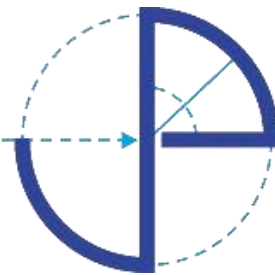




## **APPENDIX B**

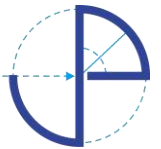
### Previous Reports



# Flemings Hall Barn

## STAGE I/ TIER I Geo-Environmental Desk Study Report

Report: NE22/009/SIT1  
31/08/2022  
Rev. 00



**DOCUMENT CONTROL**

<p><b>Report prepared by:</b></p> <p style="text-align: center;"><i>Andrew J Cartwright</i></p> <p><b>A J Cartwright BSc(Hons)</b>  <b>Environmental Engineer</b></p> <p>On behalf of JPC Environmental Services                  A Division of JP Chick &amp; Partners Limited</p>	<p><b>Report reviewed by:</b></p> <p style="text-align: center;"><i>Adam Steele</i></p> <p><b>A Steele BSc(Hons) MSc MEnvSc</b>  <b>Associate</b></p> <p>On behalf of JPC Environmental Services                  A Division of JP Chick &amp; Partners Limited</p>
<b>JPC Issuing Office</b>	<b>23 St Stephens Road, Norwich, NR1 3SP</b>

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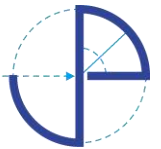
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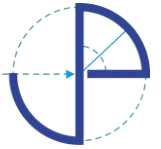
## APPENDIX

Appendix A:	Site Location Plan
Appendix B:	Site Photographs
Appendix C:	GroundSure Report



## EXECUTIVE SUMMARY

<b>Site Name &amp; Address:</b>	Flemings Hall Barn, Hall Road, Bedingfield, IP23 7LJ
<b>Client:</b>	Brown & Co
<b>Local Planning Authority:</b>	Mid Suffolk District Council
<b>Historical Site Use:</b>	Agricultural use
<b>Present Site Use:</b>	Agricultural use
<b>Proposed Site Use:</b>	Residential Dwelling
<b>Date of most recent investigation:</b>	Tuesday, 23 August 2022 - Site walkover survey
<b>Objectives:</b>	
<ul style="list-style-type: none"> <li>▪ To develop an understanding of the site's history and environmental context;</li> <li>▪ To determine the potential existence of any significant pollutant linkages which might represent a potential risk to construction workers, future occupants of the site or controlled waters; and</li> <li>▪ To undertake a Stage I Preliminary 'Contaminated Land' investigation in accordance with LCRM and guidance contained in the NHBC Publication 66: 2008.</li> </ul>	
<b>Source:</b>	
<ul style="list-style-type: none"> <li>▪ Our desk-based research and walkover survey identified the following potential sources of contamination: <ul style="list-style-type: none"> <li>○ On-site: Storage of oil and chemical containers and machinery; suspected asbestos containing materials; evidence of fuel leaks; Made Ground identified during the site walkover; unspecified historic tanks.</li> <li>○ Off-site (within 250m): Unspecified tanks; waste exemptions, infilled ponds.</li> </ul> </li> </ul>	
<b>Pathway:</b>	
<ul style="list-style-type: none"> <li>▪ Based on the BGS online mapping, the site is likely to be underlain by superficial deposits of the Lowestoft Formation and bedrock geology of the Crag Group.</li> <li>▪ Surface soils have a low leaching potential, with underlying strata permeability ranging from low to moderate for the Lowestoft Formation and high for the Crag Group.</li> <li>▪ Hydrological reviews indicate the site is located within Source Protection Zone 3 (total catchment). A moat system is present approximately 40m to the north of the site. The site is located within Flood Zone 1 (negligible risk).</li> </ul>	
<b>Receptor:</b>	
<ul style="list-style-type: none"> <li>▪ The Lowestoft Formation is classified as a Secondary (undifferentiated) Aquifer and the Crag Group is classified as a Principal Aquifer. The vulnerability of these aquifers is identified as medium risk for the Lowestoft Formation and low for the Crag Group.</li> <li>▪ We consider the potential on-site sources of contamination to represent a moderate to high risk to human health and moderate risk to groundwater.</li> <li>▪ The potential risk from ground gas migrating onto the site, and affecting the proposed development is moderate.</li> </ul>	



### Recommendations:

Based on the information obtained and reviewed as part of this preliminary assessment, JPC Environmental Services would advise the following:

- We would recommend that a Stage I / Tier II Ground Investigation is undertaken across the development site. The investigation should comprise boreholes drilled using a dynamic sampling rig to a maximum depth of 5.00mbgl to determine the extent of Made Ground, whilst allowing the retrieval of selected soil samples for off-site laboratory analysis. We would recommend the following geochemical analysis:
  - CLEA metals;
  - Polycyclic Aromatic Hydrocarbons (including TPH CWG);
  - Petroleum Hydrocarbons;
  - Pesticides and herbicides;
  - pH; and
  - asbestos ID.
  
