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Report No 2295R01-1

**FORMER WESTERMINSTER ARMS,
RUTHIN ROAD, BWLCHGWYN,
WREXHAM**

**PHASE 1 & 2 SITE INVESTIGATION
REPORT**

Carried out for:

Mr P and Mrs L Spiby



**FORMER WESTERMINSTER ARMS, RUTHIN
ROAD, BWLCHGWYN, WREXHAM**

PHASE 1 & 2 SITE INVESTIGATION REPORT

Date:09/06/2015

Report No 2295R01-1

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WESTMINSTER ARMS, BWLCHGWYN, WREXHAM

PHASE 1 & 2 INVESTIGATION REPORT

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WESTMINSTER ARMS, BWLCHGWYN, WREXHAM

PHASE 2 SITE INVESTIGATION REPORT

1. INTRODUCTION

1.1 Background Information

1.1.1 TerraConsult Limited was commissioned by Mrs L Spiby to carry out a Phase 1 and 2 Site Investigation for a new house on the site. The purpose of the report is to provide information on ground conditions at the site in order to discharge a planning condition prior to occupation of the new development.

1.1.2 This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Part IIA of the Environment Protection Act, 1990;
- Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, April 2012);
- National Planning Policy Framework (HCA, March 2012);
- BS5930:1999 +A2:2010: “Code of practice for site investigations”;
- BS10175: 2011 +A1:2013 “Investigation of Potentially Contaminated Sites - Code of Practice”;
- DEFRA/Environment Agency (2004) Report CLR11 “Model Procedures for the Management of Land Contamination”;
- Environment Agency (2011) Report GPLC1 “Guiding Principles for Land Contamination”.

1.1.3 TerraConsult’s service constraints and report limitations are presented in Appendix A and a description of environmental risk assessment methodology and terminology is presented in Appendix B.

1.2. Development Proposals

1.2.1 The proposed development of the site is indicated in Figure 1 over page and is understood to comprise the demolition of the existing building and the construction of a detached (5 bed) residential development with service provisions, vehicle parking and private gardens. The garden area is very limited in area with the rest of the site being covered in the new house and hard standing as indicated in Figures 1 and 2.

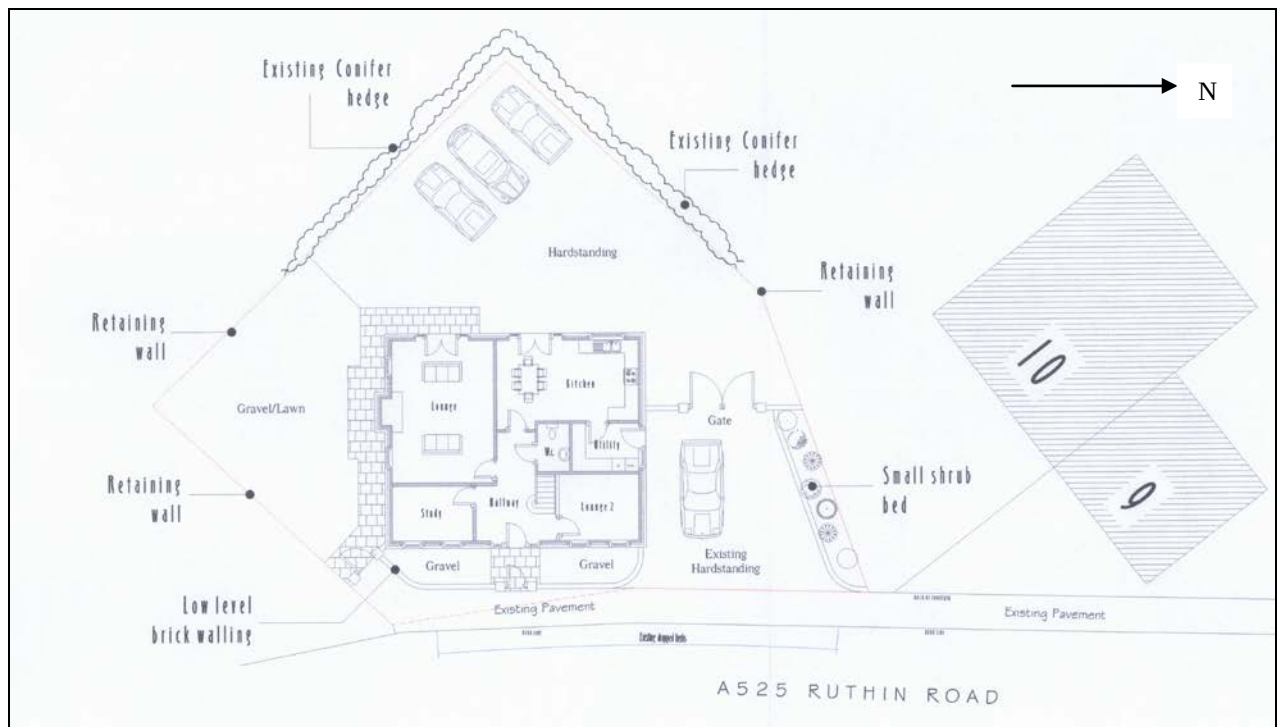


Figure 1: Proposed Development Plan.



Figure 2: Google Earth Image

- 1.2.2 During the site visit, it became apparent that the development plan (Figure1) showed inaccuracies in the boundary shape as indicated in Figure 2. The western boundary is at a slightly different angle. This further limits the area for the proposed garden along the southern boundary.
- 1.2.3 The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed residential end use. If there is a subsequent change in the proposed land the risk assessments and conclusions should be reviewed to determine whether they are still applicable for the revised end use.

1.3. Planning Status & Requirements

- 1.3.1 This report is designed to comply with the requirements of The National Planning Policy Framework (NPPF, 2012) and is intended to be used by the developer as part of the design for the works.
- 1.3.2 It is understood that the site has been granted planning permission (BRY P/2015/0008) by Wrexham Borough Council. There are planning conditions relating to the proposed development. The relevant conditions are given below:

Condition 2

Other than the demolition of the existing building, no part of the development shall commence until a scheme to deal with potential contamination at the site has been submitted to and approved, in writing, by the Local Planning Authority. This scheme shall include a phased investigation to identify the extent of contamination and any measures required to remediate the site, including post development monitoring.

Condition 3

No part of the development shall be occupied until a validation report which demonstrates that the remedial works approved as part of condition 2 above have been satisfactorily carried out, has been submitted to and approved in writing by the Local Planning Authority.

1.4 Scope of the Investigation

- 1.4.1 The scope of the investigation were to meet the requirements to provide information for the design of the development. The specific activities carried out are as follows:
- carry out an intrusive investigation comprising machine excavated trial pits with associated sampling;
 - develop a preliminary conceptual site model and refine this according to the findings of the investigation;
 - laboratory testing for potential contaminants purposes;
 - confirm whether or not there is a risk from contamination at the site to potential receptors (e.g. humans, controlled waters, etc).

1.5. Previous Investigations

1.5.1 No previous reports have been made available for review apart from a Coal Authority Coal Mining Report.

2. SITE LOCATION AND DESCRIPTION

2.1 Site Location

2.1.1 The site is indicated in Figure 3 below and the site location is summarised in Table 1:

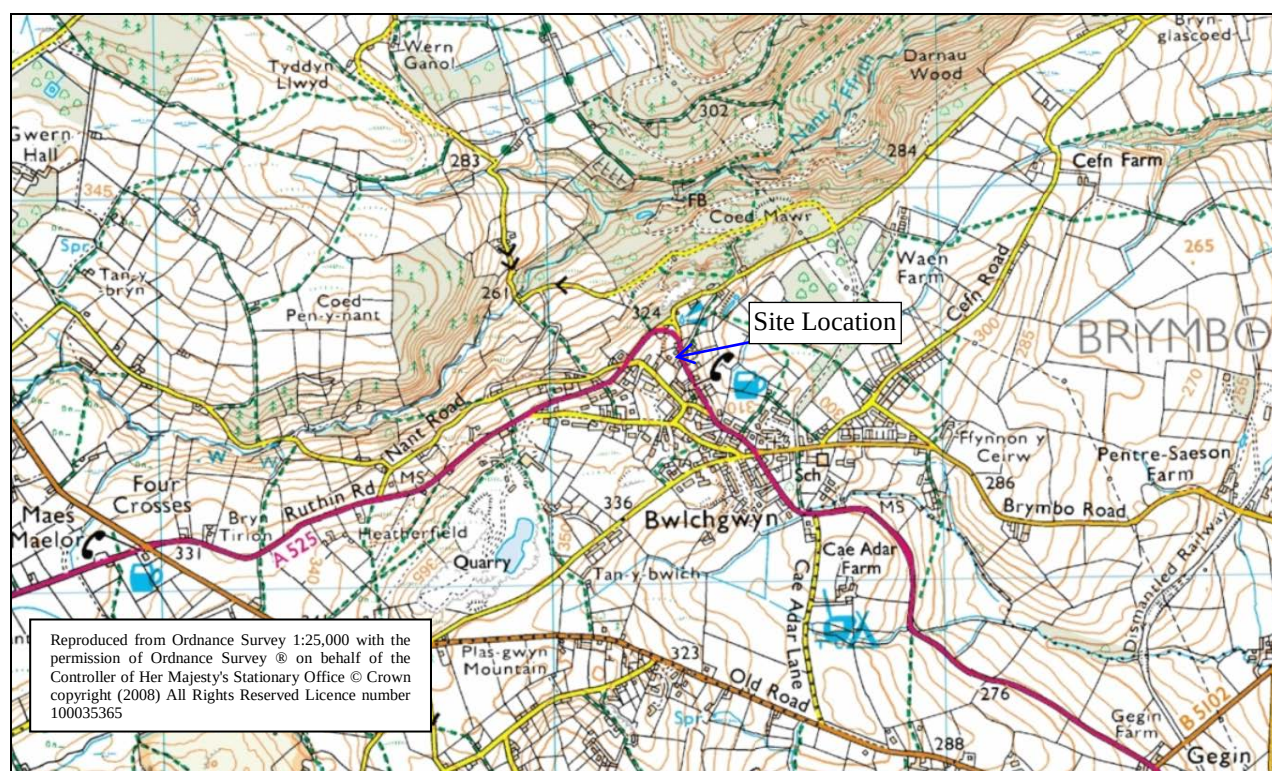


Figure 3: Site Location

Table 1: Summary of Site Location	
Location	The site is situated on the western side of Ruthin Road, Bwlchgwyn, 8km from Wrexham town centre.
Post Code	LL11 5UT
Site Shape	The site has maximum plan dimensions of 25 m by 20 m and is roughly rectangle in shape.
Topography	The site is currently relatively flat after demolition of the previous Public House. The adjacent land to the west and north are significantly higher and there are retaining walls on these boundaries.

2.2 Site Description

2.2.1 A site visit was undertaken on 22-05-2015. Photographs taken are presented in Section 8. Details of this site visit are present in Table 2 below.

Table 2: Summary of Description of the Site and its Environs	
Current Use:	The site is currently unoccupied. The demolition of the previous public house has been completed however there are two stockpiles located on site.
Access	Access is through heras fencing from Ruthin Road.
Existing Buildings & Structures	No buildings on site – pub has been recently demolished.
Site Surface	Mixture of bedrock and soils and two stockpiles of arisings
Vegetation	No vegetation
Storage Tanks	Below Ground Tanks: No evidence / bedrock encountered Above Ground Tanks: None present. Previous heating oil tank removed during demolition located at rear of site (western side of the site).
Services	All services are understood to have been removed.
Asbestos	No potential Asbestos Containing Materials (ACMs) noted on the ground surface
Waste Disposal/ Materials Storage	Two stockpiles. Larger stockpile consists of a mixture of natural and demolition material. Smaller stockpile consists of reworked bedrock within sand matrix
Surrounding Area	The site is surrounded by residential properties to the south, west and north and Ruthin Road to the east.
Ecology	There is no evidence of protected burrowing animals (e.g. badgers) or habitats suitable for protected amphibians (e.g. Great Crested Newts). <i>These comments on the ecology are for initial preliminary assessment. They are based on the assessment of personnel who are not trained ecologists and does not constitute a Phase I Habitat Survey or similar.</i>
Local / Background Knowledge	The site has previously been Westminster Arms Public House.

2.3 Site Ownership

2.3.1 The site is understood to be owned by Mr & Mrs Spiby.

4.1 Data Summary

3.1.1 A summary of the environmental background information (geology, hydrology, hydrogeology, database information etc.) and regulator consultation information has been tabulated and presented below and is based on website searches and a Groundsure report presented in Appendix C.

3.2 Geology

3.2.1 The 1:50,000 scale BGS Drift map and Solid map show the site has been shown to be underlain by Carboniferous Cefn-y-fedw Sandstone Formation. White and pale grey,

fine- to medium-grained, planar- and cross-bedded, quartzose sandstones, pebbly sandstones and thin beds of quartz conglomerate. No drift deposits are recorded on site.

3.3 Mining

- 3.3.1 From the historic maps, there is no evidence of mineral extraction or quarrying at the site (e.g. brick pits, sand and gravel extraction etc.). The site is however close to historic surface workings which were located about 10 m north of the property. The site is in an area where there have been historic lead (and silver) mining. There has also been sandstone quarrying and silica sand/rock quarrying in the area. Further from the site (about 200 m from it) there has also been coal mining. The site is not in a mine or gypsum extraction area.
- 3.3.2 On the basis of the geology of the area, the Coal Authority Report (see Appendix D) and the historic maps, it is considered that the site is not likely to be at risk from ground movements due to previous mines and quarrying. However, localised small scale quarrying of mineral veins could have taken place at the site but from the site visit there does not appear to be any evidence of this.

3.4 Hydrogeology

- 3.4.1 The Environment Agency have classified different types of aquifer from which groundwater can be extracted. The bedrock (Carboniferous Cefn-y-fedw Sandstone) is classified as a Secondary A Aquifer.
- 3.4.2 The Environment Agency have defined Source Protection Zones (SPZs) for over 2000 groundwater sources such as wells, boreholes and springs used for public drinking water and industrial water supply. Where these SPZs are present there is an increased risk of contamination from any activities on site that might cause pollution of groundwaters and water supply in the area. The site lies further than 500m from the nearest SPZ.

3.4 Hydrology, Flooding and Drainage

- 3.4.3 The nearest water feature is the Nant y Firth, a primary watercourse located 320 m north from the site. The river lies at a considerable higher level than the site. On account of this it is considered that the site is very unlikely to pose a risk to controlled surface waters.
- 3.4.4 The site is in Flood Zone 1, where the risk of flooding from rivers is classified as low.

3.5 Radon

- 3.5.1 The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level. Full radon protective measures are necessary as set out in Building Research Establishment document BR211.

3.6 Other Potential Environmental Sources and Receptors

- 3.6.1 The other environmental records show that the site is in an area with relatively benign characteristics with no significant off-site sources of contamination in the vicinity of the site or major receptors (other than adjacent housing) as indicated below:
- There are no records of sites Determined as Contaminated Land under Part 2A EPA 1990.
 - There are no records of historic IPC Authorisations within 500m of the study site.
 - There are no records of Part A(1) and IPPC Authorised Activities within 500m of the study site.
 - There are no records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site.
 - There are no records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site.
 - The nearest licensed discharge consent is more than 250 m from the site.

- The nearest Environment Agency Recorded Pollution Incident to the site is 295 m north of the site
- There are no records of COMAH & NIHHS sites within 500m of the study site.
- There are no records from Environment Agency or BGS/DoE of any landfills within 1000m of the study site.
- There are no records of Landfills from Local Authority and Historical Mapping records within 1500m of the study site.
- There are no records of waste treatment, transfer or disposal sites within 500m of the study site.
- There are no records of Environment Agency licensed waste sites within 1500m of the study site.
- The only industrial site in 250 m of the site is Delfryn Garage (Vehicle Repair, Testing and Servicing) on the land immediately to the north of the site.
- There are no records of petrol or fuel sites within 500m of the study site.
- The nearest Sites of Special Scientific Interest (SSSI)/SAC is 1.3 km south of the study site:
- There are no records of Special Protection Areas (SPA) or Ramsar sites within 2 km of the study site.
- The nearest ancient woodland is 380 m NW of the study site.

4. HAZARD ASSESSMENT & PRELIMINARY CONCEPTUAL SITE MODEL

4.1 Hazards Identified with the Proposed Development

4.1.1 The hazard identification is based on the assumptions presented below:

- the site will be a residential development, therefore high risk end users;
- the development will include soft landscaped areas and there is the small but creditable possibility for users to grow their own vegetables.
- drinking water will be from mains supply.

4.2 Potential Sources of Contamination

4.2.1 For the purpose of this assessment the potential contaminants of concern have been considered according to whether they are likely to have originated from on-site or off-site sources.

Potential On-site Sources of Contamination

- Hydrocarbon impact from historical above ground fuel storage tanks, associated pipework and general small scale leakages. The previous public house building was heated with oil and heating oil tank was located along northern boundary. Pipework went from tank into boiler-room;
- Made Ground - unknown origin / thickness: possible metals, metalloids, asbestos, PAH and petroleum hydrocarbons;

- Radon from geology in the area.

Potential Off-site Sources of Contamination

- There is no other significant off-site source to the site.

4.3 Potential Receptors of Contamination

- 4.3.1 Based on the data previously discussed, the following potential receptors to contamination have been identified:

Table 3: Identified Potential Receptors	
Sensitive Receptors	
A	Humans – Pre development completion, i.e. working on site during demolition and construction.
B	Humans using the site post construction.
C	Controlled waters – Surface Waters (rivers and streams).
D	Perched groundwater in Made Ground and Controlled waters – (groundwater – Secondary A Aquifer).
E	Local flora and fauna during and post demolition and construction.
F	Building structure and services.

- 4.3.2 The possible contaminant linkages are discussed below. It should be noted not all may be formed between all sources and receptors.

- 4.3.3 The preliminary assessment of risks undertaken for the development considers potential risks to receptors A to F in Table 5 above. The receptors A to F incorporate each of the receptors normally required by the Local Authority to be considered in their planning conditions relating to land contamination;

- Human Health (A & B)
- Property (including buildings, crops, livestock, pets, woodland, service lines) (E & F)
- Adjoining land (D & F)
- Groundwater and surface water (C & D)
- Ecological systems (E)
- Buildings and structures (F)

- 4.3.4 It should be noted that there are no archaeological sites or ancient monuments considered to be within the zone of influence of the site. They are therefore not considered in the risk assessment.

- 4.3.5 The closest of each of the above receptor categories to the site are considered to be;

On-site

- Site users
- Buildings

- Flora and fauna
- bedrock aquifer

Off-site

- Residential (adjacent land)

4.3.6 The possible contaminant linkages are discussed below. It should be noted that not all may be formed between all sources and receptors.

4.4 Identification of Pathways

Pathways to Human Health

4.4.1 There are various routes by which a potential contaminant may reach a receptor. For example, in areas where contaminated material is exposed, dermal contact with the material, inhalation or ingestion of dust may occur.

4.4.2 Rockhead is very shallow and there is no Made Ground / drift material in most areas of the site.

4.4.3 It is considered that the risk of short term exposure for ground workers and other construction workers is negligible.

4.4.4 Post construction, the surface of the development area will be occupied with buildings and hardstanding, however there will be a small area of soft landscaping.

4.4.5 Migration of radon from the ground into buildings is a relevant pathway.

Pathways to Controlled Waters

4.4.6 The depth to groundwater in the bedrock (Secondary A Aquifer) is anticipated to be at significant depth. Migration of potentially contaminated groundwater off-site (either via permeable made ground or the underlying aquifer) must be considered.

4.4.7 The vertical leaching of contaminants from the Made Ground into the groundwater is a potential pathway for contaminants to impact upon groundwater. The risk of potential contaminants leaching into the groundwater at depth is considered very low due to limited contamination sources on or adjacent to site.

4.4.8 Surface run off from contaminated areas into surface watercourses must also be considered. Post construction the majority of the site and surface run-off will be limited and controlled through drains. There are not any viable overland migration pathways for surface run off to reach any controlled waters receptors, the nearest being 320m away and is at a higher elevation.

Other Pathways

4.4.9 Other potential pathways that are possibly less significant to the site but still require consideration are; potential phytotoxic effects on sensitive landscaping plants; chemical attack on foundations and services and permeation of contaminants through domestic water pipes.

4.5 Contaminant Linkages

- 4.5.1 For each contamination source there are potential contaminant linkages with all receptors. However, in the context of this site, not all of the contaminant linkages are plausible. The likelihood of the various pathways linking the contaminants to the receptors is presented in Table 5 below:

Table 4: Matrix of Contaminant Linkages							
Source/ Contaminated Medium	Pathway	Receptor					
		A - Humans using the site pre-development completion	B - Humans using the site post construction	C – Surface Water	D - Groundwater	E - Flora & fauna	F - Building & Services
Soil / Made Ground	Ingestion	-	P	-	-	-	-
	Dermal Contact/Direct Contact	-	P	-	-	-	U
	Inhalation	-	P	-	-	-	-
	Infrastructure/Drainage	-	P	U	U	-	P
	Groundwater	-	U	U	U	-	U
	Surface water	-	P	U	U	-	P
Groundwater	Ingestion	-	-	-	-	-	-
	Inhalation	-	S	-	-	-	-
	Dermal Contact	-	-	-	-	-	-
	Groundwater	-	-	U	U	-	U
	Surface Water	-	-	U	U	-	P
Radon	Migration	U	S	-	-	-	-
Gas (Hydrocarbon vapour)	Migration	U	P	-	-	-	P
Gas (CH ₄ CO ₂)	Migration	U	U	-	-	-	P
Key to significance of contaminant linkages S = Significant Pathway P = Possible Pathway U = Unlikely Pathway - =Not Applicable Only Significant and Possible contaminant linkages are taken forwards to the next part of the risk assessment.							

5.6 Conceptual Site Model

5.6.1 In accordance with BS 10175, a schematic section has been developed for the site based on the previously presented data and contaminant linkage assessment:

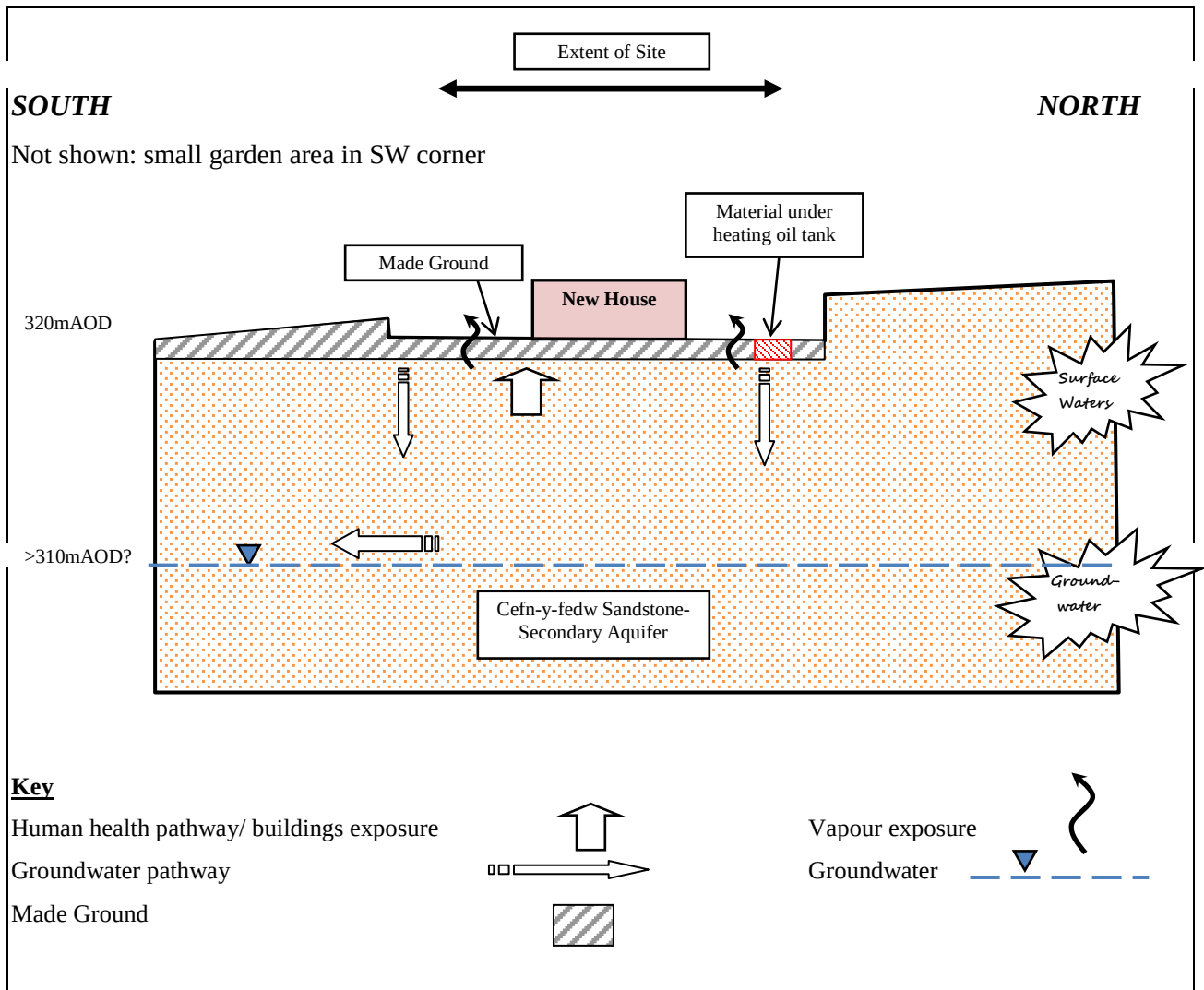


Figure 4: Preliminary Conceptual Ground Model - Schematic Section (not to scale)

5.6.2 The model shows the predicted geology and topography, the major on site potential contamination sources and vulnerable receptors, although the drawing may not be considered to scale.

5.6.3 The information presented above represents the preliminary conceptual ground model that may need to be revised based on information obtained as part of any future intrusive investigation. A number of sensitive receptors and potential pathways and sources (in association with a list of likely contaminants) have been identified. The ground model and proposed end use described above should be considered broadly representative of the standard housing with vegetable uptake (high risk end users) as defined in SR3 “Updated Technical Model to the CLEA Model” (SC050021/SR3, 2011) for the purpose of this report.

5.7 Preliminary Contamination Hazard Assessment

5.7.1 The preliminary hazard assessment is based on current available guidance published by a number of sources and is summarised in Appendix B. A preliminary conceptual site model for this site has been established using the desk study information and has been used as a basis for the preliminary hazard assessment. The significant and possible potential pathways are only considered for the hazard assessment.

5.7.2 The preliminary hazard assessment is a qualitative assessment of the risks posed by each viable pollution link identified. The hazard assessment leads to a recommended subsequent activity that could be:

- Action Required (AR) in the short term to break existing contaminant-pathway-receptor (CPR) link;
- Site Investigation Required (SIR) with objectives for risk estimation, or
- No Action Required (NAR) at this stage.

