Phase 1 Contaminated Land Assessment

Land South of Bryn Lane, Wrexham

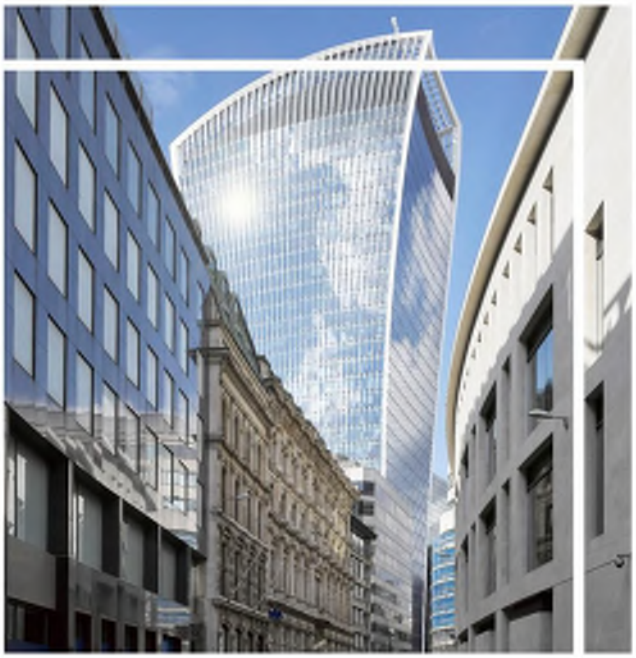
Mauna Kea Ltd, a fully owned subsidiary of Net World Sports

28 January 2025

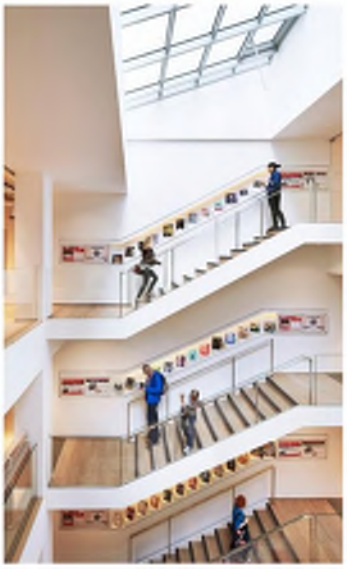
33736-HML-XX-XX-RP-U-870001

Issue P06





















Project Name:	Land South of Bryn Lane, Wrexham
Report Name:	Phase 1 Contaminated Land Assessment
Issue Status:	Final
Reference:	33736-HML-XX-XX-RP-U-870001
Date of Issue:	28 January 2025
Issue:	P06
Author:	S Davies
Checker:	S McGeever
Approver:	T Reade
HM Project No:	33736

HM Office:

Shackleton House
Hays Galleria
4 Battlebridge Lane
London
SE1 2HP

T: +44 (0)20 7940 8888
hilsonmoran.com
@HilsonMoran
hilson_moran
Hilson Moran

Document History:

Issue	Date	Details
P01	9/11/2023	FIRST DRAFT
P02	18/7/2024	SECOND DRAFT INCLUDING UXO
P03	24/10/2024	THIRD DRAFT
P04	6/11/2024	FOURTH DRAFT
P05	16/12/2024	FINAL DRAFT
P06	28/1/2025	REVISED FINAL

Copyright © Hilson Moran 2025. rights reserved. This report is confidential to the party to whom it is addressed and their professional advisers for the specific purpose to which it refers. No responsibility is accepted to third parties, and neither the whole nor any part of this report nor reference thereto may be published or disclosed without the written consent of Hilson Moran.

Contents

Executive Summary **1**

1. Introduction **3**
1.1. Background 3
1.2. Purpose 3
1.3. Proposed Development 3
1.4. Scope of Works: 5
1.5. Limitations 5

2. Legislation and Guidance **7**
2.1. Contaminated Land Risk Assessment 7
2.1.1. Environmental Protection Act 7
2.1.2. Land Contamination Risk Management 7
2.2. Planning Policy & Legislation 8
2.2.1. National 8
2.2.2. Local 9

3. Site Walkover **11**
3.1. Site Description 11
3.2. Site Topography 13
3.3. Surrounding Site Uses 13

4. Historical Information **14**
4.1. Historical Maps 14
4.2. Anecdotal Information 17

5. Site Information **19**
5.1. Geology 19
5.1.1. Bedrock and Superficial Deposits 19
5.1.2. Soils 19
5.1.3. British Geological Survey Borehole Archive 20
5.1.4. Geological Hazards 20
5.1.5. Radon 21
5.1.6. Coal Mining 21
5.1.7. Other Worked and Infilled Land 22
5.2. Hydrogeology and Hydrology 23
5.2.1. Geological Aquifer Designation 23
5.2.2. Source Protection Zones 23
5.2.3. Groundwater Abstractions 24

5.2.4. Hydrology 24
5.2.5. Flood Risk 25
5.3. Environmental Data Request 25
5.4. Planning Context 28
5.5. Unexploded Ordnance 30
5.6. Consultation 31

6. Preliminary Geo-Environmental Risk Assessment 33
6.1. Risk Assessment Framework 33
6.2. Sources 33
6.3. Receptors 35
6.4. Pathways 36
6.4.1. Human Health 36
6.4.2. Water Environment 36
6.4.3. Flora and Fauna 37
6.4.4. Built Environment 37
6.5. Conceptual Site Model and Preliminary Risk Assessment 37
6.5.1. Uncertainties 37
6.6. Wider Environmental Considerations 41

7. Conclusions and Recommendations 43
7.1. Conclusions 43
7.2. Recommendations 44

Appendix A - Site Walkover Photos 46

Appendix B - Historical Maps 47

Appendix C - Coal Mining Report 48

Appendix D - Detailed UXO Risk Report 49

Appendix E - Local Authority Correspondence 50

Appendix F - Risk Classification Framework 51

Executive Summary

Hilson Moran was instructed by Net World Sports (the 'Client') to undertake a Phase 1 Contaminated Land Assessment of land located to the south of Bryn Lane, Wrexham Industrial Estate, Wrexham, Wales, LL13 9UT (the 'Site'). The assessment was undertaken in connection with the proposed redevelopment of the site for a commercial / industrial end-use.

The site comprises two fields (grassland) previously grazed by livestock, with trees and scrub around the northern, eastern and southern perimeters. A concrete structure is located in the north-eastern corner of the site and may have been associated with the former Royal Ordnance Factory (ROF Wrexham). The factory was demolished in the late 20th century; however, the concrete structure remains extant. The site is situated in the north-east of the Industrial Estate, with a large pharmaceutical site directly to the west and Bryn Business Centre directly to the east, with smaller units and a Kellogg's Factory beyond.

It is well documented that Wrexham Industrial Estate is located on the site of the former Royal Ordnance Factory. However, it is understood that associated buildings located on the site were limited to administration / office buildings. Additional potentially contaminative historical uses of the site include a clothing factory and a farm in the north-western corner. Apart from the concrete structure, none of the buildings associated with these past land uses remain on the site.

Given the history of the site and surrounding area, a Detailed Desk Study for Unexploded Ordnance (UXO) and Explosives Hazards was obtained for the site from Zetica. The report states that the site has a Low UXO and explosives contamination hazard level. Although the site formed part of ROF Wrexham, the on-site buildings were limited to administration and farm buildings away from the main production areas. No records were found indicating that the site was bombed and no other significant sources of UXO hazard were identified. It was recommended that a UXO awareness briefing is undertaken for staff involved in excavations, however no specific mitigation measures were considered necessary for the proposed borehole drilling or piling.

Based on ground investigation data for land located to the north of Bryn Lane, the site is likely to be underlain by a significant thickness of low permeability Till, which overlies bedrock of the Salop Formation comprising mudstone, sandstone and conglomerate.

The site is considered to be located in a medium-low sensitivity environmental setting. There are drainage ditches on-site which link with Redwither Brook and subsequently the River Dee, which has a Moderate status for water quality (dated 2024). The superficial Till deposits are classified as a Secondary Undifferentiated Aquifer, while the bedrock deposits (Salop Formation) are designated as a Secondary A Aquifer. A Principal Aquifer (Kinnerton Sandstone Formation) lies approximately 60 m north-west. The overlying low permeability Till deposits can be expected to afford protection against the vertical migration of contaminants into the deeper Secondary A aquifer. There are no statutory ecologically designated sites within 2 km of the site, or priority habitat within 250 m.

A preliminary conceptual site model (CSM) of potential pollutant linkages has been developed (based on an assumed future industrial / commercial end-use) and a qualitative risk assessment completed. The main findings of the preliminary risk assessment are summarised below.

The most significant risks are those posed to human health (future site users and construction workers) from potential soil and groundwater contamination resulting from the site's former uses.

The risks to future site users and buildings from ground gas associated with potentially infilled drainage features on-site and ponds close to the site (as encountered on land north of Bryn Lane) is considered 'Moderate' at this stage. Risk from off-site infilled ponds is likely to be lower due to the size and distance of the off-site features.

Risk to identified water resource receptors (surface waters and the Secondary A Aquifer) have been classified as 'Moderate-Low'. The implementation of a Construction Environmental Management Plan (CEMP) appropriately designed sustainable urban drainage (SUDs) scheme and consideration of foundation design can mitigate the identified risks.

The main uncertainty associated with the preliminary risk assessment is that currently there is no site-specific data on the ground conditions and contamination status of soils and groundwater below the site. It is recommended that a Ground Investigation with the following aims be carried out as part of the design process of the proposed development:

- Establish the ground conditions below the site, including verifying the presence and extent of any soil and groundwater contamination including the nature of any fill material or Made Ground that may be present on-site.
- Assess risks from ground gases, particularly from on-site infilled features or off-site sources through a ground gas monitoring programme.
- Provide an understanding of the groundwater regime below the site through follow-up groundwater monitoring and sampling.
- Allow confirmation of the risk to identified receptors, including human health (future site users), the proposed development, surrounding surface waters and the Secondary A Aquifer.

In terms of wider risks to the proposed development, the following are highlighted:

- Based on evidence from the buildings present on the neighbouring Bryn Business Park, it is considered likely that historical buildings on-site may have had asbestos cement roofs and other asbestos containing materials (ACMs) within them. The presence of asbestos in soils is classified as a 'Moderate-High' risk.
- Wrexham Borough Council have stated that due to the potentially contaminative historical use a munitions site, they do have a duty to investigate the site under Part 2A of the Environmental Protection Act (EPA) 1990. They have, however, stated that the site is of lower priority than other potentially contaminated land within the borough and there is no timescale on when such an inspection would happen.
- If the site were to be redeveloped through the planning system, then risks posed by contamination would be dealt with via appropriate planning conditions to ensure safe development of the site. Redevelopment which includes appropriate ground investigation and subsequent remediation of any land contamination will therefore mitigate the regulatory risk relating to Part 2A.

Overall, it is concluded that there is no information at this stage to indicate that the site is unsuitable for the proposed development with respect to land contamination. With suitable investigation and mitigation, contamination (if present) can be adequately dealt with as part of the planning process.

1. Introduction

1.1. Background

Hilson Moran has been commissioned by Net World Sports (the 'Client') to undertake a Phase 1 Contaminated Land Assessment of land located to the south of Bryn Lane, Wrexham Industrial Estate, Wrexham, Wales, LL13 9UT (the 'Site').

The assessment was undertaken in connection with the proposed redevelopment of the site for a commercial / industrial end-use. The location and red line boundary of the site is shown in **Figure 1-1** below.



Figure 1-1 Site Red Line Boundary (Source: Pace Architecture, Drawing No. 2042.P.001(A), dated 30th September 2024).

1.2. Purpose

The purpose of this assessment was to determine the likely ground conditions at the site and assess the potential for significant soil or groundwater contamination, both at and in the immediate vicinity of the site, and the anticipated implications in a redevelopment scenario.

The Phase 1 Assessment will inform the development design, where relevant, and accompany the Full Planning Application for the redevelopment of the site.

1.3. Proposed Development

It is understood that Mauna Kea Limited (the 'Applicant'), a fully owned subsidiary of Net World Sports, intends to submit a Full Planning Application for the construction of a new commercial / industrial unit at the site.

The Proposed Development will include:

- *14,564 sq. m (GIA) of employment floorspace (Use Classes B2 and B8) alongside ancillary office floorspace (Use Class B1a);*
- *146 car parking spaces (including 15 disabled car parking spaces);*
- *30 cycle parking spaces within an external cycle store;*
- *New soft landscaping;*
- *Retention of a Strategic Ecological Network around the southern and eastern perimeter of the site; and*
- *Improved access off Bryn Lane and new internal circulation roads.*

A proposed site plan has been produced and is included as **Figure 1-2**.

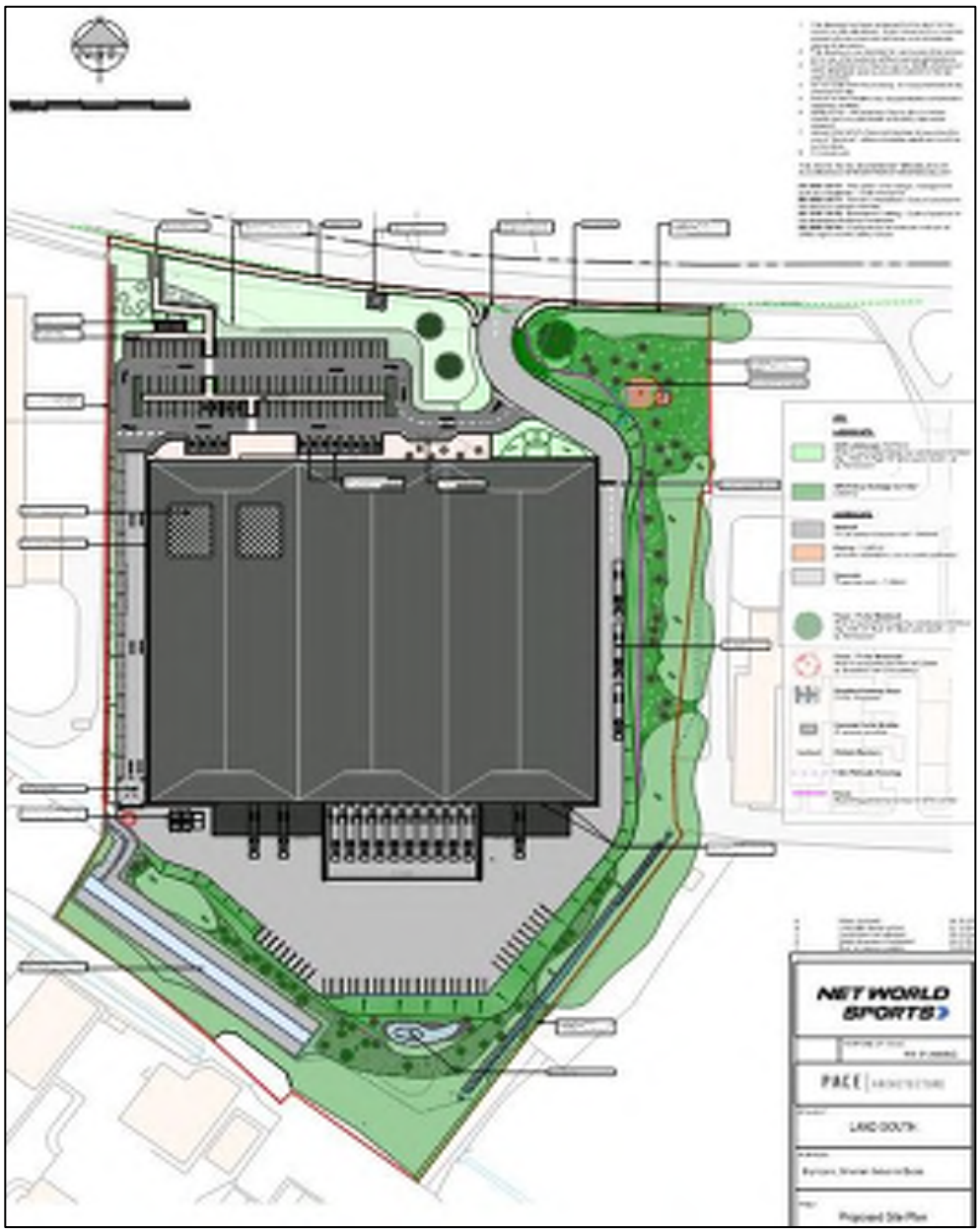


Figure 1-2 Proposed Site Plan (Source: Pace Architecture, Drawing no. 2024.P.004(E), February 2025).

1.4. Scope of Works:

The scope of the Phase 1 Contaminated Land Assessment has included the following:

- Review of historical land use of the site and the surrounding area, using sources such as Ordnance Survey maps and aerial photographs up to the present day, to identify activities which may have resulted in contamination of soil and groundwater.
- Review of published records and maps on the geology, hydrology and hydrogeology of the site to assess the vulnerability and sensitivity of controlled water resources (groundwater and surface water) to contamination, if present.
- Review of a proprietary database (Groundsure Report) of environmental permits, records and incidents at the site and surrounding area to identify potential sources of contamination.
- Procure a detailed Unexploded Ordnance (UXO) Assessment for the site.
- Review of the Local Authority planning portal to determine the development history of the site and surrounding area and identify any available previous reports and ground investigation information.
- Undertake a site walkover to provide further information on the current site use, surrounding land use and environmental setting.
- Develop a preliminary conceptual site model (CSM) of potential source-pathway-receptor linkages (also known as 'contaminant linkages') and establish whether there are potentially unacceptable risks that require further investigation or remediation.
- Provide a summary of the main findings and conclusions of the report, and the recommendations for the next steps.

1.5. Limitations

This report has been prepared on behalf of and for the exclusive use of Net World Sports, for whom the services were undertaken and is subject to and issued in connection with the provisions of the agreement set out by Hilson Moran. Hilson Moran accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party. Furthermore, this report is subject to the following limitations:

1) The concepts and information contained in this document are the property of Hilson Moran. Use or copying of this document in whole or in part without the written permission of Hilson Moran constitutes an infringement of copyright.

2) Hilson Moran accept no responsibility for the completeness or accuracy of any information or documents upon which this report is based and which were provided to us by the Client and other third parties.

3) The contents of and findings of this report are relevant as of the original date of the report and do not incorporate any facts or information which may have come into existence after the date of the report.

4) Hilson Moran has not taken any steps to update this report since it was produced, and it accept no liability for any part of this report that has or may become inaccurate as a result of circumstances that have occurred or arisen in relation to the project after the date of this report.

2. Legislation and Guidance

2.1. Contaminated Land Risk Assessment

2.1.1. Environmental Protection Act

The regime for contaminated land was set out in Part 2A (ss.78A-78YC) of the Environmental Protection Act 1990 (EPA)[i], as inserted by S.57 of The Environment Act 1995 and came into effect in Wales on 1st July 2001 as The Contaminated Land (Wales) Regulations 2001 (WSI 2001/2197, W.157). These regulations were subsequently revoked with the provision of The Contaminated Land (Wales) Regulations 2006 (SI 2006/2989 W.278), which consolidated the previous regulations and amendments and added in provisions regarding radioactive contaminated land.

These regulations came into force on 10th December 2006 and were accompanied by statutory guidance published by the Welsh Assembly Government in December 2006 ('the Guidance') for local authorities on how to implement the regime. The 2006 statutory guidance was replaced by the Contaminated Land Statutory Guidance - 2012 (WG19243), issued by the Welsh Government.

Part 2A of the EPA (Section 78A (2)) defines contaminated land as "*any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, or under the land that:*

a. *Significant harm is being caused or there is a significant possibility of such harm being caused[ii]; or,*

b. *Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused"[iii].*

The pollution of controlled waters is defined in Section 78A (9) of the EPA as *"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter".*

2.1.2. Land Contamination Risk Management

The Environment Agency have prepared the Land Contamination Risk Management (LCRM)[iv] guidance to assist in the assessment and management of risks from land contamination. The LCRM guidance was published in October 2020 and last updated in July 2023, replacing CLR 11 'The Model Procedures for the Management of Land Contamination' (2004). This Guidance applies in Wales, England and Northern Ireland.

The LCRM is used to:

- Identify and assess if there is an unacceptable risk (from land contamination);
- Assess what remediation options are suitable to manage the risk;
- Plan and carry out remediation; and
- Verify that remediation has worked.

LCRM can be used in a range of regulatory and management contexts, including planning, assessing liabilities or under the Part 2A contaminated land regime. The Environment

Agency expects you to follow LCRM if you are managing the risks from land contamination.

Stage 1 (or 'Tier 1') of the LCRM guidance is risk assessment based on the source-pathway-receptor (S-P-R) approach. Risk assessment is an iterative process which starts with a Preliminary Risk Assessment (PRA) and moves though generic and detailed tiers as more information is gathered, including intrusive ground investigation data, and the level of uncertainty in the risk assessment is reduced.

This report presents the findings of a PRA that has been undertaken for the proposed development. The PRA comprises a desk-based study and site walkover to provide information to allow development of an initial conceptual site model (CSM) of potential S-P-R (contaminant) linkages and a qualitative evaluation of risk.

2.2. Planning Policy & Legislation

2.2.1. National

2.2.1.1. Planning Policy Wales

This report has been prepared in accordance with Planning Policy Wales (PPW)[v], which sets out the Welsh Government's land use planning policies. It is supplemented by a series of Technical Advice Notes, Welsh Government Circulars and policy clarification letters, which together provide the national planning policy framework for Wales.

The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves Wales's social, economic, environmental and cultural well-being, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty.

PPW and the National Development Framework (Future Wales – the National Plan 2040 (refer to Section 2.2.1.3)) set out how the planning system at a national to local level can assist in delivering these requirements through Strategic and Local Development Plans.

Chapter 6 of the PPW ('Distinctive and Natural Places') sets out planning policies with regards to land contamination and identifies the planning system as the preferred means of addressing potential land contamination whenever development is proposed.

Paragraphs 6.9.17 - 6.9.18 place the onus on developers to ensure that the development of sites will remove any unacceptable risks associated with contaminated land, and state "*Planning authorities should take into account the nature, scale and extent of land contamination which may pose risks to health and the environment so as to ensure the site is capable of effective remediation and is suitable for its intended use. In doing so, development management decisions need to consider:*

- *the potential hazard that contamination presents to the development itself, its occupants and the local environment; and*
- *the results of a specialist investigation and assessment by the developer to determine the contamination of the ground and to identify any remedial measures required to deal with any contamination."*

Where acceptable remedial measures can overcome contamination, planning permission may be granted subject to conditions specifying the necessary measures. This remediation will then need to be verified, as detailed in Paragraph 6.9.20.

Paragraphs 6.9.22 – 6.9.23 note that development can result in land instability which may affect the site and surrounding land, and planning authorities should therefore consider the nature, scale and extent of ground instability which may pose direct risks to life and health, buildings and structures, or present indirect hazards associated with ground movement, including mine entry collapse, which provide potential pathways for the migration of landfill or mine gases.

As per Paragraph 6.9.25, "*planning decisions will need to take into account:*

- *the potential hazard that instability could create to the development itself, to its occupants and to the local environment; and*
- *the results of a specialist investigation and assessment by the developer to determine the stability of the ground and to identify any remedial measures required to deal with any instability."*

2.2.1.2. Future Wales: The National Plan 2024

Future Wales – the National Plan 2040 is Wales's national development framework, setting the direction for development up to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities. Future Wales should be read alongside PPW (Refer to Section 2.2.1.1 above).

The plan does not specifically refer to land contamination, however the need for Development Plans to reduce pollution is referenced throughout the document.

2.2.2. Local

Local planning policy for the site is currently set out in the Wrexham County Borough Local Development Plan[vi] (LDP) which was adopted on 20th December 2023 and guides development for the period 2013 to 2028. The LDP forms part of the statutory development plan alongside Future Wales and is a long-term land use and development strategy focused on achieving sustainable development.

Policy SP9 of the LDP relates to Wrexham Industrial Estate specifically, promoting it as the County Borough's Key Business Sector Area. The Estate is the primary focus for new employment development over the plan period. Land on the estate is also protected for a strategic ecological network for several protected species and habitats.

Economic policies relating to the development of sites with land contamination are outlined in the LDP and include EM1 (Protection of Existing Employment Land), EM2 (Provision of Supporting Facilities for Employees in Business, Industrial and Warehousing Developments) and EM3 (Alternative Use of Employment Land and Premises).

The LDP states that *"Responsibilities for determining the extent and effects of instability, contamination and other risks remain that of the developer, who must ensure that land is suitable for the development proposed."*

The Wrexham Unitary Development Plan[vii] provides a framework for local decision making and is split into two parts: Part 1 is the strategy which outlines the Council's broad intention for development in the area and provides a framework for the more specific policies and proposals, and Part 2 contains specific policies which expand on the strategic vision for the County Borough and provide detailed guidance for the development and other use of land. Policies within the Unitary Development Plan which are relevant to include:

Policy GDP1: All new developments should:-

i. Ensure that the development does not result in, or is subject to, flooding, soil erosion, landslides or contamination either on or off the site.

Policy E1 of the UDP related to Wrexham Industrial Estate specifically and stated that '*sufficient land will be allocated for employment development between 2001 and 2011 at Wrexham Industrial Estate'*.

Policy E2 of the UDP also requires that *'land is allocated for the establishment of high quality employment development comprising high technology, manufacturing, research and development, and prestige offices*' specifically at Wrexham Technology Park and Ruthin Road Development Area.

3. Site Walkover

The following information was derived from a site visit undertaken on 11th October 2023 by a Geo-Environmental Consultant from Hilson Moran. The purpose of the visit was to assess whether there is potential for contamination at the site from current and recent activities. Photographs taken during the site visit are provided in **Appendix A**.

3.1. Site Description

The site covers an area of approximately 3.36 hectares (ha) and falls within the north-eastern part of Wrexham Industrial Estate, located approximately 4.5 km north-east of Wrexham town centre at National Grid Reference SJ 38444 50770. The site currently comprises an area of grassland (two fields) with trees along the northern, eastern and southern boundaries. An area of slopping masonry forms a drain in the south-western corner of the site. Access to the site is via a gate off Bryn Lane, which marks the northern site boundary.

An aerial photograph of the site which resembles the layout at the time of the site walkover is shown in **Figure 3-1** below. It should be noted that the red line boundary has been updated slightly since the walkover (refer to **Figure 1-1** for the correct boundary).



Figure 3-1 Aerial Photograph of the Site, Dated 2020 (Source: Groundsure Report Ref. GS-X32-UAI-H71-9HZ).

The following observations regarding the site condition were made during the site visit:

- The site access off Bryn Lane comprises a 3-rail wooden fence and a metal gate, which was secured by a locked padlock at the time of the site walkover. There is also a 3-rail wooden fence across the north-eastern corner of the site, which is in place to prevent entry to a concrete structure which may have been associated with the former Royal Ordnance Factory.
- The concrete structure is dilapidated and overgrown, although vegetation appears to have been cleared from around it. There is a large willow tree growing in the centre of the concrete structure, and the entrances have been secured to prevent entry.
- The site comprises grassland split into two fields, which are separated by an agricultural wire and post fence. The fields appear to have previously been grazed by livestock. The grass across the two fields appears to have been cut relatively recently. The fields were wet in places.
- The northern and eastern boundaries are characterised by trees and scrub. The site slopes down from Bryn Lane but across the main part of the site it is relatively level.
- There is a drainage ditch along the south-eastern boundary. This is a drainage channel from the neighbouring Bryn Business Park to the east. Vegetation and scrub have been cleared along the ditch and around the outfall of the culvert. A wooden fence had been erected around the brick outfall. There was no water in the ditch at the time of the site visit. The southern end of the ditch enters a second brick culvert which directs any water into another ditch which appears to flow south-east through a wooded area. There is a large brick structure at the outfall within the woodland.
- There is a chain-link fence along the eastern boundary. To the south-east, there is a wooded area which has large amounts of scrub. A mound of earth, brick and rubble was noted adjacent to the boundary fence. At least one discarded vehicle tyre was also noted amongst the scrub.
- The southern boundary has a 3-rail wooden fence, with the site bound by a large concrete drainage feature which is characterised by cobbled sloping masonry sides. There was water in the base of the channel at the time of the visit. The base of the channel is heavily vegetated including with reeds and ferns. The channel has a culvert at its south-eastern end, which has a metal penstock. The penstock was open at the time of the site visit. It is not clear whether the penstock is operational. It is assumed that the culvert discharges to the ditch that was noted within the woodland to the south-east.
- There is a palisade fence along the western boundary with the neighbouring Wockhardt site, with a car park, access road and large industrial unit directly west of the fence line. In the south-west corner of the site, there is a drainage ditch flowing from the Wockhardt site into the large drainage channel. The ditch was noted to contain water at the time to the site visit.
- No significant sources of potential ground contamination were noted on the site during the visit. There was no visible evidence of the former buildings that are shown to be present on historical maps (refer to Section 4), namely Riley Farm or the former Royal Ordnance Buildings. Very occasional fragments of concrete and bricks were noted at the surface of the site.
- Based on the layout and construction of the buildings, the adjoining Bryn Business Park to the east of the site appears to comprise of the original ROF buildings. It was noted that these may include asbestos cement roofs. It is assumed that the buildings that were formerly on the proposed development site were of a similar construction

and therefore there may be a potential for asbestos containing materials (ACMs) within the ground following demolition and clearance of the buildings.