- We would also recommend a minimum of three combined ground gas and groundwater monitoring wells are installed during the investigation. This would enable a ground gas assessment to be completed, which would determine whether there is a risk to future site users from the nearby infilled pond. Groundwater monitoring should also be undertaken.





## 1 INTRODUCTION

### 1.1 Brief

- 1.1.1 JPC Environmental Services were appointed by Brown & Co, to undertake a Stage I/ Tier I Geo-Environmental Desk Study Report for ‘Flemings Hall Barn, Hall Road, Bedingfield, IP23 7LJ’ (hereafter referred to as ‘the site’).
- 1.1.2 The investigation was carried out broadly in accordance with the following guidance:
- Environment Agency (April 2021): *Land Contamination Risk Management (LCRM)*;
  - Department for Environment, Food and Rural Affairs (2012): *Contaminated Land Statutory Guidance, Environmental Protection Act 1990: Part IIA*;
  - Ministry of Housing, Communities and Local Government. (July 2021): *National Planning and Policy Framework*; and
  - BS10175:2011 +A2:2017 “Investigation of Potentially Contaminated Sites – Code of Practice”.
- 1.1.3 This report shall be for the private and confidential use of Brown & Co for whom it was undertaken. It should not be reproduced in whole or in part, or relied upon by a third party for any use without the express written authority of JPC Environmental Services.
- 1.1.4 In producing this report, we have exercised all the reasonable skill, care and diligence to be expected of an appropriately qualified and competent consultant, experienced in carrying out equivalent services for developments of a similar size, value, purpose, scope and complexity.

### 1.2 Scope

- 1.2.1 The main elements of the investigation were as follows:
- The review of historical and regulatory information relating to the site to gain an understanding of the site’s history, local environment and potential ground conditions;
  - Undertake a walkover survey of the site and surrounding area to identify the presence and types of commercial activities within the locality and seek evidence of potential sources of on or off-site contamination;
  - The formulation of a “Conceptual Site Model” to explore and evaluate the existence and potential impact of any plausible pollutant linkages;
  - To utilise the resulting information to undertake a ‘Stage I’ human and environmental risk assessment; and
  - If appropriate, make recommendations on the extent of any intrusive investigations which may be required to fully establish the condition of the site.



### 1.3 Sources of Information

1.3.1 As part of the desk-based research, JPC Environmental Services consulted the following sources of information: -

- GroundSure Report – produced by GroundSure Ltd;
- British Geological Survey (BGS) mapping and online referencing;
- Environment Agency landfill mapping – online;
- BR 211 Radon: Guidance on Protective Measures for New Dwellings, 2007 Edition;
- Magic Map Website – [magic.defra.gov.uk](http://magic.defra.gov.uk);
- Mid Suffolk District Council Planning Portal; and
- Google Earth (aerial photography).

### 1.4 Development Proposal

1.4.1 We understand development proposals comprise the demolition of an existing agricultural barn and the conversion of another existing barn into residential accommodation. The works will include the construction of a new garage building as well as associated car parking and gardens. An extract of the development proposal is shown in **Figure 1** below.

