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DESK STUDY / PRELIMINARY RISK ASSESSMENT REPORT

**ISLAND SITE,
DURHAM WAY,
ROYSTON
SG8 5GX**



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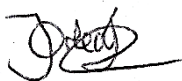
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EXECUTIVE SUMMARY

Kiafield Properties Ltd ('The client') commissioned Jomas Associates Ltd to undertake a desk study and preliminary risk assessment at Island Site, Durham Way, Royston SG8 5GX. 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) land contamination risk management (LCRM) guidance and relevant guidance within the National Planning Policy Framework (NPPF);
- To assess whether the site is safe and suitable for the purpose for which it is intended, or can be made so by remedial action.

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

Desk Study	
Current Site Use	Vacant plot within an industrial setting.
Proposed Site Use	It is understood that the proposed development comprises the construction of new commercial warehouse, with an associated car park and service yard. Areas of soft landscaping are proposed around the site boundary.
Site History	A review of earliest available (1885) historical maps indicates that the site was comprised of two agricultural plots at that time. By the map dated 1947, the site is shown to encroach on to a narrow-gauge railway which extends off to the west and south. The historic map from 1959 indicates that the narrow-gauge railway is no longer present, and once again the site is devoid of any features. Few changes then occur on the historic maps until the present day. The aerial imagery from 2018 shows the site to comprise a car park and various site cabins in the south and north of site. The imagery from 2021 indicates that most of the containers have been removed, with a car park still remaining in the middle of site. At the end of the 19th century, the land in the vicinity of site is predominantly comprised of agricultural land, with some minor industrial uses including a railway line 450m south of the site. The historic map from 1947 shows the site to lie within an area occupied by a narrow-gauge railway that extends approximately 500m towards the south and west. By the map dated 1970, various industrial and residential land uses have been developed in the surrounding area. The area to the south and east of site comprises an industrial trading estate, which is continually developed between the 1970's and present day.

Desk Study	
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the Holywell Nodular Chalk Formation. No artificial deposits are reported within the site. The solid deposits underlying the site are identified as a Principal aquifer. A review of the Enviro+Geosight Report indicates that the site lies within a Source Protection Zone 3 (Total catchment). There are 23No groundwater abstractions reported within 2km; nearest recorded as historical abstraction 710m south for direct spray irrigation. The nearest active groundwater abstraction is reported 942m east for direct potable water supply. There is 1No surface water abstraction reported within 2km; recorded 1926m north as a historical abstraction for direct spray irrigation. There are 3No potable abstractions reported within 2km; nearest recorded as active abstraction 942m east for direct potable water supply. The nearest detailed river entry is reported 152m west as an 'inland river not influenced by normal tidal action'. There is 1No surface water feature reported within 250m of the site. There are no Environment Agency Zone 2 or 3 floodplains reported within 50m of the site.
Potential Sources	• Potential for contaminated ground associated with previous site use – on site (S1) - Railway sidings (1947-1948) - Use as car park (recent aerial images) • Possible contamination associated with historic above ground fuel tank (associated with site cabin) (S2) • Potential for Made Ground associated with previous development operations – on site (S3) • Current and previous industrial use associated with Royston industrial park – off site (S4) - Vehicle repair, testing and servicing 40m southeast (recent) - Unspecified tanks: nearest 40m southeast (1992) - Unspecified factory 42m northeast (1977) - Unspecified works 84m east (1992) - Large chemical works approximately 150m east (1973)
Potential Receptors	• Construction and maintenance workers, • Neighbouring and future site users, • Buried foundations and services, • Controlled waters: - Principal aquifer - 3No potable abstractions reported within 2km; nearest recorded as active abstraction 942m east for direct potable water supply - Source Protection Zone 3 (Total catchment)

