



e3p

Phase I Geoenvironmental Site Assessment
Plot 3, Pilsworth Road, South Heywood

Reference: 11-697-R11-2
Date: November 2022



PHASE I GEOENVIRONMENTAL SITE ASSESSMENT

Plot 3
Pilsworth Road
South Heywood
OL10 2TT

Prepared for:
Russells South Heywood (Commercial) Limited



Report Ref: 11-697-R11-2
Date Issued: November 2022

Plot 3, South Heywood

Phase I Geoenvironmental Site Assessment

November 2022

E3P

Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

+ 44 (0) 161 707 9612
<https://e3p.co.uk>

Registered in England
CRN: 08725262

QUALITY ASSURANCE

PROJECT NUMBER	11-697		
VERSION	Version 1	Version 2	
REMARKS	Issue 1	Issue 2	
DATE	21 st October 2022	8 th November 2022	
PREPARED BY	N Sellars	N Sellars	
QUALIFICATIONS	MSci (Hons), FGS, MEnvSc	MSci (Hons), FGS, MEnvSc	
CHECKED BY	A Edgar	A Edgar	
QUALIFICATIONS	BSc, MSc, PIEMA, MEnvSc, CEnv	BSc, MSc, PIEMA, MEnvSc, CEnv	
AUTHORISED BY	A Edgar	A Edgar	
QUALIFICATIONS	BSc, MSc, PIEMA, MEnvSc, CEnv	BSc, MSc, PIEMA, MEnvSc, CEnv	

EXECUTIVE SUMMARY

Site Address	Land off Pilsworth Road, Heywood, OL10 2TT	
Grid Reference	E 384080, N 409169	
Site Area	9.5 Ha	
Proposed Development	Russells South Heywood (Commercial) Limited are submitting an outline planning application for 40,000 sqm of B8 Employment floorspace within the approved Red Line boundary of Hybrid Planning Permission.	
Current Site Use	The site comprises undeveloped agricultural land used for arable farming. The site is split into three parcels by hedgerows. Mature trees are present to the north of the central field boundary. Brightley Brook flows to the west across the north-western sector. A stream is also present along the southern boundary of the site. There is a gentle slope from circa 117 m AOD in the south to 112 m AOD in the north. Ditches are present in the location of the surface watercourses.	
Site History	The site has remained as undeveloped agricultural land since the earliest historical mapping dated 1851. No significant changes have occurred.	
Environmental Setting	Drift Geology	Glacial Till – CLAY, SAND, GRAVEL Head (Northwest) – CLAY, SILT, SAND, GRAVEL Glaciofluvial Sheet Deposits (Southeast) – SAND and GRAVEL
	Bedrock Geology	Pennine Lower Coal Measures (East) – MUDSTONE, SILTSTONE, SANDSTONE Helpet Edge Rock (Centre/Southeast) – SANDSTONE Rough Rock (West) – SANDSTONE Rossendale Formation (Southwest/south) – MUDSTONE & SILTSTONE
	Faults	A fault is recorded trending northwest to southeast through the centre of the site with the downthrow to the northeast.
	Hydrogeology	Secondary Undifferentiated aquifer (drift) overlying a secondary A bedrock aquifer. There are no groundwater abstractions within 1km.
	Hydrology	Brightley Brook flows to the west across the north-western sector. A stream is also present along the southern boundary of the site.
	Flood Risk	Unaffected by flooding from rivers.
Utility Locations	A formal drainage survey has not been completed, however utility connections are likely to be available associated with the commercial development to the north.	
Landfill Sites and Ground Gases	An authorised landfill site known as Pilsworth South Landfill is located 410 m west, this is for waste landfilling (excluding inert waste) and the license was issued on 20/10/2020. The closest historical landfill is Pilsworth Sand Pit Phase A located 1 km northwest.	
Radon	The site is unaffected.	



Coal Mining/Land Stability	The southern sector of the site is located within a Development High Risk Area. Two conjectured coal sub-crops are recorded dipping to the south and probable unrecorded shallow workings are recorded. A fault is located in the centre of the site trending northwest to southeast. Based on the above, a high risk of unrecorded coal mining at shallow depth has been identified in the Sand Rock and Six Inch seams in the south of the site. The CA, as a statutory consultee, will require detailed ground investigation across the site to determine the presence of any coal on-site and to understand the nature of any coal workings.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of a commercial development have been identified within influencing distance of the subject site.
Initial Conceptual Site Model	Contaminant Sources Due to the largely undeveloped nature of the site, there are limited potential sources of contamination identified. Localised Made Ground associated with tracks and footpaths may be a localised potential source of heavy metals PAHs and ACM. Arable farming is also a potential source of pesticides and herbicides. Localised Made Ground, organic deposits and coal measures are potential sources of hazardous ground gas. Off-site sources of hazardous ground gas include the former sandstone quarries. Pathways The main pathways based on the identified potential contaminants are direct contact and ingestion, dust inhalation and indoor gas accumulation. Receptors Significant on-site sources of potentially mobile contaminants are not anticipated at the subject site and based on a commercial end use, there is not considered a significant risk to future end users. The site is likely to be underlain by clay soils which will likely limit the lateral migration of any mobile contaminants to on-site surface watercourses and vertical migration towards the underlying secondary A aquifer in the bedrock.
Recommendations	It is recommended that an intrusive geo-environmental ground investigation be completed to confirm the conceptual site models and to determine the potential risk associated with shallow mine workings.