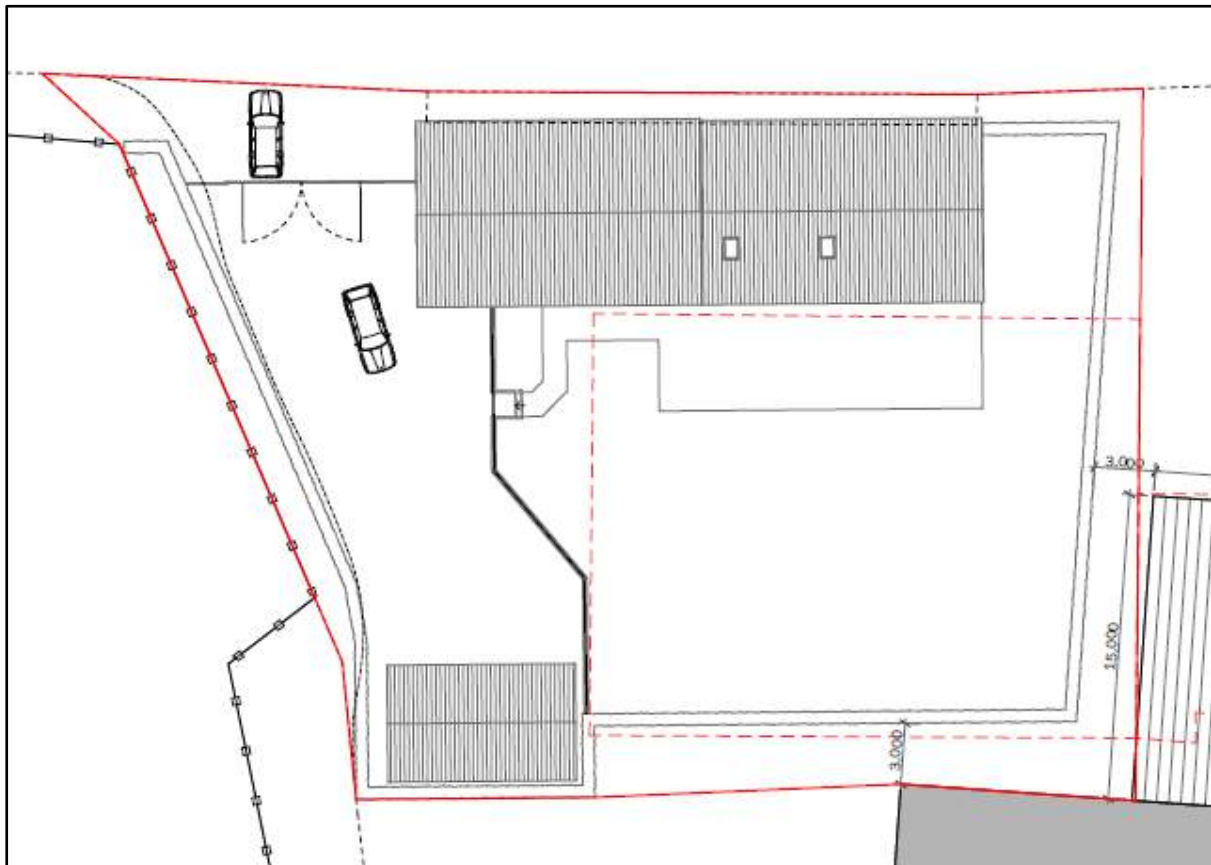


Figure 1: Proposed Site Plan (extract)

## 2 DESK STUDY

### 2.1 Location

Table 1: Site Location

<b>Location</b>	Flemings Hall Barn, Hall Road, Bedingfield, IP23 7LJ
<b>Grid Reference</b>	619227, 267815
<b>Area</b>	0.15ha
<b>Access</b>	The site is accessed off Hall Road to the north-east of the site, approximately 1.5km south-east of the village of Bedingfield.
<b>Topography</b>	The site appears relatively flat, with an elevation of between 61.27m AOD and 61.84m AOD.

### 2.2 Site Description (Walkover Survey)

2.2.1 The site walkover was conducted on Tuesday, 23 August 2022 by Andrew Cartwright on behalf of JPC Environmental Services. An extract of the site location plan is shown in **Figure 2** below and the full version is included within **Appendix A**. This has been annotated to highlight the positions of the three principal areas.

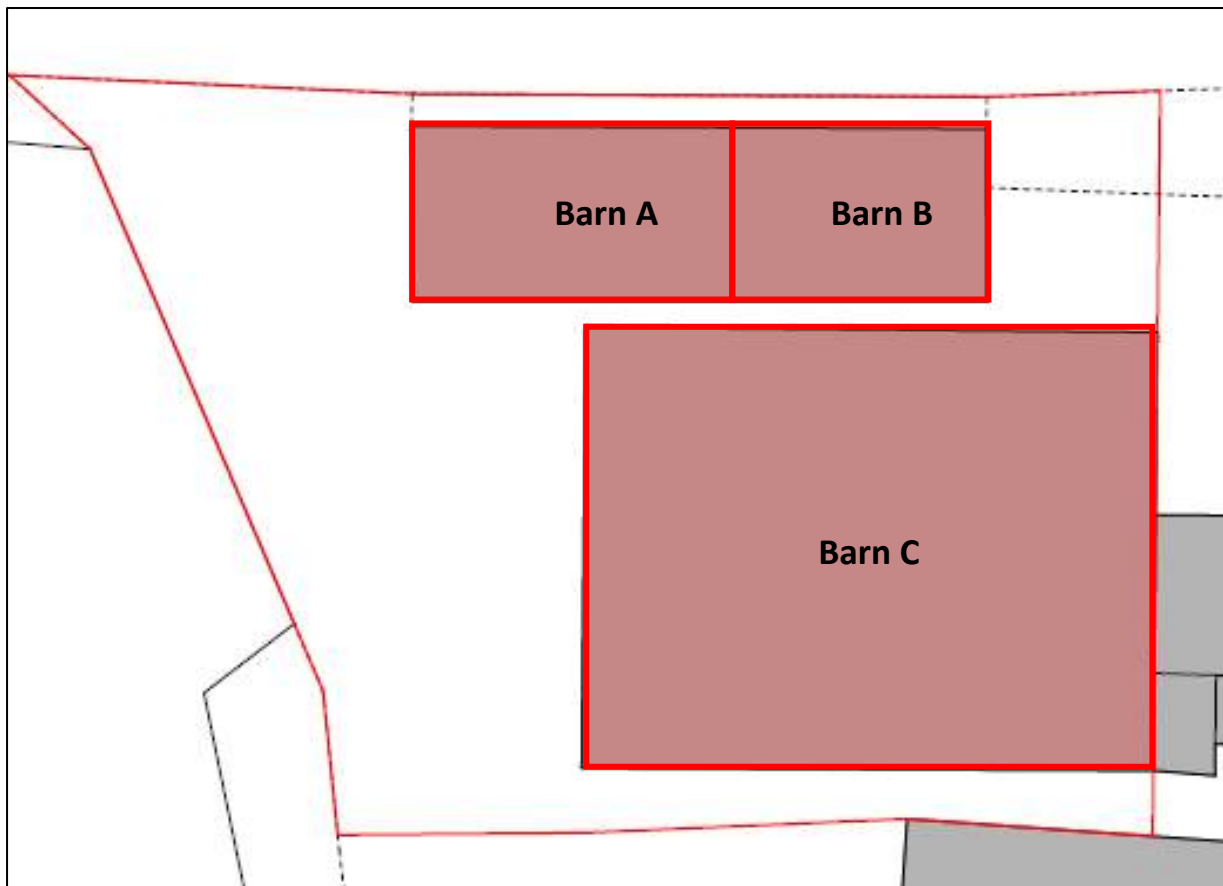
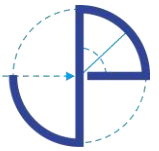


Figure 2: Site Location Plan (extract, annotated)



- 2.2.2 Site photographs taken during the site walkover are included within **Appendix B**.
- 2.2.3 The site is accessed via a concrete driveway, to the south of Hall Road, and comprises three main areas, labelled as Barn A, Barn B, and Barn C.
- 2.2.4 Barn A is constructed from concrete blocks around a timber frame, a concrete floor, and an asbestos roof. It measures approximately 0.014ha and is arranged over two storeys, with the ground floor currently used to store various construction and agricultural items. These include various wooden boxes; corrugated metal sheeting; paint tins; general machinery; and tractor tyres. There is also a sheet of corrugated asbestos containing material and a petrol lawn mower. The lawn mower appears to have been leaking and there is a large stain on the floor with a noticeable petroleum hydrocarbon odour. To the south of Barn A is a small enclosure with several gas cylinders. The first floor of Barn A is timber clad with a timber floor. It is being used to store additional building materials, insulation, roof tiles, cables, and a car battery.
- 2.2.5 Barn B is constructed from concrete blocks with a concrete floor and a tiled roof, measures approximately 0.013ha, and is attached to Barn A at its north-west end. The barn is single storey and is being used for the storage of various items arranged on timber shelving. Stored items include building supplies, fuel cans, small motors and engines, a gas cylinder, a heater, and machinery.
- 2.2.6 Barn C is timber clad with a brick base, concrete floor, asbestos downpipes, and an asbestos roof, and measures approximately 0.061ha. The north-western part of the barn is used for the storage of grain, while the remainder is used primarily as ancillary space for the adjacent workshop. Within the workshop area, there are several old car batteries, motors, used oil filters and oil rags, a gas cylinder, and a large stack of pallets. On top of the pallets is an intermediate bulk container (IBC) labelled 'Adblue'. This is connected to a pump on the outside of the barn. Both the IBC and pump have leaked, with the Adblue forming white crystals on the pallets and floor/ ground.
- 2.2.7 The areas surrounding the barns are laid to concrete hardstanding, totalling an area of approximately 0.06ha. The concrete is generally in good condition, with some cracks in places. The north-east boundary comprises the adjacent road, the north-west boundary comprises mature hedging, and the southern aspects are unbounded.

## 2.3 Site History

- 2.3.1 The site history is summarised below and determined from the GroundSure historical mapping and presented in **Table 2** below. The full GroundSure report is provided within **Appendix C**.

Table 2: Historic Mapping

Map Edition (Date, Scale)	The Site	Surrounding Area
1884, 1903 (1:2,500) 1884- 1888,	The site is occupied by two buildings along the northern boundary, adjacent to the road. The rest of the site is vacant.	The surrounding landscape is dominated by agricultural fields in all directions. Hall Road runs along the site's northern boundary, with an

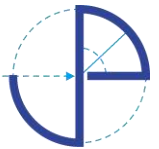


Table 2: Historic Mapping

Map Edition (Date, Scale)	The Site	Surrounding Area
1903- 1905 (1:10,560)		associated drainage ditch to the south-east. Fleming’s Hall grounds are located on the opposite side of the road, approximately 10m remote from the site, and includes an extensive moat system, two ponds, and a complex of outbuildings. Unrelated buildings are located approximately 240m to the south-east. Ponds are located at approximate distances of; 10m south-west, 70m south-west, 210m south-east, and 230m north-west.
1947, 1952 (1:10,560)	The building has increased in size to cover more of the site.	The surrounding area appears unchanged.
1978 (1:2,500) 1983- 1984 (1:10,000)	The building is shown as two separate buildings; the original building along the site boundary, and a larger building covering most of the site to the south. The buildings are part of a larger complex to the south and south-east. Two tanks are shown in the eastern corner of the site. The use and contents of these tanks are not specified.	Several new buildings are located adjacent to the site to the south-east and south-west. Ponds/ ditches located approximately 10m south-west, 170m north, 140m north-east, 210m south-east, and 230m north-west are no longer shown. The drainage ditch along Hall Road is also not shown.
1995 (1:2,500) 2003 (1:1,250) 2001 (1:10,000)	The site appears to be unchanged.	The surrounding area appears unchanged.
2010 (1:10,000)	The tanks are no longer shown.	The pond located 70m south-west is no longer shown.

## 2.4 Geology

- 2.4.1 To determine the nature of the underlying geology, we have consulted the 1:50,000 scale geological maps compiled by British Geological Survey (BGS). Based on these maps, the site is likely to be underlain by superficial deposits comprising the Lowestoft Formation (diamicton). These are then further underlain by bedrock geology comprising the Crag Group (sand).
- 2.4.2 A review of the BGS database has not identified any boreholes within 500m of the site boundary.
- 2.4.3 Potential geological hazards associated with natural ground subsidence may occur on site, the likelihood of these events is noted in **Table 3** below.