Desk Study	
	- 1No detailed river entry reported by Water Network 152m west as an ‘inland river not influenced by normal tidal action’.
Preliminary Risk Assessment	The risk estimation matrix indicates a “moderate” to “moderate/low” risk. The historic map from 1901 indicates a chalk pit located approximately 220m northeast of the site which appears to have been infilled by the map dated 1959. However, due to the small size of the ground working, the age of infill materials, and the distance from the site, a significant risk of ground gas is not considered to be present. It is recommended that an intrusive investigation is undertaken to clarify potential risks to the identified receptors.
Potential Geological Hazards	The Groundsure data identifies only very low to negligible risks – for full details see Section 4. Existing hardstanding and foundations will need to be removed and grubbed out ahead of the development. This may require the use of hydraulic breaking. The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site. Foundations should not be formed within Made Ground or organic rich material (e.g. topsoil) due to the unacceptable risk of total and differential settlement. Foundations must be designed so as not to load nor undermine adjacent boundary walls and buildings. The 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, sulphate resistant concrete may be required. Although soluble rocks are noted to exist immediately beneath the site they are not considered to pose a significant risk. The use of soakaway drainage should not be used without an assessment of the underlying chalk. A geotechnical investigation is recommended to inform foundation design.
Recommended Further Work	An intrusive investigation is recommended to confirm the preliminary geo-environmental risks identified and to provide geotechnical information for use in design. The investigation should assess the thickness of any Made Ground, and allow samples of Made Ground and natural soils to be taken for laboratory analysis.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Kiafield Properties Ltd ("The Client") has commissioned Jomas Associates Ltd, to assess the risk of contamination posed by the ground conditions at a site referred to as Island Site, Durham Way, Royston SG8 5GX, 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 18th January 2024.

1.2 Proposed Development

1.2.1 The proposed development is to comprise the construction of new commercial warehouse, with an associated car park and service yard. Areas of soft landscaping are located along the edges of the site.

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

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

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

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

1.2.5 This will be reviewed at each stage of the project.

1.3 Objectives

1.3.1 The objectives of Jomas Associates Limited's 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 land contamination risk management (LCRM) guidance.
- 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 A number of reports previously prepared by third parties were supplied to Jomas Associates at the commencement of this investigation. Table 1.1 details the documents supplied:

Table 1.1: Supplied Reports

Title	Author	Reference	Date
Geo-environmental Preliminary Risk Assessment – Royston Industrial development, Royston Hertfordshire Revision 1	WSP	00043343/001	08 January 2014
Trade Park Royston – Phase II Ground Investigation and Interpretive Report	Ground Projects	80778-1	04 August 2022
Development Site Royston East – Phase II Ground Investigation and Interpretive Report	Ground Projects	80778-2	19 October 2022

1.6 Limitations

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Kiafield Properties Ltd in accordance with the generally accepted consulting practices and for the

intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas Associates Limited. No other third-party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

- 1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas Associates Limited has actual knowledge to the contrary, information obtained from public sources or provided to Jomas Associates Limited by site personnel and other information sources, have been assumed to be correct. Jomas Associates Limited does not assume any liability for the misinterpretation of information or for items not visible, accessible, or present on the subject property at the time of this study.
- 1.6.3 Whilst effort has been made to ensure the accuracy of the data supplied, and analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.
- 1.6.4 Any reports provided to Jomas Associates Limited have been reviewed in good faith. Jomas Associates Limited cannot be held liable for any errors or omissions in these reports, or for any incorrect interpretation contained within them.
- 1.6.5 This investigation and report have 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	Island Site
Address of Site	Durham Way, Royston SG8 5GX
Approx. National Grid Ref.	534576 241504
Site Area (Approx)	0.46ha
Site Occupation	Vacant plot
Local Authority	North Hertfordshire District Council

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Jomas Associates on 15th February 2024.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	The site comprises a vacant plot of land in an industrial setting. Waste appears to be handled at a specific storage area near the site access; however, some waste items were also present across the site.
	Evidence of historic uses:	Small concrete areas, possibly having been used to support site cabins, were observed in the south of the site.
	Surfaces:	The site predominantly comprises grass and gravel cover. A small area of hardstanding is present in the northeast of site around the access. A small area of hardstanding is also located in the southwest of the site. The hard cover is a mixture of concrete and asphalt.
	Vegetation:	With the exception of grass, no vegetation was noted on site.
	Topography/Slope Stability:	Overall, there are no significant changes to the ground level across the site; however, small mounds of soil were noted.
	Drainage:	No obvious evidence of drainage issues.
	Services:	Manholes were observed in proximity to the site and therefore services may be present beneath the site.

Area	Item	Details
Neighbouring land:	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No petrol or diesel tanks were noted on site.
	North:	Costa café, A505 highway, agricultural fields
	East:	Industrial estate
	South:	Industrial estate
	West:	Car park, Aldi supermarket, agricultural fields

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 Anecdotal Information

2.3.1 During Jomas' site visit, anecdotal information was provided by the Mr Bryan Kruse. It was indicated that a historic above ground fuel tank associated with a site cabin was present in the west of site. Jomas were informed that the tank was fully banded.

