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EMA Evans Business Centre, Pontardawe Proposed Commercial Development Desk Study and Preliminary Risk Assessment

Report Reference: ESP.9548.4488

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EMA Evans Business Centre, Pontardawe Proposed Commercial Development Desk Study and Preliminary Risk Assessment

Prepared for:
Swanbrink Ltd.
Ema Evans Business Centre
Alloy Industrial Estate
Pontardawe
Neath Port Talbot
SA8 4EN

Report Reference: **ESP.9548.4488**

Revision	Status	Date	Written and Checked by	Approved by
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Appendix A Risk Assessment Methodology

Appendix B Extracts from Historical Maps

Appendix C Groundsure Report

Appendix D Mines Remediation Authority Consultants Report

Appendix E BGS Borehole Record

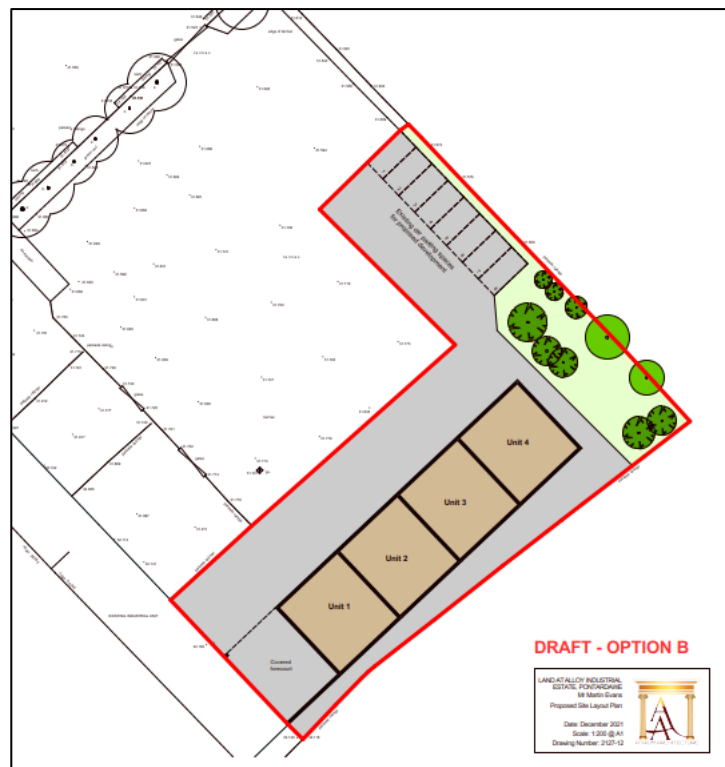
General Notes

1 Introduction

1.1 Background

Swanbrink Ltd are proposing to construct a series of new commercial units, adjacent to the existing EMA Evans Business Centre in Pontardawe. The proposed development as we understand it, is shown as Insert 1 and the site location is shown on Insert 2 in Section 2.1.

The Earth Science Partnership Ltd (ESP), Consulting Engineers, Geologists and Environmental Scientists, were instructed by the Client to undertake a Preliminary Risk Assessment (Desk Study) focussing on the potential for geotechnical hazards (including mining risks) contamination and ground gas hazards which may affect the development.



Insert 1: Location of proposed development (Red Boundary) – iPlan Architecture 2025

On the basis of the available information, we consider that the development would be classified as being from Geotechnical Category 2 (BS5930:2015), i.e. conventional structures, with no exceptional risk.

1.2 Objective and Scope of Works

The objective of the investigation was to obtain information on the geotechnical character and properties of the ground beneath the site, potential risks posed by contamination and ground gas, and to allow an assessment of these ground conditions with reference to the potential impact on the proposed development.

The contract was awarded based on a competitive tender quotation. The terms of reference for the assessment are as laid down in the Earth Science Partnership email proposal of the 14th of October 2025.

1.3 Report Format

This report includes a Preliminary Risk Assessment stage (Section 3) and the assessment of geotechnical hazards and the potential for hazardous substances (contamination) or conditions to exist on, at or near the site at levels or in a situation likely to warrant mitigation or consideration appropriate to the proposed end use has been undertaken using the guidance published by CIRIA (2001). This is discussed in more detail in Section 3.2.1 and in Appendix A.

1.4 Limitations of Report

This report represents the findings of the brief relating to the proposed end use and did not require an assessment of the implications for any other end use or structures, nor is the report a comprehensive site characterisation and should not be construed as such. It should be appreciated that no intrusive investigation has been undertaken to date. Should an alternative end use or structure be considered, the findings of the assessment should be re-examined relating to the new proposals.

Where preventative, ameliorative or remediation works are required, professional judgement will be used to make recommendations that satisfy the site-specific requirements in accordance with good practice guidance.

Consultation with regulatory authorities will be required with respect to proposed works as there may be overriding regional or policy requirements which demand additional work to be undertaken. It should be noted that both regulations and their interpretation by statutory authorities are continually changing.