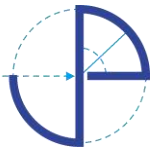


Table 3: Natural Ground Subsidence Events

Geological Hazard	Hazard Rating
Shrink-swell clays	Low
Running sands	Very low
Compressible deposits	Negligible
Collapsible deposits	Very low
Landslides	Very low
Ground dissolution of soluble rocks	Negligible

## 2.5 Hydrogeology and Hydrology

2.5.1 The hydrogeological designations and classifications for superficial deposits and bedrock geology, both underlying the site and within 250m, were obtained with reference to the Environment Agency website and GroundSure Report and are outlined in **Table 4** below.

Table 4: Hydrogeology

Geological Strata	Distance (m)	Designation	Groundwater Vulnerability
Superficial Deposits	On site	Secondary Undifferentiated – mixed flow type with low to moderate permeability	Medium risk
Bedrock Geology	On site	Principal aquifer – intergranular flow type with high permeability	Low risk

2.5.2 In terms of groundwater vulnerability, the Environment Agency divides significant groundwater catchments into three Source Protection Zones (SPZ's) based on the potential risk associated with the migration of possible contaminants. In this case, the site is located within Source Protection Zone 3 (total catchment). Groundwater underlying the site is associated with the catchment of the Waveney and East Suffolk Chalk & Crag (Water body ID: GB40501G400600) which has an overall and chemical rating of poor.

2.5.3 The surface soil leaching class for the site is considered low with an infiltration value ranging between 40- 70%.

2.5.4 In respect of the local hydrology, there are no surface water features on site. The closest water feature to the site is a moat approximately 30m to the north-east. These features are associated with the catchment of the Chickering Beck (Water body ID: GB105034045690).

2.5.5 The site is situated within Flood Zone 1 and the highest risk of flooding is noted as negligible. Groundwater flooding risk is also noted as low. There have been no recorded historical flooding events within 250m of the site.

2.5.6 Information on groundwater, surface water and potable abstractions within 250m of the site are outlined in

2.5.7

2.5.8

2.5.9 *Table 5* below.

*Table 5: Abstractions*

Abstraction	Distance (m)	Related to
Groundwater	n/a	None recorded within 250m of the site.
Surface Water		
Potable Water		

## 2.6 Industrial Land Use, Waste and Landfill

2.6.1 Records for industrial land uses, waste and landfills on site and within 250m of the site are presented below in **Table 6**.

*Table 6: Potentially Contaminative Sources*

Source	Distance (m)	Related to
<b>Industrial Land Use</b>		
Current Industrial Land Use	n/a	None recorded within 250m of the site.
Historical Industrial Land Use		
Historical Tanks	On site	Unspecified tanks (2 records).
Historical Energy Features	n/a	None recorded within 250m of the site.
Historical Petrol Stations		
Historical Garages		
Historical Military Land		
<b>Waste and Landfill</b>		
Active or Recent Landfill	n/a	None recorded within 250m of the site.
Historical Landfills		
Historical Waste Sites		
Licensed Waste Sites		
Waste Exemptions	6m north-east	Storing, disposing of, treating, and using waste on a farm. Ref: WEX281991. No site listed.
	229m south-east	Storing, disposing of, treating, and using agricultural waste. Ref: EPR/EH0273VM/A001. Site: The Hall, Hall Road, Eye, Suffolk, IP23 7LJ
	234m south-east	Storing, disposing of, treating, and using waste on a farm.

Table 6: Potentially Contaminative Sources

Source	Distance (m)	Related to
		Ref: WEX108195 Site: Bedingfield Hall, Bedingfield, Eye, IP23 7LJ

## 2.7 Licenced Activities, Permits and Incidents

2.7.1 Records for licenced activities, permits and incidents on site and within 250m of the site are presented below in **Table 7**.

Table 7: Licenced Activities, Permits and Incidents

Activity	Distance (m)	Related to
Historical Licenced Industrial Activities (IPC)	n/a	None recorded within 250m of the site.
Licenced Industrial Activities (Part A(1))		
Licenced Pollutant Release (Part A(2)/B)		
Radioactive Substance Authorisations		
Licenced Discharges to Controlled Waters		
Pollutant Release to Surface Waters (Red List)		
Pollutant Release to Public Sewer		
List 1/ List 2 Dangerous Substances		
Pollution Incidents		

## 2.8 Radon

2.8.1 The site is located in a lower probability Radon affected area. Therefore, as fewer than 1% of homes are above the action level for Radon, no radon protection measures are necessary in the construction of new buildings or residential dwellings.

## 2.9 Mineral Workings and Potentially Infilled Land

2.9.1 Records for mineral workings and potentially infilled land on site and within 250m of the site are presented below in **Table 8**.

Table 8: Mineral Working and Potentially Infilled Land

Feature	Distance (m)	Related to
Natural Cavities	n/a	None recorded within 250m of the site.
BritPits		
Surface Ground Workings	25- 28m north-east	Fish pond (3 records).