2.4 Historical Mapping Information

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

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

Table 2.3: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1885 – 1887 1:2,500 1:10,560	The site is undeveloped and appears to span two agricultural plots with fence line running NW-SE across the site.	The surrounding area predominantly comprises agricultural land, with the town of Royston present 1km SE. A railway is present approximately 450m south. A nursery is located between 600m-750m southeast.
1897 – 1899 1:2,500 1:10,560	No significant changes.	An additional nursery is located between 550m-700m southeast of site.
1901 – 1903 1:2,500 1:10,560	No significant changes.	A chalk pit is located roughly 220m northeast of site.
1919 – 1923 1:2,500	No significant changes.	Artificial manure factory is present approximately 550m southeast of site.

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Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1:10,560		
1937 – 1938 1:2,500 1:10,560	No significant changes.	No significant changes.
1947 – 1948 1:10,560	The site encroaches onto a narrow-gauge railway .	Various railways are located immediately adjacent to the south and west of site, extending up to 500m from the site.
1959 – 1966 1:10,560 <i>Small-scale mapping incomplete</i>	The railway line is no longer present, and the site remains undeveloped.	The various railways present to the south and west of site are no longer present. The chalk pit approximately 220m northeast no longer present and assumed to have been infilled .
1970 – 1973 1:2,500 1:10,000 <i>Small-scale mapping incomplete</i>	No significant changes.	Various residential and industrial developments have taken place in the surrounding area. A chemical works is located roughly 150m east of site. Numerous tanks are located 200m east. A pre-cast cement works is present approximately 250m southeast. 4No tanks are present roughly 325m southeast. A works is present 350m southeast. Extensive residential developments have occurred from 400m east of site.
1977 – 1985 1:2,500 1:10,000 <i>Small-scale mapping incomplete</i>	No significant changes.	A road has been developed immediately adjacent to the SE of site. The area adjacent to south and east of site has seen further industrial developments. Extensive industrial units are present from 20m south of site. The A505 dual carriageway has been constructed 70m northwest of site, with associated embankments . A depot is located approximately 120m northeast. 3No additional tanks are now present between 130m-200m northeast. 2No factories are present between 200m-350m northeast of site. A warehouse is present roughly 270m southeast of site. 2No depots and numerous large tanks are located between 300m-450m south of the site.

Dates and Scale of Map	Relevant Historical Information	
	On Site	Off Site
1991 – 2003 1:1,250 1:2,500 1:10,000	No significant changes.	2No tanks are located roughly 40m east. A grain store is present approximately 350m south of site. Anglian Business Park is located 500m southeast.
2010 – 2024 1:10,000	No significant changes.	No significant changes.

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

- 2.4.3 Aerial photographs supplied as part of the Groundsure Enviro+GeoInsight report range from 1999 to 2021. The aerial image from 1999 shows the site spanning two separate agricultural plots with industrial units shown to the south-east. The site remains in this way until the photograph dated 2018, by which time the site and the surrounding area have been incorporated into the adjacent industrial estate. The site at this date comprises a car park in the centre and various site cabins in the south and north of site, with numerous new industrial units and warehouses in close proximity to the site. The imagery from 2021 indicates that most of the containers have been removed, with a car park still remaining in the middle of site.

2.5 Past Land Use

- 2.5.1 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	1No reported as railways sidings (1947 – 1948)	36No reported; nearest recorded as an unspecified factory 42m northeast (1977). Other records of note include unspecified works 84m east (1992), unspecified tanks 193m east (1977), a chalk pit 206m north (1901-1948) and an unspecified depot 235m south (1992)	✓
Historical Tanks	None reported	49No reported; nearest recorded 40m southeast of site as unspecified tanks (1991-1992)	✓
Historical Energy Features	None reported	6No reported; nearest recorded as an electricity substation 126m south (1981-1992)	X
Historical Petrol Stations	None reported	2No reported; nearest recorded 249m south as a petroleum depot (1981-1983)	✓

Type of Use	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Historical Garages	None reported	None reported	X
Historical Military Land	None reported	None reported	X

