarbons in Groundwater, 2017

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Groundsure Enviro+Geoinsight Report Ref JOMAS-8446056 January 2022

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Department of Environment Industry Profiles (1996) - Miscellaneous Land ISBN 1 85112 313 X

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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JOMAS ASSOCIATES LTD

6-9 The Square
Stockley Park
Uxbridge
UB11 1FW

CONTACT US

Website: www.jomasassociates.com
Tel: 0843-289-2187
Fax: 0872-115-4505
Email: info@jomasassociates.com