3.2. Site Topography

In terms of topography, the site ranges from approximately 30 to 34 m above Ordnance Datum (AOD). The topography of the site and surrounding area is shown on **Figure 3-2**.

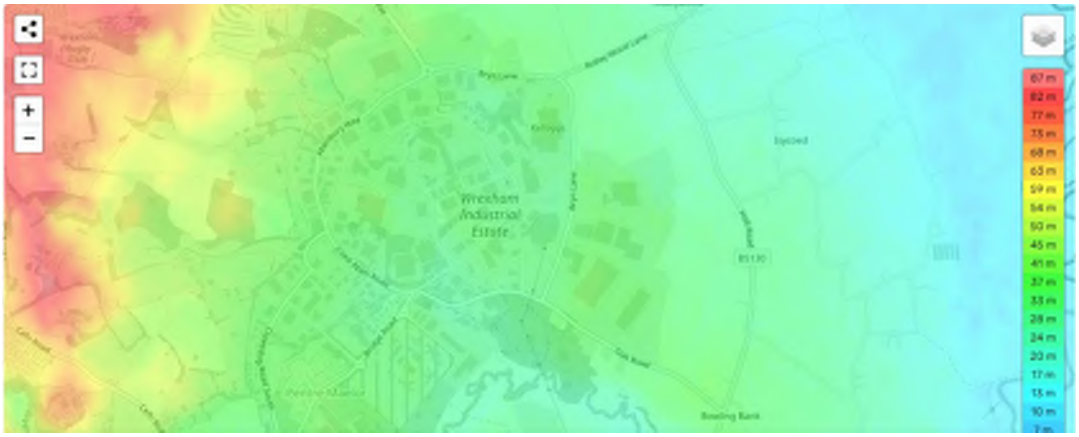


Figure 3-2 Topography of the Site and the Surrounding Area (Source: OpenStreetMap).

3.3. Surrounding Site Uses

The site is bounded by Bryn Lane to the north, which serves as the outer perimeter access road for Wrexham Industrial Estate, and a range of employment uses to the east, west and south. To the north is a farm property ('Little Acorns'), which is surrounded by fields. The Industrial Estate lies predominantly to the south-west of the site.

Adjacent to the eastern boundary is Bryn Business Centre which includes a variety of small businesses and commercial enterprises, including a gym and several food businesses. A Kellogg's Factory occupies a substantial footprint approximately 140 m south-east of the site (beyond Bryn Business Centre) and includes several above ground storage tanks (ASTs). There are also some smaller industrial units to the north of the Kellogg's Factory and east of Bryn Business Centre. Businesses shown on Google Maps include a coating & blast cleaning business and a car valeting and detailing business.

There is a wooded area to the south-east of the site, situated between the site, Bryn Business Park, the Kellogg's Factory and the industrial and commercial premises located on Abbey Road, which is one of the inner access roads on the Estate.

Directly west of the site is a large industrial unit, which appears to be part of the Wockhardt UK Limited site, a large generic pharmaceutical company.

The surrounding land uses described above, that were identified from desk-based sources (including Google Maps and Streetview), were verified during the site visit.

4. Historical Information

4.1. Historical Maps

Hilson Moran has undertaken a review of historical mapping and aerial imagery (Google Earth) of the site and surrounding area (where available) obtained from a proprietary environmental database (Groundsure Insight Report[viii]). The historical development of the site and surrounding area is detailed in **Table 4-1**.

Table 4-1 History of the Site and Surrounding Area.

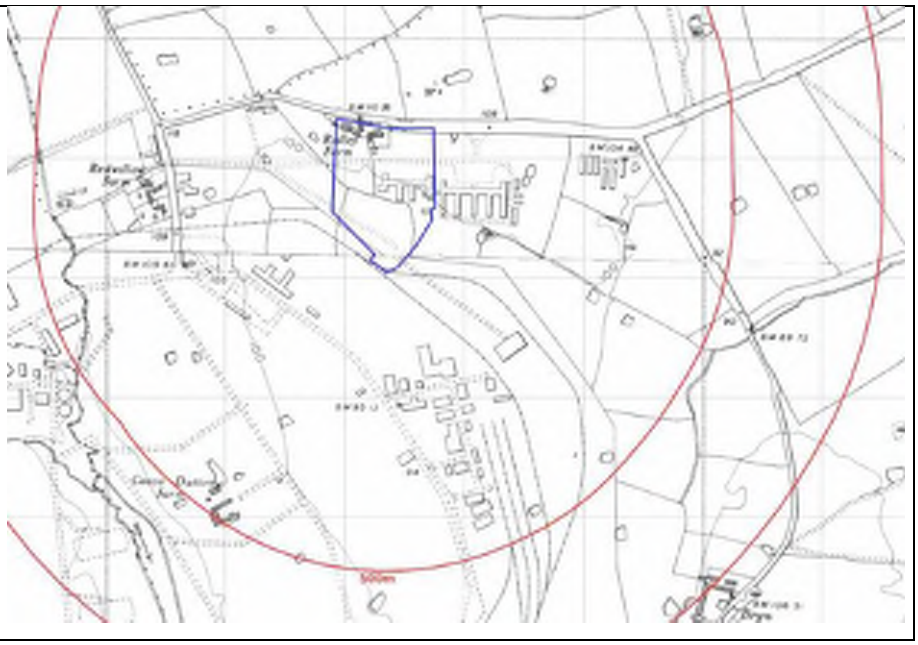
Date & Scale	Features On-Site	Features Off-Site
1872 1:10,560 **1873** 1:2,500	The site comprised farmland, with Ridley Farm located in the north of the site. Two ponds were located along the northern boundary to the east of the farm, and a third pond was located just south of the farm.	The site was located in a rural setting surrounded by agricultural fields. A road was present along northern boundary. Several small ponds were located in the adjacent fields (including ~ 25m west, ~70m south-east, ~80m north-east and ~100m west).
1898-1900 1:10,560 **1899** 1:2,500	The ponds were no longer shown (*possibly infilled*).	No significant changes in the vicinity noted, except four wells shown in the field directly north of Ridley Farm (from ~10m north of the site).
1909-1914 1:10,560 **1912** 1:2,500	Ridley Farm had been extended to the west, with two additional buildings shown. A pond was located to the south of the farm (not present in subsequent mapping).	No significant changes in the vicinity noted.
1949 1:10,560	Ridley Farm was still present in the north of the site, with a pond labelled adjacent to the east. An embankment / ground works feature was depicted in the north-eastern corner of the site (suspected concrete structure – still present). A new development of buildings had been constructed in the central east of the site (offices which formed part of the Royal Ordnance Factory (ROF) – refer to section 5.4 for further details).	A similar development of 'E' shaped buildings to the one on-site was shown directly east of the site (also known to be offices). The two developments appear to be linked and formed part of the ROF which occupied the wider area, primarily ~100m south-west, upon which the present-day Industrial Estate has been developed. A railway line had been constructed along the south-western boundary (present until at least 1968 mapping).

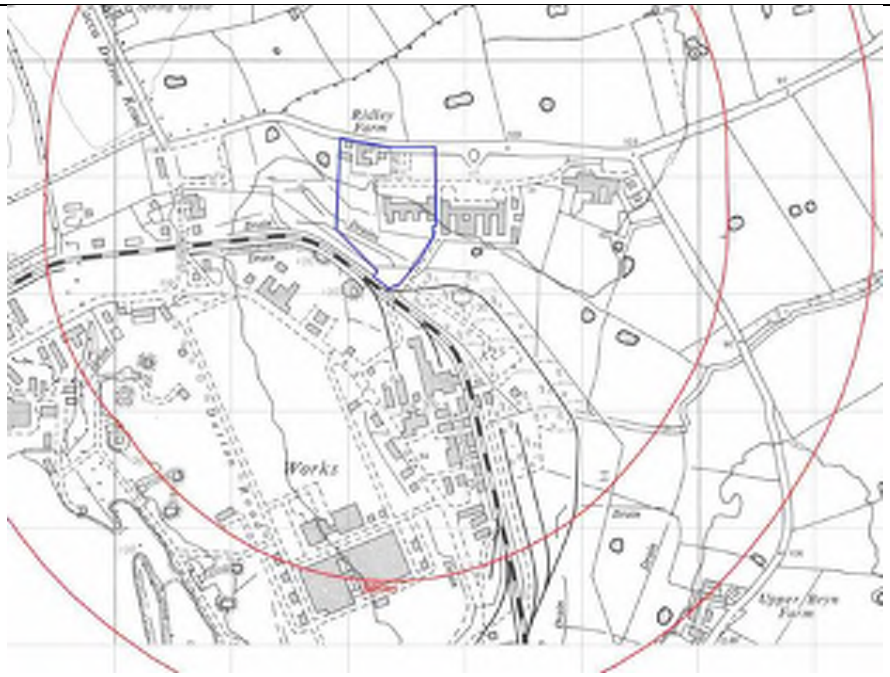
Date & Scale	Features On-Site	Features Off-Site
1960-1962 1:2,500 **1960-64** 1:10,560	Ridley Farm was still present in the north of the site, along with the ROF building present in the central east. Three hydrants were labelled around the perimeter of the ROF building on large scale maps. Drains were shown in south-western portion of the site, running in a north-west to south-east direction.	The railway was labelled as Mineral Railway on large scale maps. A wooded area was present adjacent to south-east of the site. A circular embanked feature was present to the south-west of the railway line, ~20m south-west of the site. The buildings to the south-west, formerly part of the ROF site, included numerous hydrants on the large-scale maps. Additional buildings had been constructed and a large 'Works' was shown around ~500m south of the site (assumed to be the former British Celanese Yarn Factory).
1974 1:2,500	No significant changes in land use. The ROF building located on-site was now labelled as a 'Clothing Factory'.	The buildings directly east of the site had been extended (current day Bryn Business Centre). A small building was shown adjacent to the north of the site across the road (unknown use – present until at least 1989). Works were shown ~150m west of the site. The mineral railway was no longer present or labelled, but the former line and associated embankments can be seen on the maps.
1979-1982 1:10,560	Ridley Farm was no longer shown in the north of the site (plot shown but no buildings). The industrial development was now just labelled as a 'Factory'.	The large Kellogg's Factory had been constructed ~140m south-east of the site, including the two 'tanks' ~150m to the east of the site.
1989 1:2,500	The on-site buildings had been demolished and the site was labelled as forming part of Wrexham Industrial Estate. The small square embanked area (suspected concrete structure) was still present in the north-east corner and two hydrants were still labelled in the far east. A drainage channel was present along the south-eastern site boundary. The road to the north was labelled as 'Ridley Wood Road'.	The surrounds also formed part of Wrexham Industrial Estate. The 'Works' to the west extended to run along the south-west boundary of the site, including at least four tanks and a water main or possibly effluent feature, which has sloping masonry either side of it. The Kellogg's Factory also appears to have been extended to the west. A pond was shown adjacent to the two tanks ~150m east of the site.
1991-1995 1:2,500	No significant changes noted.	Two small additional buildings had been constructed to the north of the site; original property labelled 'Ridley View'.

Date & Scale	Features On-Site	Features Off-Site
		Some new development of commercial / industrial units had occurred to south-west of the site (labelled 'Abbey Close c. 1993) – includes electricity substation. Redwither Industrial Complex was labelled around the former location of the yarn works, with additional redevelopment in this area.
2003 1:2,500	No significant changes noted.	No significant changes in immediate surrounds.
2010 1:10,560	No significant changes noted.	Wrexham Industrial Estate including Redwither Industrial Complex shown.
2023 1:10,560	No significant changes noted.	No significant change in wider area – still comprises Wrexham Industrial Estate.
2024 Google Earth Aerial Imagery	No significant changes noted.	No significant change in wider area – still comprises Wrexham Industrial Estate.

Selected historical maps are presented in **Appendix B** and key extracts of these maps are included in **Table 4-2**. It should be noted that the site red line boundary used for the Groundsure report differs slightly to the current red line boundary (refer to **Figure 1-1**).

Table 4-2 Historical Map Extracts (Source: Groundsure Report Ref: GS-X32-UAI-H71-9HZ).

Extract from 1949 County Series Ordnance Survey Map	

Extract from 1968 Provisional Ordnance Survey Map	
Extract from 2023 Ordnance Survey Map	

4.2. Anecdotal Information

It is well documented that Wrexham Industrial Estate is located on the site of the former Royal Ordnance Factory (ROF) Wrexham. The factory manufactured cordite, an explosive propellant for shells. The factory was spread over a large area to minimise any damage from aerial attack during the Second World War (WWII). The ROF had an extensive railway network associated with it to facilitate transfer of the cordite. The production facility closed in 1945, after the war, as the need for cordite ceased.

In the 1950's, British Celanese opened a large acetate yarn factory on the site. This was subsequently sold to Courtaulds by the 1990's, who remained until it was sold to Wrexham Council, who re-opened the last remaining building (Redwither Tower) and surrounding area as Redwither Business Park. Other notable large companies that historically opened up factories / production facilities on the Industrial Estate include Firestone (closed in the 1970s), Kellogg's, JCB and BICC Cables.

Table 4-2 above illustrates the changes in the surrounding land use between 1938 and 2023, in particular the location and redevelopment of ROF Wrexham and subsequent yarn works into the Industrial Estate.

Figure 4-1 below is an aerial photograph from 1958, showing the former ROF Wrexham site (and subsequent British Celanese Yarn Factory) and location of the current proposed development site.



Figure 4-1 Aerial Photograph 1958 showing Former ROF Wrexham and Proposed Development Site (Source: Royal Commission on the Ancient and Historical Monuments of Wales).

5. Site Information

5.1. Geology

5.1.1. Bedrock and Superficial Deposits

Based on the 1:10,000 scale geological plans contained within the Groundsure Report, the site is indicated to be underlain by superficial deposits of Till. The bedrock below the site comprises the Salop Formation (mudstone, sandstone and conglomerate). There are fault lines c. 60 m north-west and 200 m north of the site, with bedrock beyond the fault lines comprising Kinnerton Sandstone Formation, as shown in **Figure 5-1**. It should be noted that the site red line boundary used for the Groundsure report differs slightly to the current red line boundary (refer to **Figure 1-1**).

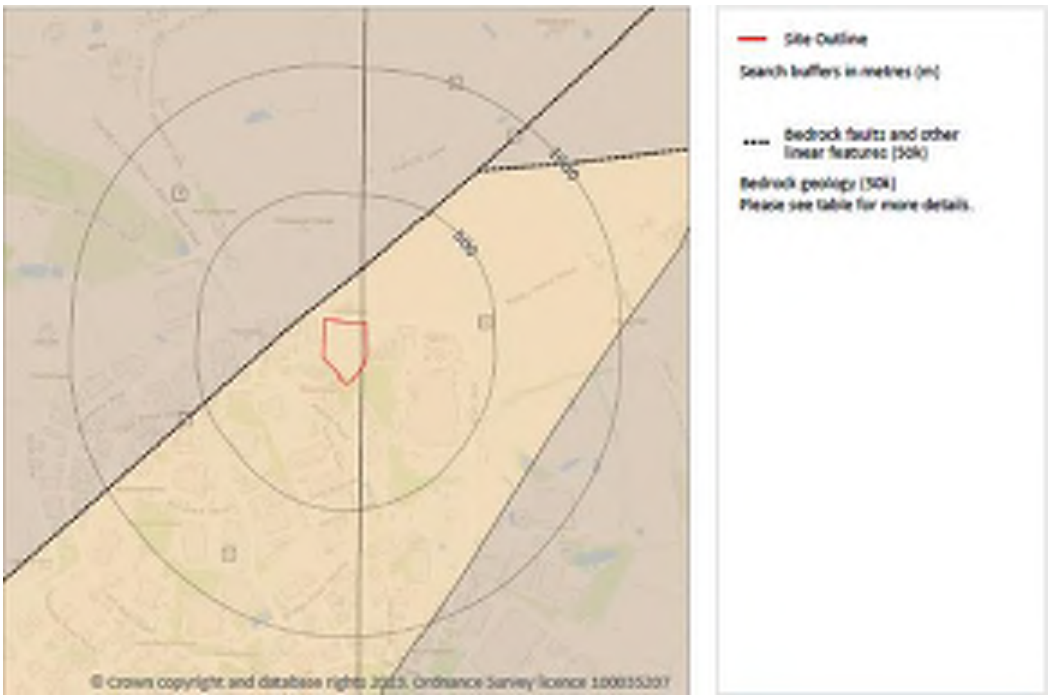


Figure 5-1 Bedrock Deposits Underlying the Site (Source: Groundsure Report Ref. GS-X32-UAI-H71-9HZ).

The site is also shown to lie within an area of 'Disturbed Ground', also described as 'Landscaped Ground' and 'Artificially Modified Ground' within the Groundsure Report.

Further interrogation of the underlying geology has been undertaken using the British Geological Survey's (BGS) Geology Viewer, which identifies geological formations at the 1:50,000 scale. This confirms that the site is underlain by Till and then bedrock of the Salop Formation, a sedimentary bedrock formed between 309.5 and 272.3 million years ago during the Carboniferous and Permian periods.

5.1.2. Soils

The Soilscape information within the MAGIC Map resource identifies the site to comprise slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

5.1.3. British Geological Survey Borehole Archive

There are no historical borehole records held by the British Geological Survey (BGS) located on the site, however there are 7 no. records within 250 m. The nearest records relate to two boreholes drilled in 1971 and located approximately 35 m and 75 m north-west and west of the site (Ridley Farm 2 and 3, respectively). These were both drilled to approximately 5 m below ground level (bgl) and recorded a thin layer of topsoil over firm, brown sandy Clay (Till).

A deeper borehole is located approximately 105 m south-east of the site (associated with the Kellogg's factory site). This was drilled in 1974 and shows firm becoming stiff brown clay from the ground surface to 20 m bgl. The base of the clay was not proved. The borehole was recorded as dry.

The deepest borehole record close to the site is one drilled approximately 230 m south of the site in 1950 for the British Celanese Factory. This was drilled to 30 m bgl and shows soft, brown silty clay from the surface becoming stiff brown silty clay at depth, again the base of the Till was not proved.

The BGS borehole records located in proximity to the site are shown in **Figure 5-2**.

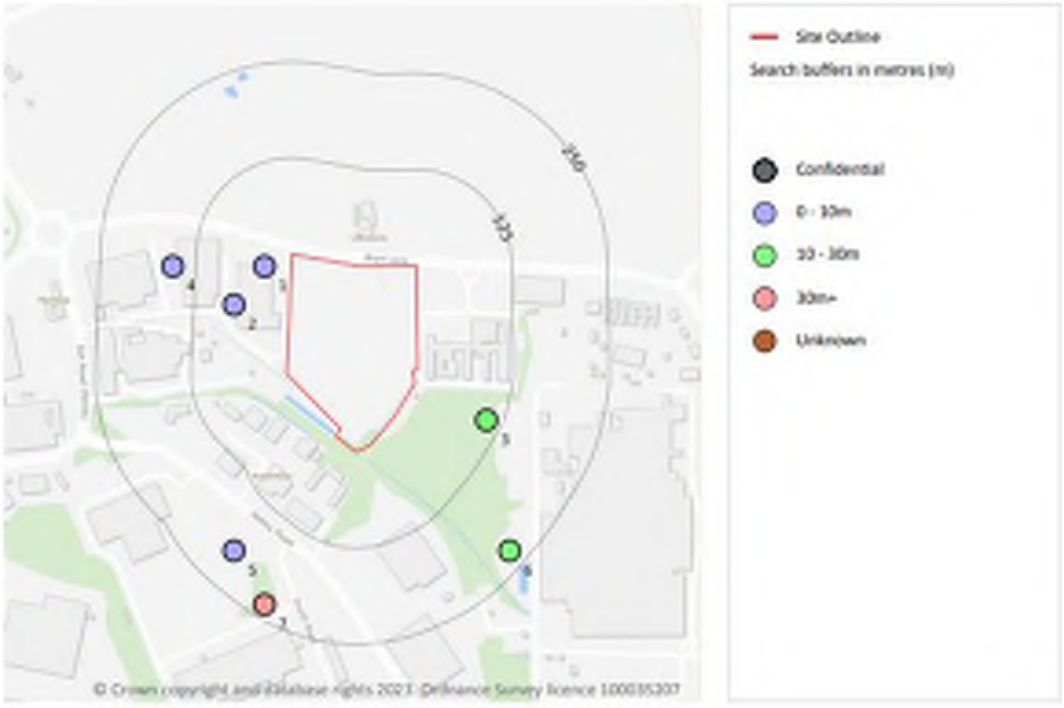


Figure 5-2 BGS Borehole Records in proximity to the site (Source: Groundsure Report Ref: GS-X32-UAI-H71-9HZ).

5.1.4. Geological Hazards

The potential geological hazards for the site as recorded in the Groundsure Report are detailed in **Table 5-1** below.

Table 5-1 Geological Hazard Ratings at the Site.

Hazard	Hazard Rating
Shrink Swell Clays	Very Low
Running Sands	Negligible
Compressible Deposits	Negligible
Collapsible Deposits	Very Low
Landslides	Very Low
Ground Dissolution of soluble rocks	Negligible

5.1.5. Radon

According to the Groundsure Report, the site does not lie in a "Radon Affected Area" as defined by Public Health England. The site is recorded as being located in an area where less than 1% of residential properties are projected to contain radon above the residential action threshold).

Under Health and Safety legislation, employers have a duty to manage workplace risks including the potential for radon exposure. Health and Safety Executive guidance recommends radon monitoring for workplaces located in radon Affected Areas. If the workplace radon threshold is exceeded, the Ionising Radiations Regulations 1999 require employers to take action to reduce risks.

According to BRE Report BR211 (2015) Radon: Protective Measures for New Buildings, radon protection measures are not required under building regulations for new buildings at this location.

5.1.6. Coal Mining

According to the Coal Authority, the site is located in a Coal Mining Affected Area. A desk-based, Coal Mining Report (Ref. GS-MD8-Y7A-QVX-QQY, dated 6th November 2024) was therefore obtained to further assess coal mining risks. The Coal Mining report is included as **Appendix C** of this report and key findings are summarised as follows:

- The site is not located in the likely zone of influence from coal workings in the past or present and is not within an area that the Coal Authority is determining whether to grant a licence to remove coal using underground methods. No future underground mining is recorded at the site.
- There are no known coal mine entries within 100 m of the site.
- The Authority is not aware of any evidence of damage arising due to geological faults, fissures and breaklines, or other lines of weakness that may have been affected by coal mining.
- The site does not lie within the boundary of an opencast site from which coal has been removed by opencast methods in the past, and no opencast mines are recorded within 500 m of the site.

- No Coal Mining Licensing (i.e. in relation to the undertaking of surface coal mining, underground coal mining or underground coal gasification) is recorded within 200 m.
- No Coal Authority managed tips (disused colliery tip sites) are recorded within 500 m.
- The Coal Authority has not received a damage notice or claim for the site or any property within 50 m since 31st October 1994, and there is no current Stop Notice delaying the start of remedial works or repairs to the property.
- There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the site.

The Coal Mining Report has identified no specific issues. As such, it is considered unlikely that a Coal Mining Risk Assessment will be required as part of the planning process, providing no issues are identified during the ground investigation.

It should be noted that even though there are no recorded instances of mine gas within 500 m of the site, the ground investigation should ensure ground gases are properly assessed.

5.1.7. Other Worked and Infilled Land

According to the Groundsure report, the site and immediately surrounding area is not part of a permitted or historical landfill site.

There are numerous areas (22 no.) of surface ground workings, potentially artificial or made ground identified within 250 m of the site, as shown on **Figure 5-3** below. These all relate to areas of surface water (ponds) identified from historical maps which may have potentially been infilled. Two records relate to unspecified heaps located 26 m south of the site, as shown on historical maps from the 1960s.

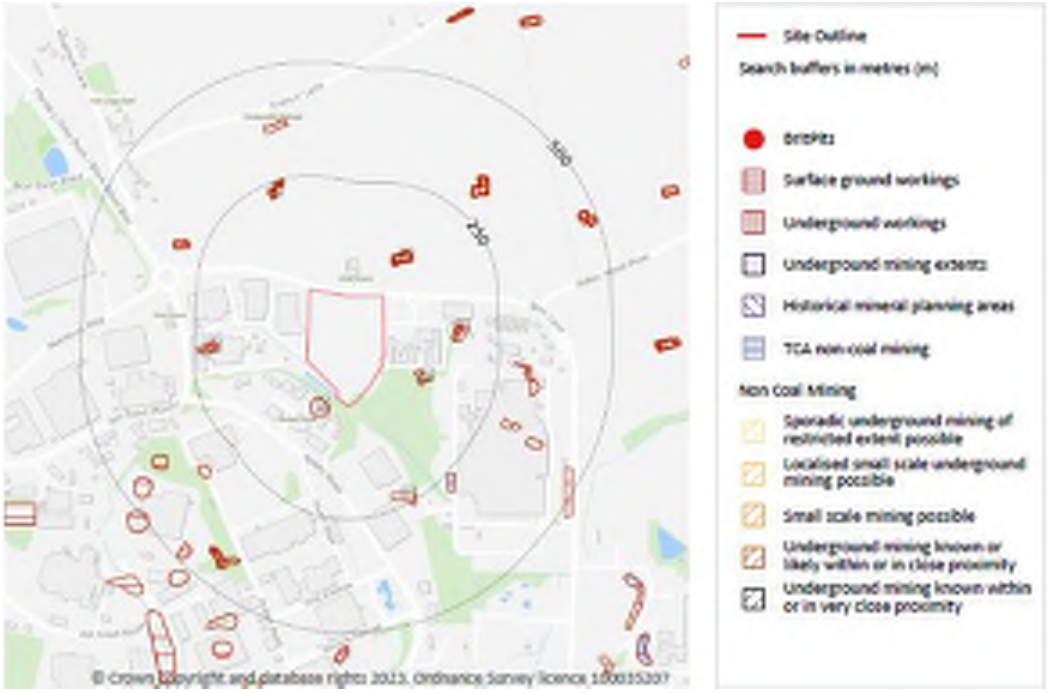


Figure 5-3 Mine and Ground Workings within 500 m of the Site (Source: Groundsure Report Ref: GS-X32-UAI-H71-9HZ).

5.2. Hydrogeology and Hydrology

5.2.1. Geological Aquifer Designation

The superficial Till deposits are classified as a Secondary Undifferentiated Aquifer. The bedrock aquifer of the Salop Formation is designated as a Secondary A Aquifer, with the Kinnerton Sandstone to the north-west designated as a Principal Aquifer (off-site), as shown in **Figure 5-4** below.