This report represents the findings and opinions of experienced geo-environmental and geotechnical specialists. Earth Science Partnership does not provide legal advice, and the advice of lawyers may also be required.

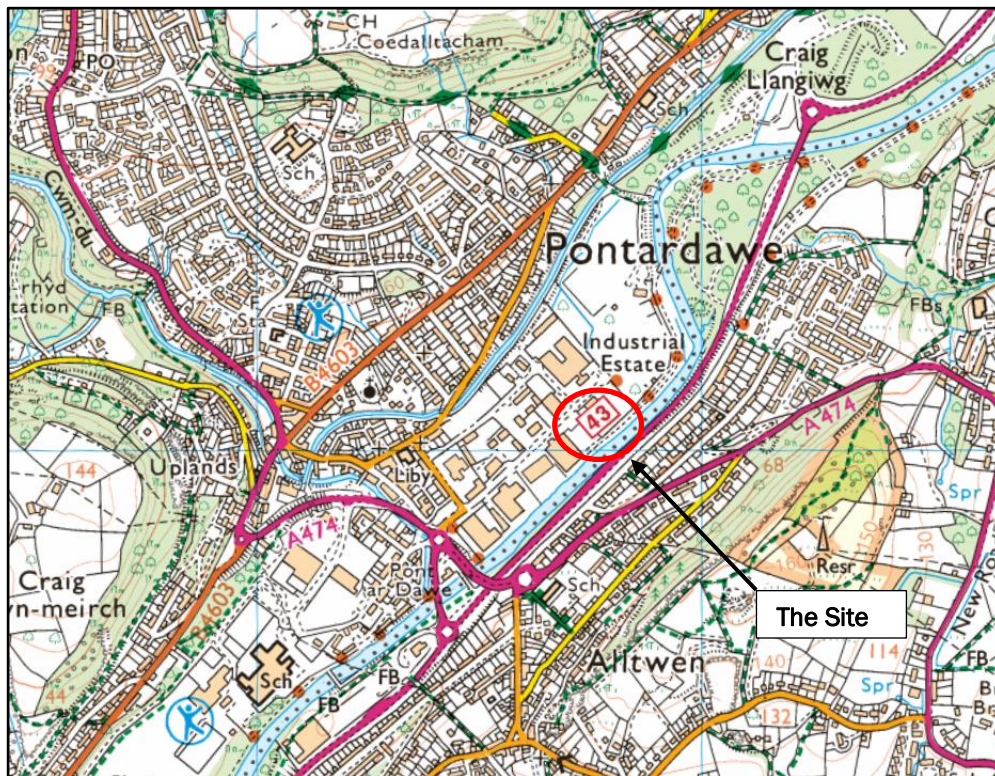
2 Desk Study

The information presented in this section was obtained from desk-based research of sources detailed in the text, including historical maps (Appendix B), a Groundsure Data report (Appendix C), a Consultant's Report obtained from the Mines Remediation Authority and available geological data sources.

At present and in line with our Proposal, no site walkover has been undertaken, however, this will be required prior to any subsequent physical investigation works.

2.1 Site Location and Description

The site is located on the southern side of Alloy Industrial Pontardawe. The National Grid Reference of the centre of the site is (SN) 272729, 204015, and the postcode is SA8 4EN. A Site Location Plan is presented as Insert 1 below.



*Insert 1: Site Location Plan. Extract from 1:25,000 scale Ordnance Survey map.
(Reproduced with permission, OS License No.: AL100015788).*

The proposed development area comprises currently undeveloped land adjacent to the existing EMA Evans building and is used for vehicle parking and material storage.

No topographic survey has been provided at this stage; however, available ordnance datum indicates ground levels of around 33m AOD. The general topography to the north is level, whilst to the south, the River Tawe is present at the south boundary with ground levels then rising southward toward Altwen.

2.2 Previous Investigations and Assessments

We are not aware of, nor have we been provided with any previous investigation or assessment data for the site or proposed development.

2.3 Site History

2.3.1 Published Historical Maps

The site history has been assessed from a review of available historical Ordnance Survey County Series and National Grid maps obtained as part of this assessment. Extracts from the historical maps are presented in Appendix A and the salient features since the First Edition of the County Series maps summarised in Table 1 below.

Table 1: Review of Historical Maps

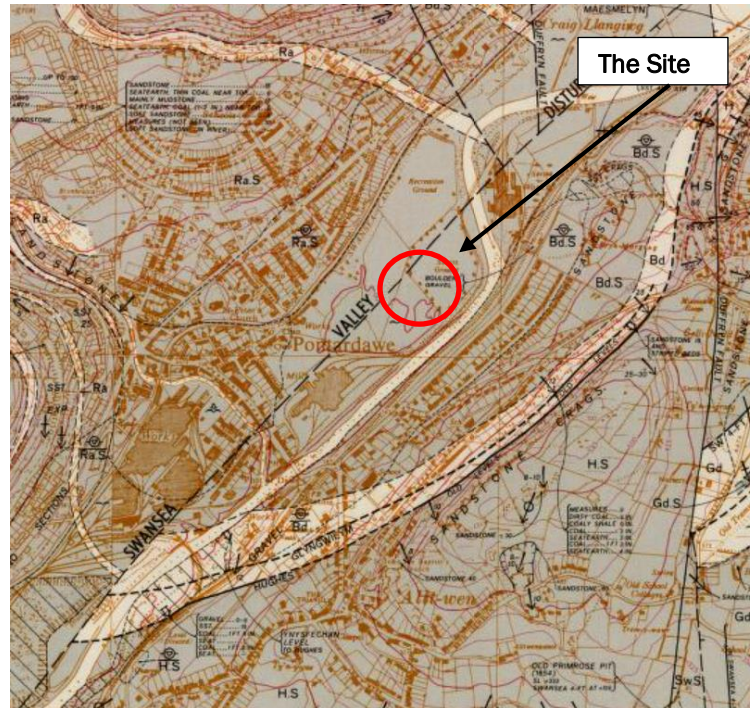
Date	On-Site	In Vicinity of Site
1877 – 1921	The site is vacant and indicated to be located amongst fields.	The River Tawe is immediately to the south, followed by the Swansea Vale railway and associated embankments (located at a higher elevation). Allotment gardens and forestry land are indicated southward of this. To the north, a foundry, smithy and gasometer are indicated approximately 250m to the north followed by residential areas associated with Pontardawe. Glantawe Tin Plate works is present to the north east with another tin plate works indicated approximately 600m to the south west.
1948 – 1966	Whilst the site remains free of buildings, railway/tram lines associated with the sheet mill to the south-west are indicated to cross the southern portion of the site. From 1966 onward, the railway lines on site are indicated to be “dismantled”.	A sheet mill is indicated approximately 100m to the south west. A sports ground is indicated approximately 100m to the north east. General development of the surrounding area with industrial and residential uses are indicated. From 1966 the sheet mill and associated railway lines to the south are no longer indicated.
1980 – present day	The site is indicated to be vacant but immediately bordered by the EMA Evans building.	A building (EMA Evans) immediately at the west boundary and the wider business estate is indicated to have been developed. Building uses within 50m of the site include factories, works and an abattoir. The abattoir is not indicated after 2001.
Notes to Table: - The above assessment of historical features around the site concentrates on the mining legacy. Other features, relating to other potential geotechnical and geo-environmental hazards may not have been considered. - Extracts of maps presented in Appendix B.		

2.4 Geology

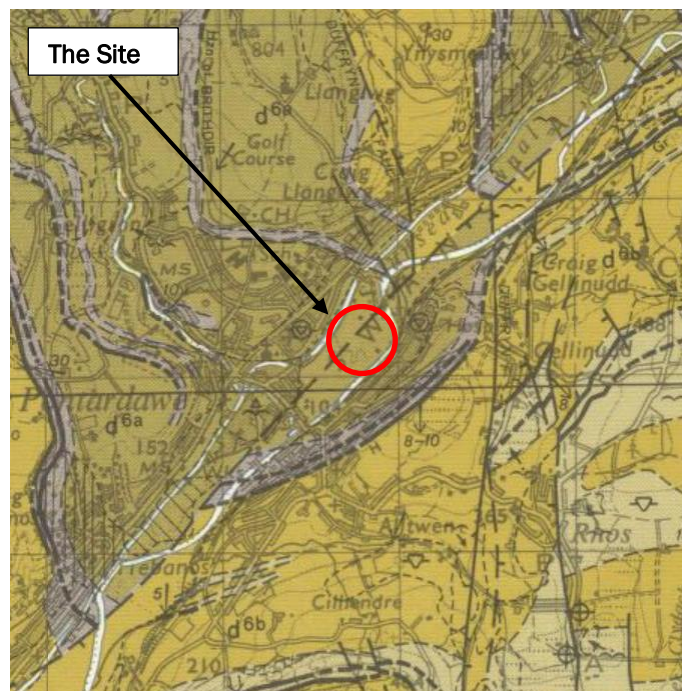
2.4.1 Published Geology

The published 1:10,560 scale geological map (Sheet SN78SW) indicates the site to be underlain by Alluvium and the Brithdir Member bedrock (Upper Coal Measures). An extract from this map is presented as Insert 3 below. Reference to the up-to-date mapping available on the website of the British Geological Survey (BGS, 2025) indicates a similar succession (Insert 4).

The Swansea Valley Disturbance is indicated immediately to the north. To the south of the disturbance, where the site is located, bedrock dips of between 5 and 15 degrees southward are indicated. The closest recorded conjectural coal outcrops comprise the Glynwilym and Hughes seams located >500m to the south and dipping away from the site. Outcropping seams to the north west (north of the disturbance) are indicated to dip to the south west.



Insert 3: Extract from 1:10,560 scale geological sheet SN70SW (reproduced with permission, BGS licence number: C15/05 CSL)



Insert 4: Extract from 1:50,000 scale geological sheet 230 (reproduced with permission, BGS licence number: C15/05 CSL)

2.4.2 Available BGS Borehole Records

Reference to the website of the British Geological Survey indicates one borehole record undertaken within the former abattoir to the north east (Ref: SN70SW28). This record indicates a cover of Made Ground to 1.1m followed by Alluvium to the maximum investigated depth of 4.2m.

A number of other borehole records are indicated to the south; however, these are south of the River Tawe, at a higher elevation and in an alternate superficial geology. As such these have not been considered in this assessment.

2.5 Hydrology

Available information indicates that the River Tawe is present at the south boundary. A smaller water course identified as the Swansea Canal is present to the north and forms a tributary to the River Tawe to the west of the site.

2.6 Hydrogeology

2.6.1 Aquifer Classification

Reference to the aquifer maps published in the data report (Appendix C) indicates that any superficial deposits present (alluvium) and the underlying bedrock are both classed as Secondary A Aquifers. Secondary A Aquifers generally correspond with the previously classified minor aquifers and comprise permeable layers capable of supporting water at a local, rather than strategic, scale and in some cases form an important base flow to rivers. Secondary A Aquifers are sensitive to pollution.

2.6.2 Anticipated Groundwater Bodies

Based on the available information, and our local knowledge, we consider that the shallowest main groundwater body is likely to be located within the alluvium, with a deeper body in the Coal Measures bedrock. Localised perched water bodies within Made Ground cannot be discounted.

2.6.3 Groundwater Movement

Groundwater movement within any superficial deposits will be controlled by intergranular flow whilst, in more competent bedrock, fracture flow is likely to be dominant.

2.6.4 Abstractions and Groundwater Vulnerability

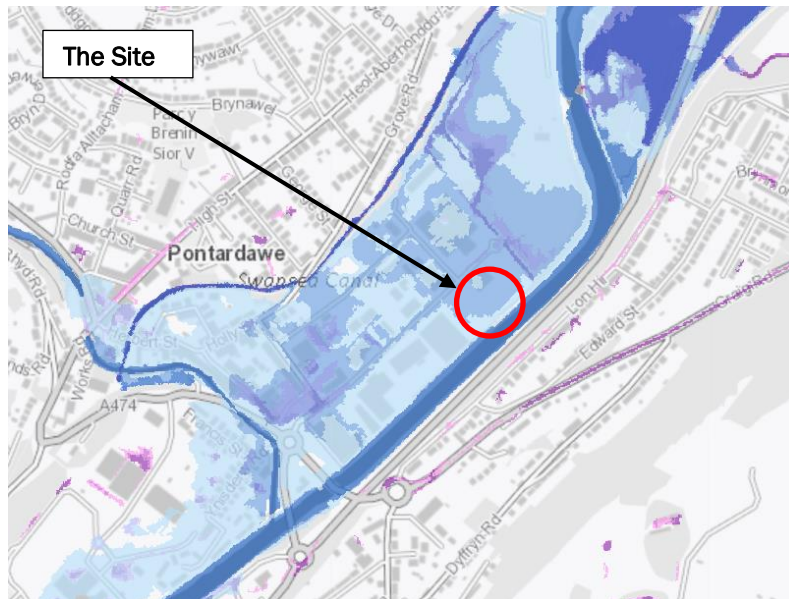
The data report (Appendix C) indicates that there are no records of groundwater abstractions or source protection zones within 250m of the site. One abstraction is noted approximately 300m to the north west

2.7 Flooding

2.7.1 Rivers and Seas

From a review of topographical plans and flooding maps presented in the data report and on the Natural Resources Wales (NRW), the site is located in an area at risk flooding from rivers (fluvial) seas (tidal) or combined flooding. The environmental report identifies evidence of historic flood events during the late 1970s and late 1990s.

The potential for flooding from rivers or seas has not been addressed further in this report and if/when required ESP are able to implement an appropriate Flood Consequences Assessment.



Insert 5: Extract from NRW Website – November 2025

2.7.2 Surface Water

From a review of the data report, the highest surface water flooding risk on the site is indicated to be 1 in 30 year, 0.1 – 0.3m, which equates to a high risk.

2.7.3 Groundwater

The data report in Appendix C indicates that the site is at a potential low risk at surface from groundwater flooding.

2.8 Environmental Setting

2.8.1 Summary of Environmental Data

The site exists in a historically rural and now urban/commercial setting. A data report has been obtained for the site and is presented in Appendix C, and the relevant data therein is summarised in the table below. The report should be consulted for further detail.

Table 2 - Summary of Environmental Data

Feature	On the Site	In the Immediate Vicinity
Environmentally Sensitive Sites ^{2,3}	None identified.	None recorded within 250m.
Potentially Contaminative Historical Land Use	Numerous records on site including unspecified mills, railway sidings, sheet mills and location within an industrial estate.	71no. records within 250m of the site including railway lines, works, an abattoir, factories, smithies, foundries, refuse heaps and a gasometer.
Current Industrial Land Uses	Existing Business centre immediately to the west and parking associated with adjacent land uses.	In the immediate vicinity and recorded to comprise substations, factories, and vehicle/garage services.
Historical Tanks, PFS, Garages	None identified.	28no. within 250m recorded as unspecified tanks, gasholder/gasometer and substations.
Regulated Explosives Sites	None identified.	None recorded within 500m of the site.
Hazardous Substances Storage/Usage	None identified.	None recorded within 500m of the site.
IPPC Authorisations	None identified.	None recorded within 500m of the site.
Discharge Consents	None identified.	6no. recorded between 280m (north) and 422m (south).
List 1 and 2 Dangerous Substances Sites	None identified.	1no. recorded 40m to the north west and comprising non-ferrous metals.
Radioactive Substance Sites	None identified.	None recorded within 500m of the site.
Pollution Incidents	None identified.	1no. recorded approximately 12m south east and recorded as a water pollutant with no impact on land or air and a significant impact on water.
Sites determined as Contaminated Land	None identified.	None recorded within 500m of the site.
Waste Management Facilities	None identified.	1no. recorded ~90m to the south east. Comprising a licensed facility to accept industrial & household waste. License recorded as issued in 1985, however, no other information on status or surrender is available.
Notes to Table: - Full details of features presented in the data report (Appendix C). - Sensitive land uses include Sites of Special Scientific Interest, Nature Reserves, National Parks, Special Areas of Conservation, Special Protection Areas, Ramsar sites, World Heritage sites and Ancient Woodland. - Nitrate vulnerable areas relate to the agricultural use of fertilizers and are not considered further in this assessment.		

2.9 Preliminary Geotechnical Risk Register

The potential for various geotechnical and geomorphological hazards at the site is provided in the data report (Appendix C). The potential hazards, as defined by the British Geological Survey (BGS) and reported in the above report, along with any salient further information has been considered in the preparation of this report.

Where a potential geotechnical hazard has been identified, it is discussed further in subsequent sections.

2.9.1 Past Coal Mining

The site is underlain by bedrock of the Upper Coal Measures, which can contain several seams of coal.

2.9.1.1 Historical and Geological Information

The published 1:10,560 scale geological map (Sheet SN78SW) indicates the site to be underlain by Alluvium and the Brithdir Member bedrock (Upper Coal Measures). The Swansea Valley Disturbance is indicated immediately to the north. The conjectural outcrops of two coal seams (the Glyngwilym and Hughes) are indicated >500m to the south and dipping away from the site. Outcropping seams to the north west (north of the disturbance) are indicated to dip south west.

Historical information does not suggest any past mining activities on the site and whilst workings are indicated in the local area within the environmental data report (see Appendix C), none are indicated on or within the vicinity of the site.

2.9.1.2 Coal Authority Website

Reference to the Coal Authority website (CA, 2025) provides the following salient information:

- There is no outcropping coal within the site boundary.
- No past surface hazard or surface mining is identified in the vicinity of the site.
- No recorded or probable past shallow coal mining is indicated in the vicinity of the site.
- No mine entries are shown within the site boundary. However, there is two mine entries south of the site approximately 50m away.
- The site does not lie within a 'Development High Risk Area'.

2.9.1.3 Coal Authority Mining Report

A consultants mining report has also been obtained from the Coal Authority and is presented in Appendix D. This indicates that, based on the available Coal Authority records:

- There are no records of past underground mining.
- There are no records of probable unrecorded shallow workings.
- There are no recorded spineways.
- There are no records of mine entries on or within 100m.
- There are no outcrops, recorded geological faults or fissures recorded on site.
- There are no recorded damage notices or claims for the subject property, or any property within 50m of the site boundary, since 31st October 1994.
- There is no record 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.
- No mine gas emission has been recorded within 500m of the property. However, the report does state that this does not mean that mine gas is not present within the vicinity. The Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.
- There is no proposed future mining or licensing proposed.
- No notices have been given under Section 46 of the Coal Mining Subsidence Act 1991 stating that the land is at risk of subsidence.
- The site located in an area of historical coal mining activity.

2.9.1.4 Preliminary Coal Mining Risk Assessment

Based on available geological, historical and mining information, it is anticipated that the risk posed by shallow mine workings and mine entries is likely to be low, however this is based on the available information and findings to date and if during development any evidence of mining or other associated hazards is identified during the development, works should stop and advice be sought.

The risk posed by mines gases, may need further consideration (see Section 3.1.4).

2.9.2 Shrinkable and Swelling Soils

The site is underlain by alluvial soils which would be anticipated to contain fine grained soils. These soils, anticipated at shallow depth beneath the site, are commonly susceptible to volume change with changes in moisture content (shrinkage and swelling). The data report (see Appendix C) indicates a very low risk, however, based on available information, it is considered that the potential for shrinkable/swelling soils at the site is **Moderate**.

2.9.3 Running Sands

The site is underlain by alluvial soils which would be anticipated to contain coarse grained soils. These soils, anticipated at shallow depth beneath the site, can become fluidised when water flows through them). The data report (see Appendix C) indicates a **moderate to high risk** which is considered suitable as a preliminary rating.

2.9.4 Compressible Ground

The alluvial soils anticipated beneath the site, being variable in nature, could comprise soils of low strength and contain organic materials and, therefore, be potentially compressible. Any Made Ground soils are also potentially compressible, particularly where containing organic materials are present, which could lead to significant settlement at the surface. The data report (see Appendix C) indicates a **Moderate** risk, which is considered suitable as a preliminary rating.

2.9.5 Pyritic Ground

The data report does not consider the potential risk from sulphate rich or pyritic ground. The soils underlying the site are listed by the BRE (2005) as potentially containing elevated levels of pyrite, which may oxidise to sulphates and lead to aggressive attack on buried concrete. Depending on its origin, the Made Ground and Alluvial soils anticipated beneath the site may also contain elevated levels of pyrite. It is considered that the potential for sulphate/pyrite attack on buried concrete would be **Moderate**.

2.9.6 Radon Hazard

Radon is a colourless, odourless, radioactive gas, which can pose a risk to human health. It originates in the bedrock beneath the site, where uranium and radium rich minerals are naturally present, and can move through fractures in the bedrock, and overlying superficial deposits, to collect in spaces within/beneath structures.

As a geotechnical hazard, radon is not addressed in the Groundsure environmental data report (Appendix C).

Reference to available online radon information (ukradon.org), the site is indicated to be in an area where 5-10% of properties are above the action level with basic Radon protection measures indicated to be required.

3 Geo-Environmental Risk Assessment

3.1 Conceptual Site Model

3.1.1 Background

The Phase One Conceptual Site Model lists the potential sources of geo-environmental risk (both contamination and hazardous gas), the receptors at risk (both human and non-human), and any feasible pathways between the two. These are discussed in the following sections.

3.1.2 Potential Soil Contamination Sources

The desk study review has identified that the site has formerly been open fields and then part of a historic commercial estate and likely impacted by railways associated with adjacent land uses. Potentially contaminative land uses in the immediately surrounding area include sheet works, tin works, vehicle garages, vehicle parking, an abattoir and railway land.

3.1.3 Potential Contaminants Present

A range of potential contaminants could be present, and we consider that the following general contaminants could be present:

- heavy metals and semi-metals (arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc);
- cyanide, sulphate, sulphide;
- polyaromatic hydrocarbon (PAH) compounds;
- petroleum hydrocarbons (TPH) compounds.
- phenols;
- organic content;
- asbestos.

No evidence has been identified from the desk study to suggest that radioactive substances may be present on the site. The potential presence of radon is discussed in Section 0

3.1.4 Potential Sources of Hazardous Ground Gas

3.1.4.1 General Ground Gas

This section considers the potential sources of hazardous gases such as methane, carbon dioxide and hydrocarbon vapours. The potential for radon was discussed in Section 2.6.2.

Based on the available desk study information, the following potential sources of hazardous ground gas have been identified on, or in close vicinity of, the site:

- Alluvial soils – on/off site source.
- Made Ground – on site source.

Based on the guidelines presented by O'Riordan and Milloy (1995) and revised by Wilson et al (2009), the general hazards would generally be classified as of low to moderate gas generation potential. Once ground conditions are confirmed during an investigation, a ground gas assessment is likely to be required.

3.1.4.2 Mines Gases

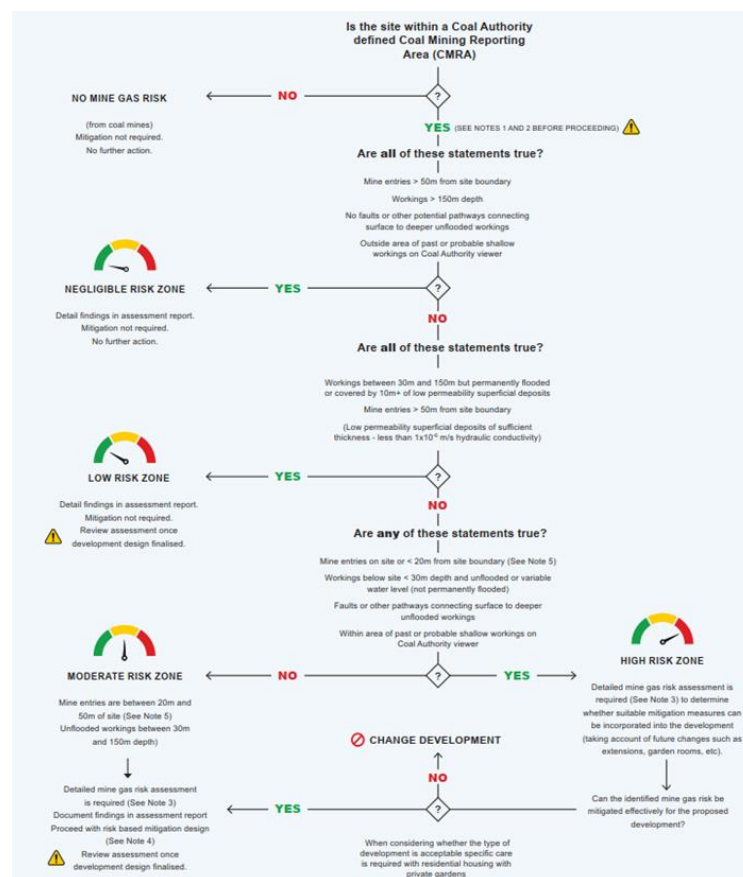
As part of this assessment, a preliminary assessment of risks posed by mines gas has been undertaken in line with “CL:AIRE, 2021. Good practice for risk assessment for coal mine gas emissions”. An extract of the relevant flow chart is presented as Insert 6.

