

# DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

FOR

LAND ADJACENT TO  
EGLEY ROAD  
WOKING  
GU22 0NJ



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## EXECUTIVE SUMMARY

Woking Football Club ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at Land Adjacent to Egley Road, Woking, GU22 0NJ. The principal objectives of the study were as follows:

- To determine the nature and where possible the extent of contaminants potentially present at the site;
- To establish the presence of significant contaminant linkages, in accordance with the procedures set out within the Environment Agency (EA) report R&D CLR11 and relevant guidance within the National Planning Policy Framework (NPPF);
- To assess whether the site is safe and suitable for the purpose for which it is intended, or can be made so by remedial action.

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

Desk Study	
<b>Current Site Use</b>	Unoccupied new barn situated within a larger piece of land.
<b>Proposed Site Use</b>	Mixed use development comprising residential dwellings and leisure facility.
<b>Site History</b>	<p>A review of earliest available (1871) historical maps indicates that the site comprised undeveloped and/or agricultural land. On the plan dated 1897 the southern half of site is identified as a nursery. No other significant changes are noted from the historical plans.</p> <p>During the Jomas walkover development on site was noted as a new barn and access road within the north east corner.</p> <p>The site vicinity on the earliest available map comprised predominately agricultural land. A railway line is noted on the western boundary on the 1871 plan until modern day. The area of Mayford towards the south east shows residential buildings and a large garden centre directly east of site. During the Jomas walkover an off site development identified as a large school and an electrical substation was noted towards the north of site.</p>
<b>Site Setting</b>	<p>The British Geological Survey indicates that the site is directly underlain by solid sand deposits of the Bagshot Formation.</p> <p>The nearest report of superficial deposits is located 154m east, identified as Alluvium deposits of sand and gravel.</p> <p>The solid deposits underlying the site are identified as a secondary (A) aquifer.</p> <p>A review of the Envirolnsight Report indicates that there are no source protection zones within 500m of the site.</p> <p>There are no groundwater, surface water or potable water abstractions reported within 1km of the site.</p> <p>The nearest detailed river entry is reported 1949m east of the site, identified as an inland river.</p> <p>The nearest Environment Agency Zone 2 floodplain is located 106m east of site. The nearest Environment agency Zone 3 floodplain is located 157m east of site.</p>
<b>Potential Sources</b>	<ul style="list-style-type: none"> <li>• Potential for Made Ground associated with previous development operations – on site (S1) <ul style="list-style-type: none"> <li>- Barn development, contractors' compound and track (north east)</li> </ul> </li> </ul>

Desk Study	
	<ul style="list-style-type: none"> <li>• Potential for contamination associated with previous development operations – off site (S2)               <ul style="list-style-type: none"> <li>- Rail track (west)</li> </ul> </li> <li>• Potential for contaminated ground from historic use as a nursery – southern half of site (S3)</li> </ul>
<b>Potential Receptors</b>	<ul style="list-style-type: none"> <li>• Construction workers (R1)</li> <li>• Maintenance workers (R2)</li> <li>• Neighbouring site users (R3)</li> <li>• Future site users (R4)</li> <li>• Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> <li>• Controlled waters - secondary (A) aquifer, Hoe Stream (R6)</li> </ul>
<b>Preliminary Risk Assessment</b>	<p>The risk estimation matrix indicates a moderate to low risk.</p> <p>It is recommended that an intrusive investigation is undertaken to further assess the potential pollutant linkages identified.</p> <p>It is recommended that the investigation include installation of monitoring wells for ground gas monitoring and/or groundwater sampling.</p>
<b>Potential Geological Hazards</b>	<p>The Groundsure data identifies low to negligible risks – for full details see Section 4.</p> <p>A ground investigation is recommended for geotechnical purposes.</p>

## **1 INTRODUCTION**

### **1.1 Terms of Reference**

1.1.1 Woking Football Club (“The Client”) has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as the Land Adjacent to Egley Road, Woking, GU22 0NJ, 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 08 February 2018.