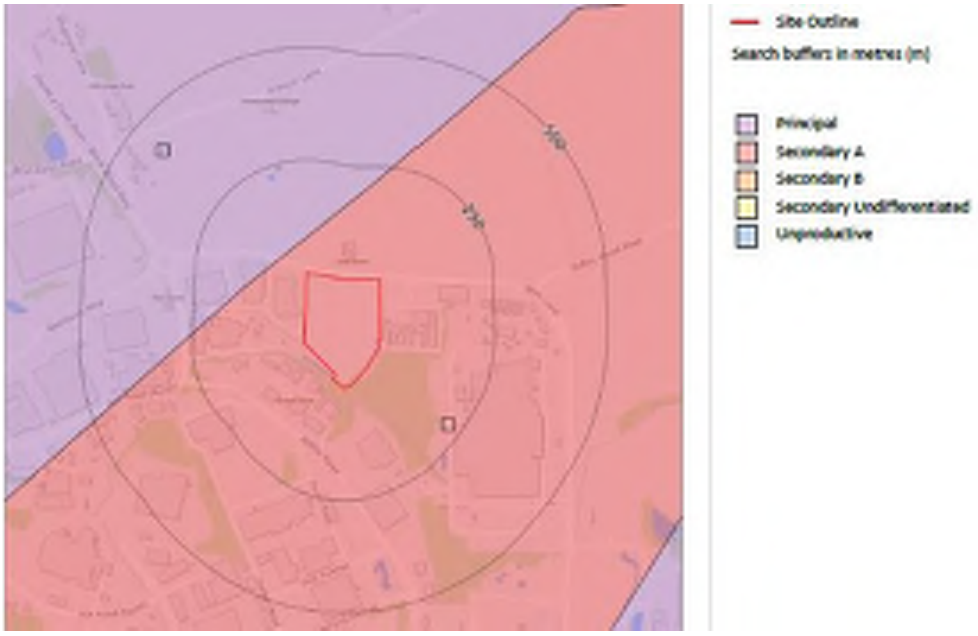


Figure 5-4 Bedrock Aquifer Classification (Source: Groundsure Report Ref: GS-X32-UAI-H71-9HZ).

The groundwater vulnerability of both aquifers is classified as Low defined as 'Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and / or the presence of superficial deposits characterised by a low permeability'.

The groundwater body below the site (Dee Permo-Triassic Sandstone) is subject to the Water Framework Directive (Water Body ID GB1101G202400) and has an overall rating of 'Poor' in 2019.

5.2.2. Source Protection Zones

The site is not located within EA designated Source Protection Zone (SPZ). There is a Zone 3 Total Catchment area located just to north-west of the site, as identified in **Figure 5-6**.

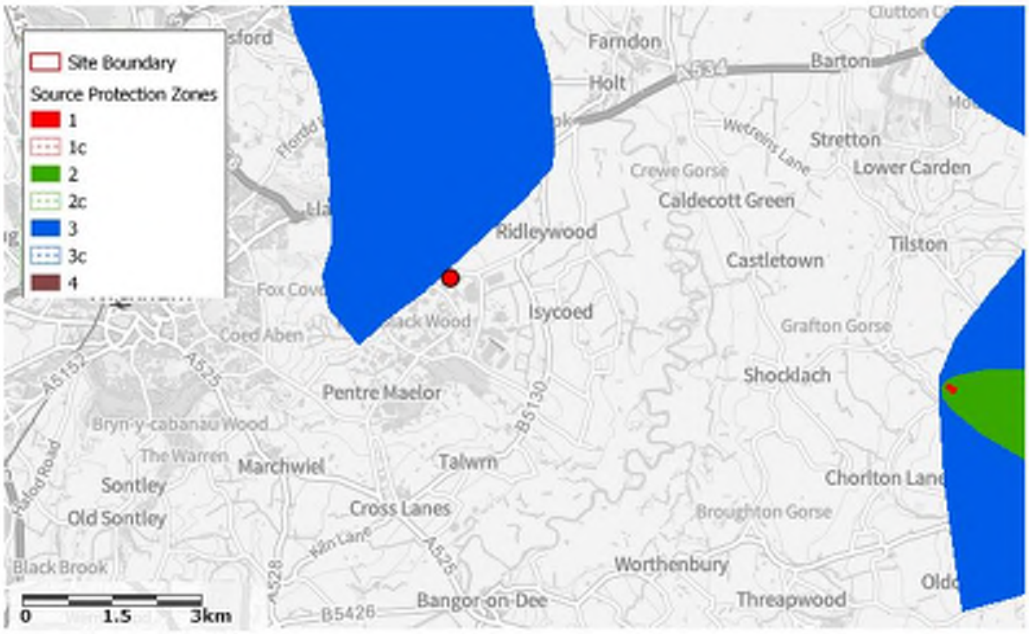


Figure 5-5 Source Protection Zones in proximity to the Site (Source: Magic Map).

For context, the Total Catchment area (Zone 3) is defined as the area around the supply source within which all the groundwater ends up at the abstraction point. The Inner Catchment (Zone 1) is defined as being 50 days travel time for a pollutant to reach the abstraction point and the Outer Catchment (Zone 2) is defined as being 400 days travel time for a pollutant to reach the abstraction point.

5.2.3. Groundwater Abstractions

According to the Groundsure Report (dated September 2023), there are no potable groundwater abstractions within 2 km of the site and no active non-potable groundwater abstraction licences within 2 km.

The nearest groundwater abstraction record is located 545 m north-west of the site and is an historical abstraction licence for 'General Farming & Domestic' use.

5.2.4. Hydrology

There are 10 no. surface water features listed within 250 m of the site. These comprise the drainage feature located along the south-east boundary of the site and the drains located to the south-east and south-west of the site.

Redwither Brook is located approximately 600 m to the south-west of the site. It flows south through the Industrial Estate and into the River Clywedog around 1.7 km south of the site, to the south of the Industrial Estate. The River Clywedog flows to the south-east and joins with the River Dee to the south of Sutton Green.

The site lies within the Water Framework Directive (WFD) Surface Water Body Catchment of Dee-Chester Wier to Ceiriog. The Dee is located 3.35 km north-east of the site. It has an overall classification of Moderate for water quality, as recorded in 2024.

According to the Groundsure Report (dated September 2023), there in one historical record for a surface water abstraction within 2 km of the site. This is located approximate 600 m west and was for abstraction of water from a tributary of Redwither Brook for non-evaporative cooling.

5.2.5. Flood Risk

With reference to the Natural Resource Wales (NRW) Development Advice Maps, the site lies within Zone A considered to be at little or no risk of fluvial or coastal / tidal flooding.

With respect to surface water flooding, the highest risk on-site is shown to be 1 in 30 years 0.3 m to 1.0 m area, but this is limited to a small area along the south-east boundary, co-incident with the drainage feature in this area, as identified in **Figure 5-7**.

There is a low risk of groundwater flooding at the site.

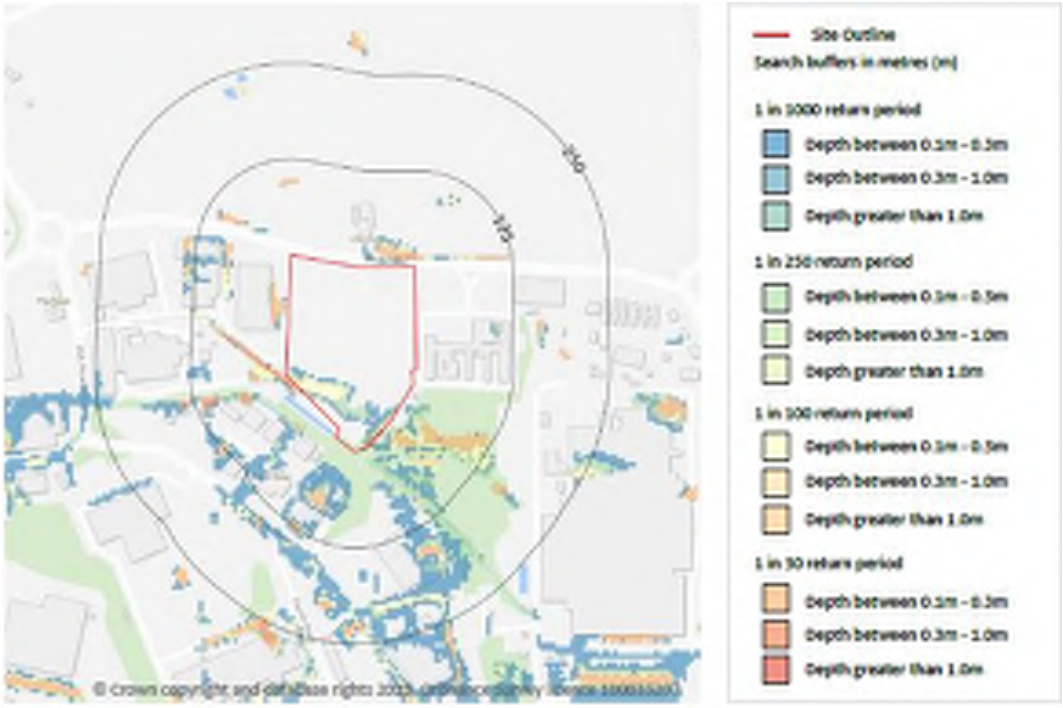


Figure 5-6 Surface Water Flood Risk Associated with the Site (Source: Groundsure Report Ref: GS-X32-UAI-H71-9HZ).

5.3. Environmental Data Request

Environmental information provided through the Groundsure Report is identified in **Tables 5-2** to **5-4**, covering aspects of pollution records, discharge consents, hydrology and hydrogeology designations, records of waste operations and sensitive land uses.

Table 5-2 Discharge and Pollution Records.

Aspect	Proximity	Number	Description
Contaminated Land Register	On-site	0	None recorded within 500 m of the development site.
	0 - 250 m	0	

Aspect	Proximity	Number	Description
Entries and Notices	251 - 500 m	0	
Active Discharge Consents	On-site	0	Only 2 no. historical records of discharges to controlled waters at 303m SE (Bryn Road) and 468m W (JCB).
	0 - 250 m	0	
	251 - 500 m	0	
Integrated Pollution and Control Part A(1) Permits	On-site	0	There are 10 no. effective entries listed for the Kellogg Factory 342m SE. These appear to be linked to two Permits: BV8016ID (6 no entries last noted as effective most recently 25/5/23) and GP3031ZW (4 no. entries last noted as effective 17/11/15). NB. There are 14 no. superseded entries for Kellogg. There are 5 no. entries for Ipsen Biopharm Ltd. Four are effective (Permit Ref: SP303OLZ and JP3038HV) and 1 no. superseded.
	0 - 250 m	0	
	251 - 500 m	14	
Integrated Pollution and Control Part A(2) and B Permits	On-site	0	The nearest entry is 70m S for Petcor Limited for Animal Feed Compound Process.
	0 - 250 m	1	
	251 - 500 m	8	
NRW/Environment Agency Recorded Pollution Incidents	On-site	0	Four of the entries are Category 4 (No Impact), including the closest recorded incident (233m W). There is 1 Category 3 (Minor) incident relating to oils and fuels recorded 479m W in 2003.
	0 - 250 m	1	
	251 - 500 m	4	
Registered Radioactive Substances	On-site	0	No records within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	

Table 5-3 Hydrology and Hydrogeology Records.

Aspect	Proximity	Number	Description
Groundwater Abstraction Licences	On-site	0	None recorded within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	
Surface Water Abstraction Licences	On-site	0	None recorded within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	
	On-site	0	

Aspect	Proximity	Number	Description
Potable Water Abstraction Licences	0 - 250 m	0	None recorded within 500 m of the development site.
	251 - 500 m	0	
Source Protection Zones	On-site	1	Total Catchment recorded on-site.
	0 - 250 m	0	
	251 - 500 m	0	

Table 5-4 Waste Records.

Aspect	Proximity	Number	Description
NRW/EA Historical & Registered Landfill Sites	On-site	0	None recorded within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	
BGS/DoE Landfill Site Survey	On-site	0	No records within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	
Local Authority Landfill or Waste Sites Data	On-site	0	1 no. record at 246m S Redwither Business Park – Historical Planning Application for a Waste Recovery Centre in 2003.
	0 - 250 m	1	
	251 - 500 m	0	
NRW & Environment Agency Licensed Waste Sites	On-site	0	11 no. entries for Material Recycling Treatment Facility 14m E (composting facility) EPR Ref: ZP3795ER. 1 no entry for AST Plastic Containers 278m SW, EPR Ref: CB3491FL.
	0 - 250 m	11	
	251 - 500 m	1	
Waste Exemptions	On-site	0	Nearest is 1 no. entry 59m SW for Dragon Hydraulics (WEX125151) Storage of waste in containers. 3 no entries at 65m SW for Rodens Hall, Isycoed for exemptions for storing waste.
	0 - 250 m	4	
	251 - 500 m	7	

Table 5-5 Hazardous substances.

Aspect	Proximity	Number	Description
Notification of Installations Handling Hazardous	On-site	0	None recorded within 500 m of the development site.
	0 - 250 m	0	

Aspect	Proximity	Number	Description
Substances (NIHHS)	251 - 500 m	0	
Control of Major Accident Hazard (COMAH) sites	On-site	0	None recorded within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	
Planning Hazardous Substance consents	On-site	0	No records within 500 m of the development site.
	0 - 250 m	0	
	251 - 500 m	0	

Table 5-6 Sensitive Land Uses.

Aspect	Proximity	Number	Description
Ecologically Designated Sites	On-site	0	None recorded within 500 m of the site (or up to 2 km of the site).
	0 - 250 m	0	
	251 - 500 m	0	
Priority Habitats	On-site	0	None recorded within 250 m of the site.
	0 - 250 m	0	
	251 - 500 m	0	
Local & National Nature Reserves	On-site	0	None recorded within 500 m of the site (or up to 2 km of the site).
	0 - 250 m	0	
	251 - 500 m	0	
Ancient Woodland	On-site	0	None recorded within 500 m of the site. 8 no. recorded 500m – 2 km from the site.
	0 - 250 m	0	
	251 - 500 m	0	
Visual and Cultural Designations	On-site	0	None recorded within 250m of the site.
	0 - 250 m	0	
	251 - 500 m	0	

5.4. Planning Context

The most recent application containing ground investigation data in close proximity to the site is the Hybrid Planning Application (Ref. P2023/0720) submitted by Net World Sports for land to the north of Bryn Lane.

Two Ground Investigation Reports have been prepared by Tier Environmental: one for areas subject to full planning and the other for areas subject to outline planning. The latest version of these reports on the planning portal at the time of writing are dated 20th October 2023:

- Ground Investigation Report for Bryn Lane – Full Planning Areas, Wrexham, TE1750-TE-))-XX-RP-GE-001-V05, Version 5, dated 20 October 2023
- Ground Investigation Report for Bryn Lane – Outline Planning, Wrexham, TE1749-TE-00-XX-RP-GE-001-V04, dated 20 October 2023

Both Ground Investigation Reports were preceded by a Preliminary Risk Assessment Report prepared by Tier Environmental covering all areas:

- Preliminary Risk Assessment (PRA) Report, Bryn Lane, Wrexham, TE1624-TE-00-XX-RP-GE-001-V03 Version 3, dated 19 June 2023

The PRA indicated that historically, the whole area covered by the planning applications was agricultural and did not form part of the Royal Ordnance Factory (ROF) Wrexham and had not been subject to any other potentially contaminative use. Areas of greatest concern were ponds across the site which may have had the potential to have been infilled. It was recommended that a ground investigation was undertaken together with a detailed unexploded ordnance (UXO) desk study.

Ground investigations comprising of machine excavated trial pits, hand excavated trial pits, cable percussive boreholes (up to circa 15 m deep) and window sample holes (up to circa 5 m deep) were completed in June 2023. The purpose of the investigation was to determine the nature and extent of soil and groundwater beneath the site for the purpose of environmental and geotechnical assessment. Samples of soil and groundwater were submitted for chemical analysis of a range of common contaminants and for geotechnical testing.

The ground investigation indicated that the site is broadly underlain by topsoil to depths of 0.18 m to 0.46 m bgl or Made Ground to depths of between 0.34 m to 0.55 m bgl, principally in the east of the site. These are underlain by natural soils of Devensian Till, described as a firm becoming stiff and locally very stiff Clay. A more weathered horizon of brown clay was recorded in the order of 0.30 m to 0.92 m thick overlying the dark grey Till which was proven to the maximum drilled depth of 15.15 m bgl. Sand lenses were also recorded near surface to 0.45 m and 0.63 m bgl. Localised areas of soft organic clays and peat are described within the east of the site within an infilled pond from depths of 0.33 m to 1.90 m bgl to depths of between 1.25 m to 2.80 m bgl.

Groundwater was encountered between 0.27 to 8.92 m bgl, with a shallow body of between 0.80-3.20 m and a deeper body of between circa 4.80 m to 9.92 m bgl in the cable percussive boreholes. Trial pits recorded limited light seepage and some shallow inflow from Made Ground soils.

No measured soil concentrations of potential contaminants of concern were recorded in excess of the Generic Assessment Criteria protective of human health appropriate to the proposed land use (commercial/industrial) and it was concluded the site did not

represent a potential risk to future end users. It was also concluded that there was no unacceptable risk to controlled water environments.

In terms of ground gas, some elevated levels of methane were recorded in one location, an historical infilled pond, where up to 60.1 % v/v methane peak was recorded with a peak flow of 2.2 l/hr. Based on a Gas Screening Value of 1.32 l/hr this area of the site has been classified as Characteristic Situation 3 (Moderate Risk Scenario) with respect to ground gas and the level of gas protection measures needed. The remainder of the site has been classified as Characteristic Situation 1 (based on a GSV of 0.062 l/hr), 'Very Low' Risk Scenario for which no ground gas protection measures are required. Tier have indicated that if the source material within the pond(s) is excavated and removed as part of the groundworks then the gas risk assessment can be revised and the need for gas protection measures negated.

The potential risk presented by historical infilled ponds across the site and need to investigate these further was highlighted in a Consultation Response from the Contaminated Land Officer (CLO) at Wrexham County Borough Council, dated 25th September 2023. Further information, including the full set of ground gas monitoring data, was submitted by Tier in response to the CLO comments. A further Memo from the CLO dated 8th November 2023 states that whilst the information submitted addresses the queries raised the previous recommendation remained unchanged that the applications be conditioned to ensure that any remaining potential contamination issues are adequately dealt with.

5.5. Unexploded Ordnance

A Preliminary Desk Study Assessment for unexploded ordnance (UXO) was obtained for the site from Zetica UXO, which recommended a detailed desk study be commissioned to assess, and potentially zone, the UXO hazard level on the site. As such, Hilson Moran commissioned Zetica UXO to undertake detailed Desk Study for UXO and Explosives Hazards for the site (ref. P14594-24-R1, dated 8th July 2024). A copy of the Detailed Desk Study is included in **Appendix D**.

The main findings of the detailed desk study are summarised as follows:

- No records of military activity on the site during World War One (WWI) have been found.
- Between 1939 and 1946, the site was encompassed by ROF Wrexham, which produced cordite propellant for military use in firearms. The site comprised administrative and farm buildings away from the main production areas. It has since been partially redeveloped.
- During World War Two (WWII) the main strategic targets in the vicinity of the site were ROF Wrexham and Royal Air Force Wrexham.
- No records have been found indicating that the site was bombed during WWII. Records indicate that the nearest High Explosive bomb fell approximately 0.5 km north-west of the site on 29th October 1940.
- There were no Heavy Anti-Aircraft (HAA) batteries within 10 km of the site during WWII. The potential for an Unexploded AA (UXAA) shell to have fallen on the site cannot be totally discounted.

Overall, as the site comprised administrative office and farm buildings away from the main production areas, ROF Wrexham is not considered to provide a significant source of UXO or explosives contamination hazard to the site. No records were found indicating that the site was bombed and no other significant sources of UXO hazard have been identified on the site. Given this, it is considered that the site has a **Low** UXO and explosives contamination hazard level, as shown in **Figure 5-7** below.

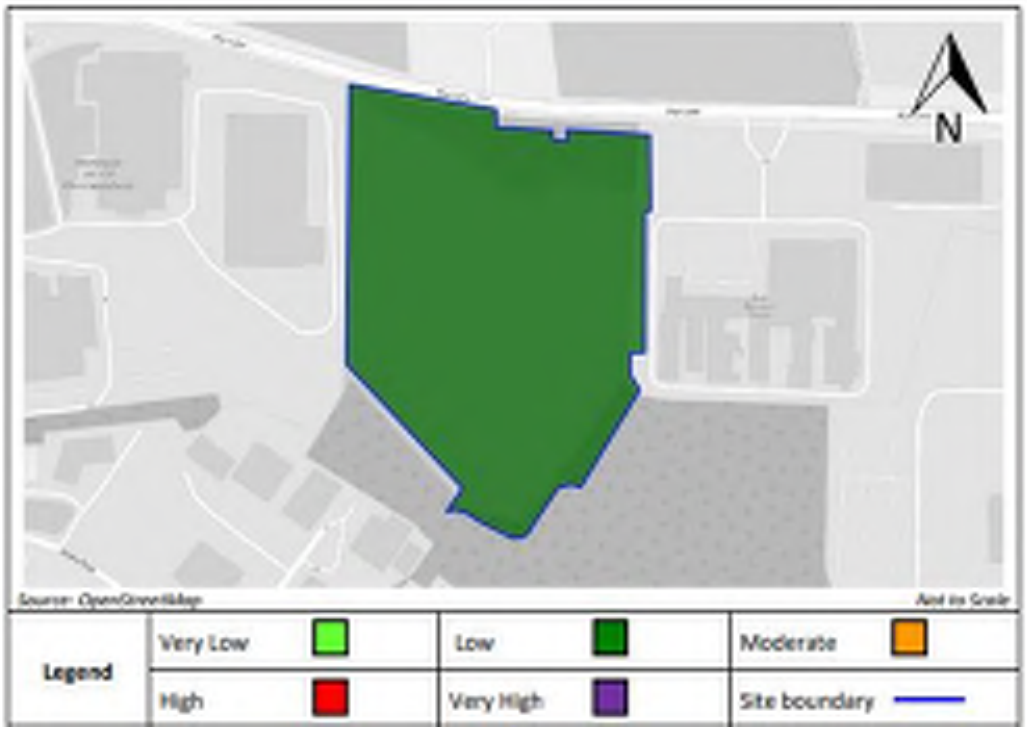


Figure 5-7 UXO and Explosives Contamination Hazard Zone Plan obtained for the site (Source: Zetica UXO).

The detailed desk study recommends the following UXO mitigation measures for the site:

- **Excavations** - an UXO awareness briefing is recommended for staff involved in excavations at the site.
- **Boreholes / Piling** – proceed with the works as normal.

5.6. Consultation

In relation to the designation of contaminated land under Part IIA of the Environmental Protection Act (EPA) 1990 (as amended), an enquiry was sent to Wrexham Borough Council (WBC) on 16th October 2023 requesting any pertinent information they hold relating to contaminated land for the site and surrounding area. A response was received on 19th October 2023 and a copy is contained in **Appendix E**.

In summary, WBC have confirmed that based on the records held by the Council the *'property is on land that was formerly used by the MoD for the manufacture of explosives'.* Some generalised details on the former ROF site and the production of cordite have been provided and Environment Agency Technical Guidance on Special Sites

has been cited by WBC a source of more information on contamination issues associated with these types of sites.

WBC has confirmed that it has not yet determined any sites within the area of the County Borough as 'Contaminated Land' under Part 2A of the EPA 1990. However, as the site may have ground contamination due to its former use as a munitions factory, they state that *'the Council will be required to consider the former MoD land under its duties of implementing Part 2A of the EPA 1990'.* In addition, the Council have stated the following:

'Due to the historical use of the land, it is likely that the above property will need to be considered further by this Department under Part 2A. It should be noted that the fact that the area is likely to be considered under Part 2A does not necessarily mean that it will be determined as 'Contaminated Land' as any future assessment undertaken may find that there is no significant risk. Unfortunately, it is not possible to advise you of a likely time when such an assessment may take place since it will be subject to financial resources and prioritisation against other potential contaminated sites in the Borough that also require assessment.

In the context of other potential contaminated land sites that have been identified to date, the site in question is currently considered to be of a lower priority. However, this could change at any point if for instance new information were to come to light, or if there is a change in guidance or any of the other factors that we consider when prioritising and planning Part 2A works.'

In the Council response they do highlight that of the sites on the Industrial Estate that have been assessed for ground contamination as part of the planning process, some have found no contamination to be present whilst others have found contamination that required remediation to allow safe development. In these latter cases the contamination was not necessarily the result of the former use as a ROF but due to subsequent land use or the presence of Made Ground.

6. Preliminary Geo-Environmental Risk Assessment

6.1. Risk Assessment Framework

In terms of risk assessment, “significant harm” or “significant pollution of controlled waters” is defined in the Guidance on risk-based criteria and must be the result of one or more relevant ‘contaminant linkages’ relating to the land.

The presence of a contaminant linkage relies on the Source-Pathway-Receptor concept, where all three factors must be present and potentially or actually linked for a potential risk to exist. For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A ***source*** - a substance that is capable of causing pollution or harm;
- A ***receptor*** - something which could be adversely affected by the contaminant; and
- A ***pathway*** - a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the matrix included as **Table 6-1** in order to give a level of risk for each potential hazard identified within this report. Further details of the assessment method are included in **Appendix F**.

Table 6-1 Classification of Risk (after NHBC/EA 2008).

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

For the purpose of this assessment, it has been assumed that the site will be redeveloped for an end-use comprising commercial / industrial.

6.2. Sources

The potential sources of contamination associated with the current and historical use of the site are identified in **Table 6-2.**

Table 6-2 Potential Sources of Contamination.

Land Use Type	Description of Source
Historical – Within Development Site	

Land Use Type	Description of Source
ROF Wrexham – Office buildings and air raid shelter	Historical maps from 1949 show buildings present in the central eastern part of the site, which served as administration / office buildings for ROF Wrexham (as per the Detailed Desk Study for UXO and Explosives Hazards obtained from Zetica UXO). A separate derelict concrete structure is still present in the north-east corner of the site, which may have formed part of the defence system in place around the ROF. According to the Detailed Desk Study for UXO and Explosives Hazards, the site comprised administrative and farm buildings away from the main production areas. As such, ROF Wrexham is not considered to provide a significant source of UXO or explosives contamination hazard to the site. No records were found indicating that the site was bombed and no other significant sources of UXO hazard have been identified. Given this, the site was awarded a **Low** UXO and explosives contamination hazard level. There is, however, potential for lead and other metal contamination and Made Ground due to demolition and clearance of the buildings, including asbestos containing materials (ACMs).
Clothes Factory	Buildings from ROF Wrexham subsequently labelled as a clothes factory during the 1970's and early 1980's. Ground contamination may result from accidental spillage of chemicals in storage areas or during various stages of either manufacturing yarn, making dyes and dyeing textiles. Effluent and waste associated with textile factories may also have led to soil and groundwater contamination. The demolition and clearance of the building, which may have contained asbestos, can also lead to ground contamination.
Ridley Farm	Farm buildings located in north-west corner of the site, along with several small ponds. May be localised ground contamination from agricultural use and maintenance of farm vehicles and equipment, and also the infilling of ponds. Asbestos may have been used in buildings and demolition may have resulted in contamination of soils.
Drainage ditches	There are a number of drainage ditches shown on historical maps in the southern part of the site which are no longer present. These may have been infilled and could represent a source of ground gas.
Current – Within Development Site	
Open area / fields	No evidence or potential sources of present-day contamination were identified on site based on the site walkover survey.
Historical – Surrounding Development Site	
Infilled surface water features	There are several surface water features in the surrounding area (mainly ponds) which may have been infilled. These could represent a source of ground gas.
ROF Wrexham	Located predominantly to the south-west of the site (main laboratory 100m south-west). Potential for explosive and non-explosive contamination. The majority of the area has now been redeveloped. There are existing buildings located to the east of the site which now form Bryn Business Centre.

Land Use Type	Description of Source
Railway Sidings	There is a railway track shown to be located along the south-western boundary of the site, associated initially with ROF Wrexham and then the British Celanese large acetate yarn factory in the 1950s/60s. Railways sidings can lead to contamination of soils and groundwater, including with heavy metals, oils and other hydrocarbons.
Acetate Yarn Factory	British Celanese opened a large acetate yarn factory on the site of the former ROF in the 1950s. The main works were located around 500m to the south of the site. Acetate yarns are textile fibres made from the cellulose acetate. Typically, this is wood pulp combined with chemicals such as acetic acid, acetic anhydride and sulphuric acid. This is then spun into fibres.
Works, including several tanks to west of the site in c. 1980s	There are several tanks located close to the south-west corner of the site. It is assumed these may be associated with an effluent plant given their proximity to the drainage feature located along the south-western site boundary.
Current – Surrounding Development Site	
Various industrial and commercial premises in Wrexham Industrial Estate	There is a large pharmaceutical site located directly west. Bryn Business Centre is located directly west, with the large Kellogg Factory beyond. There are smaller units to the south-west which include a hydraulics/engineering business, workshops and brewing companies.