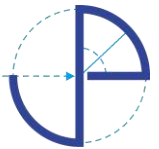


Table 8: Mineral Working and Potentially Infilled Land

Feature	Distance (m)	Related to
	91m south-east	Pond.
Underground Workings	n/a	None recorded within 250m of the site.
Historical Mineral Planning Areas		
Non-coal Mining		
Mining Cavities		
Johnson Poole and Bloomer Mining Areas		
Coal Mining		
Brine Areas		
Gypsum Areas		
Tin Mining		
Clay Mining		

## 2.10 Railway Infrastructure and Projects

2.10.1 Records for railway infrastructure and projects on site and within 250m of the site are presented below in **Table 9**.

Table 9: Railway Infrastructure and Projects

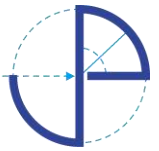
Feature	Distance (m)	Related to
Underground Railways (London)	n/a	None recorded within 250m of the site.
Underground Railways (Non-London)		
Railway Tunnels		
Historical Railway and Tunnel Features		
Active Railways		

## 2.11 Designations

2.11.1 Records for environmental, cultural and agricultural designations on site and within 250m of the site are presented below in **Table 10**.

Table 10: Environmental, Cultural and Agricultural Designations

Designations	Distance (m)	Related to
Environmental	On site	Sandlings and Chelmsford Nitrate Vulnerable Zone (NVZ) - Groundwater.
	On Site	Deben NVZ - Surface water.



	On site	Site of Special Scientific Interest (SSSI) Impact Zone.
	21m north	Waveney NVZ - Surface water.
Visual and Cultural	74m north	Listed building - Fleming's Hall, grade II.
Agricultural	On site	Grade 3: Good to moderate quality agricultural land.

## 2.12 Planning Portal

2.12.1 A search was made on Mid Suffolk District Council's planning portal. This was done to further explore the evolution of the site and any available information related to nearby sites. The search identified no applications within the vicinity of the site.

## 3 CONCEPTUAL SITE MODEL

### 3.1 Introduction

3.1.1 The "conceptual site model" is a simplified representation of the ground conditions that exist on site, which is subsequently used to assess the potential risk to human and environmental receptors. According to the Land Contamination Risk Management (LCRM) guidance, "A conceptual site model is a representation of the characteristics of the site. It shows the possible relationships between contaminants, pathways and receptors".

3.1.2 Although the model is formulated during the initial phase of the investigation it is subject to change, as new information comes to light, and our understanding of the site improves. It is central to the risk assessment process and therefore must consider all potential relationships and interactions.

3.1.3 There are four key aspects to the model, these are:

Table 11: Conceptual Site Model Key Aspects

<b>Source(s)</b>	These can include current or historic activities taking place either on or adjacent to the site, which may have had a negative impact on surface or sub-surface soils, or groundwater.
<b>Pathway(s)</b>	This is the route by which contaminants travel / migrate between their source and any available receptor.
<b>Receptor(s)</b>	These are varied and can include human or non-human organisms and eco-systems; controlled waters such as groundwater or surface water bodies; and structures or individual construction materials.
<b>Pollutant linkage(s)</b>	These exist where all three of the previous elements are present, indicating that the "link" between an identified source and a potential receptor via a pathway.

### 3.2 Potential Sources of Contamination

3.2.1 Records for potential sources of contamination on site and within 250m of the site are presented below in **Table 12**.

Table 12: Summary of Potential Sources of Contamination

On-Site	Description
Current Land Use and Activities	Storage of oil and chemical containers and machinery, possible ACMs, evidence of fuel leaks and Made Ground identified during the site walkover.
Historical Land Use and Activities	Unspecified tanks (agricultural use).
Off-Site	Description
Current Land Use and Activities	Unspecified tanks and waste exemptions
Historical Land Use and Activities	Unspecified tanks, infilled ponds and waste exemptions

### 3.3 Potential Contaminant Pathways

Table 13: Identified Potential Pathways

Pathway
Inhalation - Potential inhalation of contaminants in dust/ fibrous form.
Ingestion - Future site users could ingest small quantities of soil derived dust originating from soft landscaped areas or disturbed ground.
Dermal absorption - Contaminants present within surface or sub-surface soils/ fill material can enter the human body through the skin or via open wounds.
Buried services - If elevated levels of petroleum hydrocarbons are present within surface/ subsurface soils, then 'plastic' drinking water pipe can become compromised.
Migration/ Leaching - Potential for migration of contaminants through soil/ groundwater.

### 3.4 Potential Contaminant Receptors

Table 14: Identified Potential Receptors

Receptor
Future site users - Future site users could be affected by contaminants in the soil, entering the mains water system or ground gas entering the building.
Construction workers - Workers involved with future site clearance and preparatory work will be exposed to contaminants present within on-site soil, should they exist.
Buildings and Infrastructure - Modern construction techniques can cause accumulations of gas, if gas is able to accumulate within new, or converted, buildings there is potential for an explosion.
Buried services - Plastic drinking water pipes are vulnerable to petroleum hydrocarbons.
On-site soil - Particularly close to the surface, may have been impacted by historic activities.