In line with the CIRIA flowchart as a preliminary assessment of mins gas risk the following can be considered:

- The site is within a Coal Mining Reporting Area.
- No outcropping coal seams are indicated on or near the site and no workings are recorded at shallow depth.
- No mine entries recorded on or within 50m of the site boundary.
- Permeability of underlying soils/rock is unknown.
- Faulting/displacement is indicated with the Swansea Valley Disturbance recorded to the north; however, no seams are indicated to be present to be affected by the displacement.

Based on the currently available evidence, the site would be considered to be in a negligible risk zone, and a detailed mines gas risk assessment is not required.

Notwithstanding the risk posed by mines gases, further consideration of ground gas will be required due the potential for Made Ground and Alluvial soils present.



Insert 6 – Extract from CL:AIRE, 2021
(Good practice for risk assessment for coal mine gas emissions)

3.1.5 Potential Receptors

We consider that the most vulnerable receptors with regards to any contamination or hazardous ground gas present are likely to be as follows.

- Future employees and site visitors, the critical receptors being employees outside during their break periods.
- Construction and maintenance workers.
- Buried concrete (foundations, drainage etc.).
- The water quality in the River Tawe located at the south boundary.
- The groundwater (Secondary A Aquifer).

3.1.6 Potential Migration Pathways

Based on the Conceptual Site Model the following are considered the most likely migration pathways for any contamination or hazardous ground gas present beneath the site.

Site Users:

- Ingestion of soils and inhalation of dust in landscaping areas.
- Dermal contact with contaminated soils.
- Exposure to asbestos containing materials within the shallow soils.
- Potential risk from toxic ground gas/vapours from on-site sources.
- Potential risk from toxic ground gas/vapours from off-site sources.

Construction and Maintenance Workers:

- Exposure to asbestos containing materials within the existing buildings.
- Exposure to asbestos containing materials within the shallow soils.
- Ingestion of soils and inhalation of dust across site.
- Dermal contact with contaminated soils.
- Potential explosive risk from flammable or toxic ground gas/vapours from on-site sources.

Groundwater:

- Leaching of mobile contaminants into the water-bearing strata within the bedrock.

River Tawe:

- Leaching of mobile contaminants to the groundwater beneath the site, and then on to the nearby surface water course.
- Surface run-off of contaminated leachate to adjacent stream.

Buildings:

- Sulphate attack on buried concrete (foundations, drainage etc.).
- Potential explosive risk from flammable ground gas/vapours from on-site sources.
- Potential explosive risk from flammable ground gas/vapours from off-site sources.

3.2 Preliminary Risk Evaluation & Plausible Pollutant Linkages

The land use history of the site and surrounding area, as established from the desk study and walkover, has identified a number of potential contamination linkages due to ground conditions or former operations either on, adjacent to, or in the vicinity of the site. Note that these potential linkages will need to be later assessed and re-established using actual site data obtained from an exploratory investigation.

3.2.1 Introduction to Risk Evaluation Methodology

The general methodology set out in CIRIA C552 *Contaminated Land Risk Assessment – A Guide to Good Practice* (Rudland et al, 2001), has been used to assess whether or not risks are acceptable, and to determine the need for collating further information or remedial action.

Whilst at a later stage, this methodology may be informed by quantitative data (such as laboratory test results) the assessment is a qualitative method of interpreting findings to date and evaluating risk. The methodology requires the classification of:

- The magnitude of the potential consequence (severity) of risk occurring (Table A1 in Appendix A):
- The magnitude of the probability (likelihood) of risk occurring (Table A2 in Appendix A).

The classifications defined above are then compared to indicate the risk presented by each pollutant linkage, allowing evaluation of a risk category (Tables A3 and A4 in Appendix A). These tables have been revised slightly by ESP from those presented in CIRIA C552, to allow for the circumstances where no plausible linkage has been identified and, therefore, no risk would exist.

The methodology described above has been used to establish Plausible Pollutant Linkages (PPL) based on the Conceptual Site Model generated for the site and proposed development, and to evaluate the risks posed by those linkages, using information known about the site, at this desk study stage. This is presented as Tables 3 in Section 3.2.2 below.