* From a land contamination/site development perspective

2.6 Landfill, Waste and Potentially Infilled Surface Ground Workings

2.6.1 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
Historical Waste Sites	None reported	1No reported 333m northeast for a 'recycling centre extension'	X
Licensed Waste Sites	None reported	7No reported; nearest recorded 287m east for a 'household, commercial and industrial waste transfer station' (issued 1996)	✓
Waste Exemptions	None reported	7No reported; nearest recorded 152m east for 'use of waste in construction'	✓
Potentially Infilled Surface Ground Workings	None reported	Chalk pit – 206m-216m north (1901-1948)	✓

* From a land contamination/site development perspective

2.7 Current Industrial Land Use

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

Table 2.6: Current Industrial Land Use

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Recent Industrial Land Uses	None reported	70No reported; nearest recorded 5m north for 'water pumping stations'. Other records of note include 'construction and tool hire' 23m southeast, 'lifting and handling equipment' 24m southeast, a 'gas governor' 29m northeast, 'vehicle parts'	✓

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Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
		and accessories' 33m southeast, 'vehicle repair, testing and servicing' 49m southeast, 'tanks' 55m southeast, 'cleaning equipment and supplies' 129m south and 'rubber, silicones and plastics' 138m south.	
Current or Recent Petrol Stations	None reported	None reported	X
High Voltage Electricity Cables	None reported	None reported	X
High Pressure Gas Pipelines	None reported	None reported	X
Sites Determined as Contaminated Land	None reported	None reported	X
Control of Major Accident Hazards (COMAH) and Notification of Installations Handling Hazardous Substances (NIHHS) Sites	None reported	2No reported; nearest recorded 13m southeast as a 'current COMAH Upper Tier Operator'. A historical NIHHS site is recorded 15m southeast.	✓
Regulated Explosive Sites	None reported	None reported	X
Hazardous Substance Storage/Usage	None reported	2No reported; both records for a 'claim for deemed hazardous substances consent for the storage and use of liquid chlorine' 282m southeast	X
Historical Licensed Industrial Activities	None reported	47No reported; nearest recorded 217m southeast for non-ferrous metals. Other records of note include 'inorganic chemical processes', 'manufacture and use of organic chemicals' and 'processes involving halogens' 281m southeast	✓
Licensed Industrial Activities	None reported	118No reported; nearest recorded 281m southeast for 'inorganic chemicals'. Other records of note include 'coating, printing and textiles; using solvents', 'organic chemicals' and 'disposal of non-hazardous waste involving physico-chemical treatment' 281m southeast	X
Licensed Pollutant Release	None reported	5No reported; nearest recorded 100m southeast for a 'waste oil burner'. Other records of note include 'non-ferrous metal foundry processes' 280m southeast, 'use of bulk cement' 348m southeast, 'manufacture of coating materials' 348m southeast and 'use of bulk cement' 407m southeast.	X
Radioactive Substance Authorisations	None reported	9No reported; nearest recorded 195m southeast for 'keeping and use of radioactive materials' and 'disposal of radioactive waste'	X
Licensed Discharge to Controlled Waters	None reported	None reported	X
Pollutant Release to Surface	None reported	None reported	X

Type of Consent/Authorisation	On site	Off-site (within 500m of site, unless stated otherwise)	Potential to Impact Site*
Waters (Red List)			
Pollutant Release to Public Sewer	None reported	None reported	X
List 1 and List 2 Dangerous Substances	None reported	1No List 2 Dangerous Substance reported 93m southwest for pH, status is given as not active	X
Pollution Incidents	None reported	7No reported; nearest recorded 195m east for 'fumes'. No impact (Category 4) to water or land, minor impact (Category 3) to air. The nearest record for minor impact (Category 3) to land and water is reported 270m southeast for 'chemically contaminated run-off). No impacts reported above "minor" impact.	X
Pollution Inventory Substances	None reported	3No reported; nearest recorded 281m southeast for inorganic chemicals.	X
Pollution Inventory Waste Transfers	None reported	1No reported 281m southeast for inorganic chemicals	X
Pollution Inventory Radioactive Waste	None reported	None reported	X

* From a land contamination/site development perspective

2.8 Tunnels and Railways

2.8.1 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	2No reported as railway sidings (1947-1948)	None reported	✓
Royal Mail Tunnels	None reported	None reported	X
Railways, Crossrail and HS2	None reported	None reported	X

* From a land contamination/site development perspective

2.9 Previous Site Investigations

Geo-environmental Preliminary Risk Assessment – Royston Industrial development, Royston Hertfordshire Revision 1 – WSP, January 2014

- 2.9.1 In 2014, WSP undertook a Geo-environmental Preliminary Risk Assessment (PRA) and preliminary geotechnical assessment for Royston Industrial Development, Royston, Hertfordshire. The study site of the WSP report encompassed a larger area than the Island Site, which comprises a small section within the Royston Industrial Development.
- 2.9.2 During the walkover survey of the WSP study site, limited evidence of contamination was observed, namely some localised fly-tipping/waste storage of a degraded oil drum and engine oil container on the southeast and northwest boundaries of the site respectively.
- 2.9.3 The historical review of potential sources and the environmental setting of the site are considered to be in agreement with this report.
- 2.9.4 WSP concluded that there was a low to medium risk with respect to potential risks to human health and controlled waters at the site from contaminants either present on the site itself, or migrating onto the site from the surrounding area. In addition, the Local Authority confirmed that although the site has not been designated as 'contaminated land' within their Contaminated Land Register as defined by Part 2A, the area has been initially risk assessed as 'Stage 1', and was considered medium priority under North Hertfordshire District Council's Contaminated Land Strategy, requiring more detailed consideration and future site investigation at a later date.
- 2.9.5 The geotechnical conclusions of the WSP report are also in broad agreement with this report.
- Trade Park Royston – Phase II Ground Investigation and Interpretive Report – Ground Projects, August 2022
- 2.9.6 On 7th and 8th June 2022, a ground investigation at Trade Park Royston was undertaken by Applied Geology. The Trade Park Royston site is located approximately 90m north of the Island Site.
- 2.9.7 The scope of the ground investigation comprised 5No window sampling borehole to depths of between 1.67m and 1.79mbgl, 3No installations for gas and groundwater monitoring, 2No machines excavated soakaway trial pits to depths of 1.6m and 2.0mbgl, and 3No TRL dynamic cone penetrometer tests.
- 2.9.8 The ground conditions on site comprised Made Ground to depths of between 0.2m to 0.6mbgl, overlying medium dense structureless chalk recovered as slightly sandy, silty gravel/slightly gravelly silt (considered to represent the Holywell Nodular Chalk Formation – Grade Dc/Dm) to the base of the boreholes between depths of 1.6m to 2.0mbgl.
- 2.9.9 Groundwater was not encountered in any of the exploratory boreholes during the ground investigation. The groundwater installations were recorded as dry on the return monitoring visit on 28th June 2022.
- 2.9.10 No evidence of dissolution features were encountered within the chalk.

- 2.9.11 Exceedances of polycyclic aromatic hydrocarbons (PAH) (benzo[b]fluoranthene, benzo[a]pyrene and dibenzo[a,h]anthracene) were encountered in one sample of Made Ground in DCS2 to the north of the site. The geo-environmental assessment indicates that there is negligible risk to human health and controlled water receptors.
- 2.9.12 Following a single gas monitoring visit, a gas screening value of 0.0022l/hr was calculated and therefore, the site was characterised as Characteristic Situation 1 for which no formal gas protection measures are considered necessary.
- 2.9.13 An allowable bearing pressure of 225kN/m² should be achievable for foundations placed in the medium dense Grade Dm/Dc Chalk. The minimum depth of foundations should be 1.2mbgl.
- 2.9.14 A preliminary design CBR value of 10% is recommended for the Made Ground. A preliminary design CBR value of 2% is recommended for the weathered structureless chalk.
- 2.9.15 The results of the soakaway testing indicate a design soil infiltration rate of 3.6x10⁻⁶ m/s is appropriate for SA1. The soakaway testing in SA2 did not produce a soil infiltration rate due to insufficient drainage.
- 2.9.16 The site has a Design Sulphate Class of DS-2 and an Aggressive Chemical Environment for Concrete class of AC-1s.
- Development Site Royston East – Phase II Ground Investigation and Interpretive Report – Ground Projects, October 2022
- 2.9.17 On 8th June 2022 and between 23rd to 25th August 2022, a ground investigation at the Development Site Royston East was undertaken by Applied Geology. This site is located approximately 80m north of the Island Site.
- 2.9.18 The scope of the ground investigation comprised 5No window sampling borehole to depths of between 2.2m and 3.2mbgl, 9No machine excavated trial pits to depths of between 1.5m and 3.9mbgl, 4No soakage tests to depths of between 1.5m and 2.5mbgl, and 4No plate load tests at depths of between 0.3m and 0.4mbgl.
- 2.9.19 The ground conditions on site comprised Made Ground to depths of between 1.1m to 2.7mbgl, overlying brown sandy silt/slightly gravelly sand (possibly representing Head Deposits) encountered only in TP2 and TP4, overlying medium dense to very dense structureless chalk recovered as slightly sandy, silty gravel/slightly gravelly silt (considered to represent the Holywell Nodular Chalk Formation – Grade Dc/Dm) to the base of the boreholes at 5.45mbgl.
- 2.9.20 Groundwater was not encountered in any of the exploratory boreholes during the ground investigation. The groundwater installations were recorded as dry on the return monitoring visit on 28th June 2022.
- 2.9.21 No evidence of dissolution features were encountered within the chalk.

- 2.9.22 The results showed that no metals, Total Petroleum Hydrocarbon (TPH) or benzene, toluene, ethylbenzene, polycyclic aromatic hydrocarbons (PAHs) and xylenes (BTEX) have exceeded the screening criteria and no asbestos was encountered.
- 2.9.23 It was reported that an allowable bearing pressure of 225kN/m² should be achievable for foundations placed in the medium dense Grade Dm/Dc chalk. The minimum depth of foundations should be 1.2mbgl.
- 2.9.24 It was reported that the structureless chalk will likely be classified as Class 3 to Class 1A material.
- 2.9.25 A ground bearing slab was not considered feasible for the site. A suspended slab option should be adopted.
- 2.9.26 The results of the soakaway testing indicate a design soil infiltration rate of 4.8x10⁻⁶ m/s is appropriate for the weathered structureless chalk. It is not recommended to place soakaways within Made Ground.
- 2.9.27 The site has a Design Sulphate Class of DS-1 and an Aggressive Chemical Environment for Concrete class of AC-1s.
- 2.10 Local Authority Information**
- 2.10.1 Jomas have made a request to North Hertfordshire District Council for information relating to contamination on the site and surrounding areas. A copy of the correspondence is included in Appendix 6.
- 2.10.2 A response is pending.
- 2.11 Planning Information**
- 2.11.1 A review of the local authority's planning portal was undertaken on 23rd February 2024 at <https://pa2.north-herts.gov.uk/online-applications/>.
- 2.11.2 Various planning applications were reviewed; however, none were found containing information pertaining to ground conditions or contamination.

3 GEOLOGICAL & ENVIRONMENTAL SETTING

3.1 Introduction

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 Superficial and Solid Geology

3.2.1 The British Geological Survey indicates that the site is directly underlain by solid deposits of the Holywell Nodular Chalk Formation which is generally 25m to 35m thick. These are indicated by the BGS to consist of

“Generally hard nodular chalks with thin flaser marls and significant proportions of shell debris in part.”

3.2.2 Although artificial deposits are not reported within the site, given the identified site history a thickness of Made Ground should be expected.

3.2.3 BS5930:2015 defines Made Ground as anthropogenic ground in which the material has been placed without engineering control and/or manufactured in some way, such as through crushing or washing, or arising from an industrial process. Great variations in material type, thickness and degree of compaction invariably occur.

3.2.4 In addition, although no superficial deposits are indicated to be present beneath the site, the findings of the Ground Projects ground investigation (October 2022) in close proximity have indicated that possible Head Deposits could also be present over the underlying bedrock.

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 The nearest such record was located approximately 167m north of the site, from December 1895.

3.3.3 The base of the borehole is given as 18.51m below ground level (bgl), however, the ground conditions are not described.

3.3.4 During the drilling of the borehole groundwater was struck at (~17.98mbgl).

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

3.4 Hydrogeology & Hydrology

3.4.1 General information about the hydrogeology of the site was obtained from the Enviro+GeoInsight 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 superficial 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:	-	X
	Solid:	Principal	✓
Abstractions	Groundwater	None	23No reported within 2km; nearest recorded as historical abstraction 710m south for direct spray irrigation. The nearest active abstraction is reported 942m east for direct potable water supply ✓
	Surface water	None	1No reported within 2km; recorded 1926m north as a historical abstraction for direct spray irrigation X
	Potable	None	3No reported within 2km; nearest recorded as active abstraction 942m east for direct potable water supply ✓
Source Protection Zone	Source Protection Zone 3 (Total catchment)	Source Protection Zone 2 (Outer catchment) 406m south Source Protection Zone 1 (Inner catchment) 448m southeast	✓
Surface Water Features	None	1No surface water feature reported within 250m. 1No detailed river entry reported by Water Network 152m west as an 'inland river not influenced by normal tidal action'	✓
Flood Risk	EA Flood Zone 2	No	-
	EA Flood Zone 3	No	-
	RoFRaS	No records	-
	Historical Flood Events	None reported within 250m of the site.	-
	Flood Defences	There are no areas benefiting from flood defences within 250m of the study site.	-
	Groundwater Flooding	The highest risk onsite and within 50m is reported as negligible.	-

3.5 Sensitive Land Uses

- 3.5.1 The site is located within the Ely Ouse and Cut-off channel Nitrate Vulnerable Zone (surface water) and the Anglian Chalk Nitrate Vulnerable Zone (groundwater).
- 3.5.2 A Nitrate Vulnerable Zone (NVZ) is a conservation designation of the Environment Agency for areas of land that drain into nitrate polluted waters, or waters which could become polluted by nitrates. Nitrate Vulnerable Zones were introduced by the UK government in response to the EU mandate that all EU countries must reduce the nitrate in Drinking Water to a maximum of 50 mg/l.
- 3.5.3 The NVZs cover large areas of land that have been identified as exceeding or being at risk of exceeding 50 mg NO₃/l.
- 3.5.4 The Therfield Heath Site of Special Scientific Interest (SSSI) and Local Nature Reserve (LNR) is located 824m south of site.
- 3.5.5 The site lies within an SSSI Impact Risk Zone. As a result, any industrial/agricultural development that could cause air pollution will require consultation.
- 3.5.6 No other sensitive land use was identified within 2km of the site.

3.6 Radon

- 3.6.1 As reported, the site is not within a radon affected area, as less than 1% of properties are above the action level.
- 3.6.2 Consequently, no radon protective measures are necessary in the construction of new dwellings or extensions as described in publication BR211 (BRE, 2023).

4 POSSIBLE GEOLOGICAL HAZARDS

4.1 Database Information Review

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

Table 4.1: Geological Hazards

Potential Hazard	Site check Hazard Rating	Details	Further Action Required?
Shrink swell clays	Negligible	Ground conditions predominantly non-plastic.	No
Running sands	Negligible	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	No
Compressible deposits	Negligible	Compressible strata are not thought to occur.	No
Collapseable Deposits	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	No
Landslides	Negligible	Slope instability problems are not thought to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.	No
Ground dissolution soluble rocks	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.	No
Coal mining	None	The study site is not located within the specified search distance of an identified coal mining area.	No
Non-coal mining	Chalk – Class A	Underground mine workings are uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.	No

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

- 5No. historical surface ground working features within 250m of the site. Nearest reported 206m north of the site for a chalk pit.
- No historical underground working features within 1km of the site.
- 1No. BGS Current Ground Working Features within 1km of the site, reported as Royston Chalk Pit 225m north. The status is given as ceased.

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

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

-
- 4.1.5 Foundations should not be formed within Made Ground or organic rich material (e.g. topsoil) due to the unacceptable risk of total and differential settlement.
 - 4.1.6 Foundations must be designed so as not to load nor undermine adjacent boundary walls and buildings.
 - 4.1.7 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, sulphate resistant concrete may be required.
 - 4.1.8 Although soluble rocks are noted to exist immediately beneath the site they are not considered to pose a significant risk.
 - 4.1.9 The use of soakaway drainage should not be used without an assessment of the underlying chalk.
 - 4.1.10 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)
- Potential for contaminated ground associated with previous site use – on site (S1) - Railway sidings (1947-1948) - Use as car park (recent aerial images) - Possible contamination associated with historic above ground fuel tank (associated with site cabin) (S2) - Potential for Made Ground associated with previous development operations – on site (S3) - Current and previous industrial use associated with Royston industrial park – off site (S4) - Vehicle repair, testing and servicing 40m southeast (recent) - Unspecified tanks: nearest 40m southeast (1992) - Unspecified factory 42m northeast (1977) - Unspecified works 84m east (1992) - Large chemical works approximately 150m east (1973)	- Ingestion and dermal contact with contaminated soil (P1) - Inhalation or contact with potentially contaminated dust and vapours (P2) - Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff (P3) - Horizontal and vertical migration of contaminants within groundwater (P4) - Accumulation and Migration of Soil Gases (P5) - Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	- Construction workers (R1) - Maintenance workers (R2) - Neighbouring site users (R3) - Future site users (R4) - Building foundations and on site buried services (water mains, electricity and sewer) (R5) - Controlled waters (R6) - Principal aquifer 3No potable abstractions reported within 2km; nearest recorded as active abstraction 942m east for direct potable water supply 1No detailed river entry reported by Water Network 152m west as an 'inland river not influenced by normal tidal action'