### 3.5 Plausible Pollutant Linkages

- 3.5.1 Using the ‘source – pathway – receptor’ tables above, potential pollutant linkages are identified. An assessment of the likely significance of each linkage is then considered, which would include; the possible extent and mobility of the source; the sensitivity of the receptor and the type of migration/ exposure pathways.
- 3.5.2 An assessment of the probability and the magnitude of potential risk is presented below to give a valuation of each potential pollutant linkage identified and their significance.
- 3.5.3 This assessment is undertaken based on the current proposal for the site at the time of issuing this report, which is to demolish an existing agricultural barn and convert a second barn into a residential dwelling, with associated access and gardens.
- 3.5.4 This qualitative risk assessment has been undertaken in accordance with CIRIA C552: Contaminated Land Risk Assessment, A Guide to Good Practice (Rudland et al., 2001).
- 3.5.5 The level of potential risk ascribed to each linkage is based on the following criteria:

Table 15: Risk Classification

Risk Classification	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate risk	It is possible that without appropriate remedial action harm could arise to a designated receptor but it is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard but is likely that, at worst, this harm if realised would normally be mild.
Negligible risk	The presence of an identified hazard does not give rise to the potential to cause significant harm to a designated receptor.

- 3.5.6 The following potential pollutant linkages have been identified and are outlined within **Table 16** below:

Table 16: Risk Assessment

Assessment	Comments	Risk Characterisation
<b>Source</b>		
Potential for on-site pollutants	The earliest available historic mapping (1884) shows the site to be occupied by two connected buildings. A complex of nearby buildings is located on the opposite side of Hall Road, to the north, and many	Moderate to high

Table 16: Risk Assessment

Assessment	Comments	Risk Characterisation
	ponds are shown within 250m of the site boundary. Additional buildings are shown from 1978 onwards, both on site and adjacent to the site to the south-east and south-west. Many of the ponds are shown to be infilled at this time. Made Ground was also identified during the site walkover, as well as several items stored on site, including oil and chemical containers, machinery, possible ACMs, and evidence of fuel leaks. All of which may be a source of potential contaminants. Additionally, the infilled ponds located within 250m of the site boundary may be sources of ground gas.	
<b>Pathway</b>		
Potential for pollutants to migrate on-site	Superficial deposits of the Lowestoft Formation underlying the site have a low to moderate permeability. The underlying bedrock geology of the Crag Group is a principal aquifer and has a high permeability.	Low to moderate
Potential for pollutants to migrate off-site	Superficial deposits of the Lowestoft Formation underlying the site have a low to moderate permeability. The underlying bedrock geology of the Crag Group is a principal aquifer and has a high permeability.	Low to moderate
<b>Receptor</b>		
Environmental risk to human health	The proposed development will lead to an increase in the number of people occupying the site. The presence of suspected asbestos containing materials, evidence of fuel leaks, identified Made Ground, storage of oil and chemical containers and machinery, and nearby infilled ponds have all been identified as potential sources of contamination. A Stage I / Tier II Ground Investigation is recommended to determine the risk of ground gas from the nearby infilled ponds to future site users, and refine the risk from other contaminants related to the other potential sources.	Moderate to high
Environmental risk to controlled waters	The site is located within Source Protection Zone 3 (Total Catchment) and is underlain by superficial deposits with a low to moderate permeability.	Moderate

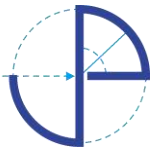


Table 16: Risk Assessment

Assessment	Comments	Risk Characterisation
Environmental risk to Biota	Landscaping is expected on site, due to the removal of Made Ground.	Low to moderate
Hazards to buildings – excluding ground gas	There are several infilled ponds within 250m of the site boundary. The site walkover identified several areas of Made Ground, which may provide additional potential sources of contamination.	Low to moderate
<b>Litigation</b>		
Environmental litigation (Part IIA)	Part IIA only applies to land with chemical contamination, where the contaminants pose an unacceptable risk to human health or the wider environment. While the desk-based study has identified several potential sources of contamination on site, these will likely be addressed by the planning regime	Low
Owner liability	Potential liability issues have been identified but likely to be addressed by the planning regime. A Stage I / Tier II Ground Investigation is recommended to clarify this risk.	Moderate to high
<b>Development Implications</b>		
Potential for soil remediation	Soil remediation may be required due to the identified potential sources and presence of Made Ground on site. A Stage I / Tier II Ground Investigation is recommended to clarify this risk.	Moderate
Potential for groundwater remediation	Groundwater remediation may be required due to the identified on site potential sources of contamination. A Stage I / Tier II Ground Investigation is recommended to clarify this risk.	Low to moderate
Potential for gas protection measures	Potential sources of contamination have been identified from the nearby infilled ponds (between 10m and 230m) and Made Ground. A Tier I / Stage II Ground Investigation is recommended.	Low to moderate
Special requirements for water supply pipes	Specialist pipework may be required due to the potential for contamination. A Stage I / Tier II Ground Investigation is recommended to clarify this risk.	Low to moderate
Potential limitations on foundation design	Concrete selection may be affected by potential for chemical attack. Ground investigation required to clarify potential risks and to ascertain underlying soil strength for foundation design.	Low to moderate

Table 16: Risk Assessment

Assessment	Comments	Risk Characterisation
Risk of encountering materials classed as hazardous waste	On site soils and localised Made Ground are unlikely to be classed as hazardous waste, although a ground investigation will clarify this risk.	Low



## 4 CONCLUSIONS AND RECOMMENDATIONS

4.1.1 Based on the information obtained and reviewed as part of this preliminary assessment, JPC Environmental Services would advise the following:

- We would recommend that a Stage I / Tier II Ground Investigation is undertaken across the development site. The investigation should comprise boreholes drilled using a dynamic sampling rig to a maximum depth of 5.00mbgl to determine the extent of Made Ground, whilst allowing the retrieval of selected soil samples for off-site laboratory analysis. We would recommend the following geochemical analysis:
  - CLEA metals;
  - Polycyclic Aromatic Hydrocarbons (including TPH CWG);
  - Petroleum Hydrocarbons;
  - Pesticides and herbicides;
  - pH; and
  - asbestos ID.
  
- We would also recommend a minimum of three combined ground gas and groundwater monitoring wells are installed during the investigation. This would enable a ground gas assessment to be completed, which would determine whether there is a risk to future site users from the nearby infilled pond. Groundwater monitoring should also be undertaken.

## 5 REFERENCES

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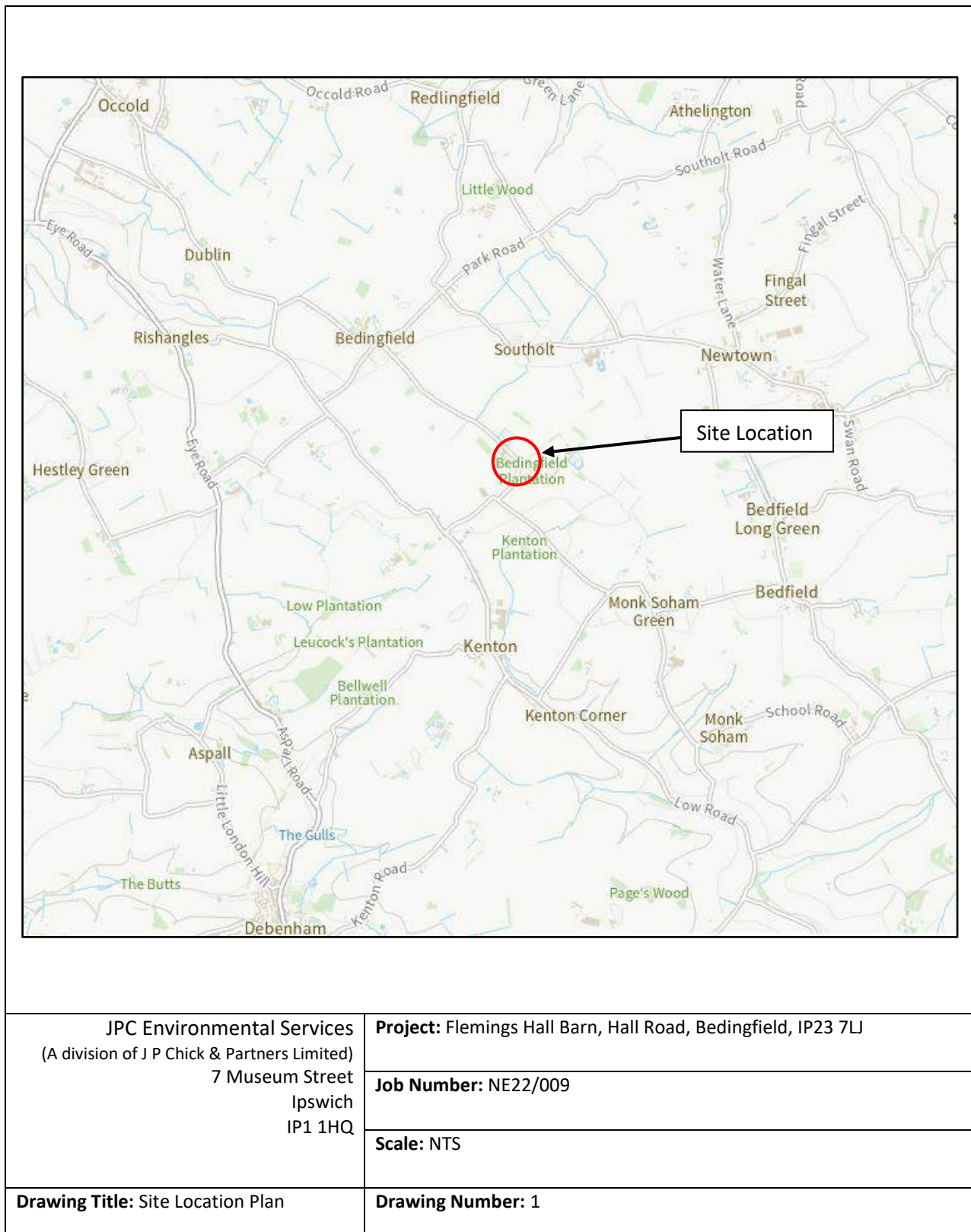


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# APPENDIX



## Appendix A - Site Location Plan





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## Appendix B - Site Photographs