5.7.3 The hazard assessment is summarised in Table 6 below.

Table 5: Preliminary Hazard Assessment							
Hazard Identification				Hazard Assessment			
Link	Contaminant	Pathway	Receptor	Probability	Consequence	Risk	Hazard Assessment
1	Contaminated soil/groundwater	Ingestion (via soil dust) and inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	A- Humans living the site during construction.	High	Mild	Medium	SIR - Total soil concentration of relevant contaminants
2		Ingestion (via soil dust) and inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	B- Humans living the site after development completion.	High	Mild	Medium	SIR- Total soil concentration of relevant contaminants
3		Via service pipes	B- Humans living the site after construction. F- Building structures	Low	Mild	Low	SIR - Total soil concentration of relevant contaminants for designer's risk assessments.
4	Gas –hydrocarbon,	Inhalation, explosion	A & B- Humans using the site during construction and after development completion.	Low	High	Medium	SIR – Soils below heating oil tank and pipework. Total soil concentration of remaining soils and Made Ground material
5	Contaminated soil/groundwater	Direct contact.	F- Building structures.	Low/Medium	Mild	Low	SIR
6	Radon	Inhalation	B- Humans living the site after development completion.	Severe	High	Very High	AR – full radon protection measures are required.

- 5.7.4 From Table 5 a range of risk ranking from low to very high was established. Potentially medium to very high risks require quantification and consideration prior to development or specific action (see radon). The site investigation objectives described above should represent part of a detailed main stage investigation that should include overall characterisation of the ground in association with obtaining and analysing the information described above.
- 5.7.5 The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level. Full radon protective measures are necessary as set out in Building Research Establishment document BR211.

6. FIELDWORK

6.1 General Observations

- 6.1.1 The fieldwork was carried out on the 22nd May 2015. TerraConsult personnel were present to supervise all work, describe the ground encountered, carry out soil sampling. Fieldwork procedures were undertaken in accordance with the relevant sections of:
- British Drilling Association “Guidance for Safe Intrusive Activities on contaminated or Potentially Contaminated Land” (2008);
 - BS EN 1997-2:2007 [Eurocode 7 Part 2];
 - BS5930:1999 +A2 (2010) "Code of Practice for Site Investigations;"
 - BS10175:2011 + A1 (2013) “Investigation of potentially contaminated sites – Code of practice.”
- 6.1.2 The investigation comprised the following fieldwork scope:
- 4 No. machine/hand excavated trial pits and associated sampling
 - Sampling of stockpile material
 - testing of soils;
 - description of the ground encountered in accordance with BS5930:1999+A2 (2010) "Code of Practice for Site Investigations;"
- 6.1.3 The locations of the trial pits were positioned within the proposed rear garden area and under / adjacent to the old heating oil tank.
- 6.1.4 During the site visit, inspection was made of the area along the eastern boundary within the proposed front garden of the new development. No soils were encountered within these areas as rockhead was immediately underneath the historical building. No sampling was attempted within this area.



Figure 5: Aerial Photograph with TP locations

6.2 Trial Pits

- 6.2.1 Four trial pits were excavated with a combination of machine (mini-digger) and by hand.
- 6.2.2 TP1-3 were carried out within the proposed rear garden area. Samples were taken from each trial pit. Rockhead was encountered at the base of each trial pit.
- 6.2.3 TP4 was carried out under the old heating oil tank. Bedrock was encountered at very shallow depth. During the excavations it was apparent that the bedrock had been excavated to install the pipes that served the historic heating oil tank and the public house. Immediately beneath the service ducts there was evidence of visual hydrocarbon impact however was only slightly odorous. A sample was taken of the impacted material.

6.3 Samples and Sample Containers

- 6.3.1 Soil samples for chemical analysis each comprised a pair of samples: a plastic tub for metals and inorganics, and an amber glass jar for organics.

- 6.3.2 All the soil samples were stored in a cool box and were sent directly to the testing laboratory the same day as sampling.

7. LABORATORY TESTING

7.1 Chemical Laboratory Testing

- 7.1.1 The samples were submitted to QTS Environmental of Lenham in Kent who are UKAS accredited in accordance with ISO17025 and are also MCERTS accredited for soil analysis in accordance with the Environment Agency's scheme. The laboratory carries out Quality Assurance and Quality Control in accordance with BS ISO 17025 and participate in external laboratory comparison and quality control schemes. Details of the accreditation and the methods of analysis are provided on the relevant test reports.
- 7.1.2 The selection of samples for laboratory testing and analytes to be determined were made based on the Phase 1 assessment, the excavation records and other observations during the investigations. The sample selection rational was as follows:
- to characterise samples which had visual or olfactory evidence of contamination;
 - to gain a good coverage across the site and of the various material types and strata encountered; and
 - sample the stockpile of soil being sent off-site for disposal.
- 7.1.3 The selected soil samples were tested for a range of typical contamination indicators including specific tests for contaminants suspected as being present from the desk study and from observations made on site.
- 7.1.4 Each of the soil samples were analysed for the 'total' concentration of a suite of potential contaminants.
- 7.1.5 The results of the laboratory analysis are presented in Appendix D. The various suites of analysis for the soil were as follows:

Table 6: Suites of Analysis for Soil Samples		
Determinand	Soil Suite 1	Soil Suite 2
Number of Samples	1	3
Index Tests		
pH	✓	✓
Metals		
As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn (all totals)	✓	✓
Inorganics		
Cyanide - Total	✓	✓
Sulphate (2:1 extract on soil samples)	✓	✓
Total Sulphate	✓	✓
Organics		
Phenols - Total (monohydric)	✓	-
Total Organic Carbon (TOC)	✓	- (3)
PAH (Speciated USEPA 16)	✓	✓
TPH (C ₈ to C ₃₆)	✓	-
TPH (C ₈ to C ₃₆) TPH CWG (RBCA) Speciation	✓	-
Mineral Oil (C ₁₀ to C ₄₀)	✓	-
Benzene, Toluene, Ethyl Benzene, Xylenes (BTEX);	✓	-
NOTE ✓ = Test carried out on all samples 2. All soil samples to be tested and reported in accordance with EA MCERTS for Soils Scheme 3. TOC carried out on Stockpile sample		

8. GROUND CONDITIONS

8.1 General

- 8.1.1 The site investigations have allowed the site specific ground conditions to be described and this information was used to provide an improved conceptual ground model.
- 8.1.2 The geology encountered during the site investigations was generally consistent with that anticipated from the desk study and is summarised below. Slight hydrocarbon impact was found in TP4 adjacent to the tank. Additional trial pits were excavated around TP4 and no further evidence of hydrocarbons was found. This indicated that the area with slight hydrocarbon impact was of very limited extent (<1 x1 m).

Table 7: Trial Pit Summary

TP Number	Depth Top (m)	Depth Bot (m)	Stratum Description
TP1	0.00	0.30	MADE GROUND: Brown slightly clayey fine to coarse sandy fine-coarse GRAVEL of sandstone and occasional brick fragments
	0.30	-	Strong light brown well cemented fine-medium grained SANDSTONE – Cefn-y-fedw Sandstone Formation
TP2	0.00	0.30	MADE GROUND: Brown slightly clayey fine to coarse sandy fine-coarse GRAVEL of sandstone and occasional brick fragments
	0.30	-	Strong light brown well cemented fine-medium grained SANDSTONE – Cefn-y-fedw Sandstone Formation
TP3	0.00	0.20	MADE GROUND: Brown slightly clayey fine to coarse sandy fine-coarse GRAVEL of sandstone and occasional brick fragments
	0.20	-	Strong light brown well cemented fine-medium grained SANDSTONE – Cefn-y-fedw Sandstone Formation
TP4	0.00	0.30	MADE GROUND: Brown slightly clayey fine to coarse sandy fine-coarse GRAVEL of sandstone and occasional brick fragments
	0.30	0.45	MADE GROUND: Black clayey sandy fine-coarse angular, tabular Gravel with slight Hydrocarbon odour
	0.45	-	Strong light brown well cemented fine-medium grained SANDSTONE – Cefn-y-fedw Sandstone Formation
Stockpile	-	-	MADE GROUND: Brown slightly sandy gravelly CLAY. Gravel is fine-coarse, sandstone, brick and concrete fragments.

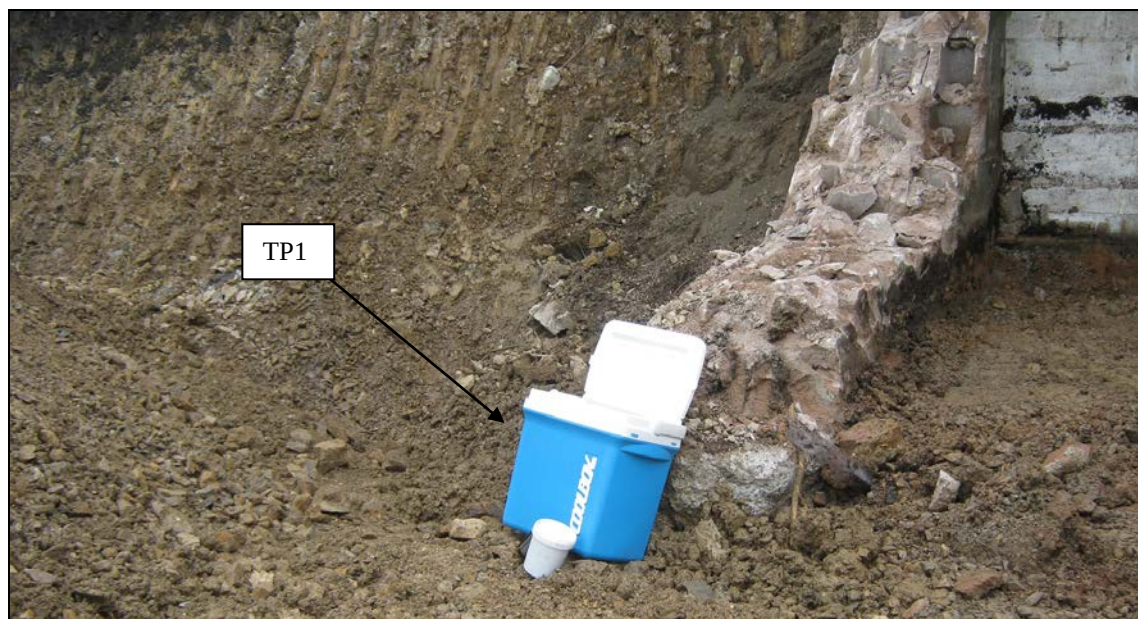


Figure 6: Photo of TP1 location



Figure 7: Photo of TP2 location



Figure 8: Photo of TP3 location



Figure 8 & 9: Photo of TP4 location

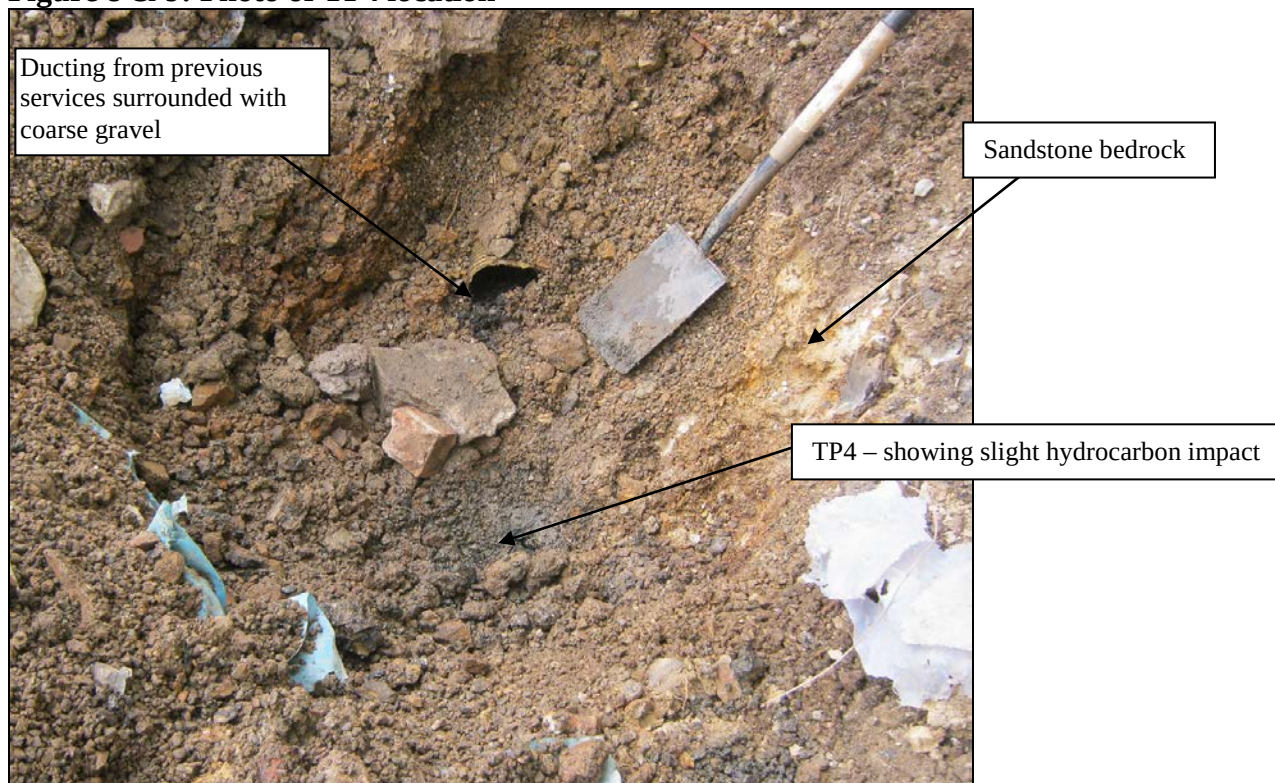




Figure 10: Photo of Large stockpile located in the centre of the site.



Figure 11: Photo from the eastern boundary showing rockhead at surface

8. GENERIC QUANTITATIVE RISK ASSESSMENT

8.1 Introduction

- 8.1.1 The assessment of contamination has been carried out in accordance with the overall guidance presented in CLR11 Model Procedures for the Management of Land Contamination using the procedures as indicated in Appendix B.
- 8.1.2 Generic risk assessment is a two stage process. Firstly, in the Risk Estimation stage, the measured contaminant concentrations are compared to the relevant GACs or C4SLs/S4ULs where they have been published. Where there is a suitable dataset, this is done after carrying out statistical analysis to determine the upper confidence limit on the true mean. Otherwise, maximum or specific data points are compared directly. The second stage, Risk Evaluation, comprises an authoritative review of the findings with other pertinent information, in cases where the C4SLs or GACs are exceeded, in order to consider if exceedance may be acceptable in the particular circumstances.
- 8.1.3 The aspects of risk from substances in the ground considered below are as follows:
- human health;
 - pollution of Controlled Waters;
 - plant life;
 - water supply pipes
 - below ground concrete; and
 - ground gases.

8.2 Assessment for the Protection of Human Health

- 8.2.1 The Generic Qualitative Risk Assessment (GQRA) is based on a soil with a Soil Organic Matter of 1% was carried in accordance with the methodology for assessing soil samples set out in Appendix B based on a residential end use. A full summary of the chemical test results is presented in Appendix G. Exceedance of applicable Generic Assessment Criteria (GAC) threshold concentrations are indicated in yellow. A discussion on the various exceedance's are presented below.
- 8.2.2 The results of the fieldwork and contamination testing have shown generally low concentrations of contamination however there is evidence of elevated levels of certain toxic metals. All five selected samples have recorded elevated lead concentrations ranging from 479 and 4,020mg/kg and all exceed the pC4SL for residential landuse. The area is known to be a lead mining area therefore the lead could be from a natural source and background concentrations could also be elevated.
- 8.2.3 TP4 also recorded Arsenic at 53mg/kg which exceeds the residential with plant uptake GAC and pC4SL for residential landuse.

- 8.2.4 The results from TP1-3 indicate that the soils present in this area could pose a risk if left accessible in the garden areas of the new development. It is therefore considered appropriate to remove all the material within the proposed garden area and replaced within clean validated material. The material can be reused under any permanent hard landscaped areas. Apart from the small garden area all of the rest of the site will be covered by the house or hard standing and these will break relevant pathways to human health.
- 8.2.5 The thickness of the proposed clean cover system for the gardens will be governed by the depth to rockhead and the final developed levels. These are likely to be between 300-450mm in thickness. The clean cover/soil for the garden area will be from imported material. This will require additional contamination testing to prove it is suitable for use.
- 8.2.6 TP4 recorded slight hydrocarbon impact assumed to be associated with the historic heating oil tank. The results of the Total Petroleum Hydrocarbons (TPH) and BTEX analysis show low concentrations and do not exceed any of the relevant GAC. The new development within the area of TP4 is proposed to be the access road / hard landscaping, therefore there is no long term risk associated with the soils within this area and can remain on site.

8.3 Assessment for the Protection of Controlled Waters

- 8.3.1 The risks to controlled waters (groundwater and surface waters) have been assessed by carrying out a Tier 1 assessment in accordance with the EA Remedial Targets Methodology. In general the total concentration of contaminants is relatively low apart from lead and therefore the risk from leachate being generated is also relatively low. Lead is a natural background contaminant in this area so it does not need to be considered further.
- 8.3.2 Given the above the conclusion of this Tier 1 risk assessment is that there is no significant concentration of contaminants and there is no pathway to controlled waters receptors, the risk to controlled waters at this site is negligible and no mitigation or remediation works are required.

8.4 Risk to Plant Life

- 8.4.1 The concentrations of the phytotoxic metals copper, chromium, nickel and zinc have the potential to be harmful to plants. However, all the measured concentrations of these metals are lower than the guideline values for the protection of plants as presented in the MAFF document "Code of Good agricultural practice for the protection of soil". Therefore there is no risk to plants at the site due to phytotoxicity should any be planted in the ground as part of the proposed development.

8.5 Water Supply Pipe Material Assessment

- 8.5.1 Plastic pipe materials are potentially vulnerable to attack from elevated levels of hydrocarbons, which can potentially lead to contamination of potable water supplies and

water supply companies also require the risk to their workers from other contaminants in the ground to be assessed. The assessment has been completed in accordance with the current UK Guidance for the Specification of Water Supply Pipes to be used in Brownfield Sites (UK Water Industry Research Ltd. UKWIR, 2014) together with guidance from United Utilities. This guidance provides threshold concentrations for different pipe material for various chemical groups.

8.5.2 The pipeline materials considered by the guidance are PE, PVC, wrapped steel, wrapped ductile iron or copper pipe and barrier pipe. PE are assessed using threshold concentrations for various chemical groups including volatile organic compounds (VOC) with tentatively identified compounds (TICs), semi-volatile organic compounds (SVOC) with TICs, and mineral oils. Wrapped steel, wrapped ductile iron and copper pipe are assessed using corrosive properties. The default recommendation for water supply pipes is to use PE with other types of pipework only used if the limits for PE pipes are exceeded.

8.5.3 The available data indicates no exceedances for the PE water supply pipe are present and as such the use of PE pipe is deemed permissible with the following caveats:

- should areas of unexpected contamination be found during construction and any water supply pipes are routed through those areas, additional sampling and testing will be required.
- Following confirmation of the water supply pipe route, the water supplier for the area should be contacted and written approval sought. They may require additional chemical data along any proposed potable water supply pipe routes.

8.6 Chemical Attack on Below Ground Concrete

8.6.1 Below ground concrete structures are potentially at risk in areas of elevated sulphates and where there is low pH. An assessment of the soil and groundwater data (following the protocol established in BRE Special Digest 1, 2005) indicates that ACEC Class AC-1s conditions prevail. Therefore no special precautions are required at the site for the design of concrete in terms of the durability and structural performance.

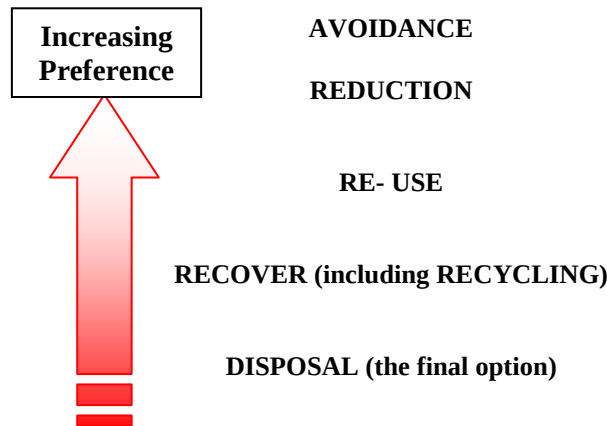
8.7 Ground Gas Assessment

8.7.1 The site is within an area where Full Radon Protection is required.

9. WASTE ASSESSMENT

9.1 Waste Hierarchy

9.1.1 In accordance with government guidance, it is required that the production and disposal of waste is managed in accordance with the following hierarchy of preference:



9.1.2 There was a stockpile on the site at the time of the site visit which was sampled to characterise prior to removal to landfill. The material was generally brown gravelly clay with sandstone, brick and concrete inclusions.

9.1.3 When soil is excavated it is technically a waste and can only be re-used if it fulfils the following requirements:

- There is a planned use for the material;
- There is planning permission for the proposed re-use;
- The material when re-used will not be a risk to flora, fauna or controlled waters;
- Appropriate procedures are followed to demonstrate the above criteria are met and the re-use of materials is recorded in a systematic way and appropriate permissions/permits are gained and relevant procedures followed.

9.2 Waste Characterisation and Classification

9.2.1 If there is a portion of excess soil this will then have to be sent to a suitable landfill site. A summary of current relatively complex guidance on categorising waste from earthworks is presented in Appendix N. A two phase approach is required comprising:

- Waste Characterisation; and
- Waste Classification (Waste Acceptance Criteria).

Waste Characterisation

- 9.2.2 The results of the total concentrations from the chemical testing on soil samples have been assessed. The sample from the stockpile was first assessed to determine whether it is non-hazardous or are hazardous in terms of waste classification. The results of this assessment indicate that due to the lead concentration much of the soil will be considered hazardous. However, the soil in the stockpile to go off site is not classified as hazardous waste.

Waste Classification

- 9.2.3 In order to determine whether soils can be sent to a licensed landfill for disposal further testing is required comprising landfill Waste Acceptance Criteria (WAC) analysis for both total concentrations for certain chemicals and for leachate analysis. No WAC testing was carried out as part of this investigation. Should it be proposed to dispose any excess soil at a landfill site then WAC testing will have to be carried out to confirm the landfill waste classification and if any pre-treatment is required.

10. CONCLUSION

10.1 Environmental Risk Assessment

- 10.1.1 A preliminary risk assessment has been carried out based on the contaminant-pathway-receptor model as defined in Statutory Guidance to Part IIA of the Environment Protection Act, 1990, and in accordance with BS 10175: 2011 +A1 2013 "Investigation of Potentially Contaminated Sites – Code of Practice". In order to make a more detailed assessment of the potential hazards, a Phase 2 intrusive investigation was carried out to develop a more comprehensive conceptual ground model of the site. This detailed the characteristic ground conditions and elements of the surrounding environment and has assisted with identifying the potential contaminants of contamination, the potential receptors of the contamination and the potential pathways between them.
- 10.1.2 Given the site history, the fieldwork and laboratory testing has shown that the thin reworked material within the proposed garden areas will pose a risk to the end users of the site primarily due to the lead content if left accessible in the garden areas of the new development. It is therefore considered appropriate to remove all the material within the proposed garden area and replaced within clean validated material.
- 10.1.3 Clean validated sub-soil and topsoil material should be used within the garden area will be placed directly onto bedrock. The overall thickness of the cover system will be governed by the depth to rockhead within the garden area. The thickness of the proposed clean cover system will be governed by the depth to rockhead and the final developed levels. These are likely to be between 300-450mm in thickness. The imported material will require additional contamination testing to prove it is suitable for use.
- 10.1.4 If required the excavated material from the garden can be reused under any permanent hard landscaped areas.
- 10.1.5 TP4 recorded slight hydrocarbon impact during the site visit assumed to be associated with the historic heating oil tank. The results have shown low concentrations of contamination the soils within this area and can remain on site.

- 10.1.6 The proposed front gardens (gravel) have been shown to be directly onto sandstone bedrock therefore there is no risk from contaminated soils.
- 10.1.7 The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level. Full radon protective measures are necessary as set out in Building Research Establishment document BR211.

10.2 Health and Safety

- 10.2.1 As outlined within the HSE publication “Successful Health and Safety Management – HSG65” this report should inform your development of safe systems of work and information as an input into the safety management system. The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations 2015. All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.
- 10.2.2 In accordance with the Construction Design and Management (CDM) Regulations 2015, TerraConsult has acted in the role of Principal Contractor and as Principal Designer for the works as described in this report. With issue of this report TerraConsult has discharged and completed all contractual and legal requirements for these positions and we have no further involvement with the project.

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APPENDICES

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Appendix C	Service Constraints, Report Limitations & Planning
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APPENDIX A

Service Constraints, Report Limitations & Planning

Service Constraints, Report Limitations & Planning

This report and the site investigation (together comprise the "Services") were compiled and carried out by TerraConsult Limited (TCL) for Mr & Mrs Spiby (the "client") in accordance with the terms of a contract between TCL and the "client." The Services were performed by TCL with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by TCL taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between TCL and the client.

Other than that expressly contained in the above paragraph, TCL provides no other representation or warranty whether express or implied, is made in relation to the Services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of TCL. If a third party relies on this report, it does so wholly at its own and sole risk and TCL disclaims any liability to such parties.

It is TCL's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without TCL's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of TerraConsult Limited.

The report was written in June 2015 and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of TCL. In the absence of such written advice of TCL, reliance on the report in the future shall be at the client's own and sole risk. Should TCL be requested to review the report in the future, TCL shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between TCL and the client.

The observations and conclusions described in this report are based solely upon the Services that were provided pursuant to the agreement between the client and TCL. TCL has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. TCL is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, TCL did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, radon gas or other radioactive or hazardous materials.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground

conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and TCL] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Planning Requirements

The National Planning Policy Framework (NPPF, 2012) has twelve core land-use planning principles, two of which directly relate to the potential for pollution and contaminated land:

- Requirement to “*contribute to conserving and enhancing the natural environment and reducing pollution*” and setting out of a preference for developments to be on land of “*lesser environmental value*”; and
- “*encourage the effective use of land by re-using land that has been previously developed (brownfield land), providing that it is not of high environmental value.*”.

In accordance with the core principles of NPPF, Paragraph 109 clarifies that enhancing the natural environment includes:

- “*preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*”.

Paragraph 121 of NPPF states that planning policies and decisions for developments should also ensure that:

- “*the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
- *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *adequate site investigation information, prepared by a competent person, is presented.*”.

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

APPENDIX B

Environmental Risk Assessment Methodology & Terminology

ENVIRONMENTAL RISK ASSESSMENT METHODOLOGY & TERMINOLOGY

LEGISLATION OVERVIEW

This report includes hazard identification and environmental risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a “suitable for use approach,” which is relevant to both the current use of land and also to any proposed future use. The contaminated land regime is the statutory regime for remediation of contaminated land that causes an unacceptable level of risk and is set out in Part 2A of the Environmental Protection Act 1990 (“EPA 1990”). The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) 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, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused;*
- or*
- (b) Pollution of controlled waters is being, or is likely to be, caused.”*

In order to assist in establishing if there is a “*significant possibility of significant harm*” there must be a “*contaminant linkage*” for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of contaminant-pathway-receptor is termed a “contaminant linkage or CPR linkage.”

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations. Key implementing legislation of the Part 2A regime includes the Contaminated Land (England) Regulations 2006 (SI 2006/1380) as recently amended by the overarching legislation for the contaminated land regime, which implements the provisions of Part IIA of the Environmental Protection Act 1990 (as inserted by section 57 of the Environment Act 1995), came into force on 14th July 2000 together with recent amended regulations: Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263). Revised and Contaminated Land Statutory Guidance was published by DEFRA in (DEFRA, April 2012). Part IIA defines the duties of Local Authorities in dealing with it. Part IIA places contaminated land responsibility as a part of planning and redevelopment process rather than Local Authority direct action except in situations of very high pollution risk. In the planning process guidance is provided by National Planning Policy Framework (NPPF) of March 2012 which requires that a site which has been developed shall not be capable of being determined “contaminated land” under Part IIA. In practice, Planning Authorities require sites being developed to have a lower level of risk post development than the higher level of risk that is required in order to determine a site as being contaminated in accordance with Part IIA. This is to ensure that there is a suitable zone of safety below the level for Part IIA determination and prevent recently developed sites becoming reclassified as contaminated land if there are future legislative or technical changes (e.g. a substance is subsequently found to be more toxic than previously assessed this increases its hazard)..