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	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/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
- Potential for contaminated ground associated with previous site use – on site (S1) - Railway sidings (1947-1948) - Use as car park (recent aerial images) - Possible contamination associated with historic above ground fuel tank (associated with site cabin) (S2) - Potential for Made Ground associated with previous development operations – on site (S3) - Current and previous industrial use associated with Royston industrial park – off site (S4) - Vehicle repair, testing and servicing 40m southeast (recent) - Unspecified tanks: nearest 40m southeast (1992) - Unspecified factory 42m northeast (1977) - Unspecified works 84m east (1992) - Large chemical works approximately 150m east (1973)	- Ingestion and dermal contact with contaminated soil (P1) - Inhalation or contact with potentially contaminated dust and vapours (P2) - Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P6)	- Construction workers (R1) - Maintenance workers (R2) - Neighbouring site users (R3) - Future site users (R4) - Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Medium	Low likelihood	Moderate	GI – Ground Investigation
	Accumulation and migration of soil gases (P5)		Severe	Unlikely	Moderate/Low	
	- Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff (P3) - Horizontal and vertical migration of contaminants within groundwater (P4)	- Neighbouring site users (R3) - Building foundations and on site buried services (water mains, electricity and sewer) (R5) - Controlled waters (R6) - Principal aquifer 3No potable abstractions reported within 2km; nearest recorded as active abstraction 942m east for direct potable water supply 1No detailed river entry reported by Water Network 152m west as an 'inland river not influenced by normal tidal action'	Medium	Low likelihood	Moderate	

- 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 LCRM.

5.4 Outcome of Risk Assessment

- 5.4.1 The risk estimation matrix indicates a “low” to “moderate” risk as defined above.
- 5.4.2 It is understood that the proposed development comprises the construction of new commercial warehouse, with an associated car park and service yard. Areas of soft landscaping are proposed around the site boundary.
- 5.4.3 A review of earliest available (1885) historical maps indicates that the site was comprised of two agricultural plots at that time. By the map dated 1947, the site is shown to encroach on to a narrow-gauge railway which extends off to the west and south. The historic map from 1959 indicates that the narrow-gauge railway is no longer present, and once again the site is devoid of any features. Few changes then occur on the historic maps until the present day.
- 5.4.4 The aerial imagery from 2018 shows the site to comprise a car park and various site cabins in the south and north of site. The imagery from 2021 indicates that most of the containers have been removed, with a car park still remaining in the middle of site.
- 5.4.5 At the end of the 19th century, the land in the vicinity of site is predominantly comprised of agricultural land, with some minor industrial uses including a railway line 450m south of the site. The historic map from 1947 shows the site to lie within an area occupied by a narrow-gauge railway that extends approximately 500m towards the south and west. By the map dated 1970, various industrial and residential land uses have been developed in the surrounding area. The area to the south and east of site comprises an industrial trading estate, which is continually developed between the 1970’s and present day.
- 5.4.6 The historic map from 1901 indicates a chalk pit located approximately 220m northeast of the site which appears to have been infilled by the map dated 1959. However, due to the small size of the ground working, the age of infill materials, and the distance from the site, a significant risk of ground gas is not considered to be present.
- 5.4.7 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.
- 5.4.8 The above conclusions are made subject to approval by the statutory regulatory bodies.

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.

6 REFERENCES

BRE Report BR211; Radon: Guidance on protective measures for new buildings, 2023

Code of Practice for Ground Investigations BS5930: 2015

CL:AIRE; Petroleum Hydrocarbons in Groundwater, 2017

Environment Agency (2020); *Land Contamination Risk Management (LCRM)*.
<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

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

APPENDICES

APPENDIX 1 – FIGURES

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