6.3. Receptors

The receptors that are commonly identified on potentially contaminated land sites can be divided into four groups comprising human health, water environment, flora and fauna and the built environment. The key receptors associated with the proposed development are detailed in **Table 6-3**.

Table 6-3 Receptors Relevant to the Site and Surrounding Area.

Receptor Group	Identified Receptors Relevant to the Assessment
Human Health	• Future site users and site visitors • Workers and site visitors of neighbouring developments • Construction workers
Water Environment	• Surface water features (ponds) • Drainage ditches leading to Redwither Brook and ultimately the River Dee (Dee-Chester Wier to Ceiriog WFD Surface Water Body Catchment) • Salop Formation - Secondary A Aquifer, • Superficial deposits of Till below - Secondary Undifferentiated.
Flora and Fauna	• Soft landscaped areas of proposed development • Woodland to south-east
Built Environment	• New buildings and associated utilities (including water supplies)

6.4. Pathways

6.4.1. Human Health

Human health receptors could be at risk if exposed directly or indirectly to contaminated soils or groundwater. The potential for future site users to be in direct contact with any soil or groundwater contamination is limited in areas of buildings and hardstanding: such as roadways and car parking. Exposure may, however, occur in areas of soft landscaping. There is the potential for exposure via ingestion or dermal contact with contaminated soils in these types of areas.

There is also the potential for both indoor and outdoor inhalation of vapours if volatile contaminants are present.

There is a risk to human health if ground gas enters buildings and concentrates in confined areas causing an explosive hazard or posing a risk to human health via asphyxiation.

With respect to exposure pathways associated with users of neighbouring properties a pathway will only exist if there has been off-site migration of contamination via groundwater or due to migration of volatile vapours or ground gas.

Demolition or construction workers may come into direct contact with contaminated material or groundwater during demolition and/or construction works. The implementation of good construction practices and environmental management combined with the use of appropriate personal protective equipment (PPE) and sensible house-keeping practices (such as washing hands before eating and not smoking whilst working) should mitigate any potential short-term hazards.

With regards to UXO risk at the site (classified as low), the Detailed Desk Study obtained from Zetica UXO recommends the following UXO mitigation measures:

- **Excavations** - an UXO awareness briefing is recommended for staff involved in excavations.
- **Boreholes / Piling** – proceed with the works.

6.4.2. Water Environment

The following pathways have been identified as plausible for contaminants to reach nearby surface water features and the aquifers:

- Leaching of contaminants and vertical migration through overlying soils. Infiltration of rain into soils, encourages leaching and vertical migration of any soluble contamination. This will be limited where there is the presence of buildings/hardstanding. Areas of soft landscaping increase the potential for contaminant leaching and migration through soils following redevelopment. Infiltration via any proposed SUDs drainage design can also encourage leaching and migration of contaminants.
- Exposure and disturbance of soils during construction could encourage the vertical migration of contaminants. This includes the potential for additional preferential pathways to be created through piling for foundations or for contaminants to be driven into underlying aquifers. The management of construction activities to prevent

pollution is therefore important, including the assessment of risks associated with piling and other foundation solutions.

6.4.3. Flora and Fauna

The presence of phytotoxic contaminants can lead to detrimental effects on plant growth and survival. This occurs due to direct contact with contaminated soils or groundwater.

There may also be a potential for the migration of contamination in groundwater below the site.

During construction, there could be a risk of dust blowing off-site and impacting flora and fauna off-site. This can be mitigated through implementation of dust suppression measures as part of any Construction Environmental Management Plan (CEMP).

6.4.4. Built Environment

With respect to buildings and utilities the only pathway for exposure is direct contact with contaminated soil or groundwater. Risks include the permeation of water supply pipe by hydrocarbon contamination, tainting water supplies and degradation of building materials.

Depending upon the ground conditions there is the potential for ground gas generated from on-site sources (such as biodegradable fill materials) or off-site sources (such as infilled pits) migrating into buildings or underground utilities and building up in confined areas causing an explosive hazard or posing a risk to human health via asphyxiation.

6.5. Conceptual Site Model and Preliminary Risk Assessment

A preliminary conceptual site model (CSM) summarising the potential pollutant linkages identified from the assessment has been developed and qualitative risk assessment undertaken to identify and assess the potential risks associated with environmental conditions at and in the vicinity of the site based on the available information. This is presented in **Table 6-4**.

6.5.1. Uncertainties

The desk-based information reviewed as part of this Phase 1 Preliminary Risk Assessment and supplemented by the observations made during the site walkover survey indicates there is the potential for ground contamination due to contaminative historical uses.

There is no detailed site-specific data on ground conditions below the proposed development site, including any chemical testing of soils and groundwater. This is the main uncertainty associated with the Preliminary Risk Assessment. This preliminary CSM is based on published geological information and ground investigation information from surrounding areas.

Table 6-4 Summary of Potential Pollutant Linkages for On-Site and Off-Site Contaminant Sources.

Source	Pathway	Receptor	Consequence	Likelihood	Risk Classification	Comment/ Recommendations
Historical use of the site including as part of ROF (office buildings), a Clothes Factory & Farm. Potentially contaminative historical and current uses of surrounding areas. Historical: • ROF Wrexham • Railway line along south-west boundary • Acetate Yarn Factory • Various Works • Current: Various industrial and commercial premises including a pharmaceutical company to the west & Bryn Business Centre to the east.	Direct contact (dermal & ingestion) Indoor & outdoor inhalation of volatile contaminants	Future site users (Direct contact exposure limited to areas of soft landscaping)	Medium	Likely	Moderate	There may be the potential for soil and groundwater contamination below the site due to the historical use of the site and surrounding area. The presence of Made Ground (Including the potential for ACMs) due to the demolition of former buildings. Possibility of infilled drainage and pond features. Fill material unknown. A Detailed Desk Study undertaken by Zetica UXO classified the site as having a **Low** UXO and explosives contamination hazard level. The study recommended that an UXO awareness briefing is undertaken for staff involved in excavations, however no specific mitigation measures are considered necessary for borehole drilling/piling. No site investigation data is available for the site; therefore, it is recommended a ground investigation is undertaken to determine the presence and extent of any soil and groundwater contamination to confirm the risk to the development and future users.
	Direct Contact and/or inhalation	Construction workers	Medium	Likely	Moderate	Risks can be mitigated through implementation of Construction Environmental Management Plan (CEMP), risk reduction measures, use of suitable personal protective equipment and good house-keeping practices (Construction workers). Risks for both explosive and non-explosive contamination can be informed by intrusive investigation. Greater risk associated with any explosive contamination that may be present.
	Direct Contact and/or inhalation Including in wind-blown dust	Workers and residents of neighbouring properties	Medium	Low Likelihood	Moderate-Low	Risks can be mitigated through implementation of Construction Environmental Management Plan (CEMP) and risk reduction measures to prevent contaminated dust from blowing onto neighbouring sites. Risks for both explosive and non-explosive contamination can be informed by intrusive investigation. The intrusive investigation will also help establish whether there is

Source	Pathway	Receptor	Consequence	Likelihood	Risk Classification	Comment/ Recommendations
						any potential for the off-site migration of any contamination via groundwater flow.
	Off-site migration (dust during construction /migration in groundwater)	Flora & Fauna	Mild	Low Likelihood	Low	No sensitive ecological sites have been identified in close proximity to the proposed development site. There is woodland and scrub around the perimeter of the site and to the south-east which may contain ecologically important habitat and species. Implementation of CEMP during construction will mitigate any unacceptable risks that may be identified (dust *etc.*) to surrounding ecologically sensitive sites. Risks can be informed by intrusive investigation.
	Direct contact & plant uptake	Planting in soft landscaped areas	Minor	Low Likelihood	Very Low	If phytotoxic contaminants are present (potential for heavy metals based on historical use) then this could lead to some minor loss of plants in the landscaping scheme on-site. Site currently supports trees and other vegetation which did not appear distressed at the time of the site visit so considered unlikely and hence very low risk.
	Direct contact	Future buildings	Mild	Likely	Moderate-Low	Potential for corrosive substances and sulphate rich compounds based on historical previous use of the site which could impact the fabric of any future buildings. Risks can be informed by intrusive investigation.
	Run-off / migration in perched groundwater	Surface Waters: Redwither Brook/River Dee	Medium	Low Likelihood	Moderate-Low	If contaminated soils or groundwater are present, then there is a potential of pollution of surrounding drainage ditches and downgradient surface water courses. Increased risk during construction phases when soils are disturbed and also with the introduction of SUDs. Risks can be informed by intrusive investigation and mitigated through implementation of a CEMP during construction and design of an appropriate SUDs scheme.
	Infiltration and leaching of contamination with vertical	Secondary A Aquifer (Salop Formation) below the site and Principal Aquifer (Kinnerton	Medium	Low Likelihood	Moderate-Low	The presence of a significant thickness of low permeability Till (as recorded on land to the north of Bryn Lane) will prevent the vertical migration of any contamination leached from soils to perched groundwater to the underlying Secondary A Aquifer and nearby Principal Aquifer. An intrusive investigation to determine the presence and extent of any soil and groundwater

Source	Pathway	Receptor	Consequence	Likelihood	Risk Classification	Comment/ Recommendations
	migration in groundwater	Formation) to the north				contamination and establish the groundwater regime below the site will allow assessment of the risk to groundwater and the underlying aquifers.
	Migration in groundwater	SPZ – Total Catchment to NW	Medium	Unlikely	Low	As infiltration and vertical migration into the underlying aquifers is considered to be a low likelihood, the risk to the nearby SPZ is considered Low.
Potentially infilled ponds and other surface water features on-site and within 250m. - Potential source of ground gas	Migration and ingress of hazardous gases into buildings and utilities	Future site users	Severe	Low Likelihood	Moderate	The desk-based information indicates possible infilled drainage features in southern portion of the site. Potential for infilled ponds within 250m of the site. The nature of any infill material is unknown. There may be the potential for the localised generation of ground gas, as indicated by site investigation carried out on land to the north of Bryn Lane. Risk from off-site infilled ponds is likely to be low due to the size and distance of the off-site features. It is recommended that a ground investigation is undertaken to verify the presence, extent of the infilled drainage features on-site in the southern part of the site. Ground gas monitoring is recommended as part of a future ground investigation to assess any risk from identified potential sources on and off-site.
		Buildings	Severe	Low Likelihood	Moderate	

6.6. Wider Environmental Considerations

The following tables (**Tables 6-5** and **6-6**) provide a preliminary assessment of risks associated with wider geo-environmental issues surrounding the redevelopment based on the findings of the desk study.

Table 6-5 Assessment of Risk from Environmental Factors.

Aspect	Description	Potential of Risk
Flooding	Natural Resource Wales (NRW) Development Advice Maps, the development site lies within Zone A considered to be at little or no risk of fluvial or coastal/tidal flooding.	**Low**
Radon	The Site falls within a 1 km square in which <1 % of homes are above the Radon 'action level'. No specific radon protection measures are required.	**Low**
Coal Mining	According to the Coal Authority, the site is located in a Coal Mining Affected Area. As such, a Coal Mining Report was obtained to further assess coal mining issues. No specific issues in relation to coal mining were highlighted and it is considered unlikely that a Coal Mining Risk Assessment will be required as part of the planning process, providing no issues are identified during the ground investigation. Appropriate ground gas risk assessment will be required as part of the investigation.	**Low to Moderate**
PCBs	The risk of PCB contamination from leaked electrical insulating oils or similar is considered low but cannot be discounted given the historical use of the site.	**Low**
UXO	According to the Detailed Desk Study for UXO and Explosives Hazards obtained from Zetica UXO, the site comprised office and farm buildings away from the main ROF Wrexham production areas. As such, ROF Wrexham is not considered to provide a significant source of UXO / explosives contamination hazard to the site. No records were found indicating that the site was bombed and no other significant sources of UXO hazard have been identified. Given this, the site was awarded a **Low** UXO and explosives contamination hazard level.	**Low**
Asbestos (Ground)	Given the historical use of the site and previous existence of 1940's buildings on-site, likely to have been similar in construction to the neighbouring Bryn Business Centre to the east, which appear to have asbestos cement roofs there is the possibility that there may be asbestos on-site or within soils.	**Moderate-High**
Asbestos (Buildings)	There are no existing buildings on-site. See above regarding historical buildings being present on-site.	**Low**
Waste Management	The redevelopment may result in the generation of waste soils as part of enabling ground works. If material is required to be disposed of off-site, then the material will need to be classified for waste disposal purposes. The presence of asbestos or other contaminants would render materials to be hazardous waste depending upon the	**Moderate**

Aspect	Description	Potential of Risk
	concentration of the substance within the soil. All materials to be disposed of off-site will need to be done so in accordance with the Duty of Care Regulations. If soils are able to be re-used on-site, then a Materials Management Plan (MMP) will need to be developed for the development and submitted to the Environment Agency ahead of the works. A verification report will need to be produced following the re-use of materials to demonstrate that the MMP has been followed. Details of the scope should be as outlined in the CL:AIRE Definition of Waste: Development Industry Code of Practice (the Code of Practice).	
Utilities	A utility survey will be required to establish the presence of any underground services on the site ahead of any intrusive investigation or ground works.	**Moderate**

Table 6-6 Assessment of Risk Considering Regulation.

Aspect	Description	Potential of Risk
Regulatory Consideration	Response received from Wrexham Borough Council dated 19th October 2023. The site is not currently designated as 'Contaminated Land' under Part IIA EPA 1990 but due to its potentially contaminative historical use as a munitions site the property will need to be considered further by WBC under Part 2A however WBC state the site is of lower priority in the context of other potential contaminated land sites within the borough.	**Moderate**

7. Conclusions and Recommendations

7.1. Conclusions

A Phase 1 Contaminated Land Assessment has been completed for land south of Bryn Lane on the Wrexham Industrial Estate. The site is situated on the north-eastern corner of the Industrial Estate, with a large pharmaceutical establishment directly to the west (Wockhardt) and Bryn Business Centre directly to the east, with smaller units and the Kellogg Factory beyond. Currently, the site comprises two fields, which have previously been used for grazing livestock, with by trees and scrub around the northern, eastern and southern perimeters. There are the remains of a concrete structure in the north-eastern corner of the site. Which may have been associated with the former Royal Ordnance Factory (ROF Wrexham) demolished in the late 20th century.

It is well documented that Wrexham Industrial Estate is located on the site of the former Royal Ordnance Factory (ROF Wrexham). However, it is understood that associated buildings located on the site were limited to administration / office buildings. The ROF had an extensive railway network associated with it to facilitate transfer of the cordite that it produced (including a railway line running along the south-western site boundary). The production facility closed in 1945, after the war when the need for cordite ceased. In the 1950's, British Celanese opened a large acetate yarn factory on the site. The Industrial Estate developed across the former ROF site during the 1970's/80's and onwards.

In summary, the site has been subject to several potentially contaminative historical uses including a farm in the north-west corner, as part of the Royal Ordnance Administration Buildings, and a clothing factory. In addition, surrounding land has been subject to historical uses which could have resulted in ground contamination, including the wider ROF and associated railway network and the acetate yarn factory.

Farm buildings (Ridley Farm) were shown to be present in the north of the site as early as the 1870's. Historical maps from the late 1940's show buildings present in the central-eastern part of the site, which were used as administration buildings associated with the ROF. A separate derelict concrete structure is still present in the north-east corner of the site, which may have formed part of the defence system in place around the ROF. The office buildings were subsequently labelled as a clothes factory in later maps from the 1970s. Except for the concrete structure, none of these buildings remain on the site.

Given the history of the site and surrounding area, a Detailed Desk Study for UXO and Explosives Hazards was obtained for the site from Zetica UXO. The site was awarded a Low hazard level, as although the site formed part of ROF Wrexham, the on-site buildings were limited to office and farm buildings away from the main production areas. No records were found indicating that the site was bombed and no other significant sources of UXO hazard were identified. Overall, it was recommended that an UXO awareness briefing is undertaken for staff involved in excavations, however no specific mitigation measures were considered necessary for borehole drilling / piling.

The environmental site setting is considered to be of medium-low sensitivity. There are no ecologically designated sites or priority habitat near the site. There are drainage

ditches on-site which link with Redwither Brook and subsequently the River Dee. Based on ground investigation data for land to the north of Bryn Lane, the site is likely to be underlain by a significant thickness of low permeability Till which overlies bedrock of the Salop Formation comprising Mudstone, Sandstone and Conglomerate. This is designated as a Secondary A Aquifer. A Principal Aquifer (Kinnerton Sandstone Formation) lies approximately 60m to the north-west.

According to the Coal Authority, the site is located in a Coal Mining Affected Area. A Coal Mining Report was therefore obtained from The Coal Authority to further assess coal mining risks at the site. No specific issues relating to coal mining were identified by the report. As such, it is considered unlikely that a Coal Mining Risk Assessment will be required as part of the planning process, providing no issues are identified during the ground investigation. Appropriate ground / mine gas risk assessment will be required as part of the ground investigation.

A preliminary CSM of potential pollutant linkages has been developed and a qualitative risk assessment completed. Eleven potential pollutant linkages have been identified. The highest risk classification assigned is 'Moderate', which has been assigned to four linkages associated with risks to human health and buildings. Two of the linkages assigned a 'Moderate' risk are related to the risks to future site users and buildings from ground gas. The other two linkages in this risk category relate to the potential risk to construction workers and future site users from contact with contaminated soils / waters. Risks can be mitigated through standard preventative construction practices (e.g., working methods and PPE) and mitigation measures (e.g., clean capping in soft landscaped areas).

Of the remaining seven pollutant linkages, four have been assigned 'Moderate-Low' and the rest are either considered 'Low' or 'Very Low'.

Risk to identified water resource receptors (surface waters and the Secondary A Aquifer) have been classified as 'Moderate-Low'. If contamination is present, there is considered to be a greater likelihood of pollution of surface waters (particularly during construction when soils are disturbed) rather than the underlying aquifer, as this is protected by overlying low permeability Till deposits. Implementation of a CEMP and appropriately designed SUDs scheme and foundation design can mitigate identified risks.

A 'Moderate-Low' risk has also been assigned to the risk to future buildings due to the potential presence of corrosive or aggressive ground conditions.

7.2. Recommendations

The main uncertainty associated with the preliminary risk assessment is that currently there is no site-specific data on the ground conditions and contamination status of soils and groundwater below the site. It is recommended that a ground investigation with the following aims be carried out as part of the design process of the proposed development:

- Establish the ground conditions below the site, including verifying the presence and extent of any soil and groundwater contamination including the nature of any fill material or made ground that may be present on-site.

- Assess risks from ground gases (including potential mine gas), predominantly relating toon-site infilled features or off-site sources through a ground-gas monitoring programme.
- Provide an understanding of the groundwater regime below the site through follow up groundwater monitoring and sampling.
- Allow confirmation of the risk to identified receptors, including human health (future site users), the proposed development, surrounding surface waters, the Secondary A and Principal Aquifer.

In terms of wider risks to the proposed development:

- Based on evidence from the buildings present on the neighbouring Bryn Business Park, it is considered likely that historical buildings on-site would have had asbestos cement roofs and other asbestos containing material within them. The presence of asbestos in soils is classified as a 'Moderate-High' risk.
- The presence of asbestos or other contaminants above threshold concentrations in soils could render materials to be hazardous waste. All materials to be disposed of off-site will need to be done so in accordance with the Duty of Care Regulations. If soils are able to be re-used on-site, then a Materials Management Plan (MMP) will need to be developed and implemented or appropriate waste exemptions submitted to the Environment Agency.
- Wrexham Borough Council (WBC) have stated that due to the potentially contaminative historical use a munitions site they do have a duty to investigate the site under Part 2A of the EPA 1990. They have, however, stated that the site is of lower priority than other potentially contaminated land within the borough and there is no timescale on when such an inspection would happen.

If the site were to be redeveloped through the planning system, then any risks posed by contamination would be dealt with via appropriate planning conditions to ensure safe development of the site. It is normal as part of the planning process that, as a minimum, following investigation and remediation land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990. Therefore, redevelopment, including appropriate ground investigation and remediation of any land contamination will mitigate this regulatory risk relating to Part 2A.

There is no information at this stage to indicate that the site is unsuitable for the proposed end-use with respect to land contamination. With suitable investigation and mitigation, contamination (if present) can be dealt with as part of the planning process.

Appendix A - Site Walkover Photos

Site Photos taken 11th October 2023

Land south off Bryn Lane, Wexham Industrial Estate

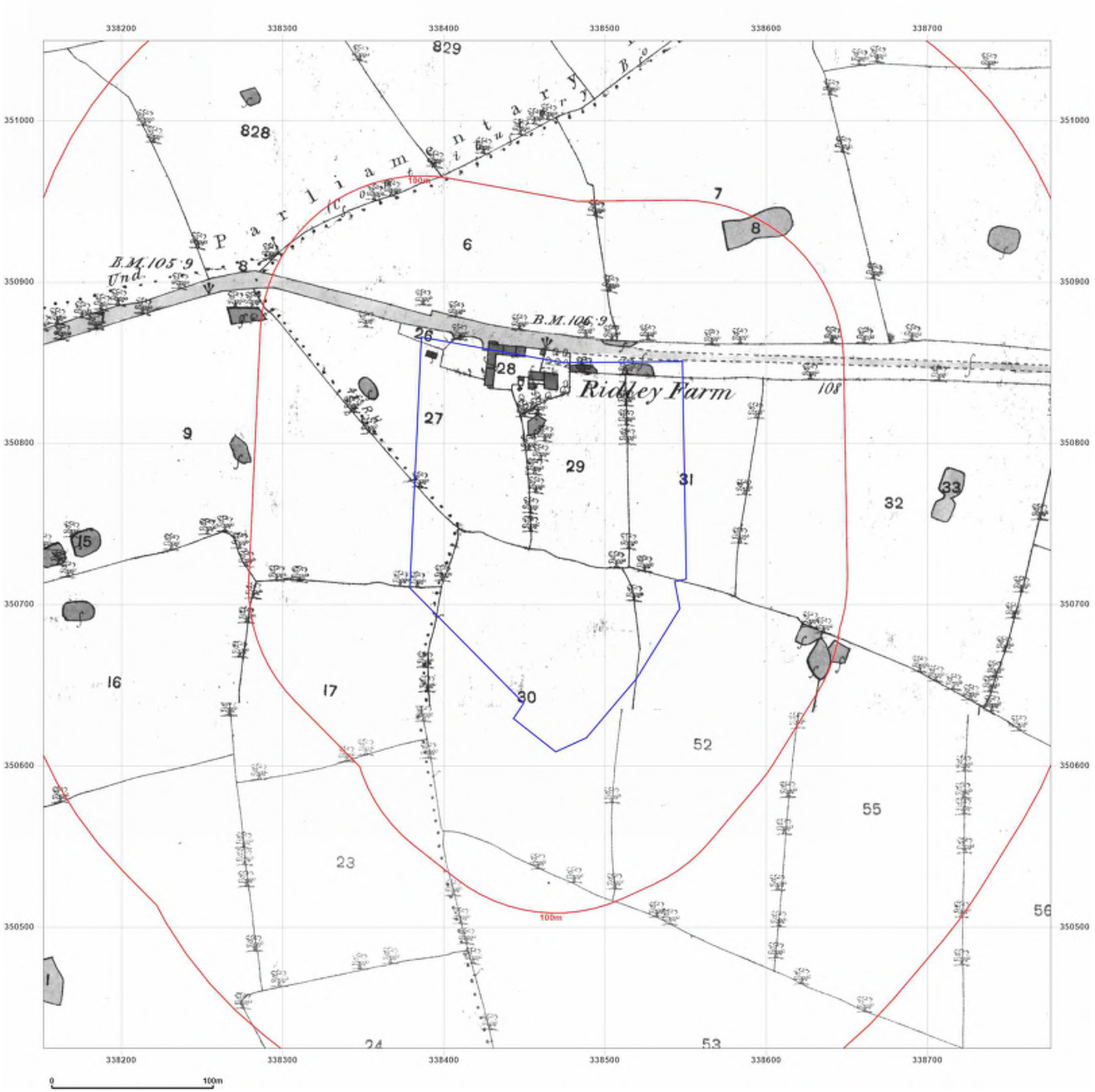
<table>
<tr><td></td><td>
</td></tr>
<tr><td>Photo 1: Site Entrance off Bryn Lane</td><td>Photo 2: Remains of World War II Pill Box in NW corner of the site</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Photo 3: Concrete structure with tree growing in the centre</td><td>Photo 4: View SW along eastern site boundary</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Photo 5: View south across site</td><td>Photo 6: View west across site toward Wockhardt Facility</td></tr>
</table>

	
Photo 7: Outfall from adjacent Bryn Business Park into drainage ditch which runs along eastern site boundary	Photo 8: Drainage ditch along eastern site boundary (view south along ditch)
	
Photo 9: Culvert at southern end of eastern boundary drainage ditch located in SE corner of the site.	Photo 10: View through eastern boundary fence into woodland with brick structure of the culvert discharge point into a ditch within the woodland
	
Photo 11: Large masonry lined drainage channel adjacent to southern site boundary	Photo 12: Penstock valve at eastern end of the drainage channel

	
Photo 13: Drainage ditch entering the large drainage channel from the west (just beyond the SW corner of the site)	Photo 14: Drainage ditch from the west (ditch runs along southern part of the Wockhardt Facility)
	
Photo 15: Example of occasional piece of concrete or brick found to be present on the site surface	Photo 16: Potential drainage feature or manhole cover in NW corner of the site
	
Photo 17: Bryn Business Park located to the east of the site. Front view (looking south)	Photo 18: Bryn Business Park – rear view looking west

	
Photo 19: Bryn Business Park – view north along western edge of the buildings to show construction	Photo 20: Ridley Wood Industrial Complex located c. 250m east of the site – provides another example of the original ROF buildings

Appendix B - Historical Maps



Groundsure INSIGHTS

Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: County Series
Map date: **1873**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
S

Surveyed 1873
Revised 1873
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1873
Revised 1873
Edition N/A
Copyright N/A
Levelled N/A

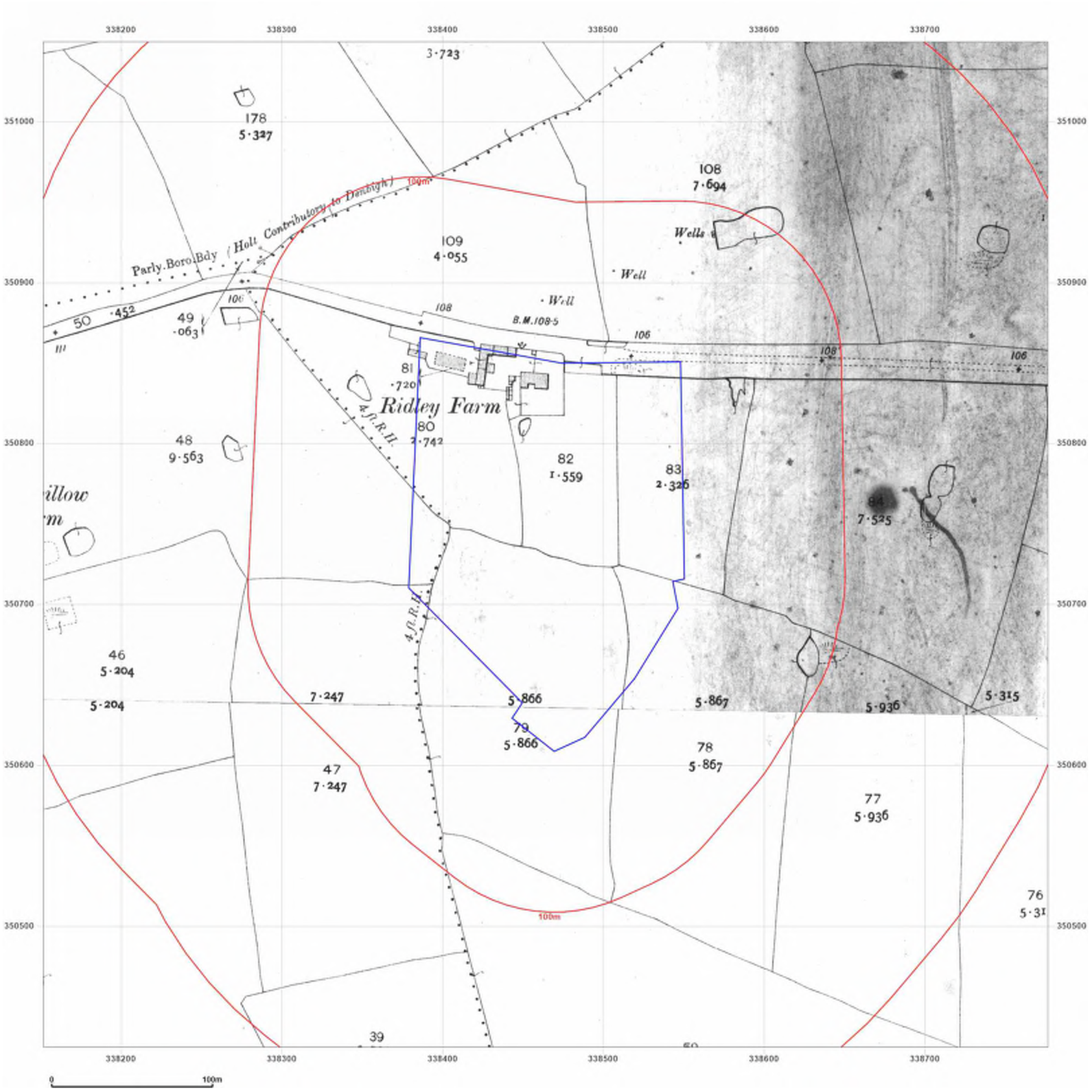
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: County Series
Map date: **1912**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
S

Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: National Grid

Map date: **1960-1962**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1962
Revised 1962
Edition N/A
Copyright 1964
Levelled 1959

Surveyed 1960
Revised 1960
Edition N/A
Copyright 1961
Levelled 1950

Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: National Grid

Map date: **1974**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1974
Revised 1974
Edition N/A
Copyright 1974
Levelled 1959

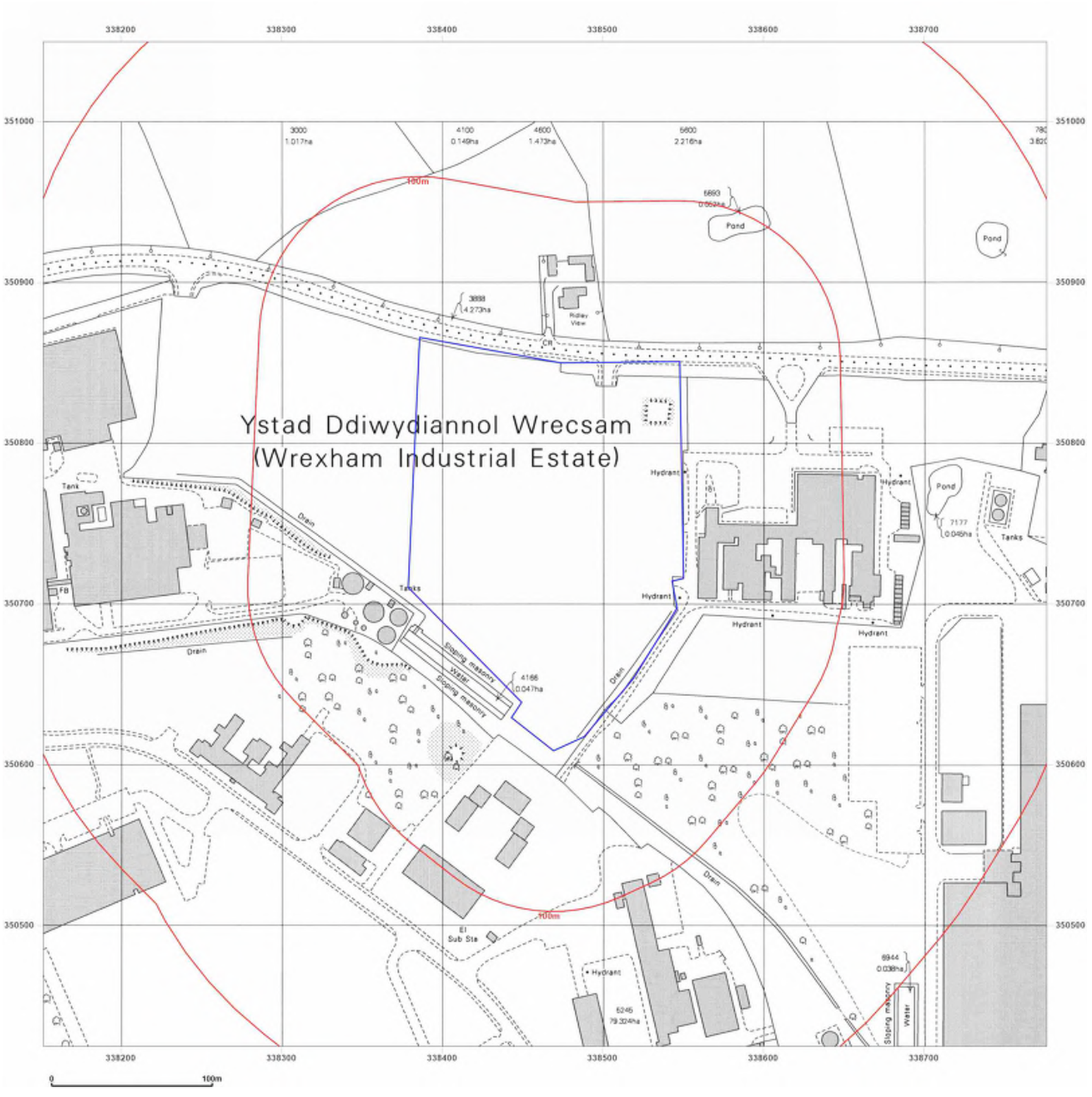
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: National Grid

Map date: **1991**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1991
Revised 1991
Edition N/A
Copyright 1991
Levelled N/A

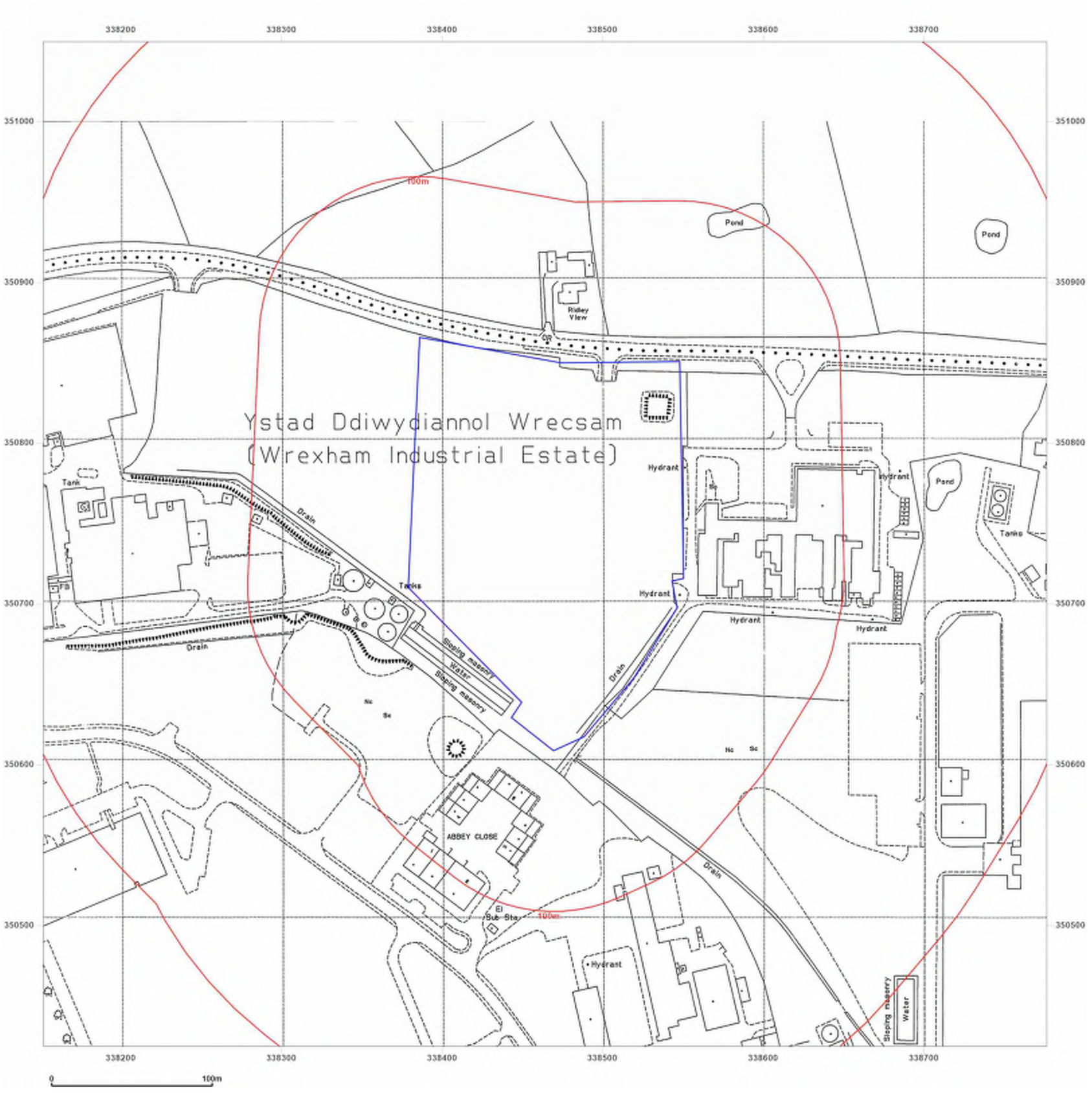
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: National Grid
Map date: **1995**
Scale: 1:2,500
Printed at: 1:2,500

N
W E
S

Surveyed 1995
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

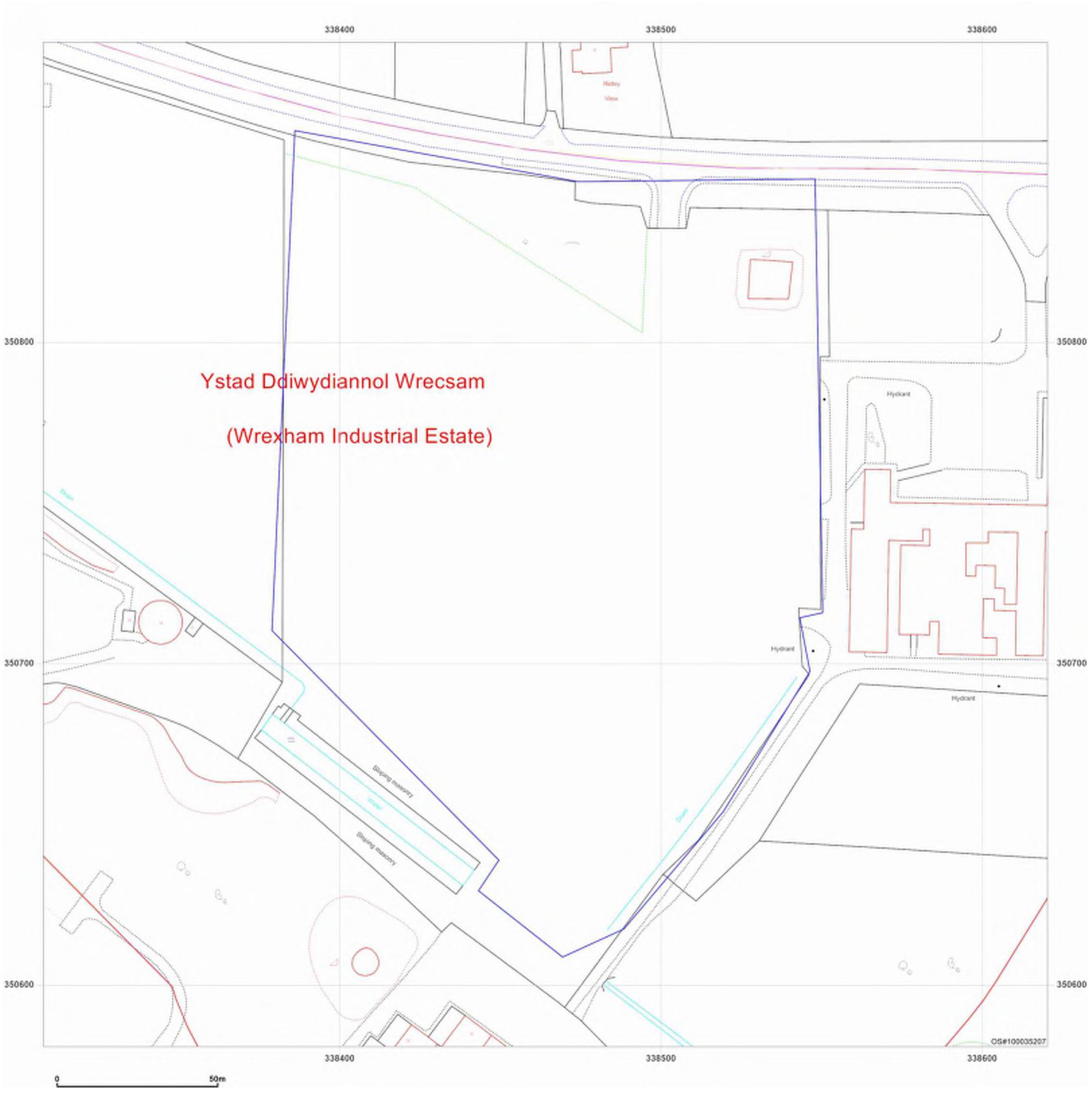
Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

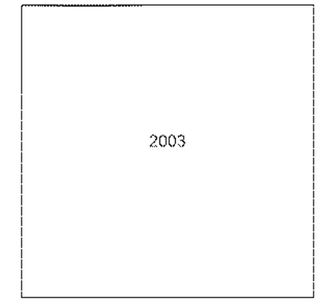
Site Details:

CROSSFIT WREXHAM, BRYN BUSINESS CENTRE, BRYN LANE, WREXHAM INDUSTRIAL ESTATE, WREXHAM, LL13 9UT

Client Ref: PO_0923-18_Net_World_Sports_34367
Report Ref: GS-GYK-FNR-RS2-6MF
Grid Ref: 338464, 350737

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

N
W E
S



Powered by OS

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 27 September 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Appendix C - Coal Mining Report

The Coal Authority

Consultants

Coal Mining Report

Net World Sports
Wrexham
LL13 9XW

Date of enquiry:	**6 November 2024**
Date enquiry received:	**6 November 2024**
Issue date:	**6 November 2024**
Our reference:	**51003461519001**
Your reference:	**GS-MD8-Y7A-QVX-QQY**



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

GROUNDSURE LIMITED

Enquiry address

Net World Sports
Wrexham
LL13 9XW



Approximate position of property

Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2018. All rights reserved.

Ordnance Survey Licence number: 100020315

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

@coalauthority
/company/the-coal-authority
/thecoalauthority
/thecoalauthority

Section 1 – Mining activity and geology

Past underground mining
No past mining recorded.

Probable unrecorded shallow workings
None.

Spine roadways at shallow depth
No spine roadway recorded at shallow depth.

Mine entries
None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers
The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

OM14246		

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops
No outcrops recorded.

Geological faults, fissures and breaklines
No faults, fissures or breaklines recorded.

Opencast mines
None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips
None recorded within 500 metres of the enquiry boundary.

Copyright © 2024 The Coal Authority

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations
None recorded within 50 metres of the enquiry boundary.

Remediated sites
None recorded within 50 metres of the enquiry boundary.

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 metres of the enquiry boundary.

Mine water treatment schemes
None recorded within 500 metres of the enquiry boundary.

Copyright © 2024 The Coal Authority

Section 3 – Licensing and future mining activity

Future underground mining
None recorded.

Coal mining licensing
None recorded within 200 metres of the enquiry boundary.

Court orders
None recorded.

Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices
The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Copyright © 2024 The Coal Authority

Section 4 – Further information

Based on the responses in this report, no further information has been highlighted.

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

Copyright © 2024 The Coal Authority

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Copyright © 2024 The Coal Authority

Opencast mines
Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips
Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations
Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites
Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence
Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas
Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

Copyright © 2024 The Coal Authority

Mine water treatment schemes
Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining
Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing
Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders
Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices
Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices
Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land
Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

Copyright © 2024 The Coal Authority

The Coal Authority

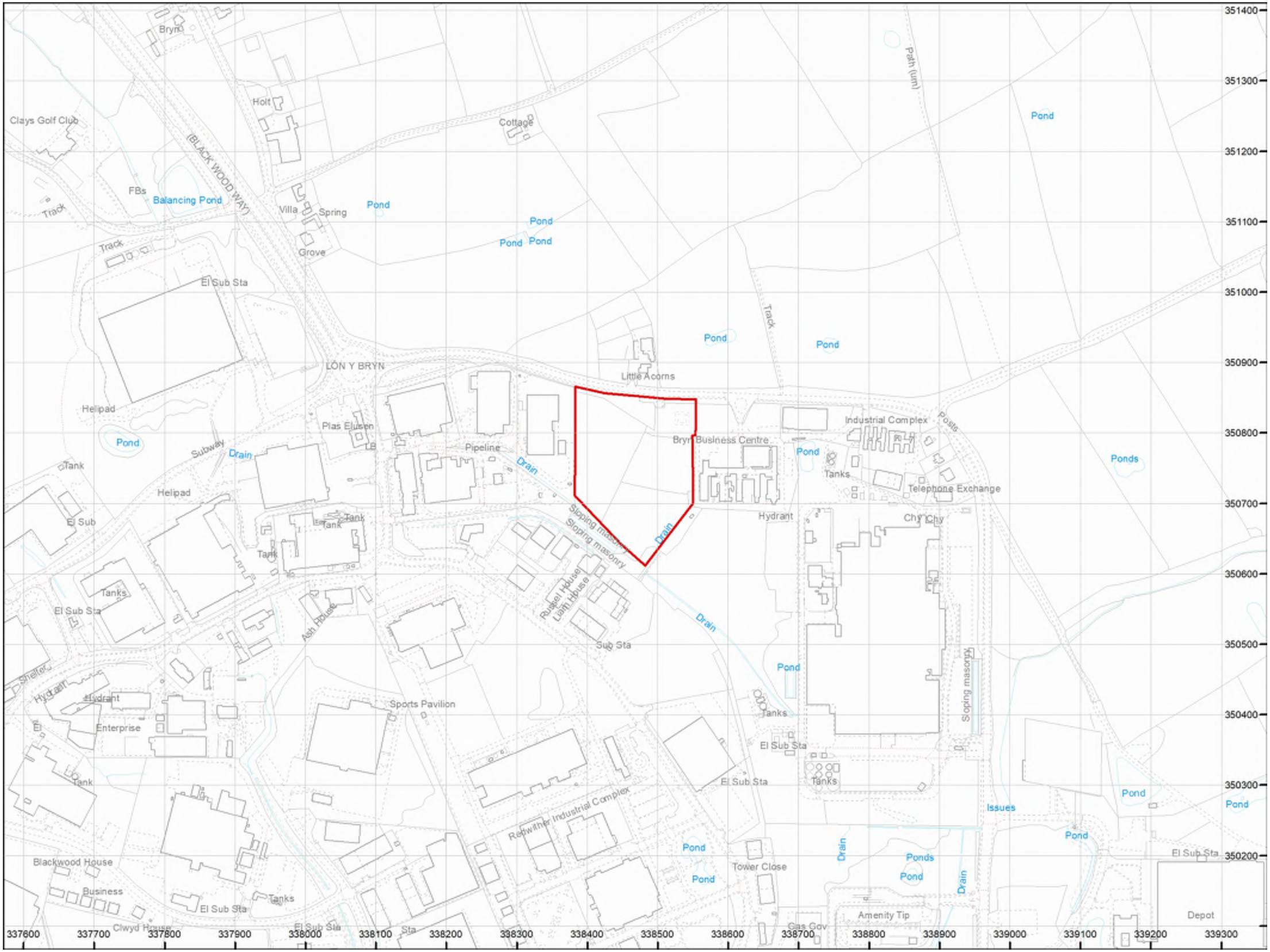
Summary of findings

Reproduced by permission of Ordnance Survey on behalf of HMSO.
© Crown copyright and database right 2018. All rights reserved.
Ordnance Survey Licence number: 100020315

The map highlights any specific surface or subsurface features within or near to the boundary of the site.

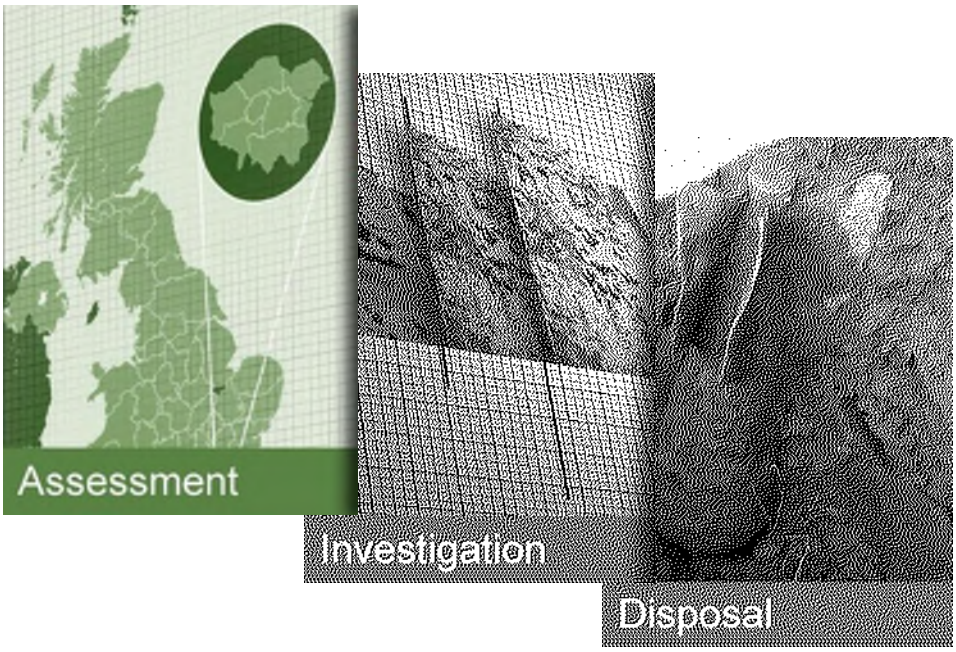
Key

Approximate position of the enquiry boundary shown



How to contact us
0345 762 6848 (UK)
+44 (0)1623 637 000 (International)
www.groundstability.com

Appendix D - Detailed UXO Risk Report



Desk Study for UXO and Explosives Hazards

Document Ref.	**P14594-24-R1**
Revision	**A**
Project Title	**Bryn Lane South**
Client	**Hilson Moran**
Date	**8th July 2024**

Drafted by	**Ellie Chaston**
Checked by	**Matthew Eatough**
Authorised by	**Stefan Lang**

DESK STUDY FOR UXO AND EXPLOSIVES HAZARDS

EXECUTIVE SUMMARY

Key findings: No significant sources of Unexploded Ordnance (UXO) or explosives contamination hazard have been identified.

Key actions: An UXO awareness briefing is recommended for staff involved in excavations.

UXO and explosives contamination hazard assessment

Between 1939 and 1946, the Site was encompassed by Royal Ordnance Factory (ROF) Wrexham, which produced cordite propellant. The Site comprised administrative and farm buildings away from the main production areas. ROF Wrexham is not considered to provide a significant source of UXO or explosives contamination hazard to the Site.

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO and explosives contamination hazard level, as shown in the following Figure, reproduced as Figure 4 in the main report.

The hazard zone plan of the Site is also given in the accompanying P14594-24-R1-MAP01-A.

UXO and explosives contamination hazard zone plan of the Site



Source: OpenStreetMap *Not to Scale*

Legend	Very Low	Low	Moderate
	High	Very High	Site boundary

The main findings of the report are summarised below.

- No records of military activity on the Site during World War One (WWI) have been found.
- Between 1939 and 1946, the Site was encompassed by ROF Wrexham, which produced cordite propellant for military use in firearms. The Site comprised administrative and farm buildings away from the main production areas. It has since been partially redeveloped.

- During World War Two (WWII) the main strategic targets in the vicinity of the Site were ROF Wrexham and Royal Air Force (RAF) Wrexham.
- No records have been found indicating that the Site was bombed during WWII. Records indicate that the nearest High Explosive (HE) bomb fell approximately 0.5km northwest of the Site on the 29th October 1940.
- There were no Heavy Anti-Aircraft (HAA) batteries within 10km of the Site during WWII. The potential for an Unexploded AA (UXAA) shell to have fallen on the Site cannot be totally discounted.

Proposed works

It is understood that works on the Site are associated with the construction of new commercial units for Net World Sports (NWS). It is assumed that this will include excavations, intrusive ground investigations, and piling.

Risk assessment

The Table below, reproduced as Table 4 in the main report, provides a UXO and explosives risk assessment for the proposed works on the Site.

Further details on the risk assessment methodology are given in Section 7.2 of the main report.

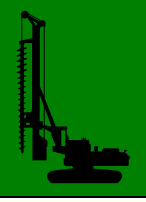
UXO and explosives risk assessment for the Site

Potential Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	**Low**
	Boreholes/Piling	1	1	1	1	4	4	**Low**
Explosives contamination	Excavations	1	1	1	1	4	4	**Low**
	Boreholes/Piling	1	1	1	1	3	3	**Low**
Other UXO	Excavations	1	1	1	1	4	4	**Low**
	Boreholes/Piling	1	1	1	1	3	3	**Low**
PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood								

Risk mitigation plan

The Table below, reproduced as Table 5 in the main report, summarises the UXO and explosives risk for proposed works on the Site and recommended actions.

Summary of UXO and explosives risk and mitigation recommendations

Proposed Works	UXO and Explosives Risk	Recommended Mitigation
Excavations		**UXO awareness briefing** – an UXO awareness briefing is recommended for staff involved in excavations.
Boreholes/Piling		**Proceed with works**

In summary, it is recommended that an UXO awareness briefing is provided for staff involved in excavations to ensure they take appropriate action in the event of a suspect find.

What do I do next?

If you require a quote for an awareness briefing or have any questions, contact us and we can help.

	01993 886682		**uxo@zetica.com**		**zeticauxo.com**

If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO and explosives risk and the risk mitigation requirements.

CONTENTS

ABBREVIATIONS **VI**

1 INTRODUCTION **1**

1.1 Project outline

1.2 Sources of information

1.3 Data confidence level

2 THE SITE **3**

2.1 Site location

3 MILITARY ACTIVITY **5**

3.1 Explosives factories, munitions depots, and disposal areas

3.2 Defences

3.3 Military airfields

3.4 Aircraft crashes

3.5 Firing ranges and military training areas

4 BOMBING **13**

4.1 WWI bombing

4.2 WWII bombing

5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES **18**

5.1 EOC tasks

6 UXO AND EXPLOSIVES HAZARD ASSESSMENT **19**

6.1 UXO and explosives hazard level

7 UXO AND EXPLOSIVES RISK ASSESSMENT **20**

7.1 Proposed works

7.2 Risk assessment methodology

7.3 UXO and explosives risk level

8 RISK MITIGATION PLAN **22**

8.1 UXO and explosives risk summary

8.2 Risk mitigation techniques

8.3 What do I do next?

APPENDICES **24**

Appendix 1 Anticipated ordnance types

Appendix 2 Sources of UXO and explosives hazard

Appendix 3 Recent UXO finds

Appendix 4 Glossary and definitions

Appendix 5 Bibliography

Appendix 6 General Notes

Figures, plates, & tables

Figure 1 Site location map 3
Figure 2 Plan of ROF Wrexham, 1945 6
Figure 3 Historical map, 1961 8
Figure 4 UXO and explosives hazard zone plan of the Site 19

Plate 1 Recent aerial photograph of the Site 4
Plate 2 Aerial photograph, 2nd May 1946..... 7
Plate 3 Luftwaffe target photograph of ROF Wrexham, October 1940 14
Plate 4 Aerial photograph, 2nd May 1946..... 16

Table 1 Luftwaffe targets in the vicinity of the Site 14
Table 2 Bombing statistics 15
Table 3 Estimated average maximum bomb penetration depths 17
Table 4 UXO and explosives risk assessment for the Site 21
Table 5 Summary of UXO and explosives risk and mitigation recommendations 22

Accompanying GIS data

P14594-24-R1-A (Desk Study for UXO and Explosives Hazards)

ABBREVIATIONS

AA	Anti-Aircraft
ALARP	As Low As Reasonably Practicable
AP	Anti-Personnel
ARP	Air Raid Precaution
AXO	Abandoned Explosive Ordnance
BCC	British Cables Company
BGS	British Geological Survey
CIRIA	Construction Industry Research and Information Association
CRAPW	Central Register of Aerial Photography for Wales
DCLG	Department of Communities and Local Government
EO	Explosive Ordnance
EOC	Explosive Ordnance Clearance
EOR	Explosive Ordnance Reconnaissance
ERW	Explosive Remnants of War
ESA	Explosive Substances and Articles
GWR	Great Western Railway
HAA	Heavy Anti-Aircraft
HE	High Explosive
HER	Historic Environment Record
IB	Incendiary Bomb
IMechE	Institution of Mechanical Engineers
IWM	Imperial War Museum
JCB	JC Bamford
LAA	Light Anti-Aircraft
MoD	Ministry of Defence
NARA	National Archives & Records Administration
NCAP	National Collection of Aerial Photography
NWS	Net World Sports
OB	Oil Bomb
OSNGR	Ordnance Survey National Grid Reference
PM	Parachute Mine
RAF	Royal Air Force
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
RE	Royal Engineers
ROF	Royal Ordnance Factory
SFTS	Service Flying Training School
US	United States
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
WO	War Office
WWI	World War One
WWII	World War Two
ZAA	Rocket Anti-Aircraft

DESK STUDY FOR UXO AND EXPLOSIVES HAZARDS

Please read: Zetica has colour coded each paragraph. Paragraphs with black text on a white background provide site-specific information or information specifically researched as part of this project.

Boxed paragraphs in a dark green text with a green background provide general information and, where appropriate, links to online resources giving further detail. These are all available at www.zeticauxo.com. If you cannot gain access to these resources, Zetica can forward them on request.

1 INTRODUCTION

1.1 Project outline

Zetica Ltd was commissioned by Hilson Moran to carry out a detailed Desk Study for Unexploded Ordnance (UXO) and Explosives Hazards for an area of approximately 3.3 hectares (ha) off Bryn Lane South in Wrexham, Denbighshire (the 'Site').

The aim of this report is to gain a fair and representative view of the potential UXO and explosives hazards on or affecting the Site in accordance with the Construction Industry Research and Information Association (CIRIA) C681 'Unexploded Ordnance (UXO), a Guide for the Construction Industry'.

Where appropriate, this hazard assessment includes:

- Likelihood of ordnance being present.
- Type of ordnance (size, filling, fuze mechanisms).
- Quantity of ordnance.
- Potential for live ordnance.
- Probable location.
- Ordnance condition.

It should be noted that some military activity providing a source of UXO or explosives hazard may not be recorded and therefore there cannot be any guarantee that all UXO or explosives hazards affecting the Site have been identified in this report.

1.2 Sources of information

Zetica Ltd researched the World War One (WWI)/World War Two (WWII) bombing and military history of the Site and its surrounding area using a range of information sources. The main sources of information are detailed in the following sections and referenced at the end of this report.

1.2.1 Zetica Ltd records

Zetica Ltd's in-house records were consulted, including the Zetica Ltd bomb risk maps (https://zeticauxo.com/guidance/risk-maps/), previous requests for information from government bodies, reference books, and archive materials from past work in the region.

Relevant documents have been cited in the bibliography of this report.

1.2.2 Historical records, maps, and drawings

Numerous reference documents including historical maps, aerial photographs and drawings have been consulted from sources such as the National Archives, the US National Archives & Records Administration (NARA), the Imperial War Museum (IWM), National Collection of Aerial Photography (NCAP), the Defence of Britain Project, Coflein, the Royal Commission on the

Ancient and Historical Monuments of Wales (RCAHMW), the Central Register of Aerial Photography for Wales (CRAPW), the Institution of Mechanical Engineers (IMechE), and relevant archaeological bodies.

The British Geological Survey (BGS) was consulted for borehole information.

1.2.3 Local records

Wrexham County Council, Wrexham Archives, Denbighshire Archives, and local historical groups were consulted for records.

1.3 Data confidence level

In general, there is a high level of confidence in the researched information sources used for this report. Further detail is given in the text of the report where appropriate.

It should be noted that Wrexham Archives was closed at the time of writing of this report. Additional information will be sought from Wrexham Archives when available and relevant updates made to this report if required.

Definitions of data confidence level		
Data Confidence Level		Definition
	Low	There are very few sources of information, and/or those available are lacking in detail.
	Moderate	There is a limited range of available sources of information, a key source of information is missing, and/or some sources may be contradictory or lacking in detail.
✓	**High**	There is a wide range of available sources of information, which are detailed and corroborate each other.

2 THE SITE

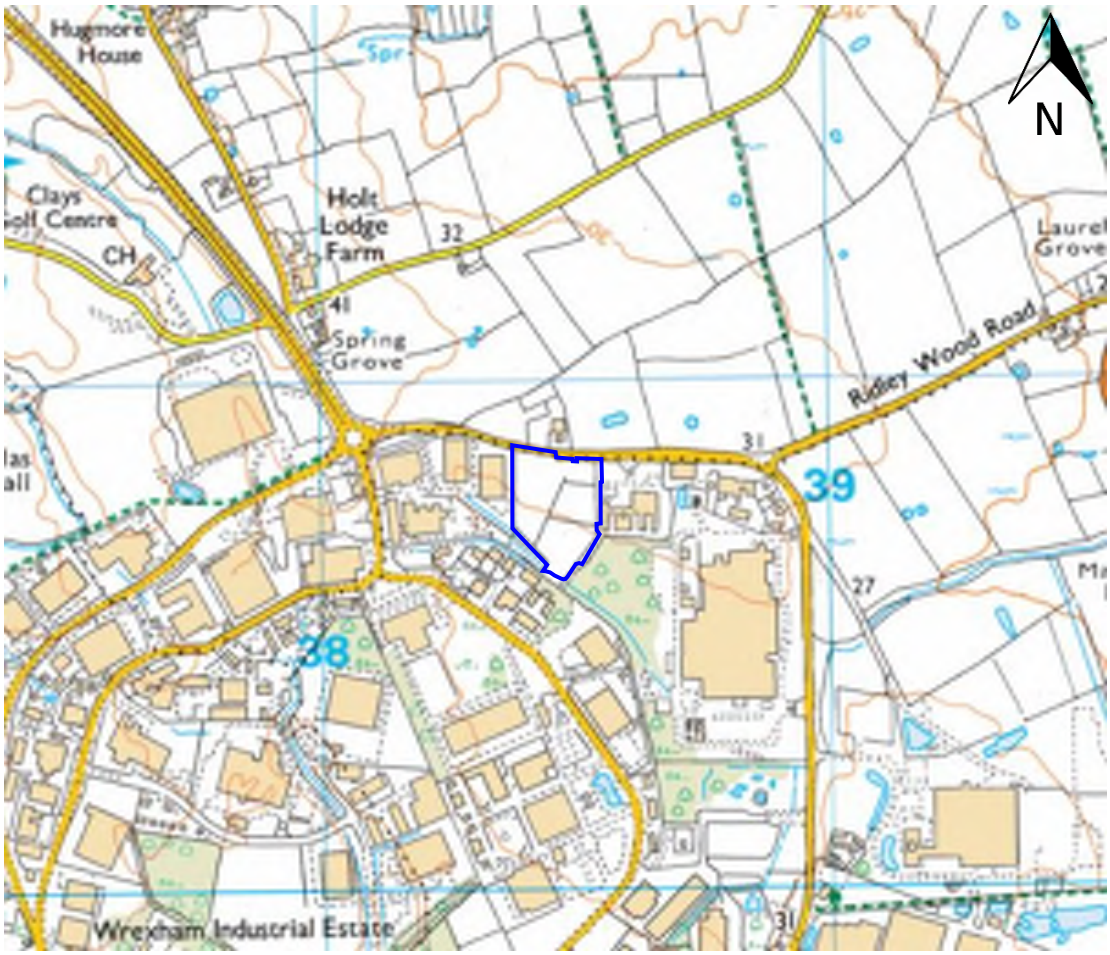
2.1 Site location

The Site is centred on Ordnance Survey National Grid Reference (OSNGR) SJ 384507. It is located at Wrexham Industrial Estate, approximately 4.8km east of central Wrexham.

The Site comprises open fields and woodland. It is bounded to the north by Bryn Lane, to the east by open ground, industrial units, and woodland, to the south by woodland, and to the west by hardstanding.

Figure 1 is a Site location map and Plate 1 is a recent aerial photograph of the Site.

Figure 1 Site location map



Source: © Crown Copyright 2024. Reproduced by permission of Ordnance Survey *Not to Scale*

Legend	Site boundary

Plate 1 Recent aerial photograph of the Site



Source: Google Earth *Not to Scale*

Legend	Site boundary

3 MILITARY ACTIVITY

The following sections outline the recorded military activity on and in the vicinity of the Site. The potential UXO hazard from WWI and WWII bombing is detailed in Section 4.

3.1 Explosives factories, munitions depots, and disposal areas

For further information on explosives factories, munitions depots and disposal areas, and the potential UXO hazards associated with them, see Appendix 2.1 or follow the links below:

- Explosives Factories
- Munitions Depots
- Munitions Disposal Areas

Between 1939 and 1946, the Site was encompassed by Royal Ordnance Factory (ROF) Wrexham. A brief operational history is provided below.

3.1.1 ROF Wrexham

In August 1939, approval was given for the construction of a ROF at Marchwiel, on a wide area encompassing the Site. Known as ROF Wrexham, the factory was constructed between 1939 and 1941. The factory buildings were spaced apart from each other to minimise damage in the event of enemy bombing or accidental explosions. Existing farm buildings, including those at Ridley Farm, on the Site, were retained to act as 'camouflage'.

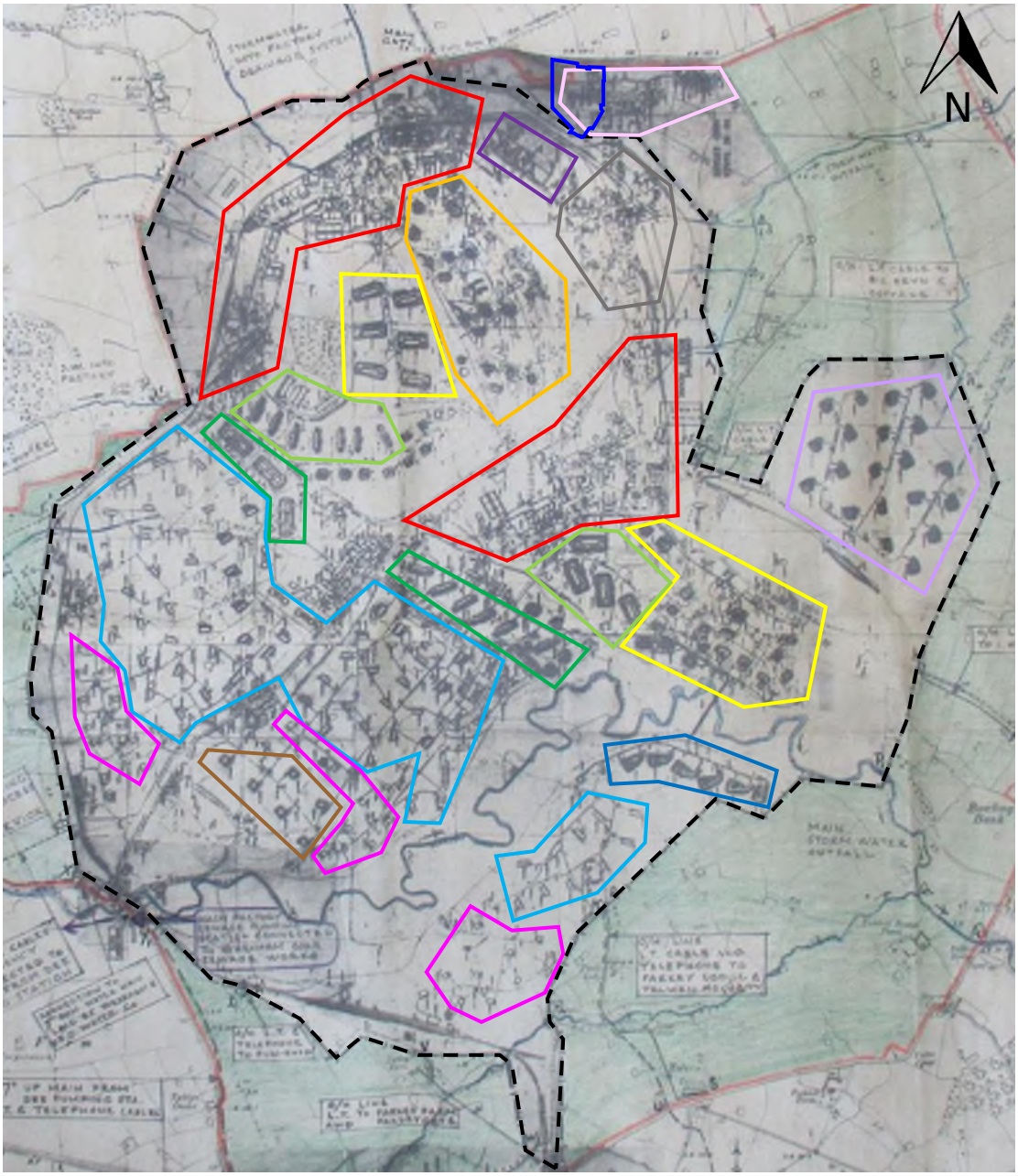
By December 1940, the factory had begun producing nitroglycerine and nitrocellulose to create cordite, a propellant used in military firearms. Throughout WWII, ROF Wrexham produced several types of cordite, including Cordite W, which included carbamite, and Cordite RDN, a 'flashless' cordite which included nitroguanidine (picrite).

By February 1941, the factory was fully operational. 3No. factory units had originally been planned, but only 2No. were ever constructed.

In 1942, an additional acid plant was added, and ROF Wrexham reached its maximum output of 520No. tons of cordite per week. Production was soon halved due to reduced demand.

Figure 2 is a plan of ROF Wrexham dating from 1945. Several factory features have been identified. This shows that the Site was located in the administrative and accommodation area, predominantly outside the danger area fence.

Figure 2 Plan of ROF Wrexham, 1945



Source: The National Archives *Not to Scale*

Legend	Site boundary	Danger area fence	Admin/accommodation
	Guncotton section	Nitroglycerine section	Paste sheds
	Rolling houses	Press houses	Stoves
	Drying sheds	Blending houses	Main laboratory
	Cordite magazines	Picrite magazines	Workshops/stores

Raw materials used in cordite production were transported into the factory via the existing mineral railway, which ran around the western and northern factory perimeter, including

adjacent to the Site. The materials were then dispersed across the factory via the internal rail network and by lorries.

The factory produced nitroglycerine and guncotton in dedicated factory units, between approximately 0.3km southwest and 1.8km south of the Site (see Figure 2). These were then combined to produce cordite. Specific additives were incorporated to give the cordite certain qualities, such as vaseline, used as a stabilizing agent, or picrite, which reduced the smoke and flash produced by the cordite when fired. The result was a gelatinous paste, which was then taken to the rolling houses to be pressed into sheets.

Once pressed, the cordite was then extruded into the characteristic cords and trimmed to size. To remove any remaining acetone, the cordite was dried in stoves and drying houses. Once fully dried, the cordite was quality checked, packed into boxes with waxed paper, and stored in magazines before being transported to filling factories for use in munitions production.

In June 1945, ROF Wrexham was declared redundant. On the 11th August 1945, operations at ROF Wrexham officially ceased.

Plate 2 is an aerial photograph dated the 2nd May 1946. Offices, air raid shelters, and farm buildings on the Site have been identified.

Plate 2 Aerial photograph, 2nd May 1946



Source: CRAPW *Not to Scale*

Legend	Site boundary	Air raid shelters/trenches	Offices
	Danger area fence	Main laboratory	Farm buildings

From 1946, ROF Wrexham was redeveloped as Wrexham Industrial Estate, with many of the buildings being demolished.

In the 1950s, British Celanese opened a large acetate yarn factory within the former ROF, approximately 0.3km southwest of the Site. The offices, on and adjacent to the Site, continued in use by British Celanese. They have since been removed.

Wrexham Industrial Estate continues to occupy the majority of the former ROF, accommodating such companies as Kellogg's, JC Bamford (JCB) Excavators, and British Cables Company (BCC).

3.1.2 Activities at ROF Wrexham

Details of activities at ROF Wrexham that may provide a source of explosives contamination to the Site are given in the sections below.

Water features

ROF Wrexham was served by a dedicated water treatment works, approximately 3.1km southwest of the Site. Effluent would have been carried out of the factory for treatment at the works, flowing away from the Site.

Records indicate that the Site was crossed by a drainage system. These were connected to administrative buildings, accommodation, and farm buildings, and would have only carried domestic wastewater.

Figure 3 Historical map, 1961 is a historical map dating from 1961. The network of drains across the Site have been highlighted.

Figure 3 Historical map, 1961



Source: © Crown Copyright 2024. Reproduced by permission of Ordnance Survey *Not to Scale*

Legend	Site boundary	Drains

A drain culvert remains extant adjacent to the southern part of the Site (see Plate 1).

Water features are not considered to provide a significant source of explosives contamination to the Site.

Railway network

ROF Wrexham was served by an old mineral railway, running adjacent to the Site (see Plate 2 and Figure 3), via which raw materials were transported into the factory.

The materials were then dispersed throughout the factory via a smaller internal railway. The internal railway was also used to transport finished products from the processing facilities to magazines within the factory, and later out of the factory via the main Great Western Railway (GWR) line.

Spillages regularly occurred on internal railway networks. They were common at loading points, bends, and junctions, where explosives or spilled chemicals could mix into rail ballast and surrounding soil. Given that the railway adjacent to the Site was a standard gauge system, as opposed to the narrow gauge used for the factory's internal railway, spillages are unlikely to have occurred.

Additionally, the section of railway adjacent to the Site was only used for transporting raw materials into the factory, with finished cordite being transported out of the southern side of the factory.

The railway network at ROF Wrexham is not considered to provide a significant source of explosives contamination to the Site.

Chemical plants and bulk storage

ROF Wrexham produced nitroglycerine and nitrocellulose, the two key components of cordite propellant. These were produced in dedicated sections of the factory (see Figure 2), between approximately 0.3km southwest and 1.8km south of the Site. Chemicals were held in storage tanks in these sections prior to use.

No chemical manufacturing facilities have been identified on or in close proximity to the Site.

Chemical plants and bulk storage are not considered to provide a source of explosives contamination to the Site.

Magazines

Cordite produced at ROF Wrexham was stored in magazines prior to despatch, approximately 2km south-southwest of the Site. Picrite, used in the production of 'flashless' cordite, was also stored in bulk at ROF Wrexham, approximately 1km southeast of the Site.

No magazines have been identified on or in close proximity to the Site.

Magazines are not considered to provide a source of explosives contamination to the Site.

Burning grounds/waste disposal

Most explosives factories had designated burning grounds or disposal areas to dispose of unwanted or outdated products. This can provide significant concentrations of explosive residue.

ROF Wrexham was equipped with numerous 'spoil tips' where waste products could be disposed of. These were located in convenient areas around the factory. The nearest was located adjacent to a guncotton section, approximately 1km southwest of the Site.

Burning grounds/waste disposal areas are not considered to provide a source of explosives contamination to the Site.

Potential explosives contamination hazard

The Site was located in the administrative and accommodation section at ROF Wrexham, predominantly outside the danger area fence.

No significant sources of explosives contamination have been identified on or in close proximity to the Site.

ROF Wrexham is not considered to provide a significant source of explosives contamination to the Site.

Potential UXO hazard

No records have been found to indicate that filling of munitions took place at ROF Wrexham. Finished cordite produced at the factory was transported to dedicated filling factories elsewhere to be used in munitions.

Guards equipped with small arms would have been stationed at the main entrances to the factory. The potential for Small Arms Ammunition (SAA) to have been spilled, albeit unlikely, cannot be totally discounted.

ROF Wrexham is not considered to provide a significant source of UXO hazard to the Site.

3.2 Defences

For further information on military defences, and the potential UXO hazards associated with them, follow the links below:

- Anti-Aircraft Guns
- Anti-Invasion Defences
- Barrage Balloons
- Bombing Decoys
- Home Guard
- Mined Locations
- Mortar & Gun Emplacements
- Pillboxes

No military defences have been identified on the Site. The nearest are described below.

3.2.1 Defences at ROF Wrexham

During WWII, ROF Wrexham was defended by at least 11No. pillboxes. These were concentrated on the southern side of the factory, between approximately 1.2km and 2.3km south of the Site.

No records have been found to indicate that any defences were located on or in close proximity to the Site.

Defences at ROF Wrexham are not considered to provide a source of UXO hazard to the Site.

3.2.2 Anti-Aircraft (AA) guns

During WWI and WWII there were no AA batteries recorded within 10km of the Site. The nearest was located at Hawarden (SJ 338619), approximately 12km northwest of the Site.

Potential UXO hazard

It should be noted that the lack of official records of AA batteries cannot be taken to imply their absence as many units were mobile and moved around as operational requirements dictated.

The potential for an Unexploded AA (UXAA) shell to have fallen on the Site unnoticed, whilst very unlikely, cannot be totally discounted.

3.3 Military airfields

For further information on military airfields, and the potential UXO hazards associated with them, follow the link below:

- Military Airfields

No records of any military airfields on or in close proximity to the Site have been found.

During WWI and WWII, the nearest operational airfield was located at Borras Lodge, approximately 2.1km northwest of the Site. From 1917, fields at Borras Lodge were used as an unofficial landing ground by Nos. 4 and 51 Training Squadrons of the Royal Flying Corps (RFC).

After WWI, the fields continued to be used by Royal Air Force (RAF) training squadrons, as well as Lancashire Aero Club and Liverpool and District Aero Club for air displays.

At the start of WWII, the fields at Borras Lodge, now known as RAF Wrexham, were used as a relief landing ground by No. 5 Service Flying Training School (SFTS). Between December 1940 and June 1941, the airfield was made permanent with the installation of concrete runways. It then became used by No. 96 Squadron, a RAF night fighter squadron.

The airfield also accommodated No. 285 Squadron, which provided target tug aircraft for training exercises, and United States (US) Army Piper Cub aircraft, which supported American field artillery and construction units.

In 1945, RAF Wrexham was placed on care and maintenance status. It was later sold and became used for gravel quarrying.

Military airfields are not considered to provide a source of UXO hazard to the Site.

3.4 Aircraft crashes

For further information on military aircraft crashes, and the potential UXO hazards associated with them, follow the link below:

- Aircraft Crashes

No records of any aircraft crashes on or in close proximity to the Site have been found.

3.5 Firing ranges and military training areas

For further information on firing ranges and military training areas, and the potential UXO hazards associated with them, follow the links below:

- Artillery Ranges
- Bombing Ranges
- Military Training Areas
- Small Arms Ranges

No records of any firing ranges or military training areas on or in close proximity to the Site have been found.

4 BOMBING

4.1 WWI bombing

For further information on WWI bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.2 or use the following link.

- WWI Bombing

No records have been found indicating that the Site was bombed during WWI.

4.2 WWII bombing

For further information on WWII bombing in the UK, and the potential UXO hazard associated with it, see Appendix 2.3 or use the following link.

- WWII Bombing

No records have been found indicating that the Site was bombed during WWII. Details of WWII bombing in the vicinity of the Site are provided in the following sections.

4.2.1 Bombing in Wrexham and North Wales

Wrexham and its outlying rural areas were subjected to fewer air raids than many other parts of the United Kingdom (UK). Bombing in the region mainly resulted from overspill during raids on nearby industrial towns and cities such as Ellesmere Port, Liverpool, Birkenhead, and Manchester.

Bombing in the Wrexham area was primarily concentrated on Esclusham Mountain, approximately 13km west of the Site, where a decoy airfield had been established to divert bombing away from airfields in the surrounding area, including RAF Wrexham (see Section 3.3), RAF Poulton, and RAF Hawarden. The Wrexham area was also subjected to tip-and-run raids, where aircraft jettisoned any remaining bombs after a raid on a strategic target.

Records of bombs falling on military establishments, such as ordnance factories, were often suppressed until the end of WWII.

It should be noted that although rural areas were bombed less heavily than urban districts, Air Raid Precaution (ARP) records may under-represent the number and frequency with which bombs fell in rural areas.

4.2.2 Strategic targets

From prior to the declaration of war in 1939, Britain was subjected to reconnaissance flights by the Luftwaffe which was building up a photographic record of potential targets.

The Site was located in a predominantly rural area which contained few strategic targets. The main strategic target in the area was ROF Wrexham, encompassing the Site.

Plate 3 is a Luftwaffe target photograph of ROF Wrexham (Target A, GB 22 45) dating from October 1940, whilst the factory was still under construction. Several targets have been identified, as outlined in Table 1 below.

Table 1 Luftwaffe targets in the vicinity of the Site

Target No.	Target
1	Manufacturing buildings
2	Outbuildings
3	Explosives stores surrounded by blast protection
4	Munitions stores surrounded by blast protection
5	Storage building
6	Loading station
7	Explosives stores under construction
8	Stack of ammunition
9	Storage buildings under construction

Plate 3 Luftwaffe target photograph of ROF Wrexham, October 1940



Source: NARA *Not to Scale*

Legend	Site boundary

4.2.3 Bombing densities and incidents

Table 2 gives details of the overall bombing statistics recorded for the Local Authority Districts of the Site (highlighted by bold text) and surrounding districts. These were categorised as Rural Districts (RD), Urban Districts (UD), Municipal Boroughs (MB), Metropolitan Boroughs (MetB), and County Boroughs (CB). WWII bomb density levels are defined below:

<5 bombs per 405ha is a Very Low regional bombing density.

5-15 bombs per 405ha is Low.

15-50 bombs per 405ha is Moderate.

50-250 bombs per 405ha is High.

>250 bombs per 405ha is Very High.

Official UK bombing statistics have been compiled from both British and German sources. There were differences in the way the figures were originally reported and collated which has led to discrepancies in the summary data.

Note that Table 2 excludes the figures for Incendiary Bombs (IBs). Discrepancies between the below list and other records, such as bomb clearance records, demonstrate that this data is likely to under-represent actual bombing.

Table 2 Bombing statistics

Area	Bombs Recorded				
	High Explosive	Parachute Mines	Other	Total	Bombs per 405ha (1000 acres)
Wrexham RD	**273**	**4**	**1**	**278**	**3.8**
Chester RD	235	4	5	244	5.6
Hawarden RD	167	0	7	174	5.5
Tarvin RD	298	8	3	309	4.9
Overton RD	39	2	1	42	1.4
Wrexham MB	1	0	0	1	0.3

It should be noted that during WWII, many Unexploded Bombs (UXBs) were mapped and subsequently removed as and when conditions and demands on Bomb Disposal teams allowed. Their removal was not always accurately recorded and sometimes records were later destroyed. In practice, most UXBs were probably removed and only a much smaller number were actually registered as officially abandoned bombs.