### **1.2 Proposed Development**

1.2.1 The proposed development comprises the following:

‘Redevelopment of the site, following the demolition of the existing building, to provide a health club building (Class D2) incorporating an external swimming pool and tennis/sports courts, the provision of 36 dwelling houses (Class C3) up to a maximum of 3 storeys in height, associated landscaping and car parking and new vehicular access from an existing road servicing Hoe Valley School.’

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

1.2.3 For the purposes of the contamination risk assessment, the proposed development is classified as ‘Residential with plant uptake’.

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

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

1.2.5 This will be reviewed at each stage of the project

### **1.3 Objectives**

1.3.1 The objectives of Jomas Associates Limited’s investigation were as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;
- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas, with respect to potentially contaminative land uses;

- To provide an assessment of the environmental sensitivity at the site and the surrounding area, in relation to any suspected or known contamination which may significantly affect the site and the proposed development;
- To assess the potential presence of significant pollutant linkages, in accordance with the procedures set out within Part IIA of the Environmental Protection Act 1990, associated statutory guidance and current best practice including the EA report R&D CLR 11;
- To identify and assess geotechnical issues that may affect the site.

#### **1.4 Scope of Works**

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

- A walkover survey of the site;
- A desk study, which included the review of third party environmental database reports (attached in Appendix 2 and Appendix 3);
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

#### **1.5 Supplied Documentation**

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

#### **1.6 Limitations**

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Woking Football Club 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.



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

## 2 SITE SETTING

### 2.1 Site Information

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

**Table 2.1: Site Information**

<b>Name of Site</b>	Land Adjacent to Egley Road
<b>Address of Site</b>	Egley Road Woking GU22 0NJ
<b>Approx. National Grid Ref.</b>	499416 156437
<b>Site Area (Approx)</b>	4.1ha
<b>Site Occupation</b>	Unoccupied land with single barn
<b>Local Authority</b>	Woking Borough Council

### 2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 13 August 2018.

**Table 2.2: Site Description**

Area	Item	Details
On-site:	<b>Current Uses:</b>	Site consists of predominately undeveloped land with a newly developed unoccupied barn located in close proximity to the site access point. The barn is accessed by a gravel driveway / track. No other developments were noted on site.
	<b>Evidence of historic uses:</b>	No evidence of historic uses noted.
	<b>Surfaces:</b>	Predominately soft landscaped.
	<b>Vegetation:</b>	An area of woodland is located within the south western area of site. None of the vegetation observed on site appeared to show signs of distress or dieback.
	<b>Topography/Slope Stability:</b>	The site is generally flat with a slight slope noted along the track towards the north-east corner of site.
	<b>Drainage:</b>	Drains are installed around the newly developed barn. No drainage issues or areas of marshy land was noted during the walkover.
	<b>Services:</b>	The barn is connected to the mains electrical supply. An electricity substation is located in close proximity to the northern boundary off site.
	<b>Controlled waters:</b>	None observed.
	<b>Tanks:</b>	None observed.

Area	Item	Details
Neighbouring land:	North:	Large school
	East:	Commercial – Garden Centre
	South:	Residential properties with private gardens
	West:	Railway track running along boundary

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

### 2.3 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
1871 – 1:10,560	Site consists of undeveloped and/or agricultural land.	A <b>rail track</b> is located along the north west border of site, orientated north east to south west.  The area of Mayford is located 200m south east consisting of small building developments.  The site vicinity consists predominately of undeveloped and/or agricultural land within 500m.
1897 – 1:10,560	Southern half of the site is identified as a <b>nursery</b> , the northern half remains undeveloped. No other significant changes noted.	The <b>rail track</b> is identified as the 'Portsmouth District Line'. Building development within the area of Mayford includes a large ' <b>Industrial School</b> ' located 97m south of site. A river is noted running through the area of Mayford 250m south east of site. <b>Nurseries</b> are located within the surrounding undeveloped and/or agricultural land within 500m.
1913 – 1:10,560	<b>Nursery</b> within southern half of site no longer listed.	Additional <b>nurseries</b> are located within 500m of site, no other significant changes noted.
1938 – 1:10:560	No significant changes.	Continued building development noted within the area of Mayford. No other significant changes noted within 500m.
1955 – 1:10,560	No significant changes.	No significant changes.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1970/77 – 1:2,500 1:10,000	No significant changes.	Continued building development within the area of Mayford, residential buildings are located along the southern border of site. Significant residential development noted 500m north of site within the area of Hook Heath.
1987 – 1:2,500	No significant changes.	Minor building development noted along the south eastern border of site including residential buildings and a garden centre.
1992/93 – 1:2,500 1:10,000	The southern half of site is listed as a <b>nursery</b> , potentially associated with an off-site garden centre to the south east.	No significant changes.
2002/10/14 – 1:10,000	No significant changes.	No significant changes.