Table of Contents

EXECUTIVE SUMMARY	1
1. INTRODUCTION	5
1.1. Background	5
1.2. Proposed Development.....	5
1.3. Objectives	5
1.4. Sources of Information	5
1.5. Limitations	6
1.6. Confidentiality	6
1.7. Risk Classification	6
2. SITE SETTING	7
2.1. Site Details	7
2.2. Current Site Use	7
2.3. Surrounding Area	8
3. SITE HISTORY	9
3.1. On-Site Historical Development.....	9
3.2. Off-Site Historical Development	11
3.3. Planning History	11
3.4. Previous Reports	11
4. ENVIRONMENTAL SETTING.....	12
4.1. Geology and Hydrogeology	12
4.2. Natural Landform and Geomorphology	13
4.3. Geotechnical Data	13
4.4. Coal Mining	13
4.5. Coal Mining Information	14
4.5.1. Coal Authority Plan	16
4.5.2. Coal Mining Geology.....	17
4.6. Preliminary Mine Gas Assessment	17
4.7. Coal Mining Risk Assessment	18
4.8. Brine Workings.....	19
4.9. Radon Risk Potential	19
4.10. Preliminary Geotechnical Assessment	20
4.11. Hydrology	20
4.12. Industrial Land Uses.....	21
4.13. Sensitive Land Uses	21
4.14. Site Sensitivity Assessment.....	21
5. REGULATORY DATA	23
5.1. Landfill Sites and Waste Treatment Sites	23
5.2. Regulatory Database	23
5.1. Unexploded Ordnance	23
6. INITIAL CONCEPTUAL SITE MODEL.....	25
7. CONCLUSIONS AND RECOMMENDATIONS.....	29
7.1. Site Summary.....	29
7.2. Contaminated Land Assessment	29
7.3. Coal Mining	30
7.4. Geotechnical Assessment	30



APPENDIX I LIMITATIONS.....	31
APPENDIX II GLOSSARY	33
APPENDIX III DRAWINGS	36
APPENDIX IV HISTORICAL MAPS	38
APPENDIX V COAL AUTHORITY REPORT	39

DRAWING LIST

11-697-001 – Site Location Plan
11-697-003 – Historical Features Plan
11-697-004 – Site Features Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P Ltd has been commissioned by Russells South Heywood (Commercial) Limited to undertake a Phase I Geoenvironmental Site Assessment at land off Pilsworth Road in South Heywood.

This report is required to determine potential contaminated land liabilities and geotechnical constraints as part of a proposed commercial development.

1.2. PROPOSED DEVELOPMENT

Russells South Heywood (Commercial) Limited are submitting an outline planning application for 40,000 sqm of B8 Employment floorspace within the approved Red Line boundary of Hybrid Planning Permission.

1.3. OBJECTIVES

The objectives of the geoenvironmental investigation are as follows:

- ✳ Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a desk study in line with Environment Agency (EA) document Land Contamination: Risk Management (LC:RM) (2019)
- ✳ Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors.
- ✳ Assess the desk-study information and, where possible, provide preliminary recommendations in relation to foundations, pavement construction and floor slabs.
- ✳ Provide recommendations regarding future works required and undertake a preliminary pre-construction cost appraisal.

1.4. SOURCES OF INFORMATION

Background information was sought from the following sources:

- ✳ Envirocheck Search;
- ✳ Historical mapping dated 1851 to 2016. A selection of historical maps are reproduced in Appendix V;
- ✳ On-line planning records held by Rochdale Metropolitan Borough Council;
- ✳ Magic Map Groundwater Vulnerability Map;
- ✳ Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2007);
- ✳ British Geological Survey Map;
- ✳ Groundsure IO database;
- ✳ <https://zeticauxo.com/downloads-and-resources/risk-maps/>; and,



 <https://flood-map-for-planning.service.gov.uk>.

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.

1.7. RISK CLASSIFICATION

E3P has utilised the available data to classify the site on the basis of its likely contaminated land liability and potential for geotechnical constraints in relation to the site development. The risk classification definitions are summarised in Table 1.1.

TABLE 1.1 RISK CLASSIFICATION

RISK	DEFINITION
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the site.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the site will likely require further site investigation.
Moderate High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.



2. SITE SETTING

2.1. SITE DETAILS

Site Address	Land off Pilsworth Road, Heywood, OL10 2TT
National Grid Reference	E 384080, N 409169
Site Area	9.5 Ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 11-697-001.

2.2. CURRENT SITE USE

E3P has undertaken a site walkover of the entire site and a description of the key findings is summarised in Table 2.1.

TABLE 2.1 SITE DESCRIPTION

Occupancy/Use	The site comprises undeveloped agricultural land used for arable farming. The site is split into three parcels by hedgerows. Mature trees are present to the north of the central field boundary. Brightley Brook flows to the west across the north-western sector. A stream is also present along the southern boundary of the site. There is little variance in topography, with a gentle slope down to Pilsworth Road to the north. Ditches are present in the location of the surface watercourses.	
Surface Cover (%)	Buildings	0%
	Hardstand	0%
	Soft Cover	100%
Structures	No structures have been identified within the site boundary.	
Access	Open access is available from Pilsworth Road.	
Slope	There is a gentle slope from circa 117 m AOD in the south to 112 m AOD in the north. Ditches are present in the location of the surface watercourses.	
Retaining Structures	No retaining structures are present.	
Vegetation/Ecology	The site is used for arable farming. Hedgerows are present along field boundaries and mature trees are present in the north of the site, to the north of the central field boundary. A habitat survey may be required to support the planning application.	
Hazardous Material Storage	No above-ground storage tanks (ASTs) or underground storage tanks (USTs) were observed at the site. Due to the previously undeveloped nature of the site, it is unlikely that hazardous materials storage will have occurred on the site.	



Asbestos-Containing Material (ACM)	Asbestos may be present in any localised areas of Made Ground, however this is considered unlikely.
Polychlorinated Biphenyls (PCBs)	There is no equipment identified that may contain PCBs within the site boundary or in close proximity.
Waste Storage	Potentially hazardous waste streams are unlikely to be generated at the site.
Drainage	A formal drainage survey has not been completed; however, utility connections are likely to be available associated with the commercial development to the north.

2.3. SURROUNDING AREA

The surrounding area land uses are summarised in Table 2.2.

TABLE 2.2 SURROUNDING LAND USES

DIRECTION	LAND USE
North	Commercial units.
East	Agricultural land.
South	Agricultural land.
West	Agricultural land, Pilsworth Fishery.



3. SITE HISTORY

3.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 3.1. In addition, historical site features are presented on Drawing No 11-697-003 in Appendix III.

TABLE 3.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1851 1:10,560	The site is undeveloped agricultural land split into three parcels. A track is recorded through the central northern sector. A culvert is present in the north of the site and a stream is present along the southern site boundary.	
1910 1:10,560	There are no significant changes. A footpath is shown beyond the eastern boundary. The culvert in the north is shown to flow to the west.	
1974 1:10,000	There are no significant changes.	



MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1999 1:10,000	There are no significant changes. A ditch is shown in the location of the culvert in the north.	 A historical map excerpt from 1999 at a scale of 1:10,000. It shows a red boundary enclosing a plot of land. Inside the plot, there is a blue line representing a ditch or culvert running from the north towards the center. To the right of the plot, a dashed line is labeled 'Path'. The map also shows surrounding roads and other land parcels.
2000 Google Earth Aerial Imagery	There are no significant changes. The culvert in the north is recorded as Brightley Brook.	 Aerial imagery from 2000 showing the site. A red boundary outlines the plot. In the northern part of the plot, a small stream is visible, labeled 'Brightley Brook'. The surrounding area includes fields and some buildings.
2022 Google Earth Aerial Imagery	There are no significant changes.	 Aerial imagery from 2022 showing the site. A red boundary outlines the plot. The landscape is similar to the 2000 imagery, with a stream labeled 'Brightley Brook' in the northern part. The surrounding area shows more developed land with buildings and roads.



3.2. OFF-SITE HISTORICAL DEVELOPMENT

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 250 m radius of the site is summarised in Table 3.2.

TABLE 3.2 SURROUNDING HISTORICAL DEVELOPMENT

SURROUNDING FEATURE	DISTANCE	DATES	DIRECTION
Commercial Development	40 m	Pre 1974–Present	North
Old Sandstone Quarry Then: no longer named Then: no longer recorded	85 m	Pre 1851–Pre 1894 Pre 1894–Pre 2016 Pre 2016–Present	Southwest
Old Sandstone Quarry Then: no longer recorded	155 m	Pre 1851–Pre 1894 Pre 1894–Present	Southeast

3.3. PLANNING HISTORY

The Site sits within the Red Line of Hybrid Planning Permission 16/01399/HYBR which was approved in 2019.

3.4. PREVIOUS REPORTS

The following report was previously completed for the wider development area:

-  E3P – Phase I Geoenvironmental Site Assessment (Ref: 11-094-R1, November 2016).



4. ENVIRONMENTAL SETTING

4.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map (Sheet 85) for the site, (1:50,000, Solid and Drift editions) and online records indicate the site is underlain by the geological sequence presented in Table 4.1.

TABLE 4.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	Glacial Till	SAND, CLAY and GRAVEL	Secondary undifferentiated
	Head (Northwest)	CLAY, SILT, SAND, GRAVEL	
	Glaciofluvial Sheet Deposits (Southeast)	SAND & GRAVEL	
Solid	Pennine Lower Coal Measures Formation (East)	MUDSTONE, SILTSTONE, SANDSTONE	Secondary A aquifer
	Helpet Edge Rock (Centre/Southeast)	SANDSTONE	
	Rough Rock (West)	SANDSTONE	
	Rossendale Formation (Southwest/south)	MUDSTONE & SILTSTONE	

A summary of nearby BGS borehole records is included in Table 4.2.

TABLE 4.2 SUMMARY OF BGS BOREHOLE RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
60 m N SD80NW389	9.00 m	Topsoil and clay fill 0.70 m	Soft brown sandy CLAY with gravel and sandstone fragments 0.70 – 5.40 m Stiff light grey brown friable CLAY 5.40 – 7.30 m	Hard dark grey SHALE 7.30 – 9.00 m

A fault is recorded trending northwest to southeast through the centre of the site with the downthrow to the northeast.

The Envirocheck report indicates that the site is not located within a groundwater source protection zone. Furthermore, there are no groundwater/potable abstractions within 1 km of the site.

Based on the local topography, the location of surface watercourses and the presence of several drainage ditches and streams within the site boundary, it is considered likely that shallow groundwater, if present, will flow in a northerly direction, following the topographical gradient towards Brightly Brook in the northwest.



4.2. NATURAL LANDFORM AND GEOMORPHOLOGY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological assessment of the landform and its possible mechanism for formation.

Brighley Brook flows to the west across the north-western sector. A stream is also present along the southern boundary of the site.

A review of relevant records indicates that the site has not been subject to significant anthropogenic changes with the current site topography broadly representing the natural landform.

4.3. GEOTECHNICAL DATA

Geotechnical data presented within a commercially available environmental database is summarised in Table 4.3.

TABLE 4.3 SUMMARY OF GEOTECHNICAL DATA

HAZARD	DESIGNATION
Shrink-Swell Clay	No hazard to very low risk
Landslides	Very low risk
Ground Dissolution	No hazard
Compressible Ground	No hazard to very low risk
Collapsible Deposits	Very low risk
Running Sand	Very low to low risk

4.4. COAL MINING

The Envirocheck report states the site is in an area that may be affected by coal mining.

A CA mining report was obtained (Ref: 51003319325001) dated 19th October 2022.

The CA operates a risk-based approach to the assessment of potential instability issues associated with future development of land located within the predefined CA consultation areas. This risk-based approach subdivides the potential risk into “low” and “high” risk categories.

The risk categories can be defined as:

Low-Risk Sites – Deemed to be land where coal mining has taken place, however, it was at such depth not to pose a risk to new development and it, therefore, contains no known recorded risks and as such no further assessment is required.

For low-risk sites, the CA categorically states:

If your proposed development is within the Development Low Risk Area there is no need for you to submit any coal mining information with your planning application and The Coal Authority will not be consulted by the LPA. The LPA will include our Standing Advice as an informative note within the decision notice.



High-Risk Sites – Deemed to be landholdings located within an area known to contain legacy risks that include:

- ✿ Mine entries (shaft or adit);
- ✿ Shallow coal workings (recorded and probable);
- ✿ Workable coal seam outcrops;
- ✿ Mine gas sites and areas;
- ✿ Recorded coal-mining-related hazards;
- ✿ Geological features (fissures and break lines); and
- ✿ Former surface mining sites (sometimes using historic opencast extraction methods).

4.5. COAL MINING INFORMATION

Prior to the enactment of the Coal Mines Regulation Act (1872), which came into force on the 1st January 1883, there was no statutory requirement to record the extent of abandoned mine workings and as such the CA has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth that could result in a subsidence event in the future (through successive cavitation) associated with failure of support mechanism.

To determine if a site may have unrecorded or recorded coal mine workings requires the consideration of a wide range of information and E3P has completed a review of relevant information in relation to potential coal mining activities.

In the first instance, E3P has reviewed the Coal Authority Online Viewer and an excerpt of this is presented as Figure 4.1. The south of the site lies within a development high risk area. The map shows two coal outcrops in the south of the site with probable shallow workings to the south of the outcrops. A mine entry is present at Coal Pit Farm circa 300 m west of the site.