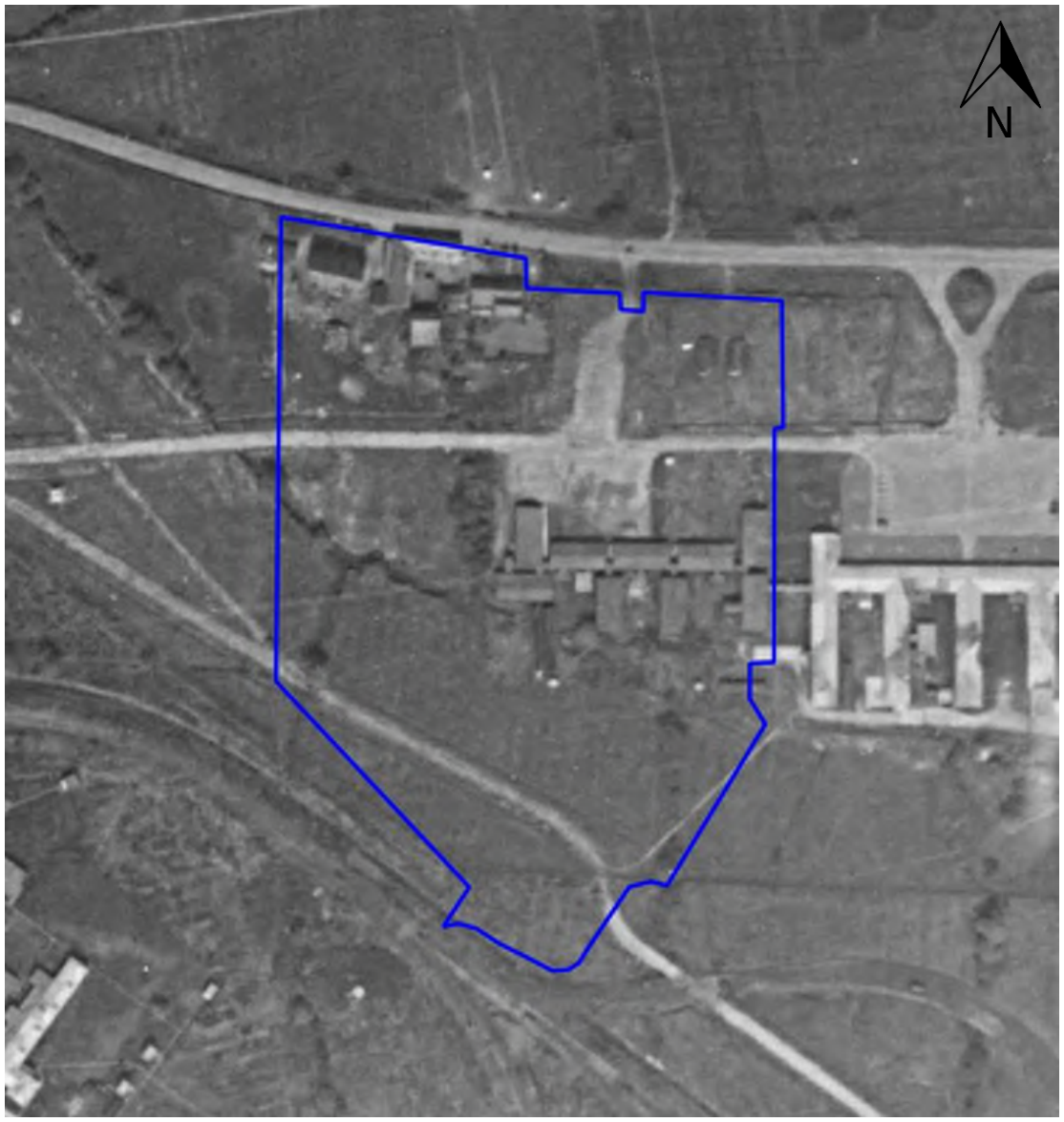
Details of the nearest recorded bombing incidents to the Site are given in the following section.

29th October 1940

1No. High Explosive (HE) bomb fell on a farm on Hugmore Lane, approximately 0.5km northwest of the Site.

Plate 4 is an aerial photograph dated the 2nd May 1946. No bomb damage or cratering has been identified on or in the vicinity of the Site.

Plate 4 Aerial photograph, 2nd May 1946



Source: Historic England *Not to Scale*

Legend	Site boundary

Potential UXO hazard

No records have been found indicating that the Site was bombed and no bomb damage has been identified on the Site on historical aerial photography.

WWII bombing is not considered to provide a significant source of UXO hazard to the Site.

4.2.4 Abandoned bombs

No records have been found indicating that any officially abandoned bombs are located on the Site.

4.2.5 Bomb penetration depths

At the time of writing, no Site-specific ground investigation data was provided.

BGS 1:50,000 Sheet 121 Wrexham (Solid & Drift) and BGS borehole records from nearby investigations have been consulted to get an indicative overview of the Site geology.

The WWII geology of the Site is understood to consist of Made Ground and open ground, over Devensian Till, overlying the Salop Formation.

Table 3 provides an estimate of average maximum bomb penetration depths for the Site assuming WWII ground conditions of 0.5m of topsoil over more than 20m of stiff to very stiff clay.

Table 3 Estimated average maximum bomb penetration depths

Estimated average bomb penetration depths for anticipated geology		
Bomb Weight	50kg	5.0m
	250kg	7.5m
	500kg	13.0m

Where Made Ground was present, the estimated average bomb penetration depths are likely to be less than the ones given in Table 3.

These calculations can be refined on receipt of Site-specific information.

The estimated bomb penetration depths given in Table 3 are from the WWII ground level and are based on the following assumptions:

a) High-level release of the bomb resulting in an impact velocity of 260m/s (>5,000m altitude).

b) A strike angle of 10 to 15 ^{o} to the vertical.

c) That the bomb is stable, both in flight and on penetration.

d) That no retarding units are fitted to the bomb.

e) That the soil type is homogenous.

Assuming the above, a bomb will enter the ground and travel on the same trajectory until momentum is nearly lost. The bomb will then turn abruptly to the horizontal before coming to rest. The horizontal distance between the centre of the entry hole and the centre of the bomb at rest is known as the 'offset'. A marked horizontal movement from the original line of entry is common.

Low-level attacks may have an impact angle of 45° or more, which will frequently lead to a much greater amount of offset movement during soil penetration.

The average offset is one third of the penetration depth. If hardstanding or Made Ground were present during WWII, bomb penetration depths would have been significantly reduced but offset distances may have been up to four times greater.

5 POST-WWII EXPLOSIVE ORDNANCE CLEARANCE (EOC) ACTIVITIES

Based on data from 1939 to 1945, War Office (WO) statistics indicate that 200,195No. HE bombs exploded within Great Britain. Additionally, 25,195No. HE bombs (approximately 11%) were recorded as UXBs. However, records from the Royal Engineers (RE) who were responsible for bomb disposal at the time indicate that by 27th February 1946, more than 45,000No. UXBs were disposed of.

On average, 8.5% of UXBs later self-exploded. In some cases, the bombs had delayed action fuzes or were never intended to explode, their purpose being to cause inconvenience and fear. Given the discrepancy in records and the fact that UXBs are still being found unexpectedly, it is clear that the original figures are understated and provide only an approximation of the number of potential UXBs in the UK.

WO statistics also show that between October 1940 and May 1941 most UXBs (93%) were either 50kg or 250kg. It should be noted that details of the recovery and size of the UXB were not always accurately reported.

The larger WWII UXBs are often difficult to recover due to both penetration depths and the presence of two or more fuzes, combined with more sensitive fillings of explosive mixtures including Amatol and Trialen.

5.1 EOC tasks

Zetica holds no records of post-WWII EOC tasks having taken place on or in the vicinity of the Site.

6 UXO AND EXPLOSIVES HAZARD ASSESSMENT

6.1 UXO and explosives hazard level

Definitions of UXO and Explosives Hazard Level for a Site	
Hazard Level	**Definition**
Very Low	There is positive evidence that UXO or explosives are not present, e.g. through physical constraints or removal.
Low	There is no positive evidence that UXO or explosives are present, but their occurrence cannot be totally discounted.
Moderate	There is positive evidence that ordnance or explosives were present or that other uncharted ordnance may be present as UXO.
High	There is positive evidence that UXO or explosives are present.
Very High	As high, but requires immediate or special attention due to the potential hazard.

Between 1939 and 1946, the Site was encompassed by ROF Wrexham, which produced cordite propellant. The Site comprised administrative and farm buildings away from the main production areas. ROF Wrexham is not considered to provide a significant source of UXO or explosives contamination hazard to the Site.

No records have been found indicating that the Site was bombed and no other significant sources of UXO hazard have been identified on the Site.

Given this, it is considered that the Site has a low UXO and explosives contamination hazard level, as shown in Figure 4.

The hazard zone plan of the Site is also given in the accompanying P14594-24-R1-MAP01-A.

Figure 4 UXO and explosives hazard zone plan of the Site



Source: OpenStreetMap *Not to Scale*

Legend					
	Very Low		Low		Moderate
	High		Very High		Site boundary

7 UXO AND EXPLOSIVES RISK ASSESSMENT

7.1 Proposed works

It is understood that works on the Site are associated with the construction of new commercial units for Net World Sports (NWS). It is assumed that this will include excavations, intrusive ground investigations, and piling.

7.2 Risk assessment methodology

A UXO and explosives risk assessment has been undertaken for the proposed works, taking into consideration the identified UXO and explosives hazard.

Firstly, the probability of encountering UXO or explosives (PE) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Encounter (PE)	Rating
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Secondly, the probability of detonating an item of UXO or explosives (PD) has been considered and rated for the proposed construction techniques, as detailed below.

Probability of Detonation (PD)	Rating
Frequent, highly likely, almost certain.	5
Probable, more likely to happen than not.	4
Occasional, increased chance or probability.	3
Remote, unlikely to happen but could.	2
Improbable, highly unlikely.	1
Impossible	0

Next, the probability of encountering and detonating the UXO or explosives (PE x PD) have been used to generate an overall likelihood rating (P).

P = PE x PD	LIKELIHOOD of Encounter and Detonation	Rating
21 to 25	Frequent, highly likely, almost certain.	5
16 to 20	Probable, more likely to happen than not.	4
6 to 15	Occasional, increased chance or probability.	3
2 to 5	Remote, unlikely to happen but could.	2
1	Improbable, highly unlikely.	1
0	Impossible	0
P ranges from 25, a certainty of UXO or explosives being encountered and detonated on the Site by engineering activity, to 0, a certainty that UXO or explosives contamination does not occur on the Site and will not be detonated by engineering activity.		

The likelihood of encountering and detonating UXO or explosives during site works (P) is multiplied by the severity (S) of such an event occurring (P x S), to provide a risk level using the following matrix.

Severity (S)	Rating
Multiple fatalities	5
Major injury, long term health issues, single fatality.	4
Minor injury, short term health issues, no fatalities.	3
First aid case but no lost time or ill health.	2
Minor injuries, no first aid.	1
No injuries.	0

UXO Risk Matrix							
	SEVERITY (S)						
LIKELIHOOD (P)		5	4	3	2	1	0
	5	25	20	15	10	5	0
	4	20	16	12	8	4	0
	3	15	12	9	6	3	0
	2	10	8	6	4	2	0
	1	5	4	3	2	1	0
	0	0	0	0	0	0	0

7.3 UXO and explosives risk level

The UXO and explosives risk assessment for proposed works on the Site is given in Table 4.

Table 4 UXO and explosives risk assessment for the Site

Potential Hazard	Anticipated Works	PE	PD	P = PE x PD	Likelihood	Severity	Risk Rating	UXO Risk
UXB	Excavations	1	1	1	1	5	5	Low
	Boreholes/Piling	1	1	1	1	4	4	Low
Explosives contamination	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low
Other UXO	Excavations	1	1	1	1	4	4	Low
	Boreholes/Piling	1	1	1	1	3	3	Low
PE = Probability of Encounter; PD = Probability of Detonation; P = Likelihood								

8 RISK MITIGATION PLAN

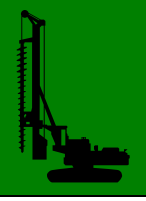
Key findings: No significant sources of UXO or explosives contamination hazard have been identified.

Key actions: An UXO awareness briefing is recommended for staff involved in excavations.

8.1 UXO and explosives risk summary

Table 5 summarises the UXO and explosives risk for proposed works on the Site and recommended actions.

Table 5 Summary of UXO and explosives risk and mitigation recommendations

Proposed Works	UXO Risk	Recommended Mitigation
Excavations		**UXO awareness briefing** – an UXO awareness briefing is prudent for staff involved in excavations.
Boreholes/Piling		**Proceed with works**

In summary, it is recommended that an UXO awareness briefing is provided for staff involved in excavations to ensure they take appropriate action in the event of a suspect find

8.2 Risk mitigation techniques

8.2.1 UXO awareness briefing

It is recommended that all staff involved in excavation works are provided with a formal UXO awareness briefing.

The briefing should offer some recognition skills for typical UXO, and suitably sensitise staff to be vigilant during site works.

An UXO awareness briefing ensures that in the unlikely event that UXO is encountered:

- All site staff take appropriate action.
- A support mechanism and points of contact are established.
- The likelihood of harm to people or property is reduced.
- Significant delays to site work are prevented.

8.3 What do I do next?

If you require a quote for an awareness briefing or have any questions, contact us and we can help.

	01993 886682		**uxo@zetica.com**		**zeticauxo.com**

If you have requirements to identify other buried hazards (such as mapping utilities or obstructions) we can provide these surveys.

If proposed works on the Site change, or additional works are planned, contact Zetica for a re-assessment of the UXO risk and the risk mitigation requirements.

APPENDICES

Appendix 1 Anticipated ordnance types

For a more comprehensive set of ordnance data sheets, see https://zeticauxo.com/guidance/ordnance-data-sheets/.

Information Data Sheet

Cordite



Variance of Cordite in stick/rod form



Comparison of Cordite and SAA



Mixing of raw Cordite

Cordite is a smokeless propellant developed in the late 19th century and used in munitions ranging from .303" Small Arms Ammunition (SAA) to 18" naval shells. Cordite is a 'Low Explosive', meaning it burns at a slower rate and with a lower pressure than a 'High Explosive'. Despite this, it can still be dangerous, particularly in large quantities or confined spaces, and should always be treated with respect.

Cordite typically takes the form of brown sticks or rods, often bundled to ease handling. It may be found loose, contained in a cartridge, or as a 'separate' charge (usually in a cloth bag or leather carrier). Residual Cordite may also be encountered as 'Explosive Contamination', particularly in manufacturing or storage facilities.

Because of its appearance, Cordite may be less recognisable than other types of UXO. It is important to maintain recognition skills and exercise additional caution in areas where Cordite may be encountered.



Weighing of loose Cordite



Production of bagged Cordite charges



Gun crew with leather Cordite carrier



Loading of bagged Cordite charge

Information Data Sheet

Small Arms Ammunition



.303" British SAA



Spent SAA cartridges



Loose SAA



Belted 0.5" SAA

Small Arms Ammunition (SAA) refers to a wide variety of cartridges with projectiles up to ~12.7mm (0.5") in calibre. Weapons using SAA may be man-portable or mounted on vehicles such as tanks and aircraft.

SAA may be found loose, or in belts, magazines, or clips. Rounds may be spent (fired) or unspent (intact). Encounters with SAA are particularly common around military establishments such as ranges, training areas, and airfields. Aircraft crashes and shipwrecks are other common sources of SAA encounter.

Generally, SAA presents a low risk to Site works, but it should still be treated with respect. Any SAA encountered should be stored in a metal box kept in a secure location. Once ~12 rounds have accumulated, they should be handed to police with an explanation of how and where they were found.

Some varieties of SAA may contain fuzes and/or explosive fillings (e.g., High Explosive/Incendiary (HE/I)). This is most common for rounds with projectiles over 10mm (0.4") in calibre. Where these varieties of SAA are anticipated or encountered, any SAA found should be treated in the same way as larger UXO.



The above is an indicative selection of some of the most common calibres of SAA. It is not exhaustive. The appearance of SAA can vary considerably depending on their origin and intended purpose.

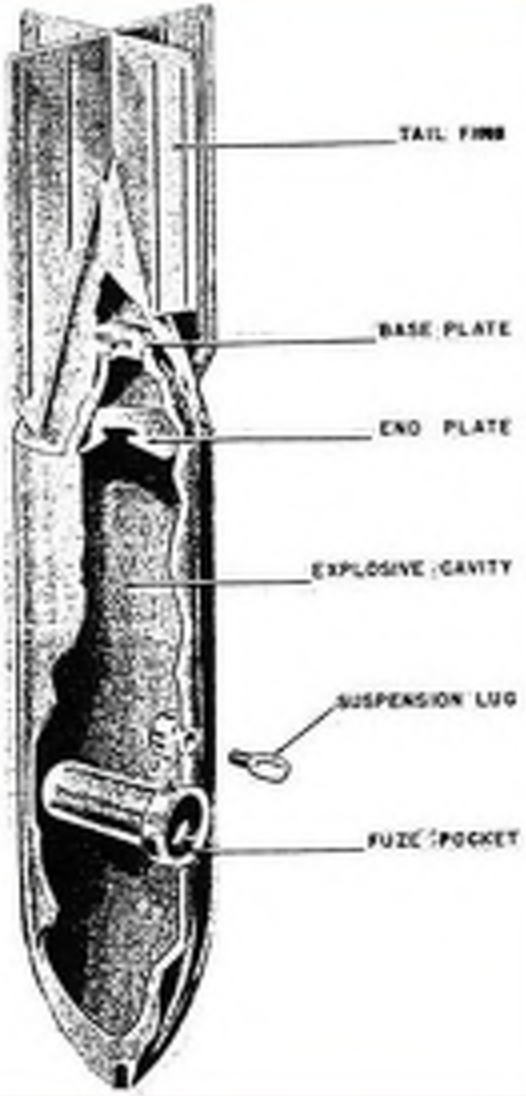
Information Data Sheet

50kg High Explosive Bomb









Specifications

Description	Cylindrical with pointed nose and four-fin tail	Function	General Purpose (Blast and Fragmentation)
Dimensions	Total 1090mm x 280mm (42.9" x 11") Body 766mm x 200mm (30.2" x 7.9")	Activation by	Impact, Time, or Tamper fuze
Material	Steel	Variations	Minor variations in length

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted or material is unauthorised.

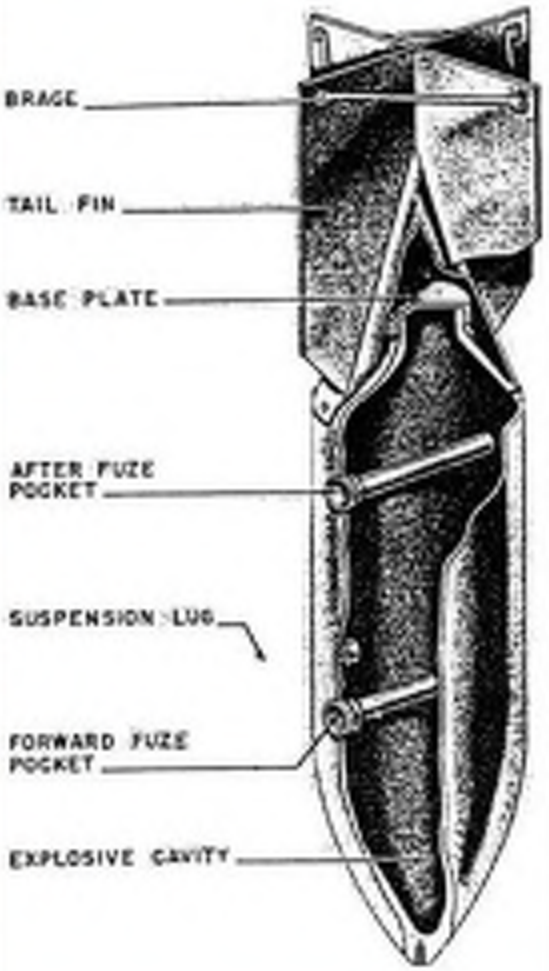
Information Data Sheet

250kg High Explosive Bomb









Specifications

Description	Cylindrical with pointed nose and braced four-fin tail	Function	General Purpose (Blast and Fragmentation)
Dimensions	Total 1640mm x 512mm (64.6" x 20.2") Body 1172mm x 368mm (46" x 14.5")	Activation by	Impact, Time, or Tamper fuze
Material	Steel	Variations	Minor variations in length

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted material is unintentional.

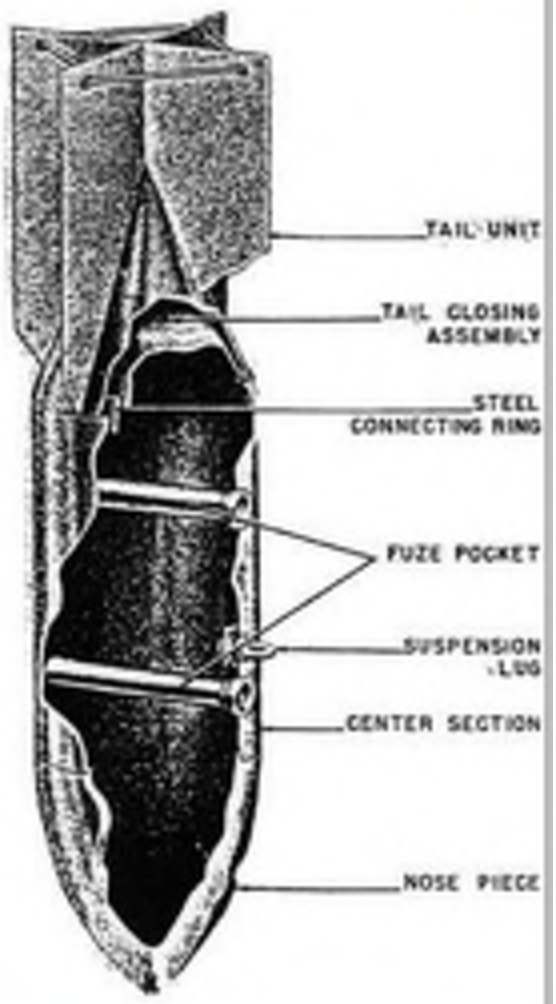
Information Data Sheet

500kg High Explosive Bomb









Specifications

Description	Cylindrical with pointed nose and braced or ring-bound four-fin tail	Function	General Purpose (Blast and Fragmentation)
Dimensions	Total 1953mm x 660mm (77" x 25.2") Body 1422mm x 470mm (56" x 18.5")	Activation by	Impact, Time, or Tamper fuze
Material	Steel body, Steel or Magnesium Alloy tail	Variations	Minor variations in length

Information is accurate for indicative purposes. Photographs used are in the public domain. Any use of copyrighted ID material is unintentional.

Information Data Sheet

Anti-Aircraft Shells


3" AA Shell


3.7" AA Shell


3.7" AA Shell

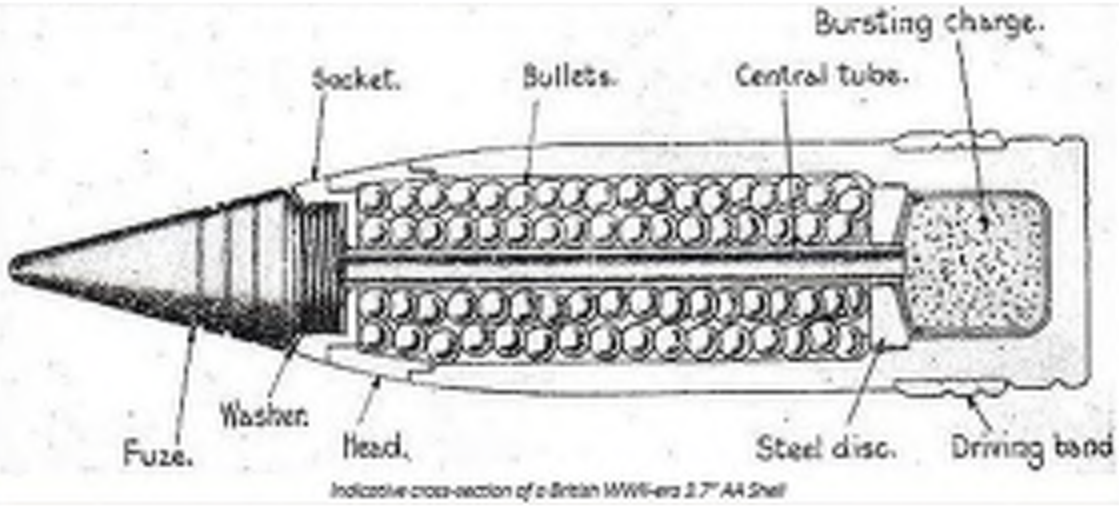

4.5" AA Shell


AA Nose Fuze

Anti-Aircraft (AA) guns are artillery pieces designed to engage aircraft. They may be classed as Heavy AA (HAA) or Light AA (LAA). HAA shells are typically streamlined, made of steel, and equipped with driving bands. They usually carry a High Explosive (HE) or shrapnel filling and use time or proximity fuzes. LAA guns are often autocannons. Indicative specifications for common British HAA shells are given below.

Specifications

Shell	Dimensions	Shell	Dimensions	Shell	Dimensions
6 pdr (c. WWI)	303mm x 57mm (12.1" x 2.2")	13 pdr (c. WWI)	294mm x 76mm (11.6" x 3")	3.7" (c. WWII)	675mm x 94mm (26.6" x 3.7")
75mm (c. WWI)	350mm x 75mm (13.8" x 3")	3" (c. WWI)	420mm x 76mm (16.5" x 3")	4.5" (c. WWII)	696mm x 113mm (27.4" x 4.5")
12 pdr (c. WWI)	445mm x 102mm (17.5" x 4")	4" (c. WWI)	445mm x 102mm (17.5" x 4")	5.25" (c. WWII)	780mm x 133mm (30.8" x 5.25")



Indicative cross-section of a British WWII-era 3.7" AA Shell

Information is in a guide for indicative purposes. Photographs used are in the public domain. Any use of copyrighted ID material is unauthorised.

Appendix 2 Sources of UXO and explosives hazard

The sections below provide background information on the potential sources of UXO and explosives hazard affecting the Site. For a more comprehensive set of UXO information sheets, see https://zeticauxo.com/guidance/uxo-hazard-sources/.

Appendix 2.1 Explosives factories

Information Data Sheet

Category Explosives and Ordnance Factories

Description:

Since the 16th century explosives and ordnance manufacturing has taken place in the UK. Beginning with gunpowder mills, the manufacturing process has developed over time to include a wide range of munitions and explosive products.

In WWI the demand for munitions manufacture increased dramatically and National Explosives Factories (NEFs) and National Filling Factories (NFFs) were established across the UK. Provisions were also made for the manufacture of chemical munitions, such as phosgene and Mustard Gas.

Many WWI explosives factories were located in heavily-urbanised areas, making them vulnerable to enemy bombing, and increasing the chances of explosions and dispersal of explosives residues.

In WWII, Royal Ordnance Factories (ROFs) were constructed in more remote areas, to prevent a repeat of the factory disasters of WWI and to protect them against enemy bombing. ROFs manufactured a wide range of munitions and explosives, including developmental explosives such as Research Department Explosive (RDX) which had been invented in the 1930s.

Additionally, during WWI and WWII numerous conventional and commercial factories were converted to 'agency factories' for manufacturing ordnance. Chemical companies, such as Imperial Chemical Industries (ICI), also produced explosive products at many of their factories during WWII.

After WWII several ROFs remained active, eventually being incorporated into private ownership, whilst other purpose-built factories were demolished and redeveloped. Most 'agency factories' returned to commercial production.



Shell storage at an NFF during WWI



An ROF from WWII

Hazard:

Explosives and ordnance manufacturing offers a potential hazard from both explosives and UXO. Standard procedures of explosive/ordnance disposal through burial or burning means that explosive contamination and UXO hazards will be present in some areas of these establishments.

The potential hazard remaining at a former ordnance or explosives factory depends on the type of historic production and the amount of subsequent remediation that has taken place at the site.

Ground investigations are always advisable at former explosives factories to determine whether any significant concentrations of residue remain that may contaminate the ground.

A UXB hazard may also exist at former explosives and ordnance factories, which were deliberately targeted by enemy aircraft during WWI and WWII.

Appendix 2.2 WWI bombing

Information Data Sheet

Category World War One (WWI) Bombing

Description:

During WWI, significant bombing took place across some areas of the UK. An estimated 9,000No. German bombs were dropped on Britain during the course of 51No. airship and 52No. aircraft raids. It was the first time that strategic aerial bombardment had been used.

Nearly 100No. air raids were carried out on London and Southeast England, over 40No. of which were by Zeppelin airships. Areas along the East Coast was also targeted regularly due to their proximity to the European continent. Bombing raids further inland were rare and West England and Wales were out of reach for German aircraft of the time.

Aerial bombing during WWI initially relied on visual aiming, with bombsights not developed until later in the war. The inaccuracy inherent in this method meant that bombs often fell some way from their intended targets.

The first recorded raid against England occurred on the 21st December 1914 when 2No. High Explosive (HE) bombs fell near the Admiralty Pier at Dover. Zeppelin raids intensified during 1915 and 1916, with aircraft raids becoming more frequent after 1917. The last raid of WWI took place on the 19th May 1918, when 38 Gotha and 3 Giant aircraft bombed London and surrounding districts, dropping a total of more than 2,500lbs of bombs.