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

2.3.4 An aerial photograph supplied as part of the GroundSure EnviroInsight report and taken in April 2013 generally shows that the site comprises undeveloped land with an adjacent rail track to the west, this information coincides with the historical map review.

2.3.5 During the Jomas Walkover (Table 2.2) development was noted within the eastern part of site comprising a new barn development and access track, this is not located on the aerial photograph. Furthermore, a new school development was noted north of site. This school is not noted on either the aerial photograph or historical maps. A search for the school has identified that it is due for opening September 2018, a review of readily available satellite imagery shows that the school began development in March 2017.

## 2.4 Historical Industrial Sites

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

**Table 2.4: Industrial and Statutory Consents**

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Potential Contaminative Uses identified from 1:10,000 scale mapping	2No reports of nurseries, dated 1895 and 1938.	57No reported; nearest entry, cuttings located 1m west. Other entries include nursery located 25m west, 64m north east and industrial school located 97m south.	✓
Historical Tank Database	None	2No reported; both entries reported as unspecified tanks, both located 376m south east.	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Energy Features Database	None	18No reported; all entries reported as electricity substations, nearest located 93m south east.	X
Historical Petrol & Fuel Site Database	None	None reported.	X
Historical Garage & Motor Vehicle Repair Database	None	10No reported; all entries reported as garages, nearest located 113m south east.	X
Potentially infilled land	None	12No reported; nearest entry, cuttings located 1m west. Other entries include cuttings located 226m north.	✓
Tunnels	None	None reported within 250m.	X

2.4.2 During the Jomas Walkover (Table 2.2) an electrical substation was noted within close proximity of the northern boundary. This is assumed to be associated with the new school development due for opening September 2018, and that began development in March 2017

## 2.5 Industrial and Statutory Consents

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

**Table 2.5: Industrial and Statutory Consents**

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Discharge Consents.	None	1No reported; reported as surface water discharge, located 248m south east.	X
Water Industry Act Referrals	None	None	X
Red List Discharges	None	None	X
List 1 and List 2 Dangerous Substances	None	None	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites.	None	None	X
Planning Hazardous Substance Consents	None	None	X
Category 3 or 4 Radioactive substances Authorisations	None	None	X
Pollution Incidents (List 2).	None	1No reported, identified as construction and demolition materials and waste pollution. Water and air impacted	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
		category 4 (no impact), land impact category 3 (minor impact).	
Pollution Incidents (List 1)	None	None	<b>X</b>
Contaminated Land Register Entries and Notices.	None	None	<b>X</b>
Registered Landfill Sites.	None	Westfield tip, for household and commercial wastes 732m NW	<b>X</b>
Waste Treatment and/or Transfer Sites.	None	None	<b>X</b>
Fuel Station Entries	None	2No reported; nearest entry located 119m south east.	<b>X</b>
Current Industrial Site Data.	None	16No reported; nearest entry, electrical features located 94m south east.	<b>X</b>

\* From a land contamination perspective

## **2.6 Previous Site Investigations**

2.6.1 Jomas Associates are not aware of any previous site investigations undertaken at this site prior to this desk study.

## **2.7 Local Authority Information**

2.7.1 Jomas have made a request to Woking Borough Council for information relating to contamination on the site and surrounding areas.

2.7.2 A response was provided by Justin Haves a Contaminated Land Officer at Woking Borough Council. A copy of the correspondence is included in Appendix 6.