The criteria for assessing levels of contaminants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

- (a) to identify and remove unacceptable risks to human health and the environment;
- (b) to seek to bring damaged land back into beneficial use;
- (c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the “suitable for use” approach to remediation of contaminated land. The “suitable for use” approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

- (a) *ensuring that land is suitable for its current use* - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise ("remediating" the land); the contaminated land regime provides the regulatory mechanisms to achieve this;
- (b) *ensuring that land is made suitable for any new use, as planning permission is given for that new use* - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and
- (c) *limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought* - in other words, recognising that the risks from contaminated land can be satisfactory assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of contaminants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the use that the site has, and will have in the future.

OVERALL METHODOLOGY

The work presented in this report has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in the CLR 11 Model Procedures for the Management of Land Contamination (Environment Agency, 2004), and BS10175:2011+A1 2013. Important aspects of the risk assessment process are transparency and justification. The particular rationale behind the risk assessments presented is given in this appendix.

The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011), often referred to as the Phase 1 Study, comprising desk study and walk-over survey, which culminates in the Preliminary Risk Assessment. A preliminary conceptual site model (CSM) is developed. From this are identified any geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them. From the geo-environmental perspective, the Hazard Identification process uses professional judgement to evaluate all the hazards in terms of possible contaminant linkages (of contaminant source-pathway-receptor). Possible contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and generic risk assessment.

The second stage is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The scope of the Ground Investigation is based on the findings of the Preliminary Risk Assessment and is designed to reduce uncertainty in the geotechnical and geo-environmental hazard identification. The Ground Investigation comprises fieldwork, laboratory testing and usually also on-site monitoring. The Ground Investigation may include the Exploratory, Main and Supplementary Investigations described in BS 10175:2011+A1 2013. The results of the Ground Investigation reduces uncertainty in the geotechnical and geo-environmental risks. Depending on the findings more detailed investigations or assessments may be required.

PRELIMINARY RISK ASSESSMENT

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby “risk” is defined as:

- “(a) The probability, or frequency, or occurrence of a defined hazard; and
- (b) The magnitude (including the seriousness) of the consequences.”

The UK’s approach to the assessment of environmental risk is set out in by the Department of the Environment Transport and the Regions (2000) publication “A Guide to Risk Assessment and Risk Management for Environmental Protection” (also called Greenleaves II). This established an iterative, systematic staged process which comprises:

- (a) Hazard identification;
- (b) Hazard assessment;
- (c) Risk estimation;
- (d) Risk evaluation;
- (e) Risk assessment;

At each stage during the development process the above steps are repeated as more detailed information becomes available for the site.

For an environmental risk to be present, all three of the following elements must be present:

- Source/Contaminant: hazardous substance that has the potential to cause adverse impacts;
- Receptor: target that may be affected by contamination: examples include human occupants/users of site, water resources (rivers or groundwater), or structures;
- Pathway: a viable route whereby a hazardous substance may come into contact with the receptor.

The absence of one or more of each component (contaminant, pathway, receptor) would prevent a contaminant linkage being established and there would be no significant environmental risk.

The identification of potential contaminant linkages is based on a Conceptual Model of the site, which is subject to continual refinement as additional data becomes available. As part of a Phase I Investigation (Desk Study and site walk over) a Preliminary Conceptual Site Model (PCSM) is formed. Based on the PCSM, potential contaminant linkages can be assessed. If the PCSM and hazard assessment indicate that a pollution linkage is not of significance then no further assessment or action is required due to this linkage. For each significant and possible linkage a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the Conceptual Site Model and assess the level of risk from each contaminant linkage.

Definition of Risk Assessment Terminology

The criteria used for risk assessment are broadly based on those presented in DETR’s “A Guide to Risk Assessment and Risk Management for Environmental Protection” (2000). The Severity of the risk is classified according to the criteria in Table B.1 below:

Table B.1 Severity/Consequence of Risk	
Severe	Acute risks to human health. Catastrophic damage to buildings/property (e.g. by explosion). Direct pollution of sensitive water receptors or serious pollution of other controlled water (watercourses or groundwater) bodies.
Medium	Harm to human health from long-term exposure. Slight pollution of sensitive controlled waters (surface waters or aquifers) or pollution of other water bodies. Significant effects on sensitive ecosystems or species.
Mild	No significant harm to human health in either short or long term. No pollution of sensitive controlled waters, no more than slight pollution of non-sensitive waters. Significant damage to buildings or structures. Requirement for protective equipment during site works to mitigate health effects.
Negligible	Damage to non-sensitive ecosystems or species. Minor damage to buildings or structures. No harm or pollution of water.

The probability of the risk occurring is classified according to criteria given in Table B.2 below:

Table B.2: Probability of Risk Occurring	
High likelihood	Contaminant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Medium/Reasonably Foreseeable	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low/Unlikely	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Negligible/ Not credible	Contaminant linkage may be present but the circumstances under which harm would occur are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table B.3 below:

Table B.3: Comparison of Severity and Probability					
		Severity			
		Severe	Medium	Mild	Negligible
Probability	High likelihood	Very High Risk	High Risk	Medium/Low Risk	Low Risk
	Medium/Reasonably Foreseeable	High Risk	Medium Risk	Low Risk	Near Zero
	Low/Unlikely	High/Medium Risk	Medium/Low Risk	Low Risk	Near Zero
	Negligible/ Not credible	Medium/Low Risk	Low Risk	Low Risk	Near Zero

The various risk rankings provide guidance for recommended actions, whether this is:

- AR - Action Required, Remediation or mitigation or site investigation works required
- SIR - Site Investigation Required, further assessment is required.
- NAR - No Action Required.

A description of the evaluated risk is as follows:

Table B.4 – Description of the Classified Risks and Likely Action Required	
Evaluated Risk	Recommended Actions
Very High Risk	AR: There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	AR: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate Risk	SI: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	NAR: It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Near Zero	NAR: There is a negligible possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

GENERIC QUANTITATIVE RISK ASSESSMENTS

In the following sections the current UK guidance the risks to the following receptors are discussed: human health, plant life and pollution of Controlled Waters

- **Human Health**

The overall methodology for assessing the risk to human health from potential contaminants in soil is set out in the Environment Agency's guidance "Using Soil Guideline Values" SC050021/SGV Introduction, March 2009 and using the CLEA 1.06 model software. The generic assessment criteria are in accordance with the following:

- Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil;
- Science Report SC050021/SR3: Updated technical background to the CLEA model;
- Science Report SC050021/SR4: CLEA Software (Version) Handbook;
- Toxicological reports and SGV technical notes;
- Toxicological data published by LQM/CIEH (2009) and CL:AIRE/EIC/AGS (2009)
- DEFRA Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010 (December 2013).
- LQM/CIEH Suitable 4 Use Levels for Human Health Risk Assessment

In March 2014 six 'proposed' Category 4 Screening Levels (pC4SL) were issued by Defra. These screening values are considered to be within Category 4 as defined in the Contaminated Land Statutory Guidance and indicate safe levels for new developments passing through the planning system. The SGV for lead has been withdrawn, and the pC4SL for lead has been derived using current best practice. In December 2014 LQM/CIEH Generic Assessment Criteria for 89 elements/metals in accordance with the C4SL criteria.

Note that groundwater contamination may pose a risk to human health but that there are no relevant generic assessment criteria available for comparison. TerraConsult has derived our own assessment criteria for this.

- **Phytotoxic Risks**

Generic assessment of phytotoxicity is by comparison with guideline values presented in the British Standard for Topsoil and the MAFF document "Code of Good agricultural practice for the protection of soil", October 1998. This is in accordance with CLR's reference to DEFRA notice CLAN 4/04.

- **Controlled Waters**

The risks to controlled waters (groundwater and surface waters) from contaminants on-site have been assessed in accordance with the EA documents Groundwater Protection: Policy and Practice GP3 (2012) and Remedial Targets Methodology (RTM, 2006). Pollutant inputs from contaminated land sites are considered as passive inputs under the European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives, and as such are regulated under the Agency's 'limit' pollution objective. Acceptable water quality targets (WQT) are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)). The risk posed to controlled waters from total soil concentrations cannot be directly assessed. The risk is assessed either by comparison of results of leachate tests carried out on soil samples, or from the direct testing of samples of groundwater to screening criteria. Leachate testing generally forms a conservative assessment and is not appropriate for organic contaminants.

CURRENT GUIDANCE ON INTERPRETATION OF CHEMICAL ANALYSIS OF SOILS

Contaminated land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995. This supports a 'suitable for use' based approach to the risk assessment of contaminated land. The site specific risk assessment is based upon an assessment of plausible contaminant linkages, referred to as the contaminant-pathway- receptor model, based upon the current or proposed use of the site.

Before undertaking a risk assessment a conceptual site model is devised in order to identify the potential contaminants, pathways and receptors. The individual contaminants, pathways and receptors then need to be further investigated in order to refine the initial assessment and risk assessment undertaken.

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the EA published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. These reports (CLR7-10) together with associated "SGV" documents were withdrawn and the following documents have been published as revised guidance to the CLEA assessment:

- Environment Agency : 2008: Using Soil Guideline Values SC050021/SGV Introduction, March 2008.
- Environment Agency : 2008: Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
- Environment Agency : 2008: Science Report SC050021/SR3: Updated technical background to the CLEA model.
- Environment Agency : 2008 :Compilation of Data for Priority Organic Contaminants for Derivation of Soil Guideline Values Science report SC050021/SR7
- Science Report SC050021/SR4: CLEA Software (Version) Handbook.
- DEFRA Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010 (December 2013).
- LQM/CIEH Suitable 4 Use Levels for Human Health Risk Assessment

Additional guidance on statistical assessment replacing CLR 7 is partly provided in:

- CL:AIRE :2009: Guidance on Comparing Data With a Critical Concentration

A different approach to the statistical appraisal of data is required depending on whether the assessment of risk is to assess whether land is Contaminated Land in accordance with regulations, or whether the assessment is to assess whether the site is suitable for new development in according with Planning guidance. This is discussed further in CL:AIRE :2009 "Guidance on Comparing Data With a Critical Concentration".

The introduction of the Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) reassessed the CLEA Model and the derived SGVs (and associated GACs calculated using the model). This re-assessment concluded that the SGVs/GACs were conservative screening criteria

for determining the suitability of soil with regard to the risk to human health under the planning regime and defined a new upper limit for planning purposes which is the boundary between the new Category 3 and 4. In March and September 2014 DEFRA issued guidance on these new Category 4 Screening Levels (C4SL) and these are discussed further below.

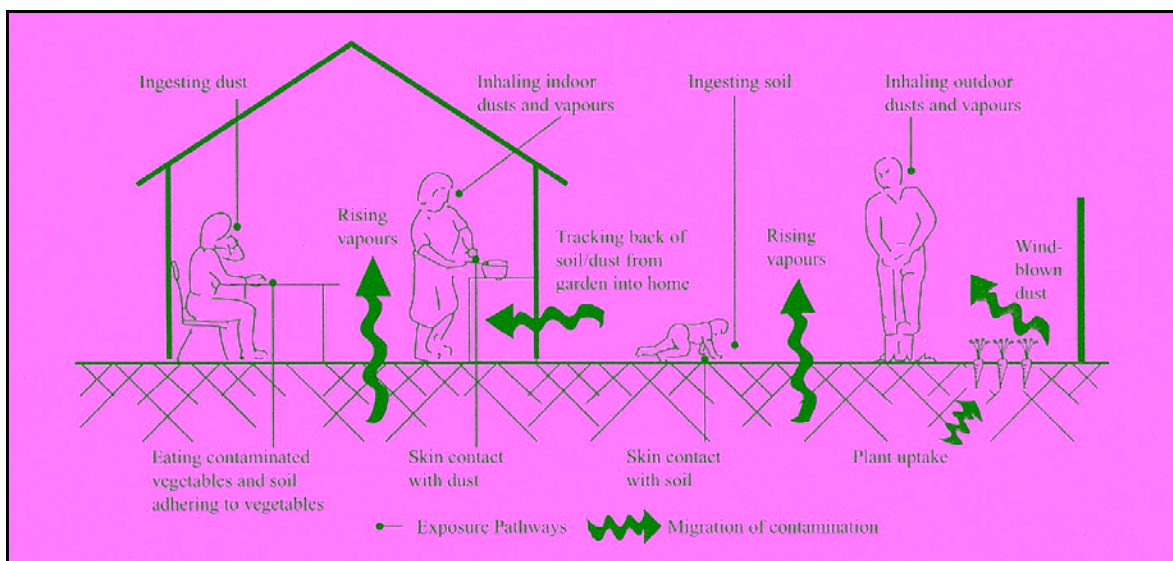
Soil Guideline Values

A program for the derivation of SGVs based on the above guidance is provided by the Environment Agency and is entitled “CLEA Software Version 1.06”. These reports, together with supporting toxicology reviews (“Tox” or Supplementary Information Reports) for individual substances (which will be gradually updated), Soil Guideline Value Reports and other guidance referred to in the above documents, provide guidance and the scientific basis for assessing the risk to human health from potential contaminants. Soil Guideline Value Reports (SGV Reports) have been published for a number of contaminants and these are published on the Environment Agency website. Eventually the reports will include SGVs for:

- heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury nickel, and selenium;
- benzene, ethylbenzene, toluene and xylenes;
- phenol;
- dioxins and dioxin-like polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAHs) – 11 substances.

In addition CIEH through LQM and the EIC have published generic assessment criteria (GACs) for a wide variety of other parameters including metals, hydrocarbons, solvents, PAHs and explosive substances for three standard land uses. These have been produced to supplement the Environment Agency guidance. These GACs will be replaced by SGVs when or if the EA publishes any more SGVs.

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set ‘default’ exposure pathways. Ten human exposure pathways are covered in the CLEA model as presented below:



- **Ingestion**
 - ingestion of outdoor soil;
 - ingestion of indoor dust;
 - ingestion of home grown vegetables;
 - ingestion of soil attached to home grown vegetables.

- **Dermal Contact**
 - dermal contact with outdoor soil;
 - dermal contact with indoor dust.

- **Inhalation**
 - inhalation of outdoor dust;
 - inhalation of indoor dust;
 - inhalation of outdoor soil vapour;
 - inhalation of indoor soil vapour.

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g. certain organic compounds can pass through plastic water pipes into drinking water supply.

The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principle 'default' land use types and makes a series of 'default' assumptions with regard to human exposure frequency, duration and critical human target groups for each land use considered:

- residential land use;
- allotments;
- commercial and industrial land use.

The land use categories defined in the CLEA are detailed below.

Residential: This land use category assumes that people live in a variety of dwellings including terraced, detached and semi-detached houses up to two storeys high. The structure of buildings varies. Default parameters for building materials and building design are included in CLEA documents to calculate the relevant multi-layer diffusion coefficients for vapour intrusion and to model indoor vapour intrusion. The CLEA model assumes that regardless of the style of housing the residents will have access to either a private garden or community open space nearby, and that soil tracked into the home will form indoor dust. It allows for the ingestion pathways from home grown vegetables.

Allotments: The CLEA model incorporates an assessment of land provided by local authorities specifically for people to grow fruit and vegetables for their own consumption. Consumption of such fruit and vegetables present several exposure pathways; plants absorb contaminants mainly via water uptake through roots, the contaminants move to edible portions of plants via translocation and contaminated soil particles become trapped in the skin and between leaves. At present the model fails to account for exposure through the consumption of animals, and their products (e.g. eggs), which have been reared on contaminated land.

Commercial/Industrial: Although there are a wide variety of workplaces and work-related activities, the CLEA assessment of this land-use assumes that work occurs in a permanent, three-storey structure, where employees spend most time indoors, conducting office-based or light physical work. The model assumes employees sit outside during breaks for most of the year. Limitations in applying this land-use to different industries is detailed in EA publication "Updated technical background to the CLEA model" (2011). The generic model assumes that the site would not be covered by hard standing. Risk of exposure to contaminants would be clearly less where commercial land is essentially all buildings and hard standing.

Based on the assumptions of each land use and the associated applicable exposure pathways, a 'Soil Guideline Value' (SGV) may be calculated for each contaminant under consideration for a particular land use in order to determine whether certain contaminant soil concentrations pose a significant risk to human health. The primary purpose of the CLEA SGVs are as 'trigger values' – indicators to a risk assessor that soil concentrations below this level require no further assessment as it can be assumed that the soil is suitable for the proposed use. Where soil concentrations occur above the SGV then further assessment of the results is required. The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012 provides new clarity on the assessment of risk where soil concentrations exceed the SGV. The guidance

introduces a four stage classification system relating to concentration of contaminants and the assessed risk which indicates appropriate actions. Category 1 and 2 sites are classified as “Contaminated Land” as defined in Part IIA of The Environmental Protection Act (1990). Category 3 and 4 sites are not considered as “Contaminated Land” in accordance with the Act. This can be explained using the figure on the following page.

There are also difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be ‘unacceptable’ and that they would lead to “significant possibility of significant harm” as defined in Part IIA of The Environmental Protection Act (1990) and determine that the land is “contaminated.” This ultimately requires detailed ‘toxicological’ information of the health effects of individual contaminants and also a scientific judgement on what constitutes an ‘unacceptable’ risk. It is for local authorities or the Environment Agency to determine whether a particular site is contaminated land and it is for local Planning Authorities to determine whether land affected by contamination can be redeveloped.

Given the SGVs have been derived only for a limited number of contaminants and there was little prospect of further SGVs being published, two professional groupings have produced Generic Assessment Criteria (GACs) in accordance with the CLEA model for a large number of additional contaminants. These GACs were recognised in the new Contaminated Land Statutory Guidance (DEFRA, 2012) and have been produced as follows:

- LQM/CIEH : 2009 Nathaniel CP, McCaffrey C, Ashmore MH, Cheng NPS GROUP, Gillett A, Ogden R & Scott D : 2009 . The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition). Land Quality Press, Nottingham.*
- CL:AIRE/EIC/AGS: 2009 : Soil Generic Assessment Criteria (GAC) for Human Health Risk Assessment. Contaminated Land: Applications in Real Environments, Environment Industries Commission & Association of Geotechnical and Environmental Specialists. December 2009.*

Category 4 Screening Levels

For new developments progressing through the planning regime, it is desirable that the soil concentrations are within Category 4 where there is a valid contaminant linkage. The upper boundary between Category 4 and 3 is not defined in the guidance. This boundary can also be better defined by carrying out a Detailed Quantified Risk Assessment (DQRA) and this is discussed later in this appendix.

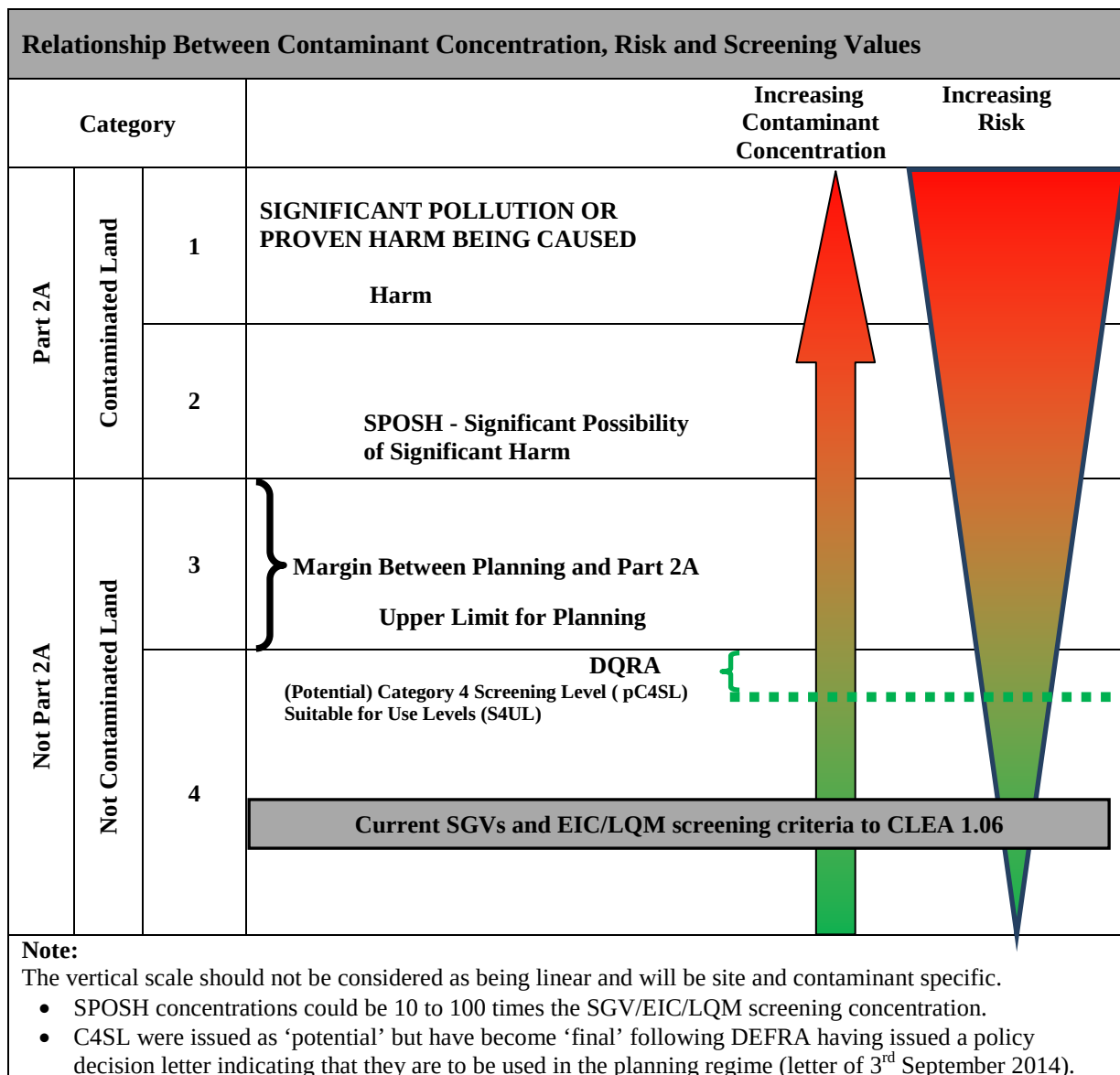
In December 2013 Defra issued the findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. The report was not designed to produce ‘final’ C4SL as the steering group producing the report believes that final C4SL should be set by a ‘relevant authority’ (e.g. Defra), the toxicological framework proposed has not been reviewed by the Committee on Toxicity and the document has yet to be subject to peer review.

In March 2014, appendices to the main Defra report were published detailing the derivation of pC4SL for 6 contaminants and other appendices regarding a review of the CIEH/CL:AIRE statistics guidance and sensitivity analysis. For each contaminant, a range of pC4SL have been produced relating to modifying toxicological parameters only, modifying exposure parameters only or by modifying both. It should be noted that the pC4SL produced for lead (the SGV was withdrawn in 2011) has undertaken a relatively large toxicological review in relation to modelling blood lead concentrations. pC4SL have been produced for:

- Arsenic;
- Benzene;
- Benzo(a)pyrene (as a surrogate marker for PAHs);
- Cadmium;
- Chromium (VI); and
- Lead

As previously discussed the values were initially published as ‘potential’ C4SL but have become ‘final’ following DEFRA having issued a policy decision letter indicating that they are to be used in the planning regime (letter of 3rd September 2014). It is considered that the pC4SL provide a simple test for deciding whether land is suitable for use without any remediation. The pC4SL represent a new set of screening levels that are more pragmatic (but strongly precautionary) compared to the existing soil guideline values (SGVs and the other GACs calculate in accordance with

the existing CLEA methodology). The pC4SL provide cautious estimates of contaminant concentrations in soil that are still considered to present an acceptable level of risk, within the context of Part 2A, by combining information on toxicology, exposure assessment and normal levels of exposure to these contaminants. pC4SL values should not be seen as 'SPOH values.' Exceeding a C4SL means that further investigation is required, not that the land is necessarily contaminated.



Lead

The SGV for lead was withdrawn in 2011 and is not used in this report. The pC4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling in line with current scientific understanding of lead toxicology.

Public Open Space

The Defra report (December 2013) has also introduced exposure scenarios for two other commonly occurring land uses which require assessment (under the planning and Part 2A regimes) on a relatively frequent basis. These exposure scenarios are:

- Public Open Space – Space Near Residential Housing (POS_{resi}); and
- Public Open Space – Public Park (POS_{park}).

Potential use of pC4SL relating to Public Open Space (POS) require care due to the significant variability in exposure characteristics. For example, POS may include:

- Children's play areas, public parks where children practise sport several times a week and teenagers only once a week;
- Grassed areas adjacent to residential properties which are rarely used;
- Dedicated sports grounds where exposure is only to players and groundworkers; and
- Nature reserves or open ground with low level activity (for example, dog walking).

Within the Defra report (December 2013) the following exposure scenarios have been modelled as these are considered the most important for potential exposure for the critical receptor i.e. young children:

- Green open space close to housing, including tracking back of soil (POS_{resi}); and
- Park-type scenario where distance is considered sufficient to discount tracking back of soil (POS_{park}).

Detailed Quantified Risk Assessment (DQRA)

SGVs, GACs and pC4SL are based on a number of basic assumptions. There are two main options for developing Site Specific Assessment Criteria (SSAC) by adjusting the CLEA model so that they have greater relevance to the site:

- **Simple adjustment of the generic SGV / C4SL model.** Such adjustment is restricted to the choice of exposure routes selected for the generic land use, building type, soil type and soil organic matter content within the CLEA software.
- **Detailed adjustment.** It may be relevant to make greater modifications to the model due to the specific use of the land in question. This can include modification to any parameter value, including exposure assumptions, building parameters, and the choice and application of fate and transport models. This is equally relevant to site-specific modifications of existing generic land uses, the development of new land uses, and the inclusion of additional exposure pathways. Much of this can be undertaken using the CLEA software. Depending on the complexity of the detailed adjustments required, it may be necessary to use other tools either alone or in conjunction with the CLEA software. Both options should follow established protocols for DQRA and require sufficient justification and supporting information for the adjustments made. Detailed adjustments are likely to require substantially greater technical justification and supporting documentation, especially if modifications are based on information not contained within the SGV framework documents.

The two choices present the risk assessor with three options/decisions:

- (1) Use a published SGV/GAC/C4SL if it can be demonstrated that the assumptions inherent in the value are appropriate to the site in question. If they are not, proceed to either option 2 or 3 below.
- (2) Make simple site-specific adjustments to the generic exposure model used to derive the SSAC. Three examples of when this could be appropriate are:
 - a. High density residential development with no exposed contaminated soil at surface. It is appropriate in this case to consider the relevance of direct contact pathways and consumption of homegrown produce.
 - b. Soil type is significantly different (specifically when soil type is likely to be less protective e.g. made ground) to that assumed in the SGV/GAC/C4SL.

- c. Soil organic matter content is significantly different to that assumed in the derivation of the SGV/GAC/C4SL.

- (3) If simple adjustments are not sufficient to reflect site conditions, undertake a DQRA. This may be undertaken using the CLEA software or by using an alternative risk assessment methodology that is relevant, appropriate, authoritative and scientifically based. Changes to toxicological end points may also be considered, although this should only be undertaken by a toxicology expert. In the context of this guidance, simple adjustments of a generic land use scenario for soil type or SOM content for example are not considered sufficient to be classed as a DQRA.