A variety of WWI German bombs

Hazard:

The potential of coming across an Unexploded Bomb (UXB) from WWI is far less likely than an UXB from World War Two (WWII), given the lower bombing densities during raids in WWI.

Some areas which were subjected to sustained bombing raids recorded a higher number of UXBs. In these areas, where there has been no significant development for the last century, the potential of a UXB remaining from WWI cannot be totally discounted.

Appendix 2.3 WWII bombing

Information Data Sheet

Category World War Two (WWII) Bombing

Description:

Bombing raids began in summer 1940 and continued until the end of WWII. Bombing densities generally increased towards major cities, such as London, Birmingham, Coventry, and Hull, or strategic targets such as docks, harbours, industrial areas, and airfields. Coastal towns, such as Eastbourne, and cathedral cities, such as Canterbury were also heavily targeted.

The German bombing campaign saw the extensive use of both High Explosive (HE) bombs and Incendiary Bombs (IBs). 50kg and 250kg HE bombs were most commonly used, although 500kg were also used to a lesser extent. More rarely 1,000kg, 1,400kg and 1,800kg bombs were dropped. HE bombs tended to contain about half of their weight in explosives and were fitted with one or two fuzes. Not all HE bombs were intended to explode on impact and some contained timing mechanisms where detonation could occur more than 70 hours after impact.

Incendiary devices ranged from small 1kg thermite filled, magnesium bodied IBs, to 250kg and 500kg Oil Bombs (OB). Occasionally IBs were fitted with a bursting charge which exploded after the bomb had been alight for a few minutes, causing burning debris to be scattered over a greater area. Large OBs were similar in appearance to HE bombs, although their design was sufficiently different to warrant a specially trained unit of the Royal Engineer (RE) to deal with their disposal.



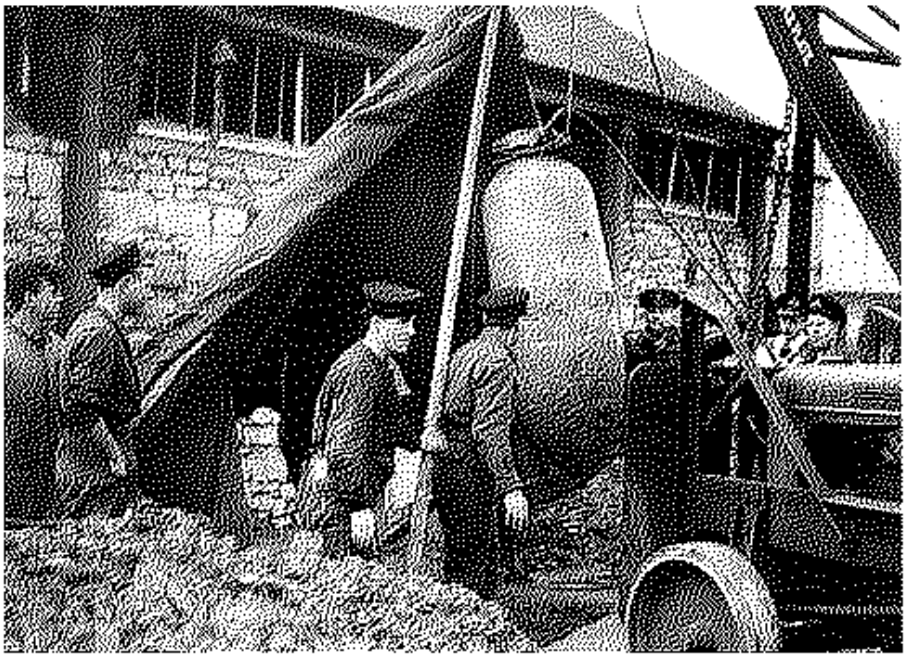
Variety of WWII bombs

Anti-Personnel (AP) bombs and Parachute Mines (PMs) were also deployed. The most common AP bombs were 1kg and 2kg, which could inflict injury across an area up to 150m away from the impact. PMs could be up to 4m in length and were typically detonated either magnetically or by noise/vibration. Anti-shipping PMs were commonly dropped over navigable rivers, dockland areas, and coastlines. Whilst the Royal Navy (RN) was responsible for ensuring that anti-shipping PMs were made safe, their removal and disposal was still the responsibility of the RE.

In 1944, new offensive weapons were introduced. The Flying Bomb (V1), a pilotless guided missile, exploded on impact and could cause significant damage. The Long Range Rocket (V2), a ballistic missile rocket, travelled at such speed that no one could see or hear its approach.

WWII bomb targeting was inaccurate, especially in the first year of the war. A typical bomb load of 50kg HE bombs mixed with IBs aimed at a specific location might not just miss the intended target but could fall a considerable distance away.

Local Civil Defence authorities in urban areas typically had a comprehensive system for reporting bomb incidents and dealing with Unexploded Bombs (UXB). In more rural and coastal areas where fewer bombing raids occurred, it is known that Air Raid Precaution (ARP) records under-represent the number and frequency of bombs falling. Bombs could be released as part of 'tip and run' raids where bomber crews would drop their bombs to avoid Anti-Aircraft (AA) fire or Allied fighter aircraft, on route to and from other strategic targets. Bombs dropped as a result of poor targeting or 'tip and run' raids often went unrecorded or were recorded as 'fell in open country' or 'fell in the sea'. The Luftwaffe are thought to have dropped approximately 75,000 tons of bombs on Britain throughout WWII and an estimated 11% of all bombs dropped during the war failed to detonate.



Removal of an UXB

Hazard:

The potential for a UXB hazard to exist on a site depends on a variety of factors:

- Were their strategic targets in the surrounding area?
- Was the site bombed and how heavy were the raids?
- Could an UXB impact have been missed, masked by rubble or debris?

Even in rural areas, the potential for UXBs cannot be totally discounted and therefore it is essential that detailed local bombing records are obtained when assessing the UXB hazard on any site.

Appendix 2.4 Anti-Aircraft defences

Information Data Sheet

Category Anti-Aircraft (AA) Defences

Description:

As aerial bombardment first began during World War One (WWI), AA gun batteries were gradually established throughout much of England to counter German bombing raids. By June 1916, there were approximately 271No. AA guns and 258No. searchlight installations defending London alone.

Common WWI AA defences included 3", 75mm, 6-pounder (pdr), and 1pdr guns. Many of these guns were mobile and would follow the course of an airship, firing from areas of open land.

During WWI, Unexploded AA (UXAA) shells, could land up to 13km from the firing point, although they more typically fell within 10km.



WWI 3-pdr mobile Vickers AA gun



WWII 3.7" static AA gun

During World War Two (WWII), AA gun batteries were used extensively to counter the threat posed by enemy aircraft. AA shells could be distributed over a wide area and could land up to 27km from the firing point, although they more typically fell within 15km.

3No. types of AA batteries existed:

- Heavy AA (HAA) – typically 3.7", 4.5", and 5.25" calibre guns designed to engage high flying bomber aircraft. These tended to be permanent gun emplacements.
- Light AA (LAA) – typically used 40mm shells and machine gun ammunition and designed to counter low flying aircraft. These were often mobile and were moved periodically.
- Rocket AA (ZAA) – fired 3" or 3.7" AA rockets with a maximum altitude of 5,800m and a ground range of 9km. These tended to be permanent gun emplacements.

Hazard:

AA batteries had munitions stores which stored shells for the batteries and Small Arms Ammunition (SAA) for troops manning the position. Such stores were typically removed at the end of WWII, although some disposal may have occurred in the immediate vicinity of the gun battery.

In areas heavily protected by AA batteries, it is prudent to consider the potential for UXAA shells in the area surrounding a battery, taking into consideration the likely extent within which shells would have fallen. Finding an UXAA shell immediately adjacent to a former gun battery is less likely.

Appendix 3 Recent UXO finds

Information Data Sheet

Category Recent UXO Finds

UXO finds in the UK are a regular occurrence, although they almost never result in an accidental detonation.

Explosives rarely lose effectiveness with age. In some instances, mechanisms such as fuzes and gaines can become more sensitive and more prone to detonation, regardless of whether the device has been submersed in water or embedded in silt, clay, or similar materials.

Zetica Ltd, and other commercial EOD companies, uncover and make safe thousands of items of UXO each year, though details are rarely made public knowledge.

Publicly recorded discoveries also occur regularly, as shown by the list of recent significant UXO finds in the UK below. Click here to keep up to date with the latest UXO finds.

On the 2nd January 2022, 1No. heavily deteriorated 105mm artillery shell was discovered by dogwalkers on a beach in Cumbria. This may have originated on one of the several offshore ranges which have been operational along the nearby coastline since WWII.

On the 14th July 2022, 1No. 2" mortar bomb and several Small Arms Ammunition rounds were discovered on a beach near Ardnamurchan. An EOD team disposed of the items.

On the 28th November 2022, 45No. Self-Igniting Phosphorus grenades were discovered during construction works at a school in Swindon. They were disposed of by an EOD team.

On the 5th December 2022, 1No. UXB was discovered during construction at Biggin Hill Airport. An EOD team removed the UXB for safe disposal.

On the 7th February 2023 1No. 250kg bomb was found during dredging works in the River Yare, Great Yarmouth. An exclusion zone was put in place as the EOD team put in blast. On the 10th February the UXB detonated unplanned whilst being disarmed by an Army EOD team.



250kg German UXB discovered at Great Yarmouth and the resulting detonation, 2023

On the 16th March 2023, 1No. unexploded grenade was discovered by magnet fishers in the Worcester & Birmingham Canal. This was the second item of UXO discovered in this stretch of canal after an initial item was discovered on the 7th March. Both items were removed and made safe by EOD teams.

On the 17th April 2023, 1No. unexploded mortar bomb was discovered at Cavenham Heath Nature Reserve. It was destroyed in a controlled explosion by an EOD team. This followed 2No. other similar discoveries on the 7th March and 12th March in the same stretch of canal.

On the 27th July 2023, 1No. 250kg WWII bomb was discovered off the coast of Guernsey by a recreational diver. It was detonated in situ by a Royal Navy EOD diver team.

On the 18th August 2023, 1No. unexploded grenade was discovered at a property in Little Clacton. An EOD assessed the grenade was safe to move to a nearby location, where it was rendered safe.

On the 3rd September 2023, 2No. artillery shell fuzes were destroyed in a controlled explosion in Wigan. The fuzes were discovered earlier in the year through metal detecting on Rivington Pike.

On the 15th October 2023, 1No. WWI shell was discovered near Folly Bridge, Oxford. An EOD team removed the shell for safe disposal.

On the 11th January 2024 1No. 500kg-1000kg WWII mine was discovered in fishing nets at East Looe quayside. A Royal Navy EOD team relocated the mine for controlled detonation.

On the 20th February 2024, 1No. 500kg UXB was discovered in a garden in Plymouth (see below). An exclusion zone was put in place, evacuating approximately 3,250No. people over a course of 4No. days. On the 24th February the UXB was moved and detonated at sea by EOD teams.



500kg German UXB discovered in Plymouth, 2024

On the 20th March 2024, 1No. unexploded Incendiary Bomb (IB) was discovered at Joyden's Wood, Bexley. The IB was removed by an EOD team for controlled detonation.

On the 4th April 2024, several items of UXO including practice bomb heads and 20mm rounds, were discovered on Medmerry Beach, West Sussex. An EOD team detonated the items in situ. These are the latest in a series of UXO finds at Medmerry Beach, which was a bombing and air-to-ground firing range in WWII.

On the 9th May 2024, 1No. item of UXO was discovered at Ashdown House, Hastings. An MoD EOD team attended and identified the device as a 105mm shell. The device was detonated in situ.

Appendix 4 Glossary and definitions

Abandoned Explosive Ordnance (AXO)	Explosive ordnance that has not been used during an armed conflict, that has been left behind or disposed of by a party to an armed conflict, and which is no longer under control of that party. Abandoned explosive ordnance may or may not have been primed, fuzed, armed or otherwise prepared for use.
Cordite	A family of smokeless propellants developed and produced in Britain since 1889 to replace black powder as a military firearm propellant.
Demil	Derived from the term 'Demilitarisation', demil refers to the break down and the recycling or disposal of ordnance components.
Detonation	The high-speed chemical breakdown of an energetic material producing heat, pressure, flame, and a shock wave.
Device	Any component, sub-assembly or completed ordnance, which may or may not have an explosive risk. It can apply to detonators, primers, gaines, fuzes, shells, or bombs.
Explosive	Compounds forming energetic materials that under certain conditions chemically react, rapidly producing gas, heat, and pressure. These are extremely dangerous and should only be handled by qualified professionals.
Explosive Ordnance (EO)	All munitions containing explosives, nuclear fission or fusion materials, and biological and chemical agents. This includes bombs and warheads, missiles, artillery, mortar, rocket, Small Arms Ammunition, mines, torpedoes, depth charges, pyrotechnics, cluster bombs and dispensers, cartridge and propellant devices, electro-explosive devices, clandestine and improvised explosive devices, and all related items/components which are explosive in nature.
Explosive Ordnance Clearance (EOC)	The operation of ordnance detection, investigation, identification, and removal, with Explosive Ordnance Disposal being a separate operation.
Explosive Ordnance Disposal (EOD)	The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of Unexploded Ordnance.
Explosive Ordnance Reconnaissance (EOR)	The detection, identification, and on-site evaluation of Unexploded Ordnance before Explosive Ordnance Disposal.
Explosive Remnants of War (ERW)	Unexploded Ordnance and Abandoned Explosive Ordnance, excluding landmines.
Explosive Substances & Articles (ESA)	Explosive substances are solid or liquid substances (or a mixture) which are either: capable by a chemical reaction of producing gas at a speed, temperature, and pressure to cause damage to the surroundings; or designed to produce an effect by heat, light, sound, gas, or smoke (or a

	combination) as a result of a non-detonative, self-sustaining, exothermic reaction. One or more explosive substances form an explosive article.
Fuze	The part of an explosive device that initiates the main explosive charge to function. In common usage, the word fuze is used indiscriminately, but when being specific (and especially in a military context), fuze is used to mean a more complicated device, such as a device within military ordnance.
Gaine	Small explosive charge that is sometimes placed between the detonator and the main charge to ensure ignition.
Geophysical survey	A range of methods that can be used to detect objects or identify ground conditions without the need for intrusive methods (such as excavation or drilling). This is particularly suited to ordnance, as disturbance of ordnance is to be avoided where possible.
High Explosive (HE)	Secondary explosives (commonly known as HE) make up the main charge or filling of an ordnance device. They are usually less sensitive than primary explosives. Examples of secondary explosives are Nitro-glycerine (NG), Trinitrotoluene (TNT), Amatol (Ammonium nitrate and TNT), gunpowder, and Cyclotrimethylenetrinitramine (RDX).
Land Service Ammunition (LSA)	Items of ordnance thrown, propelled, or placed during land warfare, to include grenades, mortar bombs, projectiles, rockets, and landmines.
Munition	The complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in military operations, including demolitions. This includes those munitions that have been modified for use in training, ceremonial, or non-operational purposes. These fall into three distinct categories: inert (contain no explosives), live (contain explosives and have not been fired), and blind (have fired but failed to function as intended.)
Primary Explosive	Explosives used to initiate less sensitive explosives and usually extremely sensitive to friction, heat, and pressure. Primary explosives are commonly found in detonators. Examples of primary explosives are lead azide, lead styphnate, and mercury fulminate.
Propellants	Provide ordnance with the ability to travel in a controlled manner and deliver the ordnance to a predetermined target. Propellants burn rapidly producing gas, pressure, and flame. Although usually in solid form they can be produced in liquid form. Examples of propellants are ballistite, often in flake form, and cordite, often in string form.
Pyrotechnic	An explosive article or substance designed to produce an effect by heat, light, sound, gas, or smoke (or a combination), as a result of non-detonative, self-sustaining, exothermic chemical reactions.

Small Arms Ammunition (SAA)	Projectiles around 12mm or less in calibre and no longer than approximately 100mm. They are fired from a variety of weapons, including rifles, pistols, shotguns, and machine guns.
Unexploded Anti-Aircraft (UXAA) Shell	Ordnance containing High Explosives, although they can also contain pyrotechnic compounds that produce smoke. They ranged from 2" to 5.25" calibre, although most common were 3.7" and 4.5" HE shells.
Unexploded Bomb (UXB)	A common term for unexploded air-dropped munitions.
Unexploded Ordnance (UXO)	Explosive ordnance that has been primed, fuzed, armed, or prepared for use and subsequently fired, dropped, launched, projected, or placed in such a manner as to present a hazard to operations, persons, or objects, and remains unexploded either by malfunction or design.
V1	The Vergeltungswaffe-1, also designated Fieseler Fi 103/FZG-76, known colloquially in English as the Flying Bomb, Pilotless Aircraft, Buzz Bomb, or Doodlebug, was the first guided missile used in WWII and the forerunner of today's cruise missile.
V2	The Vergeltungswaffe 2 ('Reprisal Weapon 2') was the first ballistic missile. It was used primarily against Belgian and British targets during the later stages of WWII. It was also the first man-made object launched into space, during test flights in 1944.

Appendix 5 Bibliography

Bulloch G, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, Land Contamination: Technical Guidance on Special Sites: MoD Land

Bulloch G, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, R&D Technical Report P5-042/TR/03, Land Contamination: Technical Guidance on Special Sites: Explosives Manufacturing & Processing Sites

CIRIA, Unexploded Ordnance (UXO), a Guide for the Construction Industry, 2009

Clarke N J, Luftwaffe Target Reconnaissance, German Aerial Photography 1939-1942, 1996

Cocroft W D, Dangerous Energy, 2000

Cocroft W D, Thomas R J, Cold War, 2003

Department of the Environment, Sampling Strategies for Contaminated Land, Department of the Environment: Contaminated Land Research Report, CLR Report No. 4, 1994

Dobinson C S, Twentieth Century Fortifications in the United Kingdom, Vol 2: Wales, Council for British Archaeology, 1998

Dobinson C S, Fields of Deception, Britain's Bombing Decoys of World War II, 2000

Dobinson C S, AA Command, 2001

Morris J, German Air Raids on Britain 1914-1918, 1993

Pratt D & Grant M, Wings Across the Border: A History of Aviation in North Wales and the Northern Marches, Vol III, 2005

Price A, Blitz on Britain 1939-45, 2000

Ramsey W, The Blitz Then and Now, Vol 1, 1987

Ramsey W, The Blitz Then and Now, Vol 2, 1988

Ramsey W, The Blitz Then and Now, Vol 3, 1990

Zetica, ZeticaUXO Handbook: a guide to dealing with UXO during construction, 2018

Appendix 6 General Notes

1. This report has been prepared in relation to the specific requirement of the contract or commission.
2. The report should not be used by third parties without prior consultation with Zetica Ltd. The copyright for this report remains with Zetica Ltd.
3. No part of this report may be reproduced, published or amended without prior written consent from Zetica Ltd.
4. The report refers to the conditions of the Site at the time of investigation/reporting. Zetica Ltd cannot accept liability for subsequent changes of Site conditions.
5. Zetica Ltd may have relied on externally provided information. Zetica Ltd cannot be held responsible for the accuracy of such information or data supplied.
6. The report has been written utilising relevant guidance and legislation in use at the time of report compilation. Subsequent improvement in techniques, changes in legislation or in site conditions may render parts of this report obsolete. If the report is utilised after such changes have occurred or at a time in excess of 1 year of the issue date, it would be prudent to contact Zetica Ltd to reassess the report under a new contract (see pg. ii).

zeticauxo

Established for over 33 years, Zetica's services include

- Desk studies
- Unexploded ordnance risk assessments and risk mitigation
- Utility services detection
- Environmental and engineering geophysical surveys
- Transport infrastructure surveys
- Pipeline & cable route surveys
- Intrusive ground investigations

More details are available at

www.zetica.com

Institute of Explosives Engineers
VOICE OF THE EXPLOSIVES INDUSTRIES

British Assessment Bureau UKAS MANAGEMENT SYSTEMS
ISO 9001
QUALITY MANAGEMENT

British Assessment Bureau UKAS MANAGEMENT SYSTEMS
ISO 14001
ENVIRONMENTAL MANAGEMENT

Appendix E - Local Authority Correspondence

Cyngor Bwrdeistref Sirol Wrecsam/ Wrexham County Borough Council
Neuadd y Dref, Wrecsam. LL11 1AY
Guildhall, Wrexham. LL11 1AY
DX: 721924 - Wrexham 4
www.wrecsam.gov.uk www.wrexham.gov.uk
Cyfnewid Testun/Text Relay: 18001

wrexham
COUNTY BOROUGH COUNCIL
CYNGOR BWRDEISTREF SIROL
wrecsam

Fiona Parsons
Chartered Environmentalist

Eich Cyf/Your Ref	
Ein Cyf/Our ref	Search 1099
Dyddiad/Date	19 October 2023
Gofynner am/Ask for	Stacey Inglis
Rhif Cyswllt/Contact No	01978 298773
E-bost/E-mail	contaminatedland@wrexham.gov.uk

BY EMAIL ONLY

ENVIRONMENTAL SEARCH – LAND OFF BRYN LANE, WREXHAM INDUSTRIAL ESTATE, LL13 9UT (NGR SJ 38444 50770)

Dear Ms Parsons,

Further to your email dated 16 October 2023 and subsequent receipt of payment for the search received on 17 October 2023 I can provide the following comments:

1. *Has the site or and neighbouring site (within 250m) been designated as 'Contaminated Land' under Part 2A of the Environmental Protection Act 1990?*

   The Council has not yet determined any sites as 'Contaminated Land' under Part 2A of the Environmental Protection Act 1990 within this area of the County Borough.

2. *Has the council any contamination concerns or is taking any action (even informally) against the site or any neighbouring site (within 250m) requiring the respective land owner/operator to provide further information?*

   The Council is not taking any action, even informally, against the site or any neighbouring site (within 250m) in relation to any specific contamination concerns.

   The Contaminated Land Team does not yet have a comprehensive database regarding historic land use or contamination, however the limited information available to the Contaminated Land Team indicates that the above property is on land that was formerly used by the Ministry of Defence (MoD) for the manufacture of explosives. The limited records held by this Department, associated with this former use, are summarised as follows:

   i. The Royal Ordnance Factory (ROF) Wrexham was the largest explosives factory in the area;
   ii. The site covered an area of over 1400 acres and was served by its own railway;
   iii. It became operation in 1941, about a year after the facility was constructed. It consisted of a number if production buildings, widely spaced to minimise and damage should an accidental explosion occur;
   iv. Two units were built for the manufacture of solventless cordite also known as Cordite W;

Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn ymateb i unrhyw ohebiaeth yn Gymraeg ac ni fydd hyn yn arwain at unrhyw oedi.
We welcome correspondence in Welsh. We will respond to any correspondence in Welsh and this will not lead to any delay.

v. Operation of the ROF ceased on 11 August 1945. Shortly after the war the site was sold for development as an Industrial Estate;
vi. Cordite is produced by the incorporation of Nitrocellulose (guncotton) with Nitroglycerine in the presence of a solvent to assist gelatinisation, although at Wrexham Carbamite was introduced as a suitable stabiliser instead of solvents. The cordite produced at Wrexham was 'flashless', produced by the inclusion of a large proportion of finely divided Nitroguanidine (Pircrite);
vii. Further information of contamination issues associated with the manufacture of explosives is contained in the Environment Agency document 'Land Contamination: Technical Guidance on Special Sites: Explosive Manufacturing & Processing Sites' Research & Development Technical Report P5-042/TR/03, dated June 2001.

The former Department of Industry Profiles and Contaminated Land Research (CLR) Report 8: Potential Contaminants for the Assessment of Land identify historical munitions sites as sites that may have ground contamination, therefore the Council will be required to consider the former MoD land under its duties of implementing Part 2A of the Environmental Protection Act 1990.

Due to the historic use of the land it is likely that the above property will need to be considered further by this Department under Part 2A. It should be noted that the fact that the area is likely to be considered under Part 2A does not necessarily mean that it will be determined as 'Contaminated Land' as any future assessment undertaken may find that there is no significant risk. Unfortunately it is not possible to advise you of a likely time when such an assessment may take place since it will be subject to financial resources and prioritisation against other potential contaminated sites in the Borough that also require assessment.

In the context of other potential contaminated land sites that have been identified to date, the site in question is currently considered to be of a lower priority. However this could change at any point if for instance new information were to come to light, or if there is a change in guidance or any of the other factors that we consider when prioritising and planning Part 2A works.

You may be interested to know that some sites on the Industrial Estate have had ground contamination issues assessed. These have mainly been the result of a planning condition requiring a contamination assessment for the development of the site. Some assessments have shown no contamination to have been present, whilst others have shown some contamination that has required remediation measures for its safe development. In many of these cases the contamination was not necessarily due to the sites former use by Royal Ordnance but by subsequent operations on the site or made ground.

In addition the site being on former MoD land there is a 'Tank' located to the south west of the site.

3. *Does your Department hold any information on contamination/ground conditions/geology/groundwater levels of the area? Furthermore, is your Department aware of any pertinent ground gassing issues at the site?*

Please see response to question 2.

The Contaminated Land Team is not aware of any pertinent ground gassing issues at the site.

4. *Is your Department aware of infilled/made-up ground (other than that indicated on historical mapping)?*

   The Contaminated Land Team is not aware of any other infilled/made ground other than the ‘water fill’ (1954) marked on Landmark Information Group historical maps.

5. *Are you aware of any other issues regarding contamination that may constrain the future development of the Site?*

   Please see response to question 2.

6. *Has the Department any specific concern or needs to be addressed over the redevelopment of the site, such as foundations, services or usage?*

   The Contaminated Land Team are not aware of any specific concerns regarding foundations, services or usage, however in relation to future redevelopment, all potential contamination issues would be dealt with through the planning process and our recommendations for a contamination assessment would be dependent on the specifics of any future planning application.

Should you have any queries then please do not hesitate to contact me on the above number.

Yours sincerely



Ms Stacey Inglis
Contaminated Land Officer

Appendix F - Risk Classification Framework

Table E.7-1 Classification of Consequence

Classification	Definition	Examples
Severe	Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environmental Protection Act 1990 (as amended), Part IIA. Short-term risk if pollution [note: Water Resources Act does not contain provision for consideration of the significance of pollution] of sensitive water resource. A short-term risk to a particular ecosystem, or organism forming part of such an ecosystem. [Note: the definition of ecological systems in the Defra Contaminated Land Statutory Guidance, 2012).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site to a controlled water. Explosion, causing building collapse (can also equate to short-term human health risk if buildings are occupied).
Medium	Chronic damage to human health ('significant harm' as defined by Defra Contaminated Land Statutory Guidance 2012). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem. [Note: the definition of ecological systems in the Defra Contaminated Land Statutory Guidance 2012].	Concentration of contaminant from the site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a principal or secondary aquifer. Death of species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to buildings, structures and crops ('Significant harm' as defined in Defra Contaminated Land Statutory Guidance 2012 and Environmental Protection Act 1990 (as amended) Part IIA). Damage to sensitive buildings/structures or the environment.	Pollution of non-classified groundwater. Damage to building, rendering it unsafe to occupy (*e.g.,* foundation damage resulting in instability).
Minor	Harm, although no necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective equipment *etc.*). Easily repairable effects of damage to buildings/structures.	The presence of contaminants at such concentration is that protective equipment is required during site works. The loss of plants in landscaping scheme. Discolouration of concrete.

Table E.7-2 Classification of Probability

Classification	Definition
High Likelihood	There is a pollution linkage and an event which would either appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage, and all the elements are present in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely to occur over the long-term.
Low Likelihood	There is pollution linkage and circumstance are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

References

[i] HMSO (1990) Environmental Protection Act 1990 (as amended).

[ii] Water Act 2003 (Commencement No. 11) Order 2012.

[iii] Section 86 of the Water Act 2003 remains only partially implemented in Wales.

[iv] Environment Agency (2023) Land Contamination Risk Management (LCRM). Accessed through www.gov.uk.government/publications/land-contamination-risk-management-lcrm.

[v] Welsh Government (2024) Planning Policy Wales.

[vi] Wrexham County Borough Council (2023) - Wrexham Local Development Plan 2 (LDP2) 2013 to 2028

[vii] Wrexham County Borough Council (2005) Unitary Development Plan 1996-2011

[viii] Groundsure Enviro+Geo Insight Report, Ref: GS-X32-UAI-H71-9HZ, Dated 12/04/24.

People. Places. Planet.