3.2.2 Tabulated Preliminary Risk Evaluation & Plausible Pollutant Linkages

Table 3: Preliminary Risk Evaluation & Plausible Pollutant Linkages (PPL)

Source	Pathway	Receptor	Classification of Consequence	Classification of Probability	Risk Category	Further Investigation or Remedial Action to be Taken
Potential contaminants in shallow soils	Direct contact/ inhalation/ ingestion of contaminated soil or dust	Site Users	Medium – potential for chronic levels.	Likely ²	Moderate Risk	Sampling of near-surface soils to confirm levels of total contamination present.
	Direct contact/ inhalation/ ingestion of contaminated soil or dust	Construction/ Maintenance Workers	Minor – standard PPE likely to be sufficient	Likely ²	Low Risk	
	Leaching of soil contaminants	Impact on Groundwater /Potable Water	Medium – site lies on Secondary A Aquifer	Likely ²	Moderate Risk	
	Leaching of soil contaminants	Impact on River Tawe	Medium – site lies adjacent to surface water	Likely ²	Moderate Risk	
Asbestos in shallow soils	Inhalation of fibres	Site End Users	Medium – potential for chronic levels	Likely ²	Moderate/ Low Risk	Sampling of shallow soils for asbestos.
		Construction/ Maintenance Workers				
Soil sulphate and pyrite	Aggressive groundwater	Buried Concrete	Mild – damage to structures	Likely ²	Moderate/ Low Risk	Sampling of soils to confirm levels of sulphate, pH.
Hazardous ground gas (Made Ground)	Asphyxiation/poisoning. Injury due to explosion.	Site Users/Visitors.	Severe – acute risk.	Likely ⁵	High Risk	Install and monitor gas wells.
	Damage through explosion.	Building/Property	Severe – acute risk.		High Risk	
	Asphyxiation/poisoning. Injury due to explosion.	Construction and Maintenance Workers.	Severe – acute risk.		High Risk	
Radon gas	Migration into Buildings	Site Users	Medium – potential for chronic levels	Likely ⁶	Moderate Risk	Protection measures required - see Section 2.11

- Notes:**
1. Methodology and details of risk consequence, probability and category based on CIRIA C552 (2001) and presented in Section 3.2.1.
 2. The presence of Made Ground or contamination has not yet been confirmed on site.
 3. If present, Alluvium can potentially contain sulphates/pyrite. See Section 2.9.5.
 4. Adjacent Alluvium forms a potential source of hazardous ground gas/vapours at the site. See Section 3.1.4.
 5. Radon risk identified in data report. See Section 0.
 6. The above risk evaluation is to be updated following the intrusive investigation.

4 Preliminary Geotechnical Comments

We understand that the development proposals comprise the construction of a series of commercial units within currently vacant areas of the site.

Based on available geological, historical and mining information, it is anticipated that the risk posed by shallow mine workings and mine entries is likely to be low, however this is based on the available information and findings to date and if during development any evidence of mining or other associated hazards is identified during the development, works should stop and advice be sought

There are a number of geotechnical hazards that will need further consideration, these include:

- Potentially deep/compressible alluvial soils.
- Volume change potential of shallow soils.
- Potential for running sands in open excavation.
- pH/sulphate content of soils.
- Radon.

Based on available information, foundation solutions are likely to comprise less traditional techniques, such as lightly loaded rafts that can accommodate settlement or the use of deeper foundations such as piles for higher loads. It is likely that subject to proposed slab loads, ground bearing floor slabs will not be acceptable, and slabs will need to be raised. Determination of suitable foundation design will require intrusive investigation.

Based on the size of the scheme footprint, it is anticipated that an application to the Statutory Approval Body (SAB) will be required for drainage. Infiltration testing will be required to determine suitability of the soils for soakaway drainage. The use of infiltration drainage will also need to consider the proximity to the River Tawe and the presence of Made Ground.

5 Recommendations

In order to further explore and assess the risks identified in the Desk Study, an intrusive investigation will be required to determine the ground model, ground gas regime and refine the risk drivers and to allow determination of appropriate design and if required, remedial measures.

The recommended Exploratory (preliminary) Investigation is outlined below.

Table 4: Summary of Recommendations for Intrusive Ground Investigation Works

Further pre-Investigation Requirements	
1.	Obtain services plans prior to investigation.
2.	Obtain preliminary UXO report.
3.	Site walkover to allow determination of access/working restraints.
Ground Investigation Requirements	
4.	Investigation across the site area to include assessment of both shallow and deep ground conditions. This will likely involve (subject to site constraints) deep boreholes and shallow windowless or trial pits.
5.	Installation and monitoring of ground gas wells.
6.	Geoenvironmental laboratory testing.
7.	Geotechnical laboratory testing.
8.	Detailed assessment of the identified ground conditions to update Ground Model and further assess potential geo-environmental hazards identified including provision of site specific recommendations for further assessment and/or remedial options.
Additional Requirements	
9.	To be determined as part of proposed investigation work.

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