2.7.3 In his response he notes that he does not hold any further info myself, however it looks like a part of the site was used as a contractor's compound area as part of the adjacent school redevelopment.

2.7.4 He also notes that there are reports on planning files for the school redevelopment area publicly available via the planning portal. This review was undertaken and is discussed below.

## **2.8 Planning Information**

2.8.1 A review of the local authority's planning portal was undertaken on 15 August 2018 at '<https://caps.woking.gov.uk/online-applications/>'.

2.8.2 Several applications were identified in the vicinity of the site, including for the Hoe Valley School to the north of the site.

2.8.3 From reviewing the applications it would appear that a number of barns were demolished on the school site and the barn on the study site was to replace these barns. The study site was used as contractors compound including three shipping containers.

- 2.8.4 Correspondence on the planning portal included correspondence from the Environment Agency which notes:
- “The proposed site is in flood zone 1 and is not in a high risk location for the protection of groundwater, however there is a very shallow water table beneath the site. Chapter 9 of the submitted Environmental Statement and Combined Geotechnical and ground contamination report dated May 2015, produced by Ashdown site investigation Ltd, reference LW26036Rev1 shows that there is contamination in the soils within the south east corner of the site in the vicinity of the former nursery. The risks to groundwater will be increased if there is infiltration in this corner of the site.”
- “Soakaways should be as shallow as possible, not intercept the water table at any time and not be placed in contaminated ground. There should preferably be 1 metre unsaturated ground beneath the base of any infiltration devices. “
- 2.8.5 It is should be noted that the Environmental Statement and Combined Geotechnical and Ground Contamination Report dated May 2015, produced by Ashdown site investigation Ltd, reference LW26036Rev1 could not be located on the Planning Portal. Consequently the nature, extent and quantification of the noted contamination could not be confirmed.
- 2.8.6 It is noted that a number of ecological and archaeological surveys were required as part of the planning process for the school.
- 2.9 Unexploded Ordnance**
- 2.9.1 A search of publicly available data indicates that there is a low risk.
- 2.9.2 Low-risk regions are those with a bombing density of up to 10 bombs per 1000 acres..
- 1.1.1 This does not comprise a full UXO risk assessment.

### **3 GEOLOGICAL & ENVIRONMENTAL SETTING**

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

3.1.2 The data discussed herein is generally based on the information given within the EnviroInsight Report and published information provided by the Environment Agency and British Geological Survey.

#### **3.2 Solid and Drift Geology**

3.2.1 Information provided by the British Geological Survey indicates that the site is directly underlain by solid sand deposits of the Bagshot Formation. No superficial deposits are reported to underlie the site.

3.2.2 The BGS describes the Bagshot Formation as consisting of

*“pale yellow-brown to pale grey or white, locally orange or crimson, fine- to coarse-grained sand that is frequently micaceous and locally clayey, with sparse glauconite and sparse seams of gravel. The sands are commonly cross-bedded but some are laminated. Thin beds and lenses of laminated pale grey to white sandy or silty clay or clay (‘pipe-clay’) occur sporadically, becoming thicker towards the top of the formation.”*

3.2.3 The nearest report of superficial deposits is located 154m east, identified as Alluvium deposits of sand and gravel. The BGS describes the alluvium as consisting of

*“Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.”*

3.2.4 The GeoInsight reports 7No areas of artificial ground within 500m of the site boundary. The report identifies one area of Made Ground underlying the site at the south western border, however this feature appears to be encroaching onto site. Other reports of artificial ground within the site vicinity include Made Ground located 28m west of site.

#### **3.3 British Geological Survey (BGS) Borehole Data**

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

3.3.2 No borehole records providing information on the underlying ground conditions were identified within 250m of the site boundary.

#### **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?
<b>Aquifer</b>	<b>Superficial:</b>	None	Secondary (A) located 153m east. <b>X</b>
	<b>Solid:</b>	Secondary (A)	Secondary (A) located within 500m of site. <b>✓</b>
<b>Source Protection Zone</b>	None	None reported within 500m of site. <b>X</b>	
<b>Abstractions</b>	<b>Ground water</b>	None	6No reported; nearest entry located 1413m east, identified as active. <b>X</b>
	<b>Surface water</b>	None	6No reported; nearest entry located 1751m north west, identified as historical. <b>X</b>

Feature	On Site	Off Site	Potential Receptor?	
<b>Potable</b>	None	None reported within 2km of site.	X	
<b>Surface Waters</b>	None	Nearest entry reported 194m east, identified as Hoe Stream inland river.	✓	
<b>Flood Risk</b>	<b>EA Flood Zone 2</b>	None	Nearest entry reported 106m east, updated May 2018.	-
	<b>EA Flood Zone 3</b>	None	Nearest entry reported 157m east, updated May 2018.	-
	<b>RoFRaS</b>	Very low	-	-
	<b>Flood Defences</b>	There are no areas benefiting from Flood Defences within 250m of the study site.		-
	<b>BGS</b>	BGS has a "Low" confidence that there is the limited potential for below surface "Clearwater" flooding.		-

### 3.5 Sensitive Land Uses

- 3.5.1 The site is reported as a record of Green Belt land, identified as London Area Greenbelt within Woking District (B). This area exists within 1km of the site boundary.
- 3.5.2 5No reports of Sites of Special Scientific Interest (SSSI) are identified within 1km of the site boundary. Nearest entry located 510m south west, identified as Smart's and Prey Heaths.
- 3.5.3 1No reports of Ancient Woodland identified within 1km of the site boundary. This entry is located 473m south.
- 3.5.4 1No reports of Local Nature Reserves (LNR) identified within 1km of the site boundary. This entry is located 190 east, identified as Mayford Meadows.
- 3.5.5 No other sensitive land uses reported within 1km of the site boundary.

### 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, 2007).

## 4 POSSIBLE GEOLOGICAL HAZARDS

### 4.1 Database Information Review

4.1.1 The following are brief findings extracted from the GroundSure GeolInsight 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	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays.	No
Landslides	Very low	Slope instability problems are unlikely to be present.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks.	No
Compressible deposits	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits.	No
Collapsible Rock	Very low	Deposits with the potential to collapse when loaded and saturated are unlikely to be present	No
Running sand	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site.	No
Coal mining	None	No coal mining areas are reported within 1km of the site boundary.	No
Shallow mine workings	Negligible	No shallow mine workings are reported within 1km of the site boundary.	No
Brine affected areas	No	No brine affected areas are reported within 1km of the site boundary.	No

4.1.2 In addition, the GeolInsight report notes the following:

- 4No reports of historical surface ground working features are reported within 1km of the site. Nearest entry located 1m west, identified as cuttings. Other entries include cuttings located 226m north.
- No historical underground working features are reported within 1km of the site.
- No BGS current ground working features are reported within 1km of the site.

**SECTION 4**  
**POSSIBLE GEOLOGICAL HAZARDS**



- 
- 4.1.3 The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site.
  - 4.1.4 Foundations should not be formed within Made Ground (in its current state) or organic rich material (e.g. Topsoil to the unacceptable risk of total and differential settlement.
  - 4.1.5 The presence of Made Ground derived from demolition material may be a source of elevated sulphate, associated with plaster from the previous structures. If such levels are noted then sulphate resistant concrete may be required.
  - 4.1.6 A geotechnical investigation is recommended to inform foundation design for the proposed development.

## 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"> <li>• Potential for Made Ground associated with previous development operations – on site (S1) - Barn development, contractors compound and track (north east)</li> <li>• Potential for contamination associated with previous development operations – off site (S2) - Rail track (west)</li> <li>• Potential for contaminated ground from historic use as a nursery – southern half of site (S3)</li> </ul>	<ul style="list-style-type: none"> <li>• Ingestion and dermal contact with contaminated soil (P1)</li> <li>• Inhalation or contact with potentially contaminated dust and vapours (P2)</li> <li>• 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)</li> <li>• Horizontal and vertical migration of contaminants within groundwater (P4)</li> <li>• Accumulation and Migration of Soil Gases (P5)</li> <li>• Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)</li> </ul>	<ul style="list-style-type: none"> <li>• Construction workers (R1)</li> <li>• Maintenance workers (R2)</li> <li>• Neighbouring site users (R3)</li> <li>• Future site users (R4)</li> <li>• Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> <li>• Controlled waters - secondary (A) aquifer (R6), Hoe Stream</li> </ul>

### 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"> <li>Potential for Made Ground associated with previous development operations – on site (S1) - Barn development, contractors compound and track (north east)</li> <li>Potential for contamination associated with previous development operations – off site (S2) - Rail track (west)</li> <li>Potential for contaminated ground from historic use as a nursery – southern half of site (S3)</li> </ul>	<ul style="list-style-type: none"> <li>Ingestion and dermal contact with contaminated soil (P1)</li> <li>Inhalation or contact with potentially contaminated dust and vapours (P2)</li> <li>Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)</li> </ul>	<ul style="list-style-type: none"> <li>Construction workers (R1)</li> <li>Maintenance workers (R2)</li> <li>Neighbouring site users (R3)</li> <li>Future site users (R4)</li> <li>Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> </ul>	Medium	Low	Moderate	GI – Ground Investigation
			Severe for Asbestos	Low	Moderate	
	Severe		Unlikely	Low		
	Medium		Unlikely	Low		
	<ul style="list-style-type: none"> <li>Accumulation and migration of soil gases (P5)</li> </ul>					
	<ul style="list-style-type: none"> <li>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)</li> <li>Horizontal and vertical migration of contaminants within groundwater (P4)</li> </ul>	<ul style="list-style-type: none"> <li>Neighbouring site users (R3)</li> <li>Controlled Waters – secondary (A) aquifer, Hoe Stream (R6)</li> <li>Building foundations and on site buried services (water mains, electricity and sewer) (R5)</li> </ul>				

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 to low risk as defined above.

5.4.2 The proposed development comprises the following:

‘Redevelopment of the site, following the demolition of the existing building, to provide a health club building (Class D2) incorporating an external swimming pool and tennis/sports courts, the provision of 36 dwelling houses (Class C3) up to a maximum of 3 storeys in height, associated landscaping and car parking and new vehicular access from an existing road servicing Hoe Valley School.’

5.4.3 A review of earliest available (1871) historical maps indicates that the site comprised undeveloped and/or agricultural land. On the plan dated 1897 the southern half of site is identified as a nursery. No other significant changes are noted up until the most recent available historical map dated 2014. During the Jomas Walkover development on site was noted as a new barn and access road within the north east corner.

5.4.4 The site vicinity on the earliest available map comprised predominately agricultural land with a rail track located directly west of site. The area of Mayford towards the south east shows consistent building development comprising of residential buildings and a large garden centre directly east of site. During the Jomas Walkover an off-site development identified as a large school was noted towards the north of site, this feature was not identified during the historical map review and is a recent development.

5.4.5 Although an electrical sub-station was noted in close proximity to the northern boundary of the site, this has been constructed as part of the current redevelopment of the adjacent site for a school. Consequently this is not considered to pose a risk from Polychlorinated biphenyls (PCBs)

5.4.6 It is recommended that an intrusive investigation is undertaken to further assess the potential pollutant linkages identified.

5.4.7 It is recommended that the investigation include installation of monitoring wells for ground gas monitoring and/or groundwater sampling.

#### **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 It is noted that the adjacent to the site is a railway line and as such the DoE industry profile for “Railway Land” has also been reviewed.

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

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

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**6 REFERENCES**

Groundsure EnviroInsight Report Ref HMD-377-5286456 August 2018

Groundsure GeoInsight Report Ref HMD-377-5286457 August 2018

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

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

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

Code of Practice for Site Investigations BS5930: 2015

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

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

Department of Environment Industry Profiles (1995) - Railway Land ISBN 1 85112 253 2

## APPENDICES

## APPENDIX 1 – FIGURES

## **APPENDIX 2 – GROUNDSURE REPORTS**



## APPENDIX 3 – OS HISTORICAL MAPS

## **APPENDIX 4 – QUALITATIVE RISK ASSESSMENT METHODOLOGY**

## **APPENDIX 5 – LOCAL AUTHORITY CORRESPONDENCE**