FIGURE 4.1 EXCERPT OF THE COAL AUTHORITY ONLINE VIEWER



Table 4.4 provides a summary of pertinent coal mining information.

TABLE 4.4 COAL MINING INFORMATION

SOURCES OF INFORMATION	SUMMARY					
Known Past Underground Mining	No past mining recorded.					
Probable Unrecorded workings	Yes.					
Spine Roadways at Shallow Depth	None recorded.					
Mine Entries within 100m of the site	None within 100 m.					
Mine Abandonment plans	Yes.					
Known outcrops	Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
	SAND ROCK	Coal	Yes	Within	N/A	94
	SAND ROCK	Coal	Yes	Within	N/A	104
	SIX INCH	Coal	Yes	Within	N/A	23
	SIX INCH	Coal	Yes	Within	N/A	109
	SIX INCH	Coal	Yes	Within	N/A	111
	SIX INCH	Coal	Yes	Within	N/A	111



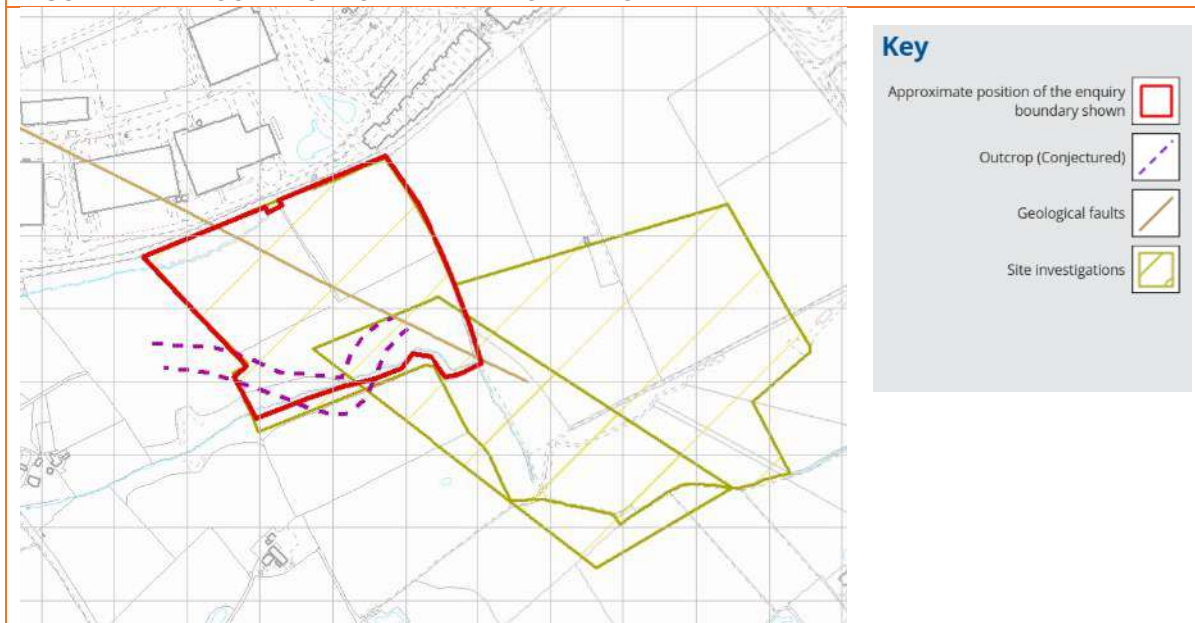
SOURCES OF INFORMATION	SUMMARY
Faults / Fissures	A fault is recorded through the centre of the site.
Opencast mines	None recorded within 500 m.
Coal Authority Managed Tips	None recorded within 500 m.
Remediated Sites	None recorded within 50 m.
Coal Mining Subsidence	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
Mine Gas	None recorded within 500 m.
Mine Water	None recorded within 500 m.
Future Underground Mining	None recorded.
British Geological Survey Mapping	The 6 inch plan for the site shows a crop of coal in the south of the site dipping at between 5–10 degrees to the south.
Historical Ordnance Survey Mapping	A review of the 1:10,000 Ordnance Survey mapping from circa 1850, which has records of mine workings that predate the Mining & Regulation Act of 1872, identified the following features indicative of historical mine workings in proximity to the application site:  Old Coal Pits – 320 m W. In consideration of the historical mining features in proximity to the site and the potential for coal close to the surface, it is considered possible that coal extraction has occurred, underlying the site at relatively shallow depths; further investigation would be required to determine the extent and depth of any worked seams.
Historical Site Investigations	E3P has not been provided with any historic site investigation reports.

4.5.1. COAL AUTHORITY PLAN

The Coal Authority plan referenced: MR-LARGE-PLOT-51003319325001-1666177826910 (Figure 4.2) shows the two coal conjectured outcrops (Sand Rock and Six Inch) in the south of the site and the fault through the centre of the site. Site investigations have been completed within the site boundary.



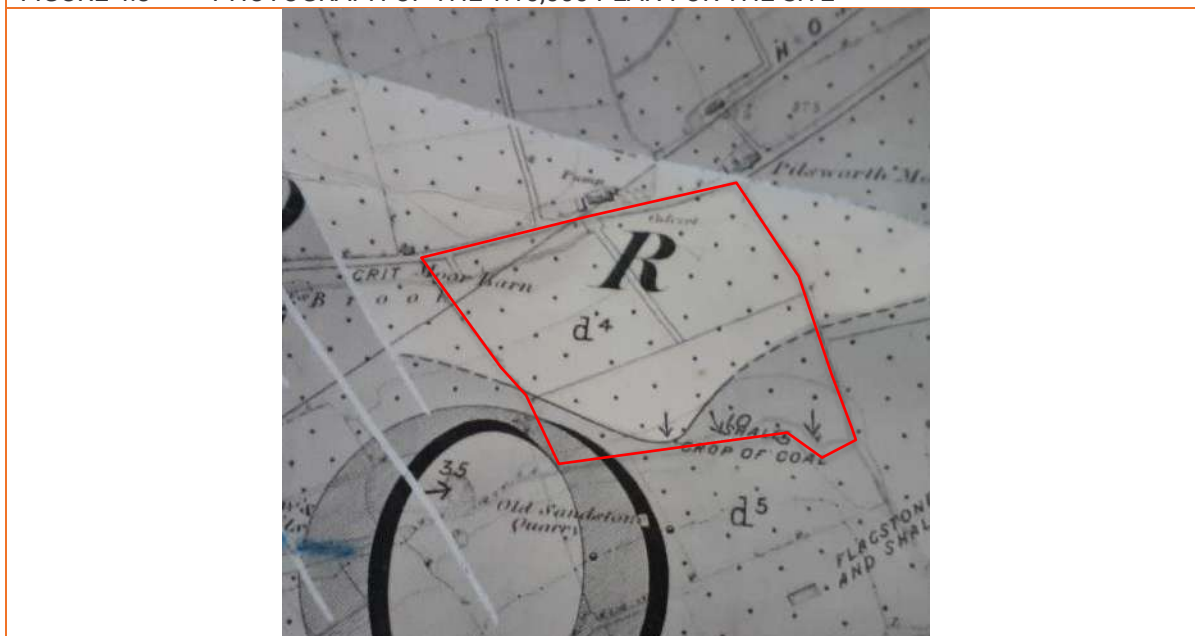
FIGURE 4.2 COAL AUTHORITY PLAN FOR THE SITE