DQRAs should be conducted with the agreement of the local authority (or the Environment Agency) since it is the authority that determines whether land is Contaminated Land or whether Planning Permission for a new development may be granted.

Representative Data

The type, quantity and quality of the available soil data influence the method chosen to obtain a site representative soil concentration that is compared with a SGV / GAC / C4SL in the screening process. The soil data should be representative of the exposure scenario being considered. This can include factors such as:

- averaging area over which exposure occurs;
- sample depth;
- heterogeneity of soil

where the 'averaging area' is defined as:

That area (together with a consideration of depth) of soil to which a receptor is exposed or which otherwise contributes to the creation of hazardous conditions'.

Site investigations take discrete samples from a given area (and to a certain depth). It has to be assumed that these samples are to some degree representative of the contaminant concentration throughout that volume of soil. The critical soil volume (taking into account area and depth) which might be usefully compared with a SGV / GAC / C4SL is a site-specific decision, but a starting point is the generic land use scenarios used in the derivation of the SGV / GAC / C4SL. The critical soil volume depends on two factors:

- Contaminant distribution and vertical profile (bands of highly contaminated material or lateral hot spots should not necessarily be averaged out with more extensive cleaner areas of soil without justification)
- Contribution to average exposure underpinning the SGV. Direct contact exposure pathways depend on the adult or child coming into contact with near-surface soils and the area over which that exposure occurs is usually important (i.e. the averaging area). Vapour pathways are less dependent on surface area, for example vapour intrusion may result from a highly concentrated hot spot beneath a building leading to elevated average indoor air concentrations. For the three standard land uses for which SGVs are derived, relevant considerations are:
 - For the standard **residential or allotment land use**, the critical soil volume is the area of an individual garden, communal play area or working plot from the surface to a depth of between 0.5m and 1.0m. This is the ground over which children are most likely to come into contact with soil or from which vegetable and fruit produce will be harvested. In the case of volatile contaminants, it may also be appropriate to consider the volume of soil underneath the footprint of the building although vapour intrusion may be driven by a soil volume much smaller than this if the contaminant source is highly concentrated.
 - For the standard **commercial land use**, the critical soil volume has to be decided on a case-by- case basis due to the wide range of possible site layouts. However, for non-volatile contaminants, landscaped and recreational areas around the perimeter of office buildings are likely to be most important. For volatile contaminants, the footprint occupied by the building itself should also be considered.
 - For **most exposure pathways**, the contamination is assumed to be at or within one metre of the surface.

The use of averaging areas must be justified on the basis of relevance to the exposure scenario. SGVs are relevant only when the exposure assumptions inherent in them are appropriate for the identified exposure averaging area. Further guidance on critical soil volumes and the consideration of averaging exposure areas can be found in:

- *Secondary model procedure for the development of appropriate soil sampling strategies for land contamination* (Environment Agency, 2000);
- *Guidance on comparing soil contamination data with a critical concentration* (CIEH/CL:AIRE, 2009); and
- *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Appendix I* (Defra December 2013, March 2014)

It is the mean soil concentration for the individual contaminant within an individual averaging area, which is compared to the SGV. However, as contaminant concentrations vary across a site, and sampling and analysis will introduce measurement errors, the comparison between measured mean concentration and the SGV must take this uncertainty into account.

There are two principal options available to obtain site representative soil concentrations from a site investigation dataset; statistical and non-statistical methods. Data objectives, quality and quantity are likely to determine which approach is most appropriate. If statistical methods such as those presented in CIEH/CL:AIRE (2011) are to be used, sufficient data need to be available or obtained. No one single statistical approach is applicable to all sites and circumstances. The wider range of robust statistical techniques developed by organisations including the US Environmental Protection Agency (USEPA) are also important tools. Risk assessors should choose an appropriate statistical approach on the basis of the specific site and the decision that is being made. For further guidance on the appropriate use of statistical approaches, refer to USEPA 2006 or good environmental monitoring statistics textbooks.

When statistical approaches are inappropriate (this will depend on the objectives of the site investigation), individual or composite samples should be compared directly to the SGV. Guidance on use of alternative data handling approaches such as the use of composite sampling can be found in documents such as:

- *Verification of remediation of land contamination* (Environment Agency, 2010);
- *Sampling and testing of wastes to meet landfill Waste Acceptance Criteria* (Environment Agency, 2005);
- *Guidance on choosing a sampling design for environmental data collection* (USEPA, 2002);
- *Soil Quality – Sampling, ISO 10381 series* (ISO, 2002–2007).

The statistical tests should not be used as arbiters for decisions under Part 2A. They are an additional, useful line of evidence to assist in decision-making. The implications of the basis for the derivation of the site representative soil concentration must be taken into account in any decision-making process and clearly documented.

Where the statistical tests are conducted in accordance with the method described in CL:AIRE 2009:

- For the Planning situation, the regulator needs to check whether the concentration of contaminants is low compared to the SGV/SSTL. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is lower than the SGV/SSTL.
- For the Part 2A scenario the regulator needs to determine whether the concentration of contaminants is greater than the SGV/SSTL. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is higher than the SGV/SSTL. However, the regulator may proceed with determination if there is just a 51% probability, “on the balance of probabilities”.

If the screening levels are exceeded then more sophisticated quantitative risk assessment can be undertaken or remedial action may be taken to break the contaminant linkages. The benefits of undertaking a quantitative risk assessment must be weighed against the likelihood that it will bring about cost savings in the proposed remediation. Further information about the use of soil guideline values is provided in Environment Agency : 2008: Using Soil Guideline Values SC050021/SGV Introduction, March 2008.

GENERIC RISK ASSESSMENT CRITERIA FOR RISK TO PLANTS

Soil contaminants, if present at sufficient concentrations, can have an adverse effect on the plant population. Phytotoxic effects can be manifested by a variety of responses, such as growth inhibition, interference with plant processes, contaminant-induced nutrient deficiencies and chlorosis (yellowing of leaves). All chemicals are probably capable of causing phytotoxic effects. Thus the phytotoxic potential of substances is dependent on the concentrations capable of having adverse effects on plants and the concentrations likely to be found at contaminated sites. Phytotoxicity is a difficult parameter to quantify given that experimental techniques vary widely and variations exist in plant tolerances, soil effects and synergistic/antagonistic reactions between chemicals. Contaminants may be taken up and accumulated by plants through a range of mechanisms. The principal pathways are active and/or passive uptake through the plant root, adsorption to root surfaces and volatilisation from the soil surface followed by foliar uptake. After plant uptake, contaminants may be metabolised or excreted, or they may be bioaccumulated and this is highly species dependant. Many of the substances capable of adversely affecting vegetation exert this effect because of their water solubility, a characteristic that could result in their transport from contaminated sites into adjacent locations where the chemical may generate a phytotoxic response. This could be important if, for example, the adjacent site has important conservation status.

The concentration in soil at which substances become phytotoxic depend on a range of factors including plant type, soil type, pH, the form and availability of the contaminant and other vegetation stress factors that may be present (such as drought). Some plants (including some rare plants will only grow in soils where there are relatively high concentrations which would be phytotoxic to other species. Whilst many contaminants may be phytotoxic, data are limited. Some heavy metals are essential as trace elements for plant growth but may become toxic at higher concentrations.

TerraConsult has carried out a review of a number of current and former guidance documents and other texts on phytotoxicity. It is not possible to produce a definitive list of phytotoxic substances on account of the variables mentioned above. However, a number of metals are repeatedly cited as commonly occurring priority pollutants. As a result, the following list is adopted by TerraConsult as indicators of the potential for phytotoxicity: As, Cr, Cu, Ni and Zn (note that Boron has been excluded from this list because the more modern studies do not assess this).

As the CLEA framework is a risk based approach, applied to humans, an alternative strategy is required to assess the risk to plants from substances that are phytotoxic. Reference to published criteria and background concentrations can help put site data into context. Published assessment criteria for the protection of plant life from a number of countries are given in the following Table. The most authoritative source is the British Standard for topsoil, but this only lists three elements. CLR 11 states that the ICRL Guidance Note 70/90 can be used for initial screening criteria. This approach has been adopted by TerraConsult where BS3882 is lacking, but where an ICRL 70/90 criterion is lacking, the lowest criterion in Table below from, firstly UK, and, secondly, European and then other world wide criteria. The adopted criteria are highlighted in the table 3.8. The MAFF value of 250 mg/kg has been chosen for As over the ICRL value of 50 mg/kg as MAFF explains the 50 is applicable to vegetables and human health, whereas 250 is applicable to the plants themselves.

Table B.5: Published Assessment Criteria for Phytotoxic Elements (mg/kg)							
Reference	As	CR (Total)	Cr (III)	Cr (VI)	Cu	Ni	Zn
British Standard for topsoil (BS3882:2007)	-	-	-	-	200 (pH >7) 135 (pH 6-7) 100 (pH 5.5-6.0)	110 (pH >7) 75 (pH 6-7) 60 (pH 5.5-6.0)	300 (pH >7) 200 (pH 6-7) 200 (pH 5.5-6.0)
MAFF Code of Good Agricultural Practice for the Protection of Soil (1998)	250	-	400 for sites containing sewage and sludge	-	500 (grass) but may fall to 250 for clover and sensitive species (at pH>6)	110 (pH>7) 75 (pH 6-7) 60 (pH 5.5-6.0)	1000 (clover & grass at pH 6), may fall to 300 for sensitive species (at pH 6-7)
ICRCL 59/83 (1987) now withdrawn for human health assessment	-	-	-	-	130	70	300
ICRCL 70/90 (1990) threshold trigger value	50	-	-	25 *	250	-	1000
Dutch ecotoxicological intervention value (Swartjes 1993 & 1994)	40	230	-	7	190	-	-
Australian Guideline B(1) (1999), Interim Urban Ecological Investigation Level (EIL). Soils not generally considered phytotoxic below these EILs.	20	-	400	1	100	60	200
New Zealand guidelines for timber treatment sites (1977), estimated based on Cu bioavailability *	-	-	-	-	500 - 1000 clay soils	-	-
New Zealand guidelines for timber treatment sites (1977), soil criteria for protection of plant life (residential/ agricultural setting)	10-20	-	600	25	130	-	-
Note: * Cr (VI) is only likely to be present when pH >11 so this does not routinely need to be tested for regarding plant health.							

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Summary of Regulatory Context

Government policy is based upon a “suitable for use approach,” which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 ^[4] (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995 ^[5], which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) 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, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- (b) Pollution of controlled waters is being, or is likely to be, caused.”*

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

*“the entry into controlled waters of **any** poisonous, noxious or polluting matter or **any** solid waste matter”*

Part IIA is supported by a substantial quantity of guidance and other Regulations, especially for England, The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012. The document re-confirms the duties of Enforcing Authorities in dealing with contamination including the role of the Environment Agency which has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

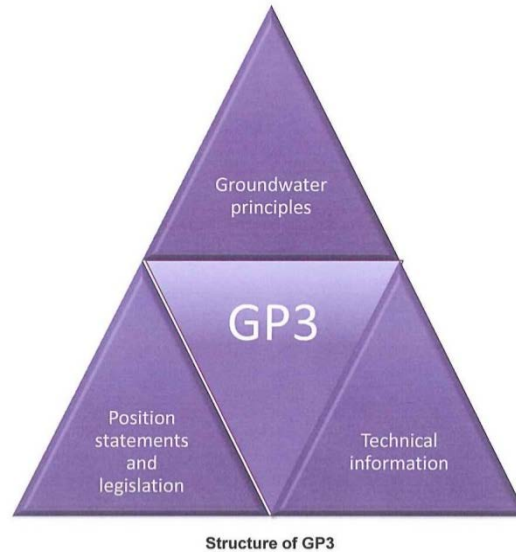
Part IIA places contaminated land responsibility as a part of the planning and redevelopment process rather than Local Authority or Environment Agency taking direct action except in situations of very high pollution risk or where harm is occurring. In the planning process guidance is provided by National Planning Policy Framework (NPPF) of March 2012. This requires that a site which has been developed shall not be capable of being determined “contaminated land” under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be readily agreed with the planners.

Environment Agency Guidance

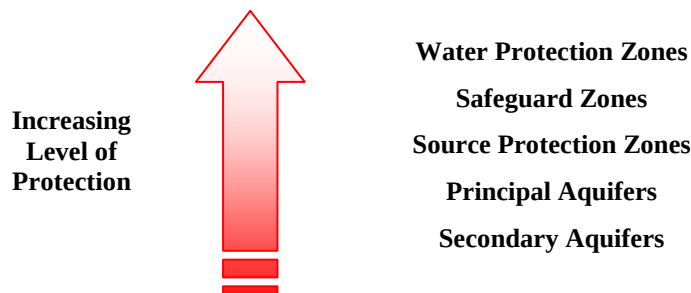
Legislation and guidance surrounding the protection of controlled waters in the UK is numerous and can be complex. The Environment Agency’s overall position on groundwater is “*To protect and manage groundwater resources for present and future generation in ways that are appropriate for the risks that we identify*” (Groundwater Protection : Policy and Practice GP3, 2012). In brief, the core objectives of the existing legislation serve to enforce this position.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document was influential as it provided a focus for key developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was then revised in 1998, since which there have been substantial changes in legislation, driven by Europe. Key European Directives relating to groundwater include the Groundwater

Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Further to legislative changes, gaps identified in the 1998 PPPG required addressing. These changes are reflected in the Environment Agency Policy document *Groundwater Protection: Policy and Practice (GP3)*, Version 1 of November 2012. The following diagram indicates the three main parts of GP3:



The Environment Agency follows a tiered, risk based approach to drinking water protection and this should be taken into account when carrying out controlled waters risk assessment:



Tools available for Risk Assessment of Controlled Waters

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. A number of tools are available for this purpose and the general approach is detailed further in Part 3 of GP3.

Three main stages apply to any risk assessment of controlled waters, these are:

- i) Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting etc)
- ii) Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)
- iii) Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

The process is summarised below (Taken from the Environment Agency GP3 draft consultation document, 2006):

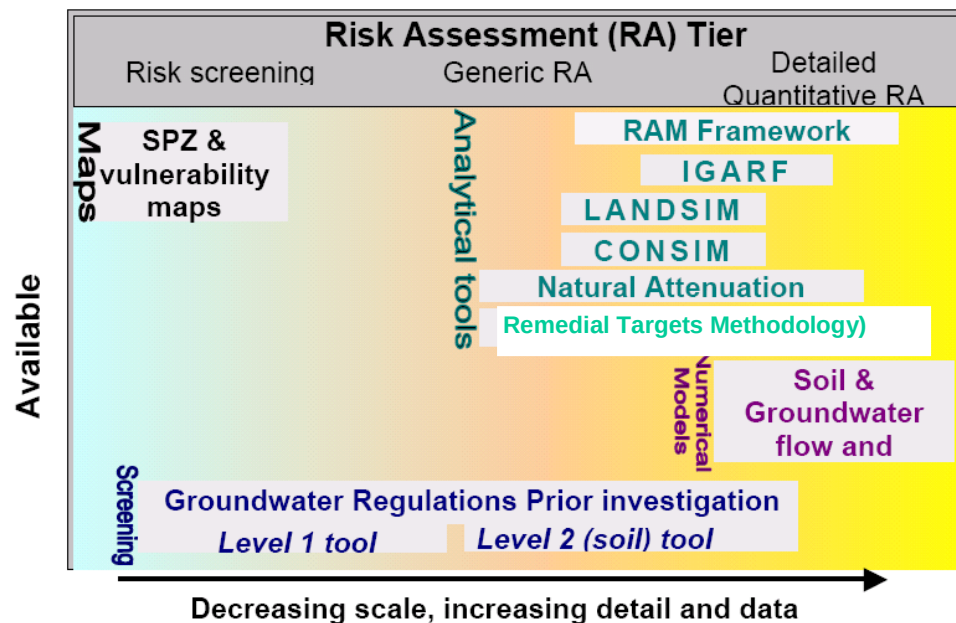


Figure 1-1 Environment Agency groundwater assessment tools, mapped against the different levels of risk assessment.

When assessing groundwater impact the Environment Agency advocate the application of their framework methodology “Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination” Environment Agency (2006). The methodology has four tiers of assessment:

Tier 1 utilises either a soil concentration (calculation of pore water concentrations based on partitioning calculations), leaching test or pore-water concentration of perched water as a source concentration input and these are contrasted directly to water quality standards. No dilution or attenuation is considered at Level 1.

Tier 2 (groundwater) considers dilution of the contaminant within the underlying receiving groundwater or surface water body. To determine a dilution factor the infiltration rate of pore water and the discharge of groundwater beneath the source must be determined. Level 2 Assessment is comprises a comparison between measured groundwater concentrations with to water quality standards.

Tier 3 considers natural attenuation in the form of dispersion, retardation and degradation of the contaminant. As the levels are progressed, the assessment becomes increasingly more detailed and less conservative as the data requirements are increased with each successive tier. The Environment Agency has released Excel Worksheets to carry out basic calculations using a conservative approach up to Tier 3. However, in this case the conceptual model is a simple one and assumes there is a simple migration of contaminants from the source zone into the aquifer receptor. Using these worksheets requires a sensitivity analysis showing how by varying each parameter, what effect it might have on the outcome of the assessment. Groundwater conceptual models are not always this simple.

Tier 4 is for more complex conceptual models where multiple sources, multiple pathways, multiple receptors and complex water balances can be assessed. The Tier 4 assessment is not supported by the RTM software.

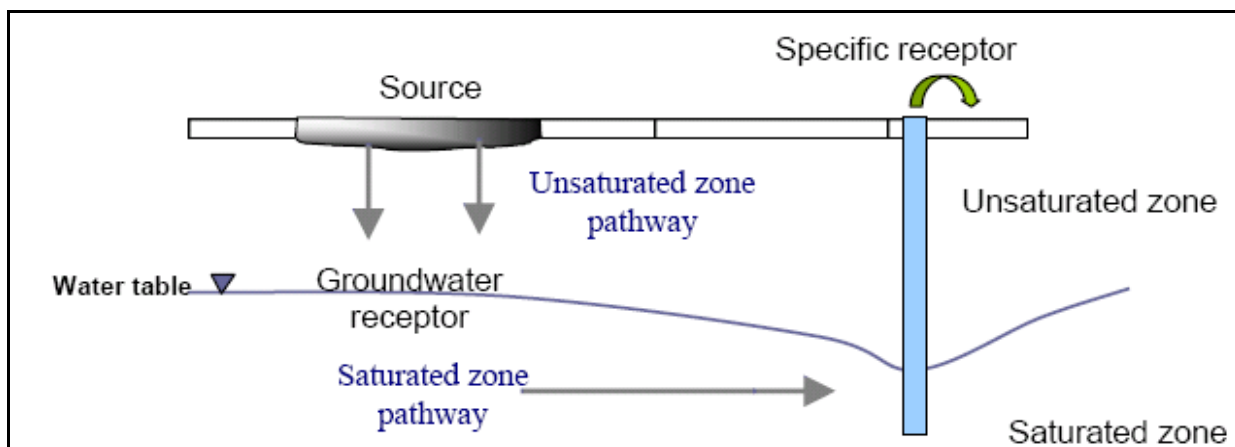
A slightly more advanced program, ConSim 2, developed on behalf of the Environment Agency, allows for the introduction of additional geological horizons and is used mainly to determine whether soil contaminants will reach their target within a specified timeframe. This model as inbuilt sensitivity, however, due to its greater complexity requires more time to run. The overall approach and basic calculations required within the Remedial Targets

Methodology framework are incorporated within ConSim 2. These models assess only the dissolved phase contaminants. There are many further models commercially available for use in controlled waters risk assessment, particularly for more complex situations, however, these should be used with caution and only once agreement has been obtained from the Environment Agency. All have the overall aim of the protection of controlled waters.

General notes on each stage of the controlled waters risk assessment process

Risk Screening

The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment. An example of a basic Source-Pathway-Receptor concept is given below (taken from the Environment Agency GP3, 2012):



Generic Risk Assessment

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

There is a hierarchy of screening criteria which is as follows:

- Updated Recommendations on Environmental Technical Standards, River Basin Management (2015-21), April 2012 by the UK Technical Advisory Group on the Water Framework Directive;
- Environmental Quality Standards (EQS) for freshwaters based on The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives);
- Surface Waters (Abstraction for Drinking Water)(Classification) Regulations (1996)
- Surface Waters (Fishlife) (Classification) Regulations (1997)
- UK Drinking Water Standards (DWS) (Water Supply (Water Quality) Regulations 2000);
- Dutch Ministry of Housing, Spatial Planning and Environment (2001) Intervention Values and Target Values – soil quality standards;
- World Health Organisation Guidelines for Drinking Water (2004)

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be dependent on the extent and implications of the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment, the remainder having been screened out.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or *compliance point*. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Definition of Controlled Waters

The term ‘controlled waters’ is defined in Section 104 of the Water Resources Act 1991 as:

“Territorial Waters...which extend seawards for three miles..., coastal waters..., inland freshwaters, waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata.”

Note that the definition of groundwater under the Water Resources Act 1991 includes all water within underground strata (including soil / pore water in the unsaturated zone). The definition of groundwater under the Groundwater Directive however is limited to water in the saturated zone. For the purposes of Part IIA of the Environmental Protection Act 1990, the Environment Agency recommends that the groundwater within the saturated zone only is considered as the receptor (rather than soil / pore water).

Environment Agency’s Aquifer Designations

The Environment Agency have classified different types of aquifer from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The maps are split into two different types of aquifer designation:

- **Superficial (Drift)** – permeable unconsolidated (loose) deposits.
- **Bedrock (Solid)**– solid permeable formations e.g. sandstone, chalk, limestone.

The aquifer designations displayed on the Environment Agency maps are as follows:

- **Principal Aquifers (formerly termed Major Aquifers)** – These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as a major aquifer.
- **Secondary Aquifers (formerly termed Minor Aquifers)** – These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:
 - **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
 - **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Unproductive Strata (formerly termed Non-Aquifer)** – These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

MANAGEMENT OF CONTAMINATED LAND

When risk assessment of the site has been completed and this indicates that remedial works are required, the main guidance in managing this process is set out in the DEFRA/EA publication CLR11 (2004) “Model Procedures for the Management of Land Contamination.” The stages of managing remediation are as follows:

- (a) Options Appraisal and develop Remediation Strategy;
- (b) Develop Implementation Plan and Verification Plan;

(c) Remediation, Verification and Monitoring.

The Remediation Strategy sets out the remediation targets, identifies technically feasible remedial solutions and presents an evaluation of the options so that these can be assessed enabling that the most suitable solution is adopted. An outline of the proposed remedial method should be presented. Agreement should be sought of the appropriate statutory bodies for the Remediation Strategy before proceeding to the next stage.

The Implementation Plan is a detailed method statement setting out how the remediation is to be carried out including stating how the site will be managed, welfare procedures, health and safety considerations together with practical measures such as details of temporary works, programme of works, waste management licences and regulatory consents required. Agreement should again be sought of the appropriate statutory bodies for this Plan.

The Verification Plan sets out the requirements for gathering data to demonstrate that the remediation has met the required remediation objectives and criteria. The Verification Plan presents the requirements for a wide range of issues including the level of supervision, sampling and testing regimes for treated materials, waste and imported materials, required monitoring works during and post remediation, how compliance with all licenses and consents will be checked etc. Agreement should again be sought of the appropriate statutory bodies for the Verification Plan. On completion of the remediation a Verification Report should be produced to provide a complete record of all remediation activities on site and the data collected as required in the Verification Plan. The Verification Report should demonstrate that the remediation has met the remedial targets to show that the site is suitable for the proposed use.

APPENDIX C

Environmental Database Information & Coal Authority Report



Terra Consult

Bold Business Centre, Bold Lane,
Bold Lane,
Sutton, WA9 4TX

Groundsure
Reference:

HMD-147-2166814

Your Reference: PO14287

Report Date 9 Jun 2015

Report Delivery Method: Email - pdf

Groundsure Enviroinsight

Address: WESTMINSTER ARMS, RUTHIN ROAD, WREXHAM, LL11 5UT

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviroinsight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

A handwritten signature in black ink, appearing to be "J. O.", followed by a comma.

Managing Director
Groundsure Limited

Enc.
Groundsure Enviroinsight



Groundsure Enviroinsight

Address: WESTMINSTER ARMS, RUTHIN ROAD, WREXHAM, LL11 5UT
Date: 9 Jun 2015
Reference: HMD-147-2166814
Client: Terra Consult

NW

N

NE

W

E



SW

S

SE

Aerial Photograph Capture date: 09-Jun-2013
Grid Reference: 326331,353568
Site Size: 0.04ha

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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
1.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
1.1.1 Records of historic IPC Authorisations	0	0	0	0
1.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
1.1.3 Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0
1.1.4 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0
1.1.5 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
1.1.6 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
1.1.7 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
1.1.8 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
1.1.9 Records of Licensed Discharge Consents	0	0	0	1
1.1.10 Records of Planning Hazardous Substance Consents and Enforcements	0	0	0	0
1.2 Records of COMAH and NIHHS sites	0	0	0	0
1.3 Environment Agency Recorded Pollution Incidents				
1.3.1 National Incidents Recording System, List 2	0	0	0	1
1.3.2 National Incidents Recording System, List 1	0	0	0	0
1.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 2: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-5000
2.1 Landfill Sites						
2.1.1 Environment Agency Registered Landfill Sites	0	0	0	0	0	Not searched
2.1.2 Environment Agency Historic Landfill Sites	0	0	0	0	0	0
2.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0

Section 2: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-5000
2.1.4 Landfills from Local Authority and Historical Mapping Records	0	0	0	0	0	0
2.2 Landfill and Other Waste Sites Findings						
2.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
2.2.2 Environment Agency Licensed Waste Sites	0	0	0	0	0	0

Section 3: Current Land Use	On-site	0-50m	51-250	251-500
3.1 Current Industrial Sites Data	0	1	0	Not searched
3.2 Records of Petrol and Fuel Sites	0	0	0	0
3.3 National Grid Underground Electricity Cables	0	0	0	0
3.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 4: Geology	
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None
4.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 5: Hydrogeology and Hydrology	0-500m					
5.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes					
5.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes					
	On-site	0-50m	51-250	251-500	501-1000	1000-2000
5.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	2
5.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	1
5.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
5.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
5.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	1	3	Not searched	Not searched
	On-site	0-50m	51-250	251-500	501-1000	1000-1500

Section 5: Hydrogeology and Hydrology

0-500m

5.9 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	No
5.10 Detailed River Network entries within 500m of the site	0	0	0	10	Not searched	Not searched
5.11 Surface water features within 250m of the study site	No	No	Yes	Not searched	Not searched	Not searched

Section 6: Flooding

6.1 What is the highest risk of flooding within 25m of the centre of the study site?	Very Low
6.2 Are there any Flood Defences within 250m of the study site?	No
6.3 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
6.4 Are there any areas used for Flood Storage within 250m of the study site?	No
6.5 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Not Prone
6.6 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Not Applicable

Section 7: Designated Environmentally Sensitive Sites

On-site 0-50m 51-250 251-500 501-1000 1000-2000

7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	3
7.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
7.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	3
7.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
7.5 Records of Ramsar sites	0	0	0	0	0	0
7.6 Records of Ancient Woodlands	0	0	0	5	18	55
7.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
7.8 Records of World Heritage Sites	0	0	0	0	0	0
7.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
7.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	1

Section 7: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
7.11 Records of National Parks	0	0	0	0	0	0
7.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
7.13 Records of Nitrate Vulnerable Zones	0	0	0	0	0	0
7.14 Records of Green Belt Data	0	0	0	0	0	0

Section 8: Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Very Low
8.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Negligible
8.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
8.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
8.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Negligible
8.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
8.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Negligible

Section 9: Mining

9.1 Are there any coal mining areas within 75m of the study site?	Yes
9.2 What is the potential for undermining as a result of underground mineral extraction, excluding coal and minerals extracted as a consequence of coal mining?	Highly Unlikely
9.3 Are there any brine affected areas within 75m of the study site?	No

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

5. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence.

9. Mining

Provides information on areas of coal, “non-coal” mining and brine affected areas.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

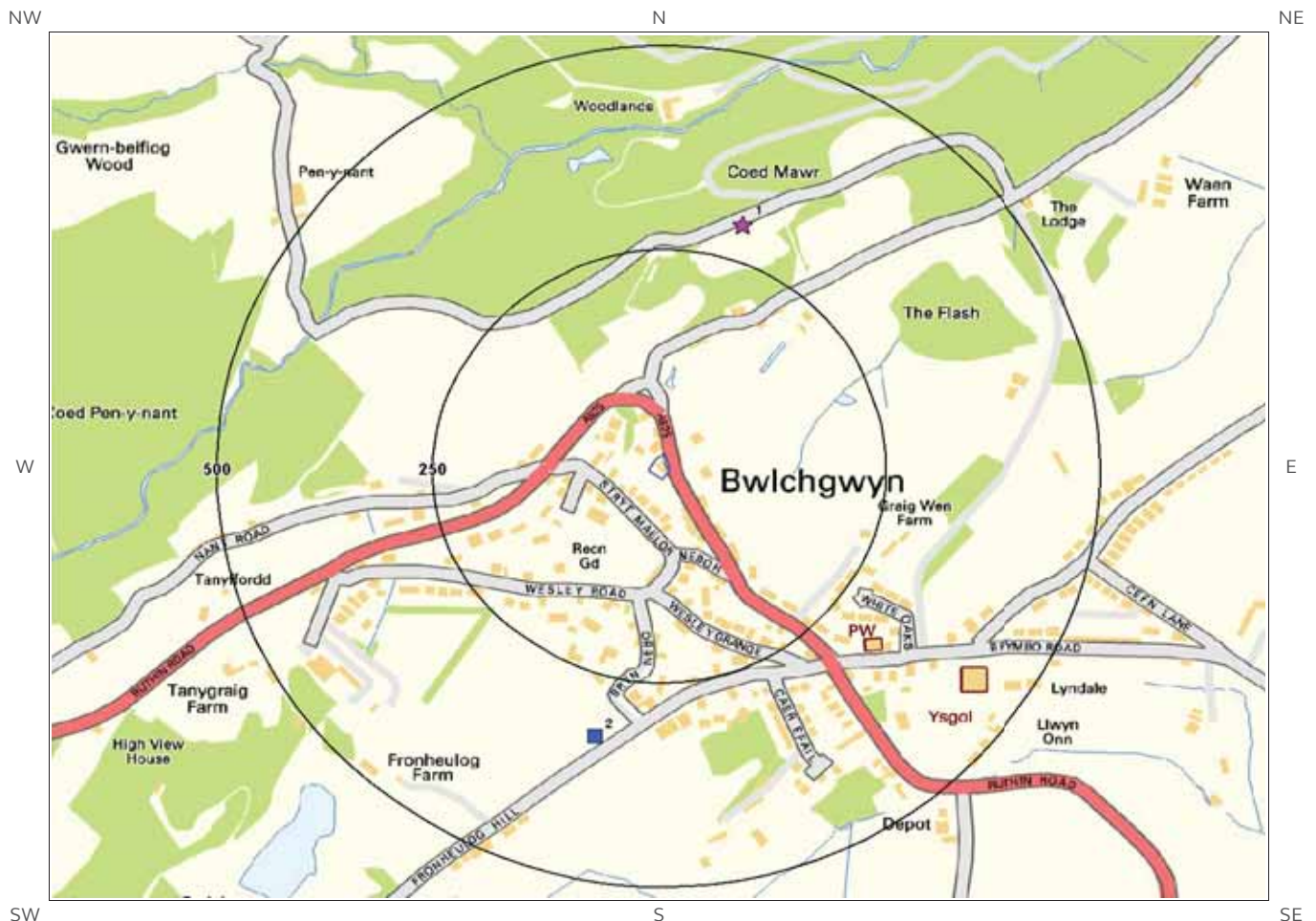
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Environmental Permits, Incidents and Registers Map



Environmental Permits,
Incidents and Registers Legend

Mapping
sourced from
Ordnance Survey

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- | | | |
|--------------------|-------------------------------|--|
| Site Outline | Recorded Pollution Incident | Radioactive Consents (Lower Risk) |
| Search Buffers (m) | Dangerous Substances (List 1) | Part A(1) Authorised Processes & Historic IPC Authorisations |
| 250 | Dangerous Substances (List 2) | Part A(2) and Part B Authorisations |
| 500 | Water Industry Referrals | Sites Determined as Contaminated Land |
| | Licensed Discharge Consents | COMAH / NIHHS Sites |
| | Red List Discharge Consents | Hazardous Substance Consents & Enforcements |

1. Environmental Permits, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

1.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

1.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

1.1.3 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

1.1.4 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

1.1.5 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

1.1.6 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

1.1.7 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

0

Database searched and no data found.

1.1.8 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

1.1.9 Records of Licensed Discharge Consents within 500m of the study site:

1

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details
2	325.0	S	326250 353240	Address: FRONHEULOG BWLCHGWYN WREXHAM, FRONHEULOG BWLCHGWYN WREXHAM, BWLCHGWYN WREXHAM, WREXHAM, UNKNOWN, UNKNOWN Effluent Type: UNSPECIFIED Permit Number: CM0146801 Permit Version: 1 Receiving Water: TO LAND Status: CONSENT EXPIRED - TIME LIMIT Issue date: 21/03/1986 Effective Date: 21-Mar-1986 Revocation Date: 11/11/1994

1.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

1.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

1

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details	
1	295.0	N	353867 326421	Incident Date: 10-Nov-2003 Incident Identification: 200671 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)

1.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

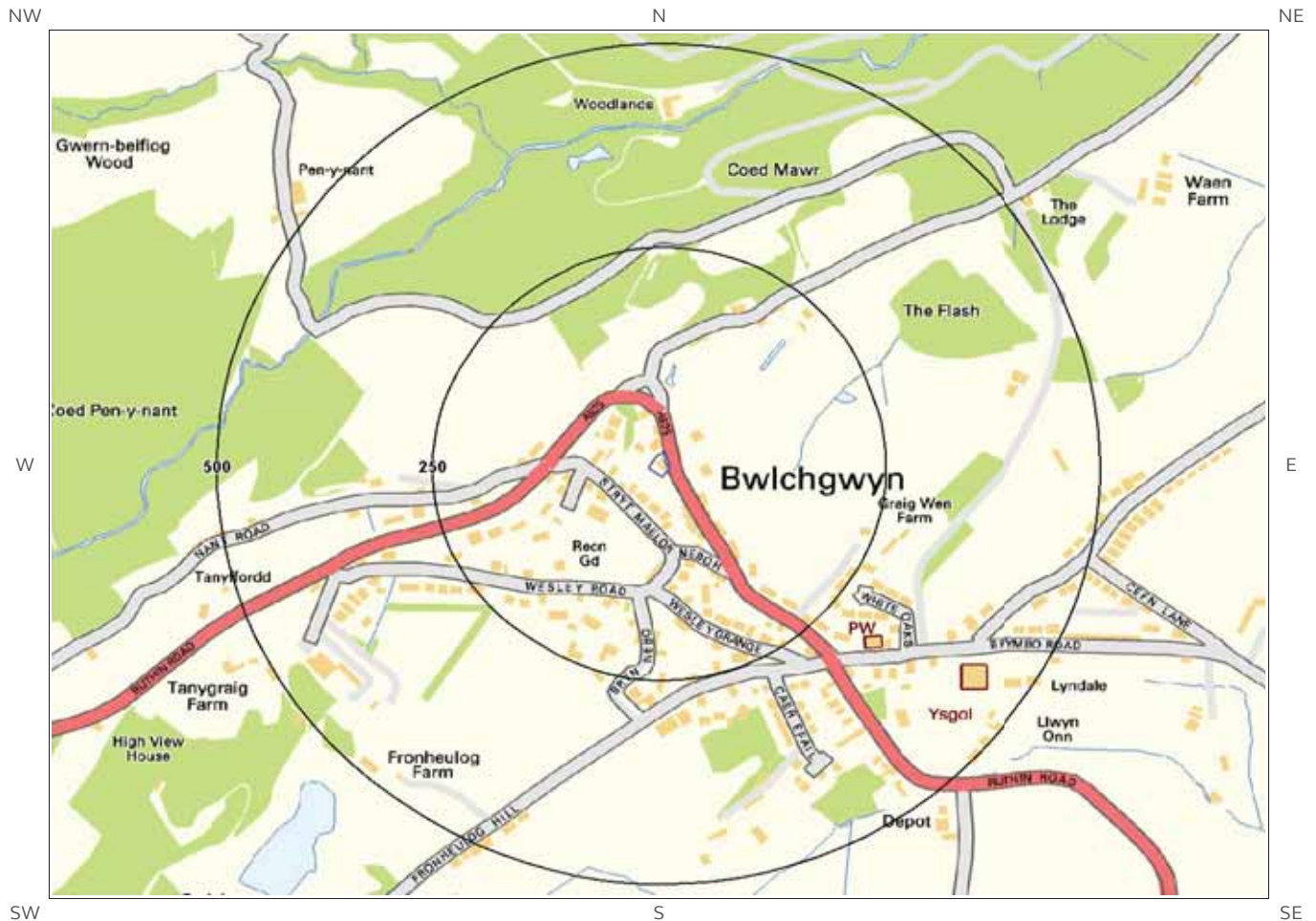
Database searched and no data found.

1.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

2. Landfill and Other Waste Sites Map

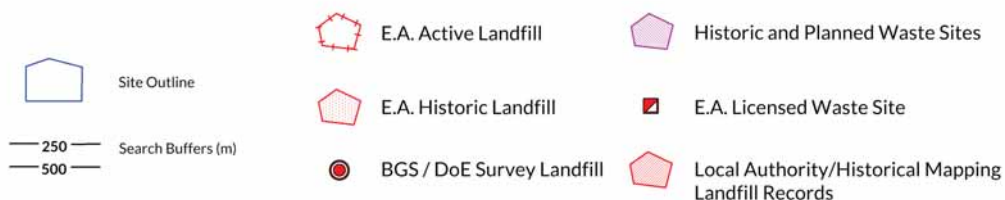


Landfill and Other Waste Sites
Legend

Mapping
sourced from

 **Ordnance
Survey**

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2. Landfill and Other Waste Sites

2.1 Landfill Sites

2.1.1 Records from Environment Agency landfill data within 1000m of the study site:

0

Database searched and no data found.

2.1.2 Records of Environment Agency historic landfill sites within 1500m of the study site:

0

Database searched and no data found.

2.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

2.1.4 Records of Landfills from Local Authority and Historical Mapping records within 1500m of the study site:

0

Database searched and no data found.

2.2 Other Waste Sites

2.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

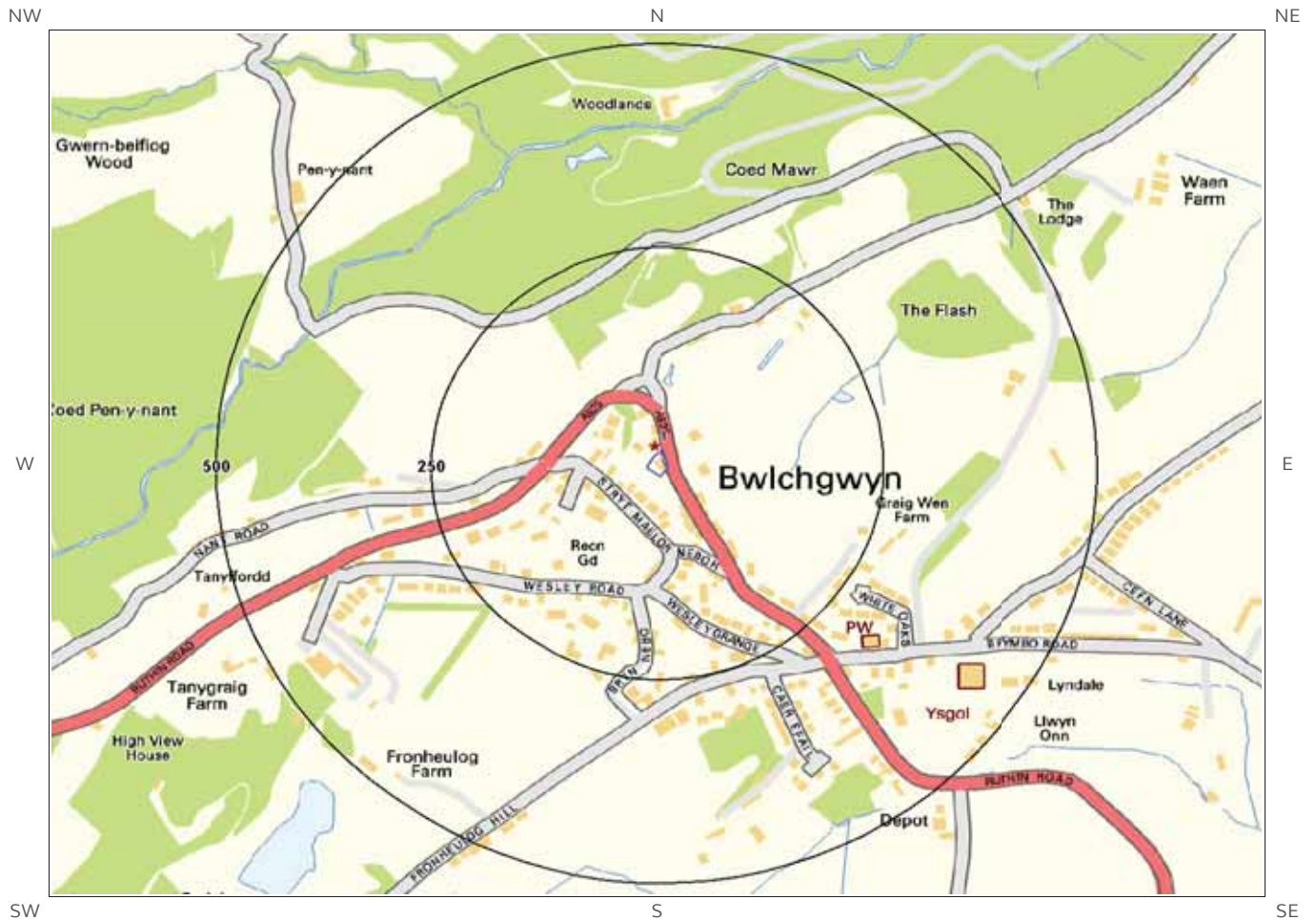
Database searched and no data found.

2.2.2 Records of Environment Agency licensed waste sites within 1500m of the study site:

0

Database searched and no data found.

3. Current Land Use Map



Current Land Use Legend



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3. Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 1

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	10.0	NW	Delfryn Garage	326321 353592	Delfryn 10, Ruthin Road, Bwlchgwyn, Wrexham, LL11 5UT	Vehicle Repair, Testing and Servicing	Repair and Servicing

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

3.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

3.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

4. Geology

4.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.2 Superficial Ground and Drift Geology

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.3 Bedrock and Solid Geology

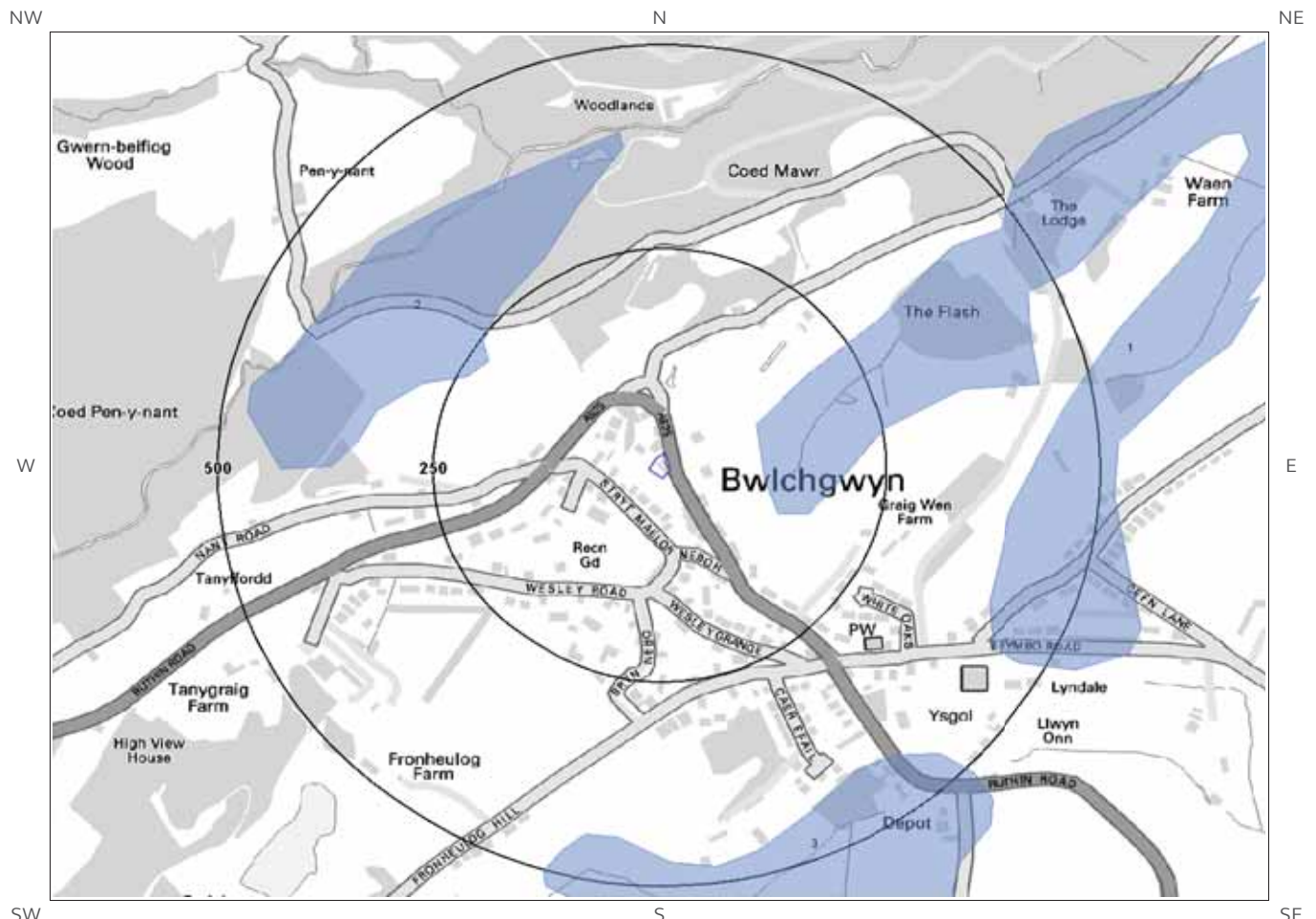
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
CFS-SDAR	CEFN-Y-FEDW SANDSTONE FORMATION	SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

5. Hydrogeology and Hydrology

5a. Aquifer Within Superficial Geology

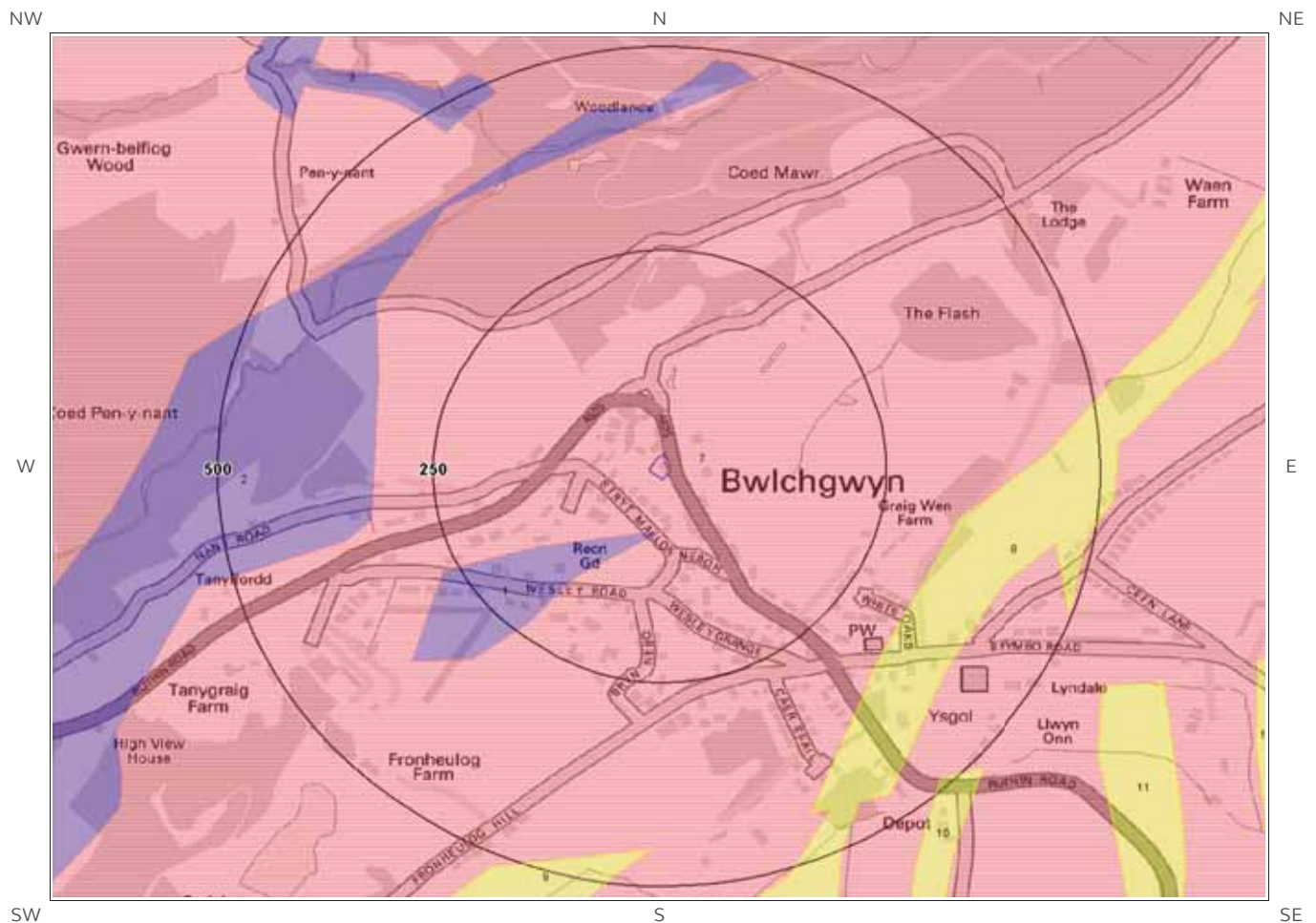


Aquifer Within Superficial Geology



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5b. Aquifer Within Bedrock Geology and Abstraction Licenses



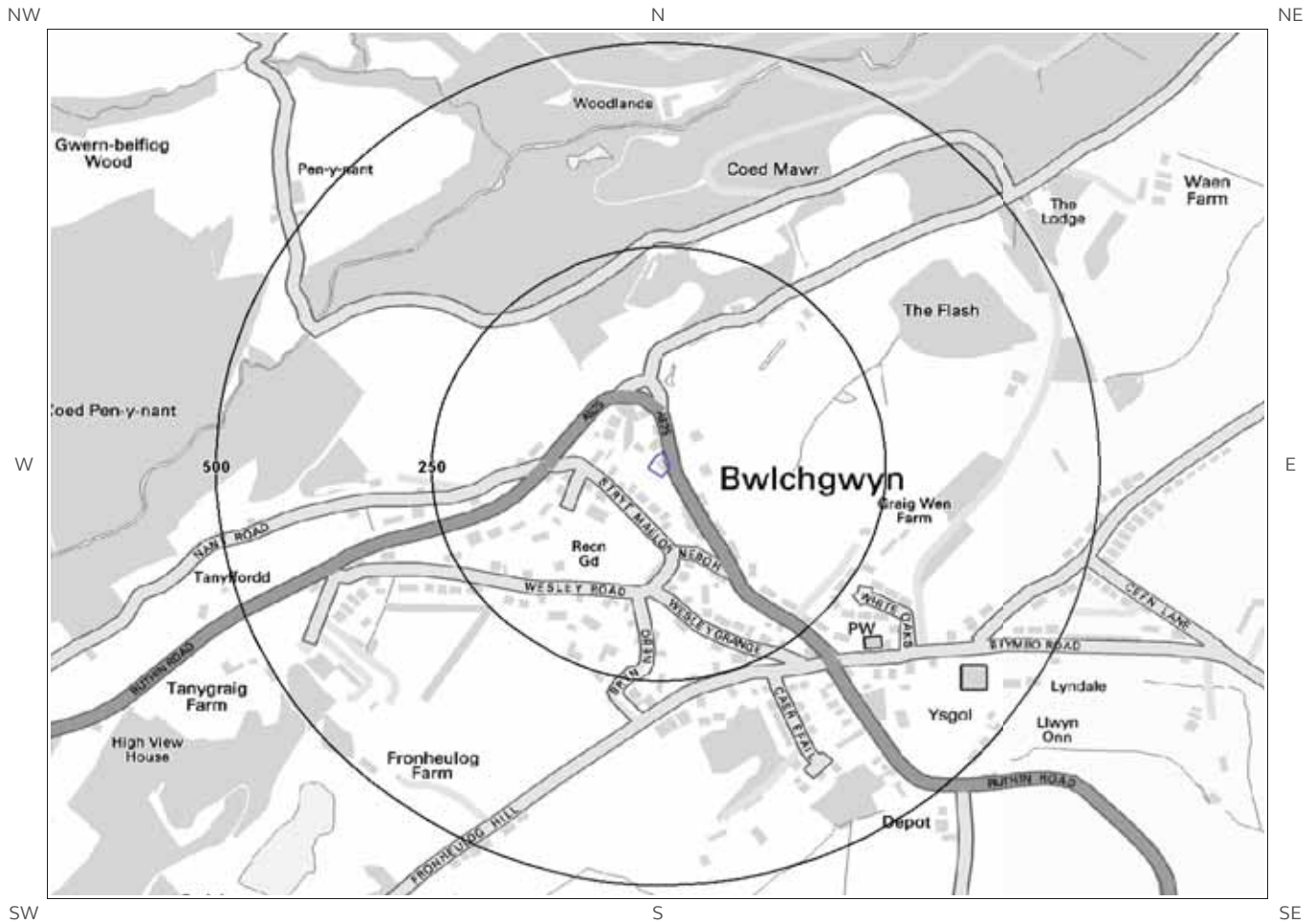
Aquifer Within Bedrock Geology and Abstraction Licenses



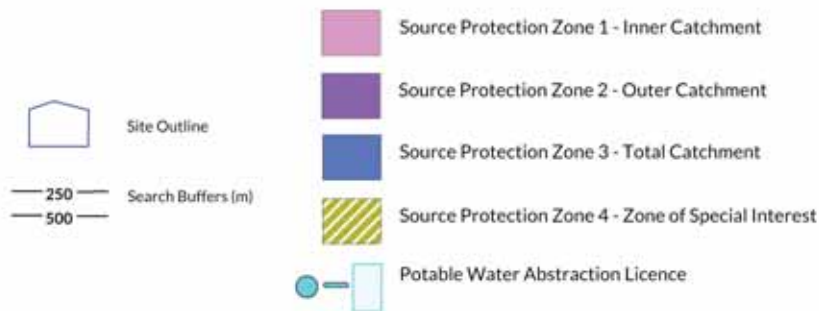
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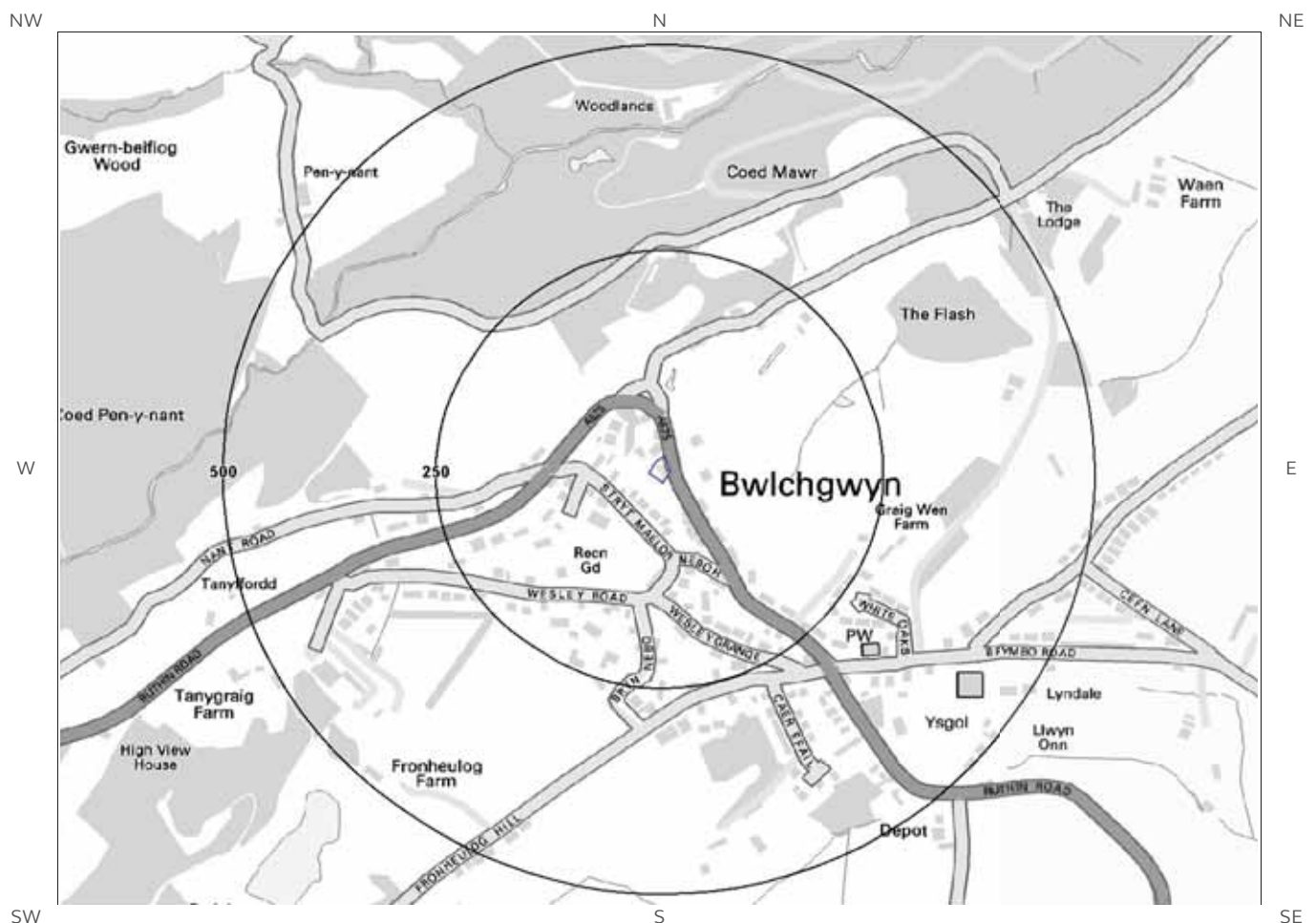
5c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses

Hydrogeology-Source Protection Zones and Potable
Water Abstraction LicensesMapping
sourced from

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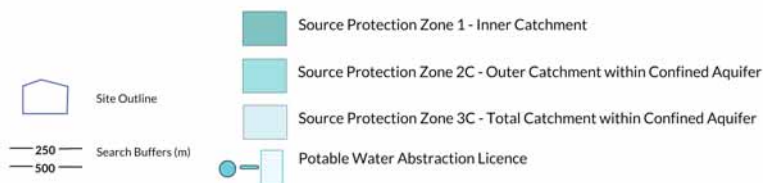
5d. Hydrogeology - Source Protection Zones within confined aquifer



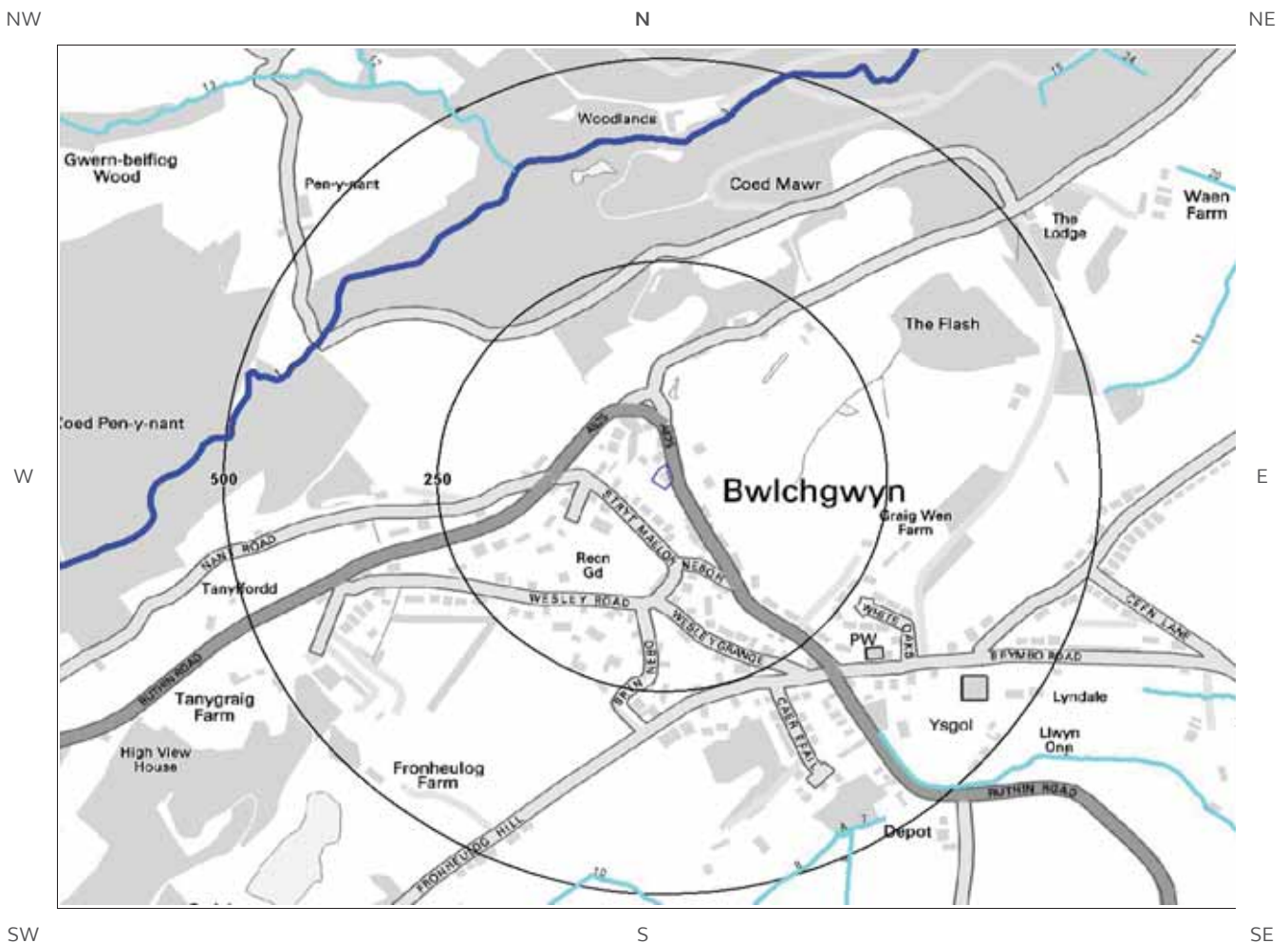
Hydrogeology Source Protection Zones



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5e. Hydrology – Detailed River Network and River Quality



Hydrology – Detailed River Network and River Quality



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- | | |
|---------------------------------------|-------------------------------------|
| Primary River | Canal |
| Secondary River | Canal Tunnel |
| Tertiary River | Culvert |
| Lake/Reservoir | Multiple Channel Culvert |
| Underground River (inferred) | Underground River (Potential Sewer) |
| General Quality Assessment: Biology | Underground River (local knowledge) |
| General Quality Assessment: Chemistry | |

5. Hydrogeology and Hydrology

5.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? **Yes**

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (5a):

ID	Distance (m)	Direction	Designation	Description
1	106.0	E	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
2	228.0	NW	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
3	421.0	SE	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

5.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? **Yes**

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (5b):

ID	Distance (m)	Direction	Designation	Description
7	0.0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
1	63.0	S	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	318.0	W	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
8	323.0	SE	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

ID	Distance (m)	Direction	Designation	Description
9	455.0	S	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
3	470.0	NW	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
10	488.0	SE	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

5.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? No

Database searched and no data found.

5.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? Yes

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (5b):

ID	Distance (m)	Direction	NGR	Name	Details
Not shown	1593.0	SW	325430 352240	Lafarge Aggregates Limited	Licence No: 24/67/7/0143 Details: Mineral Washing Direct Source: Eaw Surface Water Point: Stream Data Type: Point Annual Volume (m ³): 1363.8 Max Daily Volume (m ³): 22.73 Application No: - Original Start Date: 24/2/1967 Expiry Date: - Issue No: 102 Version Start Date: 1/4/2008 Version End Date:
Not shown	1936.0	W	324405 353230	Dee Valley Water Plc	Licence No: 24/67/8/0003 Details: Potable Water Supply - Direct Direct Source: Eaw Surface Water Point: Nantyffrith Reservoir Data Type: Point Annual Volume (m ³): 361084.23 Max Daily Volume (m ³): 1231.96 Application No: NPS/WR/002365 Original Start Date: 5/7/1966 Expiry Date: - Issue No: 101 Version Start Date: 2/9/2009 Version End Date:

5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site?

Yes

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (5c):

ID	Distance (m)	Direction	NGR	Name	Details
Not shown	1936.0	W	324405 353230	Dee Valley Water Plc	Licence No: 24/67/8/0003 Details: Potable Water Supply - Direct Direct Source: Eaw Surface Water Point: Nantffrith Reservoir Data Type: Point Annual Volume (m ³): 361084.23 Max Daily Volume (m ³): 1231.96 Original Application No: NPS/WR/002365 Original Start Date: 5/7/1966 Expiry Date: - Issue No: 101 Version Start Date: Version End Date:

5.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site?

No

Database searched and no data found.

5.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site?

No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

5.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency information on groundwater vulnerability and soil leaching potential within 500m of the study site?

Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Minor Aquifer/Low Leaching Potential	L	Soils in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants.
72	NW	Minor Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.
298	W	Major Aquifer/Low Leaching Potential	L	Soils in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants.
337	W	Major Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.
444	NW	Minor Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.

5.9 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site?

No

5.9.1 Biological Quality:

Database searched and no data found.

5.9.2 Chemical Quality:

Database searched and no data found.

5.10 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site?

Yes

The following Detailed River Network records are represented on the Hydrology Map (5e):

ID	Distance (m)	Direction	Details
1	378.0	NW	River Name: Nant y Ffrith Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined
2	389.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
3	396.0	N	River Name: Nant y Ffrith Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined
4	403.0	NW	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
5A	468.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
6A	473.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
7	473.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
8	473.0	SE	River Name: Drain Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
9	476.0	SE	River Name: Drain Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
10	484.0	S	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined

5.11 Surface Water Features

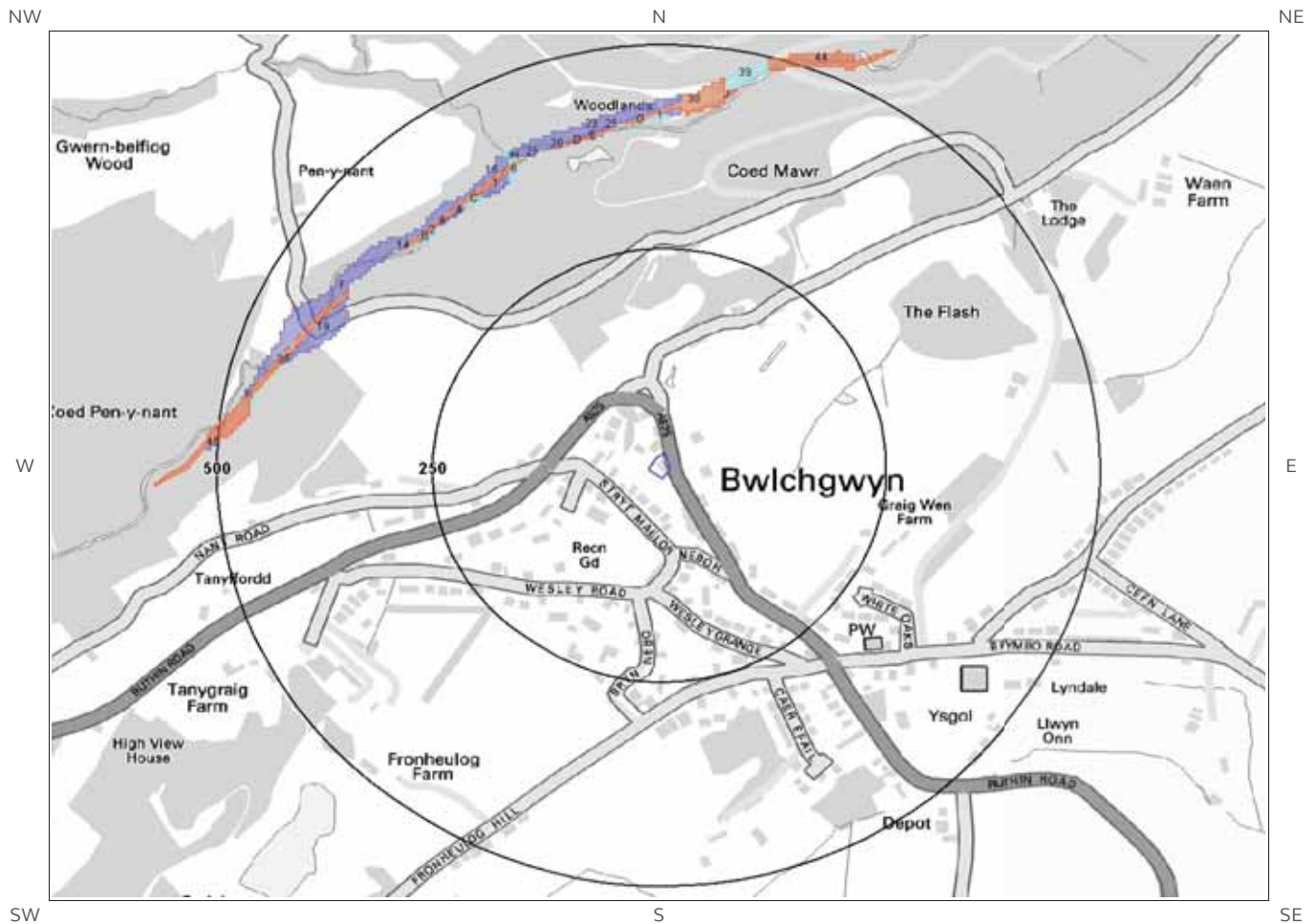
Are there any surface water features within 250m of the study site?

Yes

The following surface water records are not represented on mapping:

Distance (m)	Direction
126.0	E
220.0	E

6. Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Map

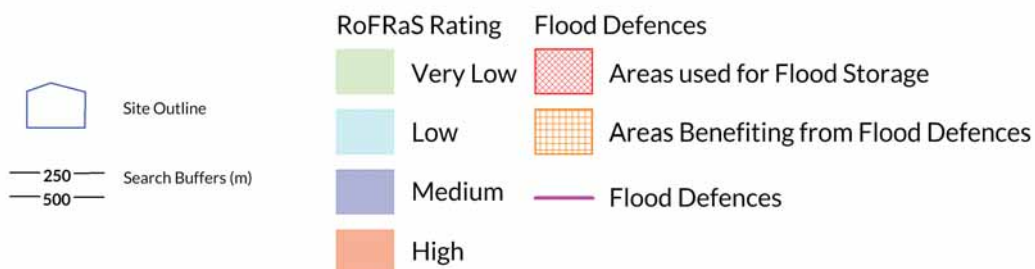


Environment Agency Risk of Flooding
From Rivers and the Sea (RoFRaS)

Mapping
sourced from

Ordnance
Survey

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6. Flooding

6.1 Risk of Flooding from Rivers and the Sea (RoFRaS)

What is the risk of flooding at the centre of the study site? Very Low

What is the highest risk of flooding within 25m of the centre of the study site? Very Low

The Environment Agency RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid as used by many of the insurance companies. RoFRaS data is based on a 50m grid system, with the flood rating at the centre of the grid calculated and given below. The data considers the probability that the flood defences will overtop or breach, and the distance from the river or the sea.

RoFRaS data for the study site indicates the property has a Very Low (less than 1 in 1000) chance of flooding in any given year.

6.2 Flood Defences

Are there any Flood Defences within 250m of the study site? No

Database searched and no data found.

6.3 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

6.4 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

6.5 Groundwater Flooding Susceptibility Areas

6.5.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site?

No

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

6.5.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Not Prone

The area is not considered to be prone to groundwater flooding based on rock type.

6.6 Groundwater Flooding Confidence Areas

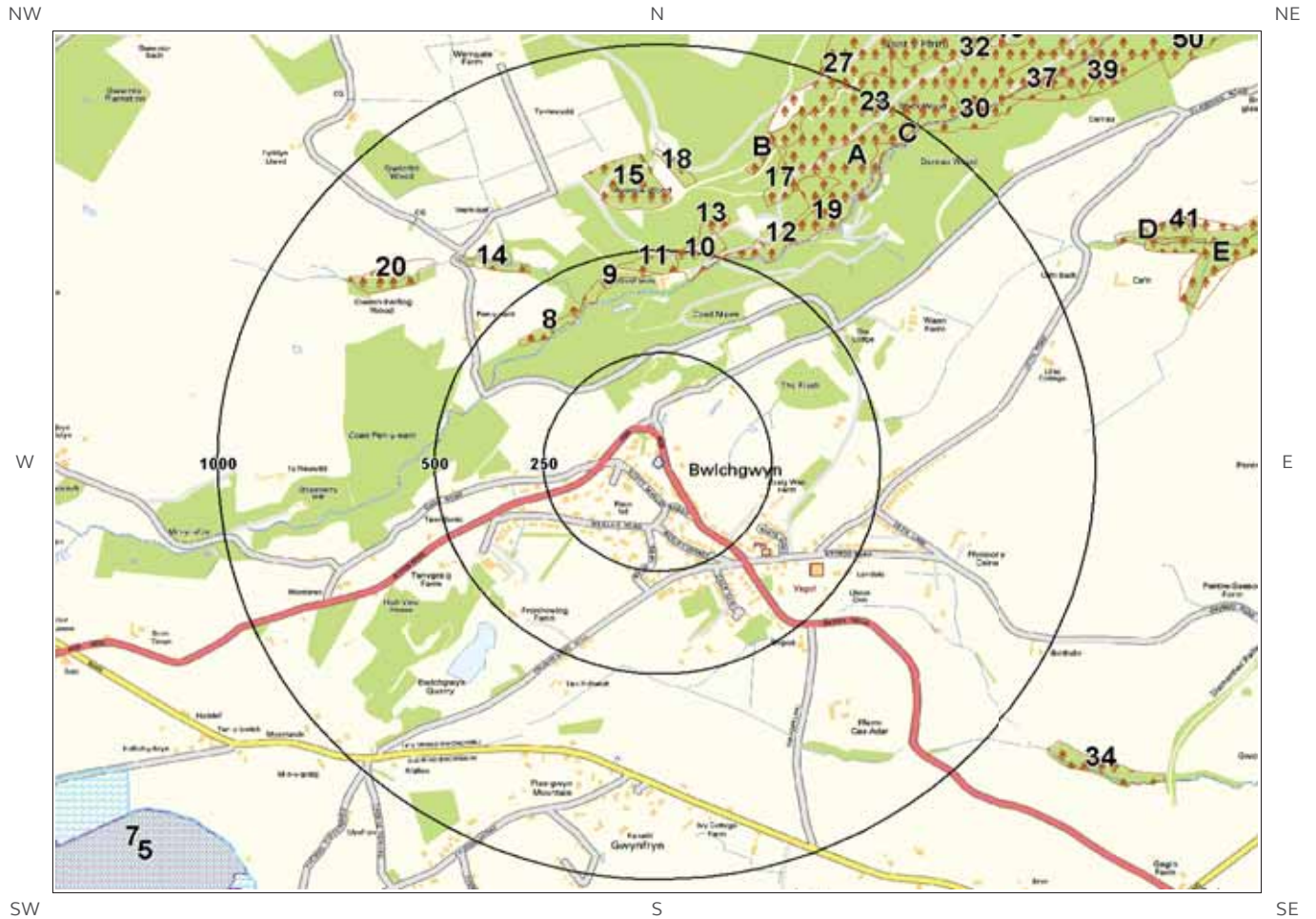
What is the British Geological Survey confidence rating in this result?

Not Applicable

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

7. Designated Environmentally Sensitive Sites Map



Designated Environmentally Sensitive Sites Map



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7. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? Yes

7.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

3

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
Not shown	1303.0	S	RUABON/LLANTYSILIO MOUNTAINS AND MINERA	Natural Resources Wales
5	1344.0	SW	RUABON/LLANTYSILIO MOUNTAINS AND MINERA	Natural Resources Wales
Not shown	1573.0	S	RUABON/LLANTYSILIO MOUNTAINS AND MINERA	Natural Resources Wales

7.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

7.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

3

The following Special Area of Conservation (SAC) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SAC Name	Data Source
Not shown	1303.0	S	Berwyn a Mynyddoedd De Clwyd / Berwyn and South Clwyd Mountains	Natural Resources Wales
Not shown	1712.0	SW	Berwyn a Mynyddoedd De Clwyd / Berwyn and South Clwyd Mountains	Natural Resources Wales
Not shown	1963.0	S	Berwyn a Mynyddoedd De Clwyd / Berwyn and South Clwyd Mountains	Natural Resources Wales

7.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

7.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

7.6 Records of Ancient Woodland within 2000m of the study site:

78

The following records of Designated Ancient Woodland provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
8	380.0	NW	Unknown	Ancient Replanted Woodland
9	393.0	NW	Unknown	Ancient Replanted Woodland
10	428.0	N	Unknown	Restored Ancient Woodland Site
11	443.0	N	Unknown	Ancient Replanted Woodland
12	499.0	N	Unknown	Restored Ancient Woodland Site
13	513.0	N	Unknown	Ancient Replanted Woodland
14	538.0	NW	Unknown	Ancient and Semi-Natural Woodland
15	602.0	N	Unknown	Ancient Replanted Woodland
16A	640.0	NE	Unknown	Ancient and Semi-Natural Woodland
17	653.0	N	Unknown	Restored Ancient Woodland Site
18	656.0	N	Unknown	Ancient Replanted Woodland
19	666.0	NE	Unknown	Restored Ancient Woodland Site
20	696.0	NW	Unknown	Ancient and Semi-Natural Woodland
21A	696.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
22B	715.0	N	Unknown	Ancient Replanted Woodland
23	727.0	NE	Unknown	Restored Ancient Woodland Site
24A	776.0	NE	Unknown	Ancient Replanted Woodland
25B	777.0	N	BLACK/NANT WOODS	Ancient Replanted Woodland
26B	799.0	N	Unknown	Ancient Replanted Woodland
27	825.0	N	BLACK/NANT WOODS	Ancient Replanted Woodland
28A	846.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
29C	952.0	NE	Unknown	Ancient Replanted Woodland
30	997.0	NE	Unknown	Ancient Replanted Woodland
31C	1011.0	NE	Unknown	Ancient Replanted Woodland
32	1084.0	NE	Unknown	Ancient Replanted Woodland
33	1121.0	NE	Unknown	Restored Ancient Woodland Site
34	1127.0	SE	Unknown	Restored Ancient Woodland Site
35	1166.0	NE	Unknown	Other Ancient Woodland
36D	1175.0	NE	Unknown	Ancient and Semi-Natural Woodland
37	1186.0	NE	Unknown	Ancient Replanted Woodland
38F	1189.0	NE	Unknown	Ancient and Semi-Natural Woodland
39	1211.0	NE	COED CELYN	Ancient and Semi-Natural Woodland
40D	1227.0	NE	Unknown	Ancient Replanted Woodland
41	1240.0	NE	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1241.0	NE	Unknown	Restored Ancient Woodland Site
43	1253.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
44	1255.0	E	Unknown	Ancient Replanted Woodland
45E	1264.0	E	Unknown	Ancient Replanted Woodland
46E	1294.0	NE	Unknown	Ancient and Semi-Natural Woodland
47F	1352.0	NE	Unknown	Restored Ancient Woodland Site
Not shown	1472.0	NE	Unknown	Ancient and Semi-Natural Woodland
Not shown	1477.0	E	Unknown	Ancient Replanted Woodland
50	1491.0	NE	Unknown	Restored Ancient Woodland Site
Not shown	1540.0	E	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1565.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
Not shown	1582.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
Not shown	1587.0	S	Unknown	Ancient and Semi-Natural Woodland
Not shown	1660.0	NW	Unknown	Ancient and Semi-Natural Woodland
Not shown	1663.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
Not shown	1669.0	NE	Unknown	Ancient Replanted Woodland
Not shown	1675.0	NE	COED CELYN	Ancient and Semi-Natural Woodland
Not shown	1676.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
Not shown	1680.0	E	Unknown	Restored Ancient Woodland Site
Not shown	1683.0	E	Unknown	Restored Ancient Woodland Site
Not shown	1684.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1692.0	E	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1694.0	E	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1706.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1720.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1749.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
Not shown	1754.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1767.0	E	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1770.0	E	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1807.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1820.0	E	GLASCOED	Ancient and Semi-Natural Woodland
Not shown	1823.0	SW	Unknown	Ancient and Semi-Natural Woodland
Not shown	1832.0	NE	Unknown	Ancient Replanted Woodland
Not shown	1832.0	NE	Unknown	Other Ancient Woodland
Not shown	1851.0	NW	Unknown	Restored Ancient Woodland Site
Not shown	1879.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1897.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
Not shown	1897.0	NE	Unknown	Restored Ancient Woodland Site
Not shown	1898.0	SW	Unknown	Ancient and Semi-Natural Woodland
Not shown	1917.0	E	Unknown	Ancient and Semi-Natural Woodland
Not shown	1954.0	NE	Unknown	Other Ancient Woodland

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
Not shown	1973.0	NE	BLACK/NANT WOODS	Ancient Replanted Woodland
Not shown	1993.0	NE	Unknown	Ancient and Semi-Natural Woodland
Not shown	1999.0	E	GLASCOED	Ancient and Semi-Natural Woodland

7.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

7.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

7.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

7.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

1

The following Area of Outstanding Natural Beauty (AONB) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	AONB/NSA Name	Data Source
7	1278.0	S	Clwyidan Range	Natural Resources Wales

7.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

7.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

7.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

0

Database searched and no data found.

7.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

8. Natural Hazards Findings

8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure GeoInsight, available from our website. The following information has been found:

8.1.1 Shrink Swell

What is the maximum Shrink-Swell** hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard

Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

8.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard

Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

* This indicates an automatically generated 50m buffer and site.

8.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard

Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

8.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard

No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard

Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

8.1.6 Running Sand

What is the maximum Running Sand** hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

* This indicates an automatically generated 50m buffer and site.

9. Mining

9.1 Coal Mining

Are there any coal mining areas within 75m of the study site?

Yes

The following coal mining information provided by the Coal Authority is not represented on Mapping:

Distance	Direction	Details
0.0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

9.2 BGS Non Coal Mining Hazards

What is the potential for undermining as a result of underground mineral extraction, excluding coal and minerals extracted as a consequence of coal mining?

Highly Unlikely

The following non-coal mining information is provided by the BGS:

Distance	Direction	Name	Commodity	Assessment of likelihood
0	On Site	Not available	Vein Mineral	Rare and localised small scale mining may have occurred.

9.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site?

No

Guidance: No Guidance Required.

Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com



British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries



Environment Agency

National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 08708 506 506
Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk



Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email: enquiries@phe.gov.uk
Main switchboard: 020 7654 8000



The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk



Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505



Local Authority

Authority: Wreccsam - Wrexham County Borough Council
Phone: 01978 292 000
Web: <http://www.wrexham.gov.uk/>
Address: The Guildhall, Wrexham, Wrexham, LL11 1AY

Gemapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444



Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England who retain the Copyright and Intellectual Property Rights for the data.

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This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

1 Definitions

In these terms and conditions unless the context otherwise requires:

“Beneficiary” means the person or entity for whose benefit the Client has obtained the Services.

“Client” means the party or parties entering into a Contract with Groundsure.

“Commercial” means any building or property which is not Residential.

“Confidential Information” means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

“Support Services” means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

“Contract” means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

“Third Party Data Provider” means any third party providing Third Party Content to Groundsure.

“Data Reports” means reports comprising factual data with no accompanying interpretation.

“Fees” has the meaning set out in clause 5.1.

“Groundsure” means Groundsure Limited, a company registered in England and Wales under number 03421028.

“Groundsure Materials” means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

“Intellectual Property” means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

“Mapping” means a map, map data or a combination of historical maps of various ages, time periods and scales.

“Order” means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.

“Ordnance Survey” means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

“Order Website” means the online platform through which Orders may be placed by the Client and accepted by Groundsure.

“Report” means a Risk Screening Report or Data Report for Commercial or Residential property.

“Residential” means any building or property used as or intended to be used as a single dwelling.

“Risk Screening Report” means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.

“Services” means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.

“Site” means the area of land in respect of which the Client has requested Groundsure to provide the Services.

“Third Party Content” means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.

“User Guide” means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.

2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client’s order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client’s obligations

3.1 The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1 The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.

4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;

- (i) the Beneficiary,
- (ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),
- (iv) the first purchaser or first tenant of the Site, and
- (v) the professional advisers and lenders of the first purchaser or tenant of the Site.

4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1 Groundsure shall charge and the Client shall pay fees at the rate and

frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").

5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.

5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to

- (i) full payment of all relevant Fees and
- (ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.

6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.

6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

- (i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;
- (ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;
- (iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);
- (iv) not combine the Services with or incorporate such Services into any other information data or service;
- (v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);
- (vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and
- (vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.

6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

- (i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or

subcontractors;

- (ii) any use made of the Reports, Services, Materials or any part of them; and
- (iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.

7.4 Groundsure shall not be liable for

- (i) loss of profits;
- (ii) loss of business;
- (iii) depletion of goodwill and/or similar losses;
- (iv) loss of anticipated savings;
- (v) loss of goods;
- (vi) loss of contract;
- (vii) loss of use;
- (viii) loss or corruption of data or information;
- (ix) business interruption;
- (x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;
- (xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;
- (xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;
- (xiii) loss or damage to a computer, software, modem, telephone or other property; and
- (xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.

7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.

8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

- (i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or
- (ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or
- (iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or
- (iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.

9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

- (a) supplied to the Client's specification(s) and in any event
- (b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.

12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.

12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.

12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.

12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.

12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

- (i) the Client or Beneficiary's failure to provide facilities, access or information;
- (ii) fire, storm, flood, tempest or epidemic;
- (iii) Acts of God or the public enemy;
- (iv) riot, civil commotion or war;
- (v) strikes, labour disputes or industrial action;
- (vi) acts or regulations of any governmental or other agency;
- (vii) suspension or delay of services at public registries by Third Party Data Providers;
- (viii) changes in law; or
- (ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner.

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law.

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Terra Consult

Bold Business Centre, Bold Lane,
Bold Lane,
Sutton, WA9 4TX

Groundsure Reference: HMD-147-2166816

Your Reference: PO14287

Report Date 9 Jun 2015

Report Delivery Method: Email - pdf

Groundsure Geoinsight

Address: WESTMINSTER ARMS, RUTHIN ROAD, WREXHAM, LL11 5UT

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geoinsight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

Managing Director
Groundsure Limited

Enc.
Groundsure Geoinsight



Groundsure Geoinsight

Address: WESTMINSTER ARMS, RUTHIN ROAD, WREXHAM, LL11 5UT
Date: 9 Jun 2015
Reference: HMD-147-2166816
Client: Terra Consult



Aerial Photograph Capture date: 09-Jun-2013
Grid Reference: 326331,353568
Site Size: 0.04ha

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Overview of Findings

The Groundsure Geosight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1:Geology

1.1 Artificial Ground	1.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?	No
	1.2.2 Are there any records relating to permeability of superficial geology within the study site boundary?	No
	1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	1.2.4 Are there any records relating to permeability of landslips within the study site boundary?	No
1.3 Bedrock, Solid Geology & Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records relating to permeability of bedrock within the study site boundary?	Yes
	1.3.3 Are there any records of faults within 500m of the study site boundary?	Yes
1.4 Radon data	1.4.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level
	1.4.2 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	Full radon protective measures are necessary

Section 2:Ground Workings	On-site	0-50m	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	0	4	20	Not Searched	Not Searched
2.2 Historical Underground Workings from Small Scale Mapping	0	0	7	5	3
2.3 Current Ground Workings	0	1	19	18	16

Section 3: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
3.1 Historical Mining	0	0	7	5	3
3.2 Coal Mining	1	0	0	0	0
3.3 Johnson Poole and Bloomer Mining Area	1	0	0	2	6
3.4 Non-Coal Mining	1	0	0	2	5
3.5 Non-Coal Mining Cavities	0	0	0	1	1
3.6 Natural Cavities	0	0	0	1	0
3.7 Brine Extraction	0	0	0	0	0
3.8 Gypsum Extraction	0	0	0	0	0
3.9 Tin Mining	0	0	0	0	0
3.10 Clay Mining	0	0	0	0	0

Section 4: Natural Ground Subsidence	On-site
4.1 Shrink Swell Clay	Negligible
4.2 Landslides	Very Low
4.3 Ground Dissolution of Soluble Rocks	Negligible
4.4 Compressible Deposits	Negligible
4.5 Collapsible Deposits	Very Low
4.6 Running Sand	Negligible

Section 5: Borehole Records	On-site	0-50m	51-250
5 BGS Recorded Boreholes	0	0	10

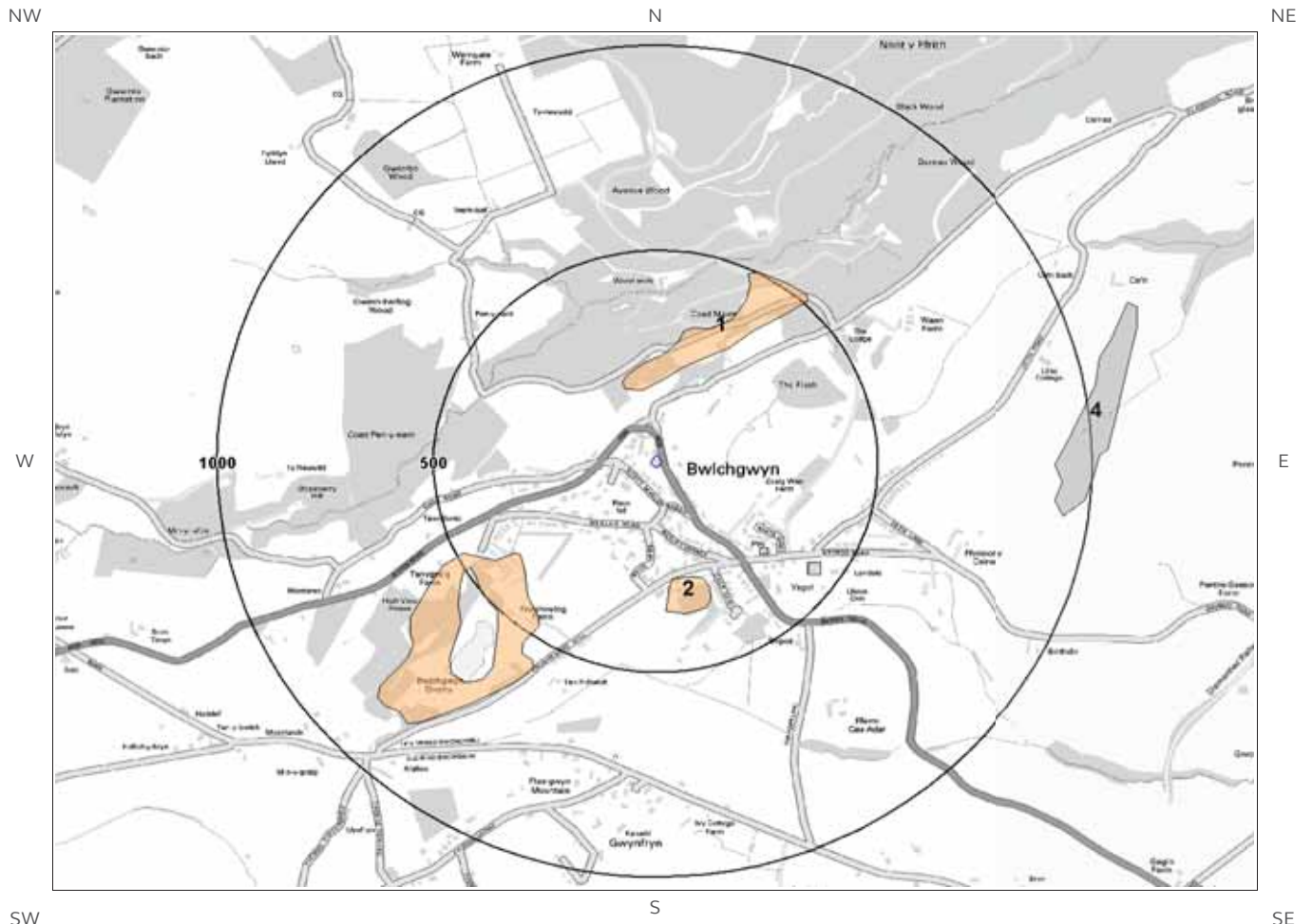
Section 6: Estimated Background Soil Chemistry	On-site	0-50m	51-250
6 Records of Background Soil Chemistry	1	0	15

Section 7: Railways and Tunnels	On-site	0-50m	51-250	251-500
7.1 Tunnels	0	0	0	Not Searched
7.2 Historical Railway and Tunnel Features	0	0	0	Not Searched
7.3 Historical Railways	0	0	0	Not Searched
7.4 Active Railways	0	0	0	Not Searched

Section 7:Railways and Tunnels	On-site	0-50m	51-250	251-500
7.5 Railway Projects	0	0	0	0

1 Geology

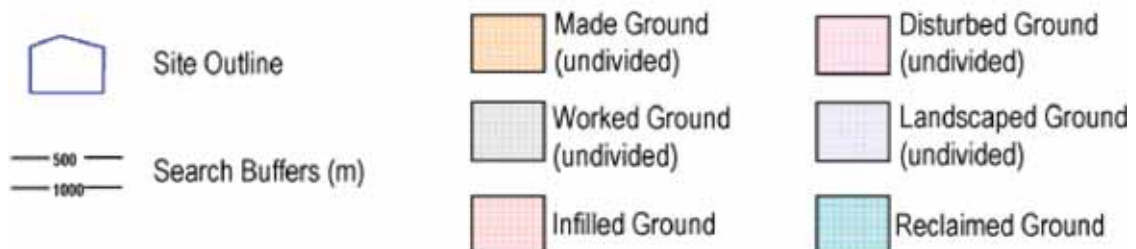
1.1 Artificial Ground Map



Artificial Ground Legend

Mapping sourced from 

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1 Geology

1.1 Artificial Ground

1.1.1 Artificial/ Made Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:121

Are there any records of Artificial/Made Ground within 500m of the study site boundary? Yes

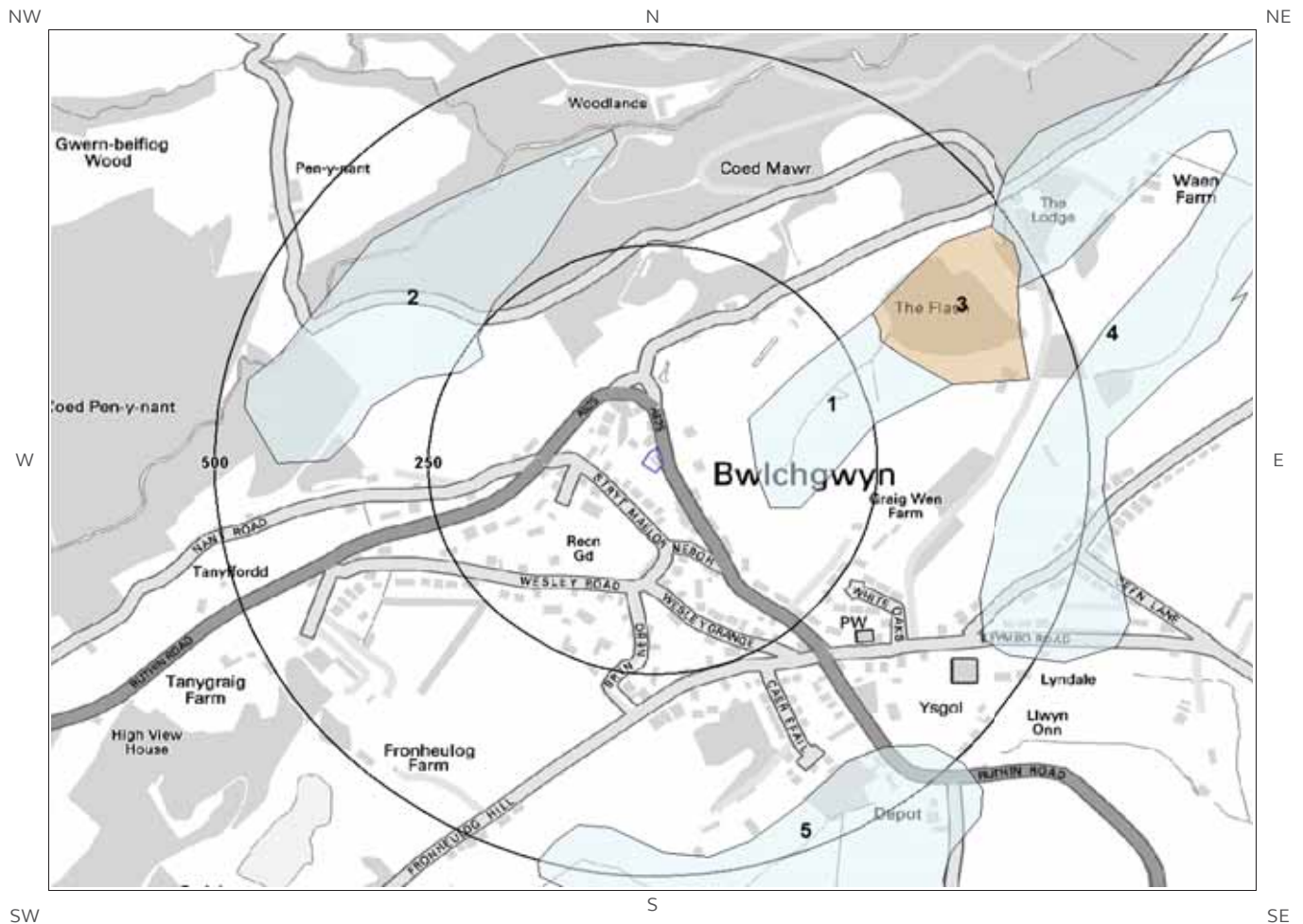
ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	162.0	N	MGR-MGRD	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	274.0	S	MGR-MGRD	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
3	374.0	SW	MGR-MGRD	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

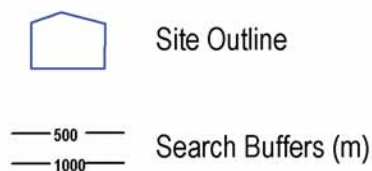
1.2 Superficial Deposits and Landslips Map



Superficial Deposits and Landslips Legend



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1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	106.0	E	TILLD	TILL, DEVENSIAN	DIAMICTON
2	228.0	NW	TILLD	TILL, DEVENSIAN	DIAMICTON
3	292.0	NE	PEAT	PEAT	PEAT [UNLITHIFIED DEPOSITS CODING SCHEME]
4	397.0	E	TILLD	TILL, DEVENSIAN	DIAMICTON
5	421.0	SE	TILLD	TILL, DEVENSIAN	DIAMICTON

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? No

Database searched and no data found.

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

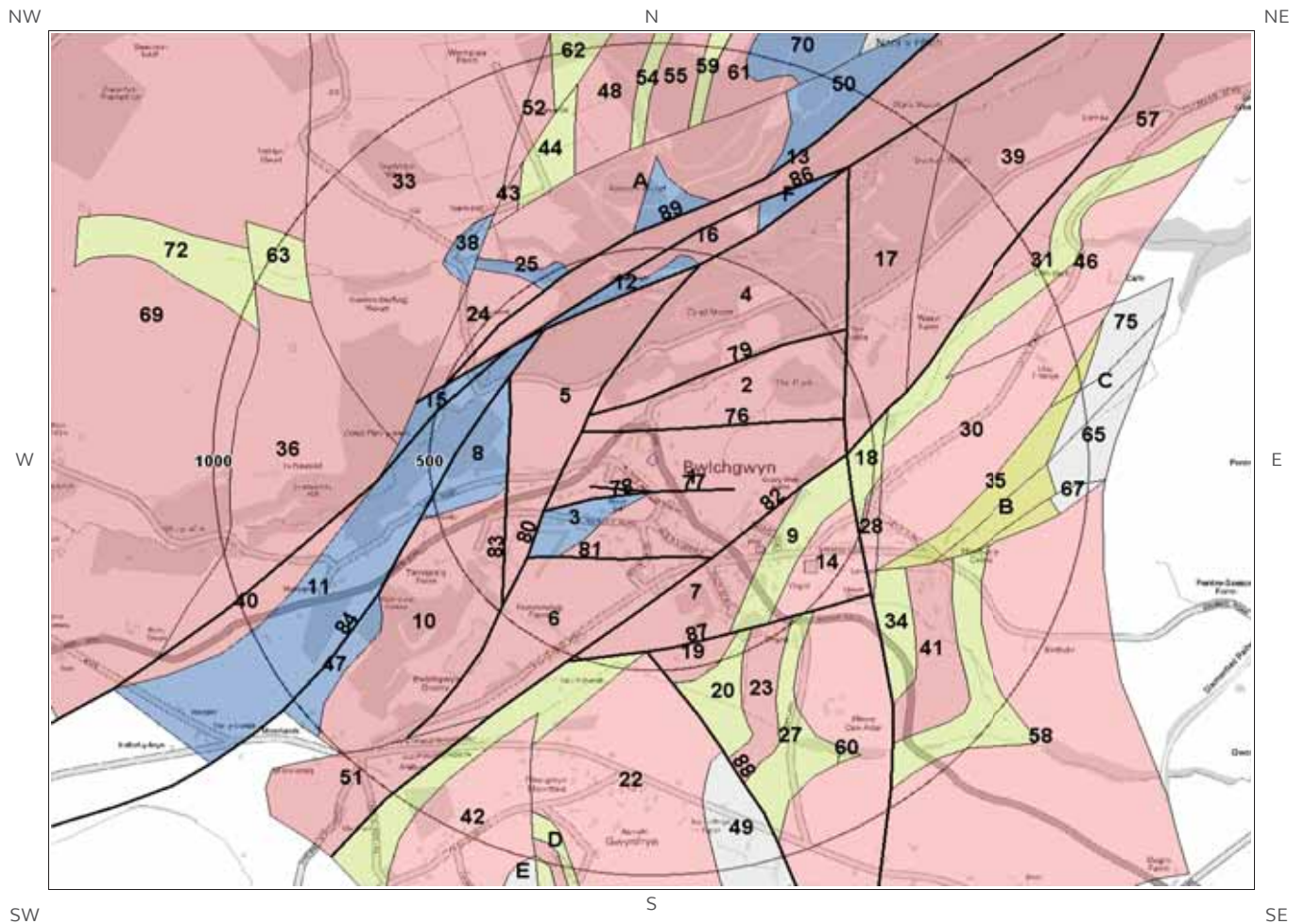
1.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site** boundary? No

Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site

1.3 Bedrock and Faults Map



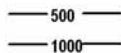
Bedrock and Faults Legend



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Site Outline



Search Buffers (m)

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:121

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/ Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
2	56.0	N	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
3	63.0	S	MRF-LMSA	Minera Formation - Limestone And [subequal/subordinate] Sandstone, Interbedded	Brigantian
4	130.0	N	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
5	165.0	NW	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
6	225.0	S	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
7	259.0	SE	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
8	318.0	W	MRF-LMSA	Minera Formation - Limestone And [subequal/subordinate] Sandstone, Interbedded	Brigantian
9	323.0	SE	BSG-MDST	Bowland Shale Formation - Mudstone	Yeadonian / Asbian
10	327.0	W	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
11	377.0	NW	MRF-LMSA	Minera Formation - Limestone And [subequal/subordinate] Sandstone, Interbedded	Brigantian
12	381.0	NW	MRF-LMSA	Minera Formation - Limestone And [subequal/subordinate] Sandstone, Interbedded	Brigantian
13	399.0	NW	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
14	401.0	SE	GS-SDAR	Gwespyr Sandstone - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Langsettian / Yeadonian
15	417.0	NW	MRF-LMSA	Minera Formation - Limestone And [subequal/subordinate] Sandstone, Interbedded	Brigantian
16	429.0	N	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
17	437.0	E	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
18	437.0	E	BSG-MDST	Bowland Shale Formation - Mudstone	Yeadonian / Asbian
19	440.0	S	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
20	449.0	SE	BSG-MDST	Bowland Shale Formation - Mudstone	Yeadonian / Asbian
21	455.0	S	BSG-MDST	Bowland Shale Formation - Mudstone	Yeadonian / Asbian
22	455.0	S	GS-SDAR	Gwespvr Sandstone - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Langsettian / Yeadonian
23	456.0	SE	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
24	466.0	NW	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
25	470.0	NW	MRF-LMSA	Minera Formation - Limestone And [subequal/subordinate] Sandstone, Interbedded	Brigantian
26A	485.0	NW	CFS-SDAR	Cefn-y-fedw Sandstone Formation - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Marsdenian / Brigantian
27	488.0	SE	BSG-MDST	Bowland Shale Formation - Mudstone	Yeadonian / Asbian
28	490.0	E	GS-SDAR	Gwespvr Sandstone - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded	Langsettian / Yeadonian

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Moderate	Low

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	Category Description	Feature Description
76	56.0	N	FAULT	Fault, inferred, displacement unknown
77	63.0	S	FAULT	Fault, inferred, displacement unknown
78	63.0	S	FAULT	Fault, inferred, displacement unknown
79	130.0	N	FAULT	Fault, inferred, displacement unknown

* This includes an automatically generated 50m buffer zone around the site

ID	Distance (m)	Direction	Category Description	Feature Description
80	165.0	NW	FAULT	Fault, inferred, displacement unknown
81	225.0	S	FAULT	Fault, inferred, displacement unknown
82	259.0	SE	FAULT	Fault, inferred, displacement unknown
83	318.0	W	FAULT	Fault, inferred, displacement unknown
84	377.0	NW	FAULT	Fault, inferred, displacement unknown
85F	381.0	NW	FAULT	Fault, inferred, displacement unknown
86	399.0	NW	FAULT	Fault, inferred, displacement unknown
87	440.0	S	FAULT	Fault, inferred, displacement unknown
88	455.0	S	FAULT	Fault, inferred, displacement unknown
89	466.0	NW	FAULT	Fault, inferred, displacement unknown

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.4 Radon Data

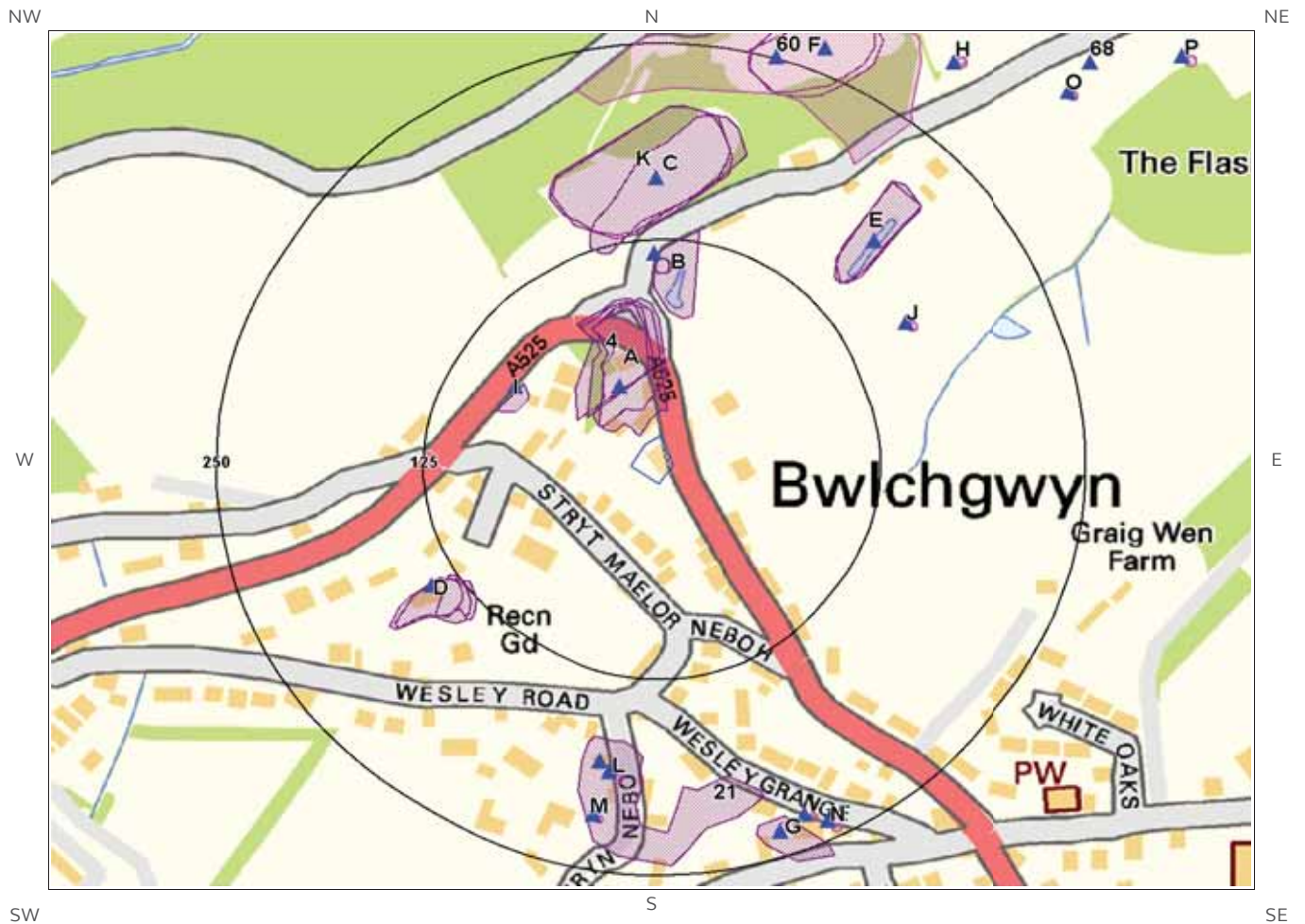
1.4.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is in a Radon Affected Area, as between 10 and 30% of properties are above the Action Level

1.4.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? Full radon protective measures are necessary

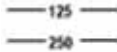
2 Ground Workings Map



Ground Workings Legend



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-  Site Outline
-  Search Buffers (m)
-  Historic Surface Ground Workings
-  Historic Underground Workings
-  Current Ground Workings

2 Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
1A	6.0	NW	326312 353629	Unspecified Heap	1872
2A	20.0	NW	326312 353633	Unspecified Old Quarry	1900
3A	35.0	NW	326303 353634	Unspecified Old Quarry	1949
4	37.0	NW	326302 353648	Unspecified Old Quarry	1960
5I	75.0	NW	326241 353610	Unspecified Pit	1872
6B	75.0	N	326338 353686	Unspecified Old Quarry	1900
7B	103.0	N	326332 353694	Cave	1985
8B	103.0	N	326332 353694	Cave	1989
9B	103.0	N	326331 353694	Cave	1974
10C	120.0	N	326335 353746	Unspecified Quarry	1985
11C	120.0	N	326335 353746	Unspecified Quarry	1989
12C	120.0	N	326335 353746	Unspecified Quarry	1974
13D	122.0	SW	326195 353478	Unspecified Old Quarry	1900
14D	126.0	SW	326191 353478	Unspecified Heap	1872
15D	126.0	SW	326202 353483	Unspecified Pit	1949
16C	128.0	N	326319 353754	Unspecified Quarry	1949
17K	131.0	N	326318 353755	Unspecified Quarry	1960
18E	144.0	NE	326461 353715	Pond	1989
19E	144.0	NE	326461 353715	Pond	1985
20E	145.0	NE	326462 353715	Ponds	1974

ID	Distance (m)	Direction	NGR	Use	Date
21	166.0	S	326299 353353	Refuse Heap	1872
22G	226.0	S	326412 353328	Refuse Heap	1872
23F	228.0	N	326424 353832	Unspecified Quarry	1949
24F	229.0	N	326422 353833	Unspecified Quarry	1960

2.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
25J	164.0	NE	326482 353655	Lead Shaft	1872
26L	188.0	S	326305 353366	Lead Shafts	1872
27F	208.0	NE	326392 353830	Old Lead Mine	1900
28M	215.0	S	326293 353340	Lead Shafts	1872
29G	229.0	S	326404 353336	Lead Shaft	1872
30G	230.0	SE	326422 353342	Lead Shaft	1872
31N	242.0	SE	326437 353335	Lead Shaft	1872
32H	296.0	NE	326512 353824	Unspecified Shaft	1900
33H	297.0	NE	326512 353825	Lead Shafts	1872
34O	327.0	NE	326580 353802	Lead Shafts	1872
35P	396.0	NE	326651 353825	Lead Shafts	1872
Not shown	461.0	W	325851 353613	Lead Shaft	1872
Not shown	908.0	NE	326868 354323	Unspecified Old Level	1960
Not shown	909.0	NE	326869 354322	Old Lead Level	1949
Not shown	912.0	NE	326871 354325	Unspecified Old Level	1900

2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

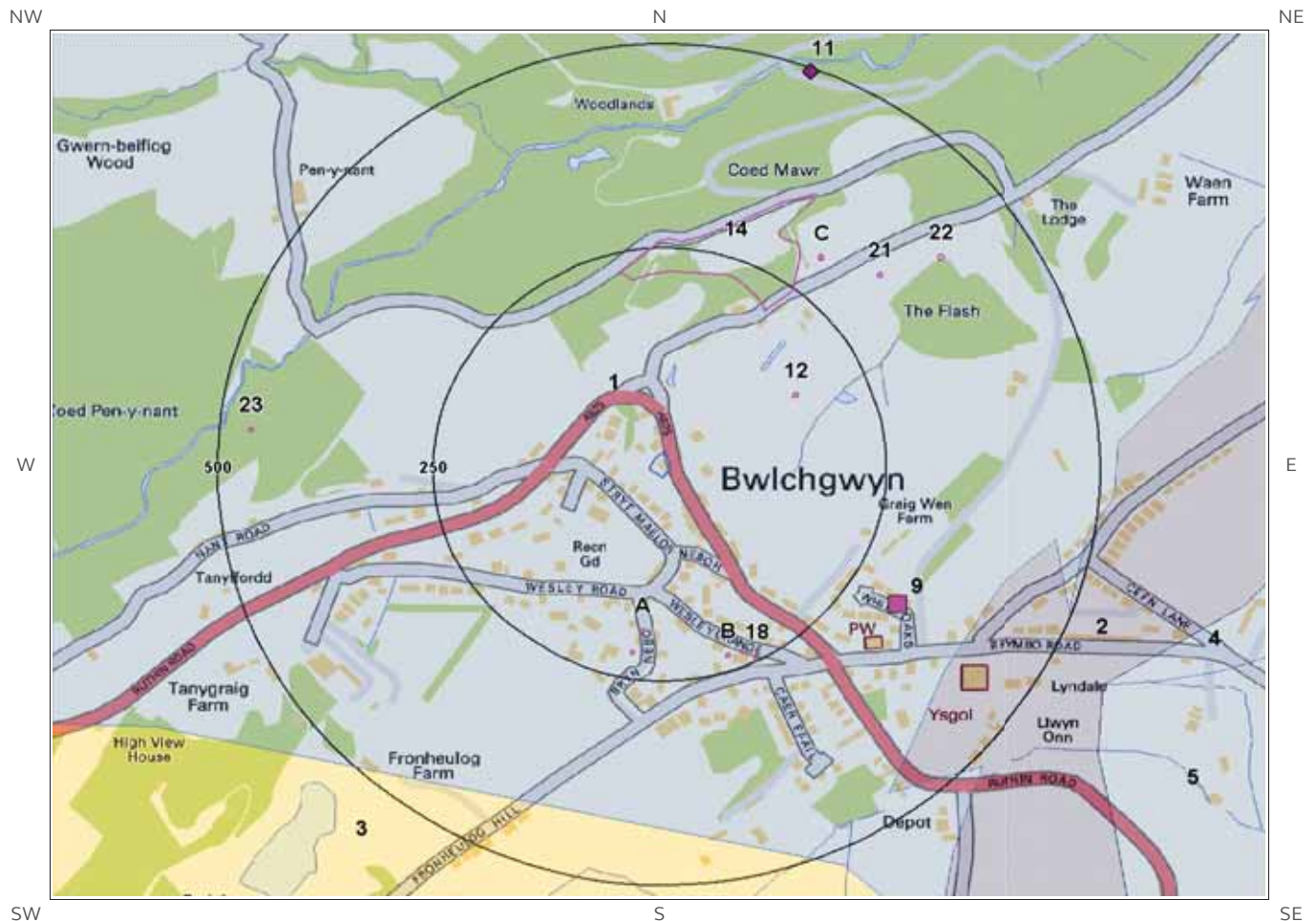
ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
40A	40.0	NW	326305 353617	Sandstone	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
41I	86.0	NW	326242 353617	Sandstone	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
42B	116.0	N	326326 353702	Lead	Bwlchgwyn Lead Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
43D	142.0	SW	326192 353490	Sandstone	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
44J	164.0	NE	326478 353658	Silver	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
45J	164.0	NE	326478 353658	Lead	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
46K	164.0	N	326327 353750	Silica Rock	Nant y Ffrith	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
47E	178.0	NE	326459 353710	Sandstone	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
48L	181.0	S	326293 353378	Lead	Bwlchgwyn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
49L	181.0	S	326293 353378	Silver	Bwlchgwyn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
50L	186.0	S	326299 353371	Silver	Bwlchgwyn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
51L	186.0	S	326299 353371	Lead	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
52M	215.0	S	326289 353344	Lead	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
53M	215.0	S	326289 353344	Silver	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
54N	229.0	SE	326417 353344	Silver	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
55N	229.0	SE	326417 353344	Lead	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
56G	234.0	S	326402 353333	Silver	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
57G	234.0	S	326402 353333	Lead	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
58N	238.0	SE	326431 353340	Lead	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
59N	238.0	SE	326431 353340	Silver	Bwlchgywn Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
60	251.0	N	326400 353827	Sandstone	Coed Mawr Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
61F	266.0	N	326429 353833	Silica Rock	Nant y Ffrith No. 2 Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
62H	296.0	NE	326507 353824	Lead	Bwlchgywn Lead Mine	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	310.0	N	326449 353873	Lead	Bwlchgywn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	310.0	N	326449 353873	Silver	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
65O	329.0	NE	326577 353805	Lead	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
66O	329.0	NE	326577 353805	Silver	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	333.0	SW	326195 353250	Silica Rock	Bwlchgwyn Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
68	352.0	NE	326590 353824	Sandstone	Gorse	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	364.0	NE	326552 353875	Silica Rock	Nant y Ffrith No. 3 Quarry	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
70P	396.0	NE	326645 353828	Lead	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
71P	396.0	NE	326645 353828	Silver	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	397.0	S	326425 353170	Silica Rock	Bwlchgwyn Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	419.0	S	326477 353163	Sandstone	Craig-corn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	468.0	W	325847 353617	Lead	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	468.0	W	325847 353617	Silver	Bwlchgwyn Mine Shaft	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	487.0	W	325830 353637	Lead	Bwlchgwyn Mine Level	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	487.0	W	325830 353637	Silver	Bwlchgwyn Mine Level	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
Not shown	531.0	W	325800 353426	Sandstone	Chapel Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	548.0	SW	325895 353210	Sandstone	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	548.0	SW	325895 353210	Silica Rock	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	565.0	W	325750 353508	Silver	Bwlchgwyn Mine Level	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	565.0	W	325750 353508	Lead	Bwlchgwyn Mine Level	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	571.0	W	325768 353391	Sandstone	Chapel Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	582.0	W	325735 353493	Silver	Bwlchgwyn Mine Level	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	582.0	W	325735 353493	Lead	Bwlchgwyn Mine Level	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased
Not shown	596.0	W	325755 353353	Sandstone	Chapel Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	634.0	SW	325895 353089	Silica Rock	Bwlchgwyn Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	818.0	SW	325720 353001	Silica Rock	Bwlchgwyn Quarries	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	868.0	S	326104 352717	Sandstone	Plas-gwyn Mountain	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	895.0	NW	325645 354167	Sandstone	Wern-isaf	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	918.0	S	326170 352651	Sandstone	Plas-gwyn Mountain	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	948.0	SW	325648 352889	Sandstone	Bwlchgwyn	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	980.0	NE	326969 354330	Coal, Deep	Darnau Wood	Working is wholly underground, access by shaft, adit or drift. Working may be termed Colliery, Mine, Drift Mine, Slant, Level, Adit or Ingoing Eye (Ingaun Ee - Scots)	Ceased

3 Mining, Extraction & Natural Cavities Map



Mining, Extraction and
Natural Cavities Legend

Mapping
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 Ordnance
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3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? Yes

The following Historical Mining information is provided by Groundsure:

ID	Distance (m)	Direction	NGR	Details	Date
12	164.0	NE	326482 353655	Lead Shaft	1872
13A	188.0	S	326305 353366	Lead Shafts	1872
14	208.0	NE	326392 353830	Old Lead Mine	1900
15A	215.0	S	326293 353340	Lead Shafts	1872
16B	229.0	S	326404 353336	Lead Shaft	1872
17B	230.0	SE	326422 353342	Lead Shaft	1872
18	242.0	SE	326437 353335	Lead Shaft	1872
19C	296.0	NE	326512 353824	Unspecified Shaft	1900
20C	297.0	NE	326512 353825	Lead Shafts	1872
21	327.0	NE	326580 353802	Lead Shafts	1872
22	396.0	NE	326651 353825	Lead Shafts	1872
23	461.0	W	325851 353613	Lead Shaft	1872
Not shown	908.0	NE	326868 354323	Unspecified Old Level	1960
Not shown	909.0	NE	326869 354322	Old Lead Level	1949
Not shown	912.0	NE	326871 354325	Unspecified Old Level	1900

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? Yes

The following Coal Mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
0.0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? Yes

The following information provided by JPB is not represented on mapping: In addition to being located inside an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. Further details and a quote for services can be obtained by emailing this report to enquiries.gs@jpb.co.uk.

3.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? Yes

The following non-coal mining information is provided by the BGS:

ID	Distance (m)	Direction	Name	Commodity	Assessment of likelihood
1	0.0	On Site	Not available	Vein Mineral	Rare and localised small scale mining may have occurred.
2	401.0	SE	Not available	Vein Mineral	Occasional minor mining may have occurred but of restricted extent.
3	421.0	S	North Wales (Minera)	Vein Mineral	Small scale mining may have occurred but restricted in extent.
4	569.0	SE	Not available	Iron Ore (Bedded)	Rare and localised small scale mining may have occurred.
5	569.0	SE	Not available	Vein Mineral	Rare and localised small scale mining may have occurred.
Not shown	712.0	S	North Wales (Minera)	Iron Ore (Bedded)/Vein Mineral	Rare and localised small scale mining may have occurred.
Not shown	792.0	E	Not available	Vein Mineral	Occasional minor mining may have occurred but of restricted extent.
Not shown	989.0	S	North Wales (Minera)	Iron Ore (Bedded)/Vein Mineral	Rare and localised small scale mining may have occurred.

3.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? Yes

The following Non-Coal Mining Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Address	Superficial Deposits	Bedrock Deposits	Extracted Mineral
9	311.0	SE	326600 353400	BWLCH GWYN, Clwyd	-	-	Lead
Not shown	734.0	N	326500 354300	COED MAWR, Clwyd	-	-	Lead

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? Yes

The following Natural Cavities information provided by Peter Brett Associates:

ID	Distance (m)	Direction	NGR	Superficial Deposits	Bedrock Deposits	Cavity Type and Number
11	494.0	N	326500 354050	-	Carboniferous Limestone Supergroup, Lower Carboniferous Limestone, Upper Carboniferous Limestone	Vadose Cave x 1

3.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

3.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level.

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

3.10 Clay Mining

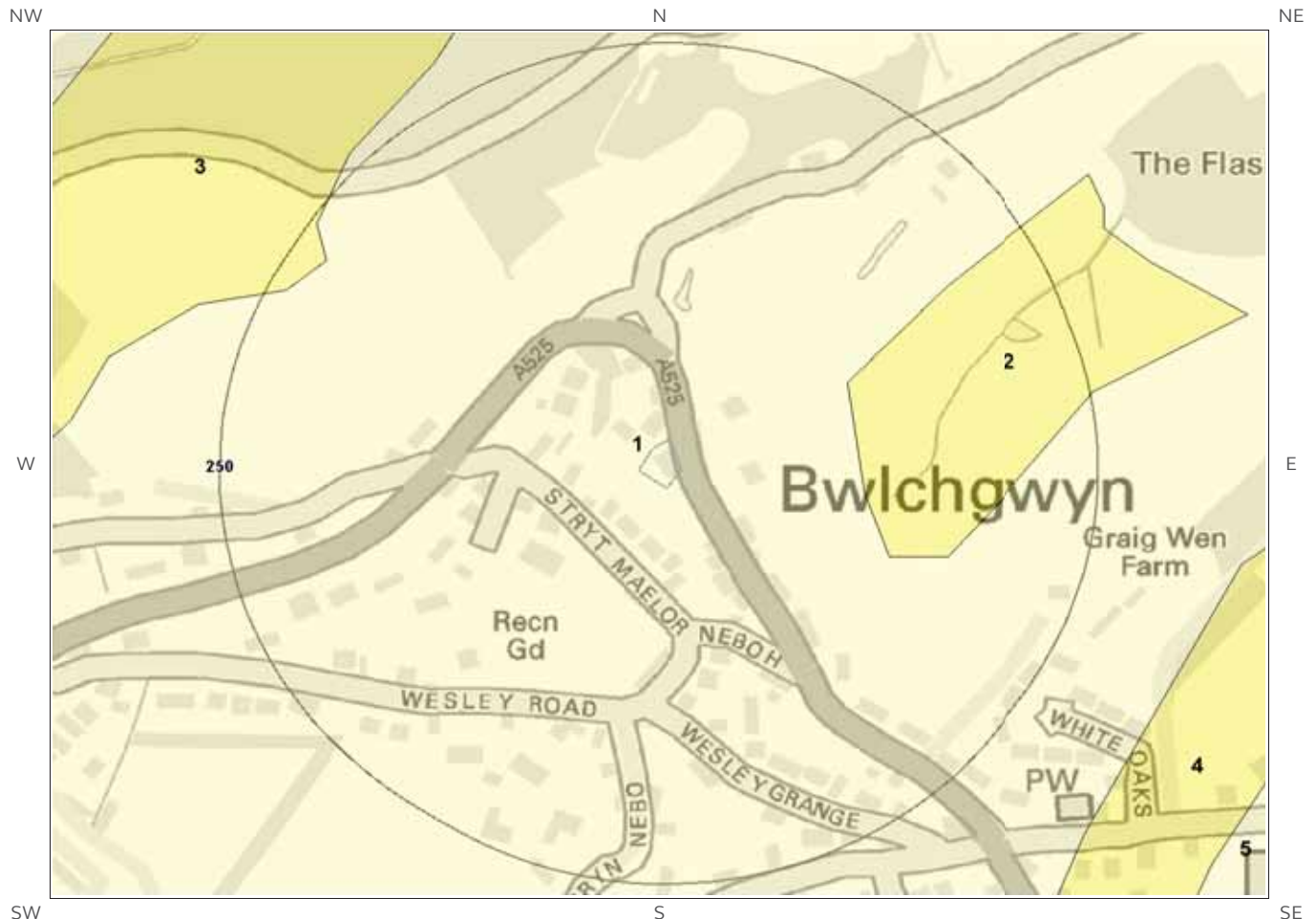
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

4 Natural Ground Subsidence

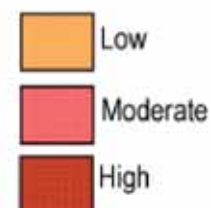
4.1 Shrink-Swell Clay Map



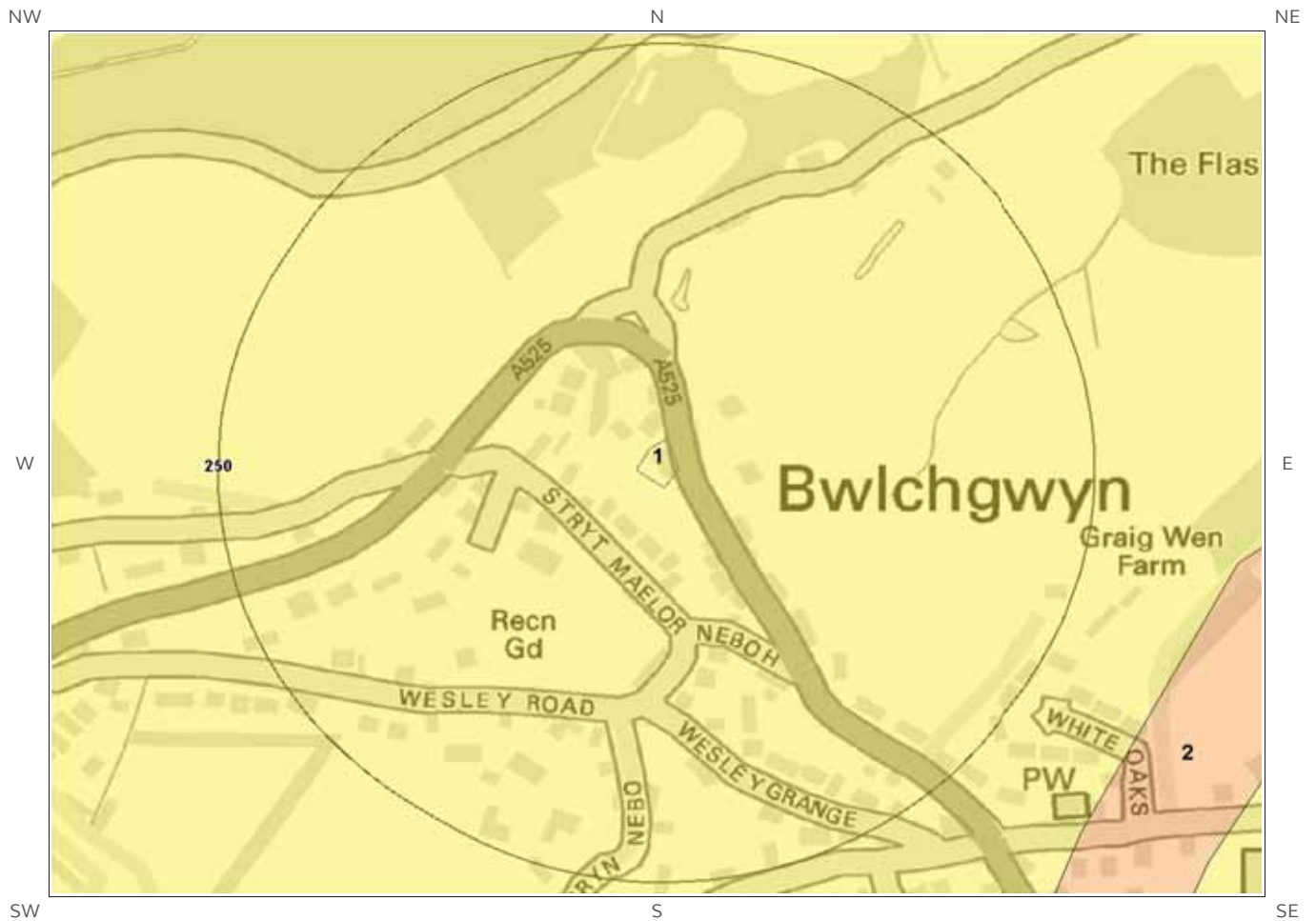
Shrink Swell Clay Legend



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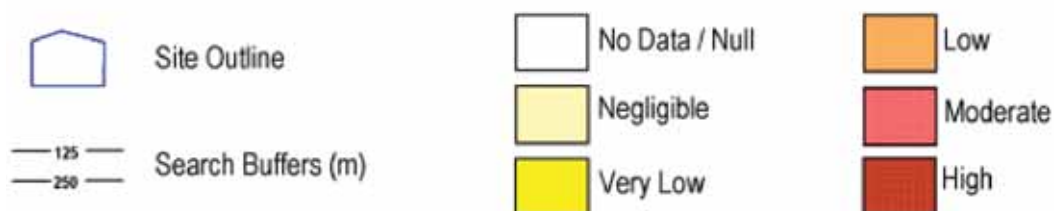
4.2 Landslides Map



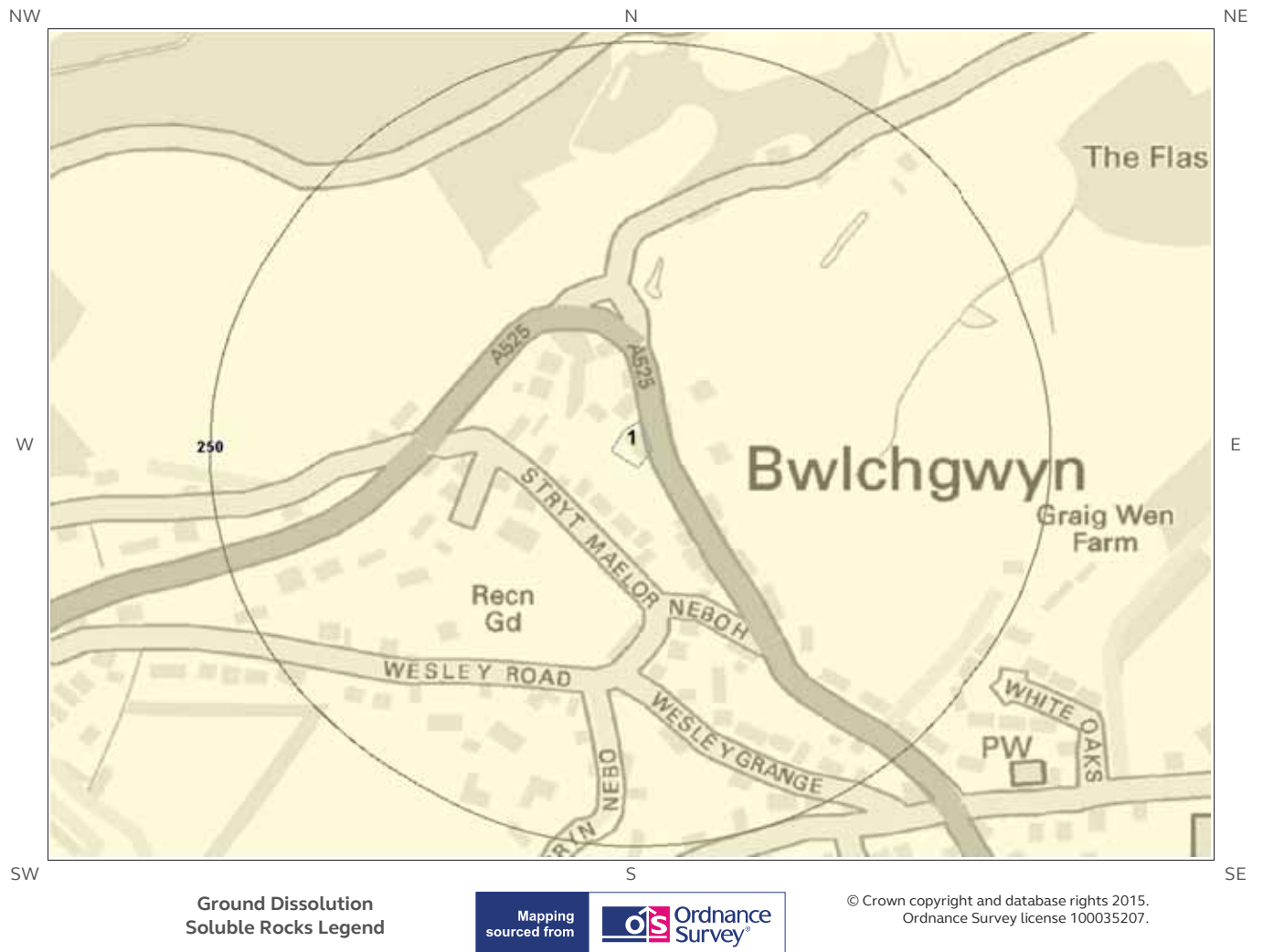
Landslides Legend