4.5.2. COAL MINING GEOLOGY

Figure 4.3 is a photograph of the 6 inch geological map for the site which shows a crop of coal in the south of the site dipping at between 5–10 degrees to the south. The seam name is not given.

FIGURE 4.3 PHOTOGRAPH OF THE 1:10,000 PLAN FOR THE SITE



4.6. PRELIMINARY MINE GAS ASSESSMENT

If coal mining is present below the site, then this may be a potential source of ground gas that could pose a risk to site end users. A preliminary mine gas assessment is provided within Table 4.5.



TABLE 4.5 PRELIMINARY MINE GAS ASSESSMENT

SCENARIO	DISCUSSION	RATING
Are there known coal seams beneath the site?	Yes – coal seams are below the site.	Moderate
Are there coal seams within 150m of the top of bedrock?	Yes	High
Are there any known workings below the site?	No	Low
Are the underlying drift deposits impermeable?	Yes – the site is likely to be underlain by low permeability clay soils to depths in excess of 5.0 m.	Moderate
Are there any mine entrances within the site boundary or within 50m of the site?	No	Low
Are there any faults below the site or in close proximity?	Yes – there is a fault beneath the centre of the site.	High
Is there any records of mine gas emission on or within 50m of the site	No	Low
Is there any record of historical mine stabilisation works?	No	Low
Evidence of rising groundwater in flooded mine workings?	Not known	Moderate
OVERALL MINE GAS RISK (IF MODERATE/ HIGH THEN FURTHER ASSESSMENT IS REQUIRED)		Moderate
Conclusions:		
Source: Probable unrecorded shallow workings are present in the south of the site.		
Pathway: A fault is present below the site which could create a preferential pathway for mine gasses to reach the ground surface. The site is likely to be underlain by in excess of 5.0 m of low permeability clay therefore the likelihood of mine gas migration through the clay to the ground surface is low.		
Recommendations: Further assessment is required to assess the potential for mine gas to be migrating up faults to the ground surface.		

4.7. COAL MINING RISK ASSESSMENT

This risk assessment comprises a desk-based review of all available information on coal mining issues that are relevant to the application site deemed to be located within a high-risk area. This includes:



- ✿ Interpretation of information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- ✿ Setting out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- ✿ Demonstrating to the local planning authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

The coal mining risk assessment is summarised in Table 4.6.

TABLE 4.6 SUMMARY OF COAL MINING RISK ASSESSMENT

COAL MINING RISK ASSESSMENT	YES/NO	RISK ASSESSMENT
Recorded Underground Coal Mining at Shallow Depth (< 30 m)	No	Low
Recorded Underground Coal Mining at Shallow Depth (> 30 m)	No	Low
Evidence of Unrecorded Surface Extraction of Coal Outcrop	No	Low
Unrecorded Underground Coal Mining at Shallow Depth (< 30 m)	Yes	High
Mine Entries (Shaft/Adits)	No	Low
Coal Mining Geology – Fractures/Fissures	Yes	High
Recorded Gas Emissions	No	Low
Recorded Mining Surface Hazard	No	Low
Surface Mining (Opencast)	No	Very Low/Low

Based on the above, a high risk of unrecorded coal mining at shallow depth has been identified in the south of the site. The CA, as a statutory consultee, will require a ground investigation to determine the presence of any coal on-site and to understand the nature of any coal workings.

4.8. BRINE WORKINGS

The site is not affected by brine workings.

4.9. RADON RISK POTENTIAL

The Envirocheck report indicates the site is situated in an area where less than 1% of homes are above the “Action Level” and that the BGS reports that full radon protective measures are not necessary in the construction of new dwellings or extensions.



4.10. PRELIMINARY GEOTECHNICAL ASSESSMENT

Based on the desk-study information, the following geotechnical assessment has been made:

- ✚ Given the predominantly undeveloped nature of the site, it is likely there will be limited Made Ground fill deposits.
- ✚ Head deposits comprising clays and silts are present in the northwest of the site in the location of the brook. An investigation will be required in order to assess these and undertake in-situ geotechnical testing to determine the likely foundation solution for structures in this area.
- ✚ An element of earthworks will be required to create a level developable platform.
- ✚ The underlying superficial geology is likely to comprise a cohesive soil matrix and as such is unlikely to offer the required degree of permeability to make soak-away drainage viable in this instance.
- ✚ Clay strata may underly the site and therefore a volume change potential assessment will be required and given that the site is lined by mature and semi-mature trees and hedges, consideration of the potential water demand of trees affecting foundations should be considered.

4.11. HYDROLOGY

Surface water features within 250 m of the subject site are summarised in Table 4.7.

TABLE 4.7 SURFACE WATER FEATURES

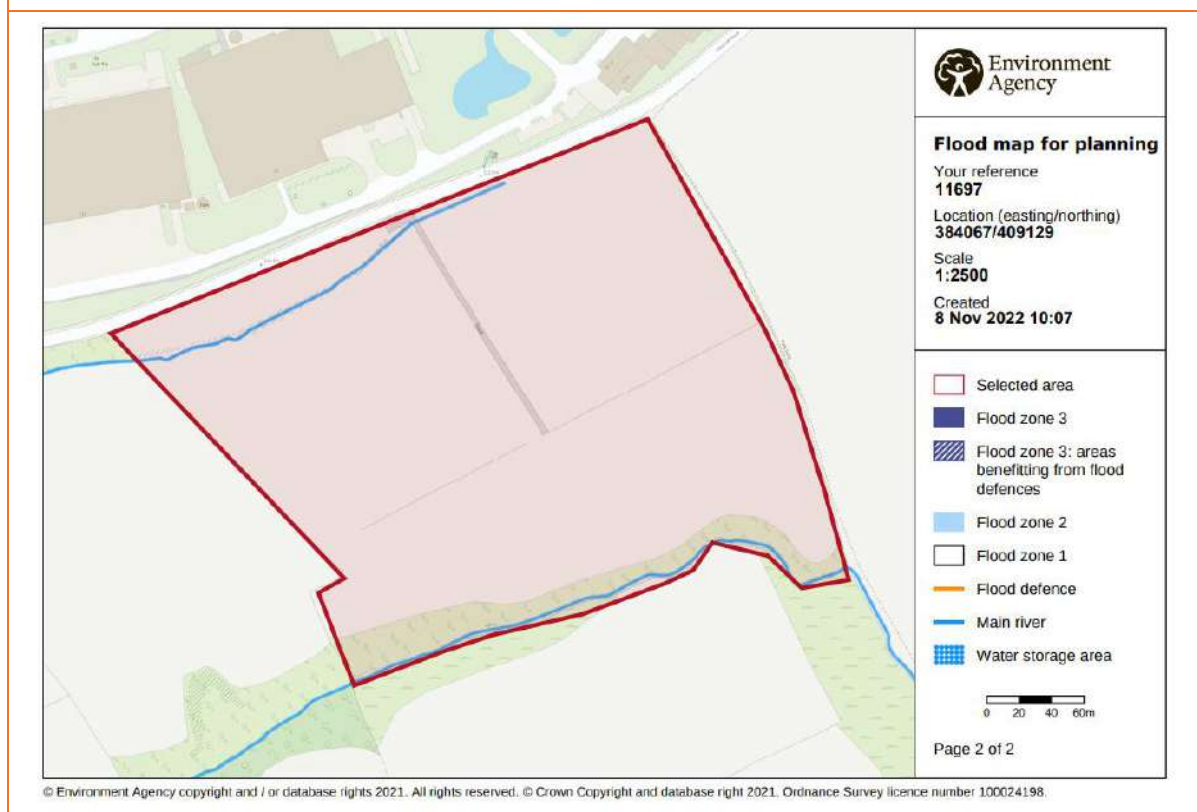
SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Brightley Brook	-	0 m	On-site
Stream/Tertiary River	-	0 m	On-site
Ponds	-	30 m	North

The site is located within a currently defined "Flood Risk Zone 1"; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding ($< 0.1\%$), and as such is considered to be unaffected by river flooding. The Environment Agency (EA) Flood Risk Map for the site is presented in Figure 4.4.

Brightley Brook and the stream in the south of the site are both mapped as Statutory Main Rivers, therefore a flood risk activity permit may be required if works are proposed within 8 m of the surface water courses. Both watercourses are shown to flow to the west.



FIGURE 4.4 EA FLOOD RISK MAP



Source - <https://flood-map-for-planning.service.gov.uk/>

4.12. INDUSTRIAL LAND USES

The closest active entry in the Trade Directory is a frozen food distribution company located circa 650 m east.

4.13. SENSITIVE LAND USES

The closest residential properties are located 250 m to the southwest. The site is surrounded by agricultural land to the east, west and south. The site is located within an area of adopted greenbelt. No other environmentally sensitive land uses have been identified within close proximity to the site.

4.14. SITE SENSITIVITY ASSESSMENT

The site is assessed to be located within a "Moderate" sensitivity setting as discussed within Table 4.8.

TABLE 4.8 SITE SENSITIVITY ASSESSMENT

SENSITIVITY PROFILE	DISCUSSION	RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected.	Low
Distance to the Closest Groundwater Abstraction Point	>1 km.	Low
Aquifer Classification in Superficial Drift Deposits	Secondary undifferentiated.	Low



SENSITIVITY PROFILE	DISCUSSION	RATING
Aquifer Classification in Bedrock	Secondary A aquifer.	High
Is the Site Underlain by Low-Permeability Drift to Depths in Excess of 10 m?	The closest BGS boreholes suggest that bedrock is present at depths of less than 10.00 m bgl. Drift deposits are likely to comprise low permeability clay soils.	Moderate
Is the Site Located Within 50 m of a Surface Watercourse?	Surface watercourses are located on-site.	High
Sensitive Land Uses	The site is located within an area of adopted greenbelt. The site is surrounded by agricultural land to the east, west and south.	High
OVERALL SITE ENVIRONMENTAL SENSITIVITY		Moderate



5. REGULATORY DATA

5.1. LANDFILL SITES AND WASTE TREATMENT SITES

An authorised landfill site known as Pilsworth South Landfill is located 410 m west, this is for waste landfilling (excluding inert waste) and the license was issued on 20/10/2020.

The closest historical landfill is Pilsworth Sand Pit Phase A located 1 km northwest.

5.2. REGULATORY DATABASE

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250 m of the subject site and are not otherwise detailed in the report.

TABLE 5.1 SUMMARY OF ENVIRONMENTAL DATA

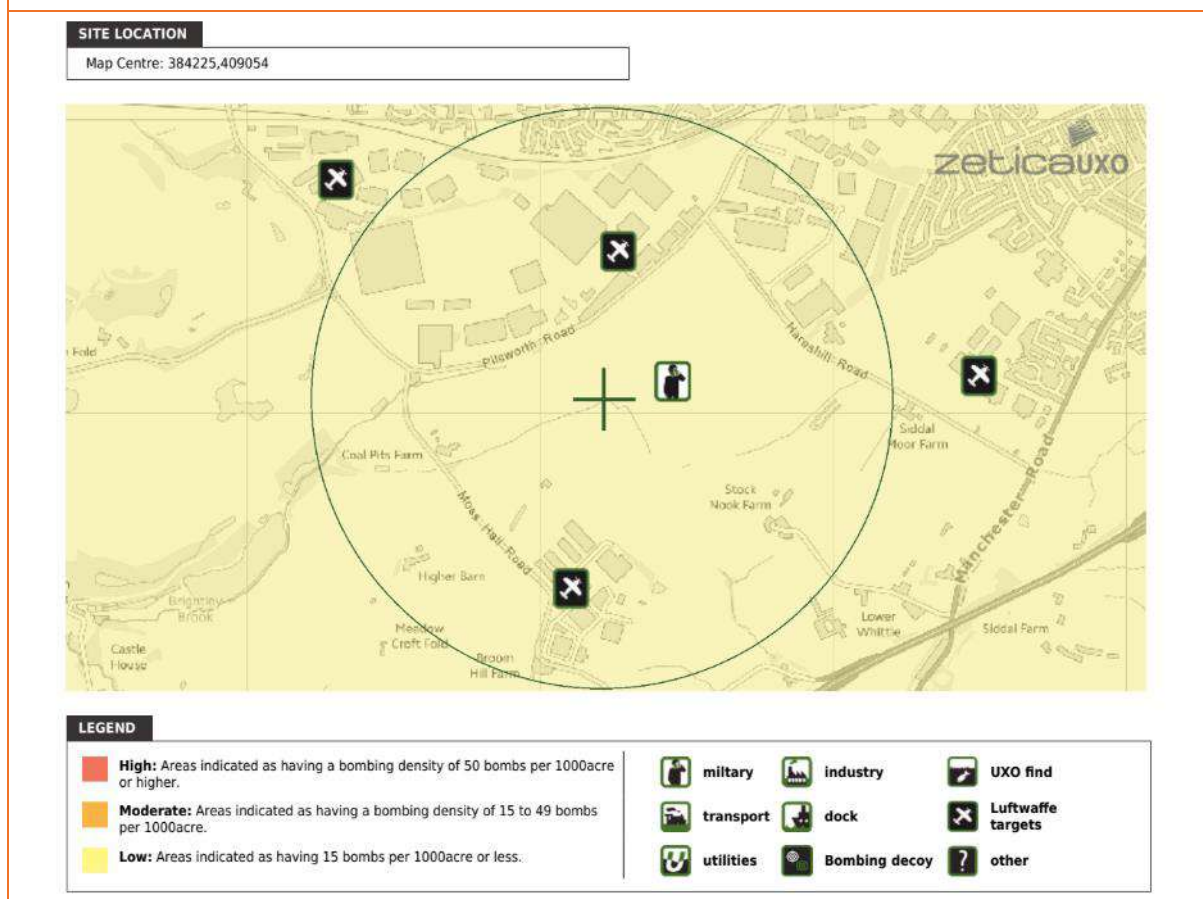
RECORD	ENTRIES WITHIN 250 m	DETAILS
Contaminated Land Register Entries and Notices	0	None Identified
Authorised Industrial Processes (IPC/IPPC/LAPPC)	0	None Identified
Fuel Stations Entries	0	None Identified
Licensed Radioactive Substances	0	None Identified
Enforcements, Prohibitions or Prosecutions	0	None Identified
Discharge Consents	0	None Identified
Pollution Incidents	0	None Identified
Consents Issued Under the Planning (Hazardous Substances) Act 1990	0	None Identified
Control of Major Accident Hazard (COMAH) Sites	0	None Identified

5.1. UNEXPLODED ORDNANCE

The regional unexploded bomb risk map from Zetica (2014) indicates that the site is in an area at low risk from possible unexploded ordnance (UXO) resulting from the Second World War. The Zetica UXO Risk Map is presented as Figure 5.1. No further assessment is required.



FIGURE 5.1 ZETICA UXO RISK MAP



Source - <https://zeticauxo.com/downloads-and-resources/risk-maps/>



6. INITIAL CONCEPTUAL SITE MODEL

In accordance with EA LCRM (2019) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), E3P has developed an initial conceptual site model (CSM) to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised in Table 6.1.

ON-SITE SOURCES OF CONTAMINATION

The following potential on-site sources of contamination have been identified:

-  Arable Farming – Pesticides, herbicides
-  Localised Made Ground (tracks/footpaths) – Heavy metals, PAHs, asbestos
-  Possible coal workings – Hazardous ground gas

OFF-SITE SOURCES OF CONTAMINATION

The following potential off-site source of contamination have been identified:

-  Old Sandstone Quarries (85 – 155 m SW) – Hazardous ground gas



TABLE 6.1 INITIAL CONCEPTUAL SITE MODEL

SOURCE	PATHWAY	RECEPTOR
Human Health		
Heavy Metals and PAHs associated with localised Made Ground	Dermal Contact and Ingestion.	Construction Workers. End Users.
Discussion: Localised Made Ground in the location of tracks and footpaths is a potential source of heavy metals and PAHs. These deposits may pose a short-term risk to construction workers who may come into contact with impacted soils during earthworks. There is a potential for heavy metals and PAH contamination through the use of fertilisers and pesticides. If present heavy metals and non-volatile PAHs may pose a short-term risk to construction workers who may come into contact with impacted soils during earthworks. However, this risk can be mitigated through the use of appropriate Personal Protective Equipment (PPE) and the provision of adequate welfare facilities. Future end users may come into contact with impacted soils within any landscaped areas. If impacted soils are identified then localised remediation or an appropriate cover system, designed in accordance with an agreed remediation strategy will mitigate the risk. Recommendation: An intrusive ground investigation is required to confirm this aspect of the CSM, but the overall risk is considered to be low.		
Volatile Hydrocarbon Compounds associated with Made Ground, agricultural use	Volatilisation/Accumulation. Vapour Inhalation.	Construction Workers. End Users.
Discussion: Although considered unlikely, any spillages from agricultural activities may be potential sources of hydrocarbon compounds and volatile PAHs, such as naphthalene. Hydrocarbon compounds and volatile PAHs may pose a risk to construction workers if they come into contact with impacted soils during further earthworks, however appropriate PPE/ Respiratory Protective Equipment (RPE) will ensure they are at no unacceptable risk. Future end users may come into contact with impacted soils in the landscaped areas, though the main pathway of volatile compounds is considered to be vapour inhalation indoors. If identified, additional remediation of impacted soils and/or perched groundwater will likely be required to mitigate the risk to future commercial end-users. Recommendation: An intrusive ground investigation will be required to assess the potential for volatile contaminants.		



Phase 3, South Heywood

Phase I Geoenvironmental Site Assessment

November 2022

SOURCE	PATHWAY	RECEPTOR
Asbestos-Containing Materials (ACMs) within Localised Made Ground	Fibre/Dust Inhalation.	Construction Workers. End Users. Third-Party Property.
Discussion: Due to the undeveloped nature of the site, it is unlikely there will be any ACM present, but this cannot be entirely discounted. Should ACM be present within any Made Ground, then impacted dust could be released during future earthworks and then subsequently inhaled by construction workers, third party property and end users. However, with the appropriate construction phase health and safety controls, asbestos containing material is likely to represent a low risk. Furthermore, if identified, landscaped areas can be mitigated through an appropriate cover system. Recommendation: An intrusive ground investigation will be required to assess the potential for ACM.		
Hazardous Ground Gases		
Methane and Carbon Dioxide associated with Made Ground, Organic Deposits, Old Sandstone Quarries	Inhalation. Accumulation.	Construction Workers. End Users.
Discussion: Localised Made Ground deposits, organic soils and ground workings within 250 m are potential sources of hazardous ground gases such as carbon dioxide and methane which have associated asphyxiation and explosive risks. If present, ground gas could accumulate within excavations, which could cause harm to construction workers via inhalation, or within the proposed extension buildings, which could cause harm via ignition or inhalation to the end users. If present, the risks can be appropriately mitigated through the careful design of building structures.		



Phase 3, South Heywood

Phase I Geoenvironmental Site Assessment

November 2022

SOURCE	PATHWAY	RECEPTOR
Controlled Waters		
Mobile Contaminants	Vertical Migration.	Secondary A bedrock aquifer, Secondary Undifferentiated superficial aquifer
	Lateral Migration	On-site brook/stream
Discussion: Significant on-site sources of potentially mobile contaminants are not anticipated at the subject site. The site is likely to be underlain by clay soils which will likely limit the lateral migration of any mobile contaminants to on-site surface water courses and vertical migration towards the underlying Secondary A aquifer in the bedrock. The sensitivity of the underlying aquifers is reduced given there are no groundwater abstractions within 1 km.		
Recommendation: Intrusive investigation with chemical analysis of soil and groundwater samples is recommended to assess the presence of mobile contaminants and facilitate further risk assessment.		
Buildings and Infrastructure		
pH and Sulphate	Corrosion of Concrete.	Foundations/Concrete.
Discussion: pH and sulphate within localised Made Ground deposits may result in the corrosion of buried concrete within the proposed development. Assessment must be undertaken to confirm the levels of pH and sulphate within Made Ground deposits and thus determine the concrete classification.		
Recommendation: Intrusive investigation to determine the levels of pH and sulphate.		
Ecology		
Phytotoxic contaminants (Made Ground)	Direct Contact (plant uptake).	Flora
Discussion: Made Ground on-site may contain levels of contamination which may be taken up by plants and trees on site.		
Recommendation: An intrusive investigation will be required.		



7. CONCLUSIONS AND RECOMMENDATIONS

7.1. SITE SUMMARY

Current Site Use	The site comprises undeveloped agricultural land used for arable farming. The site is split into three parcels by hedgerows. Mature trees are present to the north of the central field boundary. Brightley Brook flows to the west across the north-western sector. A stream is also present along the southern boundary of the site. There is little variance in topography, with a gentle slope down to Pilsworth Road to the north. Ditches are present in the location of the surface water courses. The site has remained undeveloped agricultural land since the earliest historical mapping dated 1851. No significant changes have occurred.
Historical Site Use	The site has remained undeveloped agricultural land since the earliest historical mapping dated 1851. No significant changes have occurred.
Site Sensitivity	The site is assessed to be located within a “moderate” sensitivity setting. This is due to the presence of the on-site surface water features and secondary A aquifer in the bedrock. The sensitivity of the aquifers is reduced considering there are no groundwater abstractions within 1km.

7.2. CONTAMINATED LAND ASSESSMENT

Human Health	Due to the largely undeveloped nature of the site, there are limited potential sources of contamination identified. Localised Made Ground associated with tracks and footpaths is a potential source of heavy metals PAHs and ACM. Arable farming is also a potential source of pesticides and herbicides.
Controlled Waters	Significant on-site sources of potentially mobile contaminants are not anticipated at the subject site. The site is likely to be underlain by clay soils which will likely limit the lateral migration of any mobile contaminants to on-site surface water courses and vertical migration towards the underlying Secondary A aquifer in the bedrock. The sensitivity of the underlying aquifers is reduced given there are no groundwater abstractions within 1 km.
Ground Gas	Localised Made Ground, organic deposits and coal measures are potential sources of hazardous ground gas. Off-site sources of hazardous ground gas include the former sandstone quarries. Carbon dioxide and methane have associated asphyxiation and explosive risks, respectively. If present, the risks can be appropriately mitigated through the careful design of building structures. A programme of ground gas monitoring is required to confirm the ground gas regime for the site.



Potable Water	No significant sources of contamination have been identified that would pose a significant risk to the proposed potable water supply, however, this will need to be confirmed following an intrusive investigation.
----------------------	---

7.3. COAL MINING

Coal Mining	The southern sector of the site is located within a Development High Risk Area. Two conjectured sub-crops are recorded dipping to the south and probable unrecorded shallow workings are recorded. A fault is located in the centre of the site trending northwest to southeast. Based on the above, a high risk of unrecorded coal mining at shallow depth has been identified in the south of the site. The CA, as a statutory consultee, will require a ground investigation to determine the presence of any coal on-site and to understand the nature of any coal workings.
--------------------	--

7.4. GEOTECHNICAL ASSESSMENT

Geological	Clay strata may underly the site and therefore a volume change potential assessment will be required particularly given that the site is lined by mature and semimature trees and hedges. Localised organic deposits may be present in the location of the surface water courses.
Civil and Structural	Relict foundations/sub-structures are not anticipated underlying the site.
Abnormal Foundations	Foundation solutions will be largely dependent on the proposed development levels and the requirement to cut and fill to achieve the development platform levels. However, given that the scheme will comprise a commercial unit, it is likely that an engineered foundation, slab and externals design will be required.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



Phase 3, South Heywood

Phase I Geoenvironmental Site Assessment

November 2022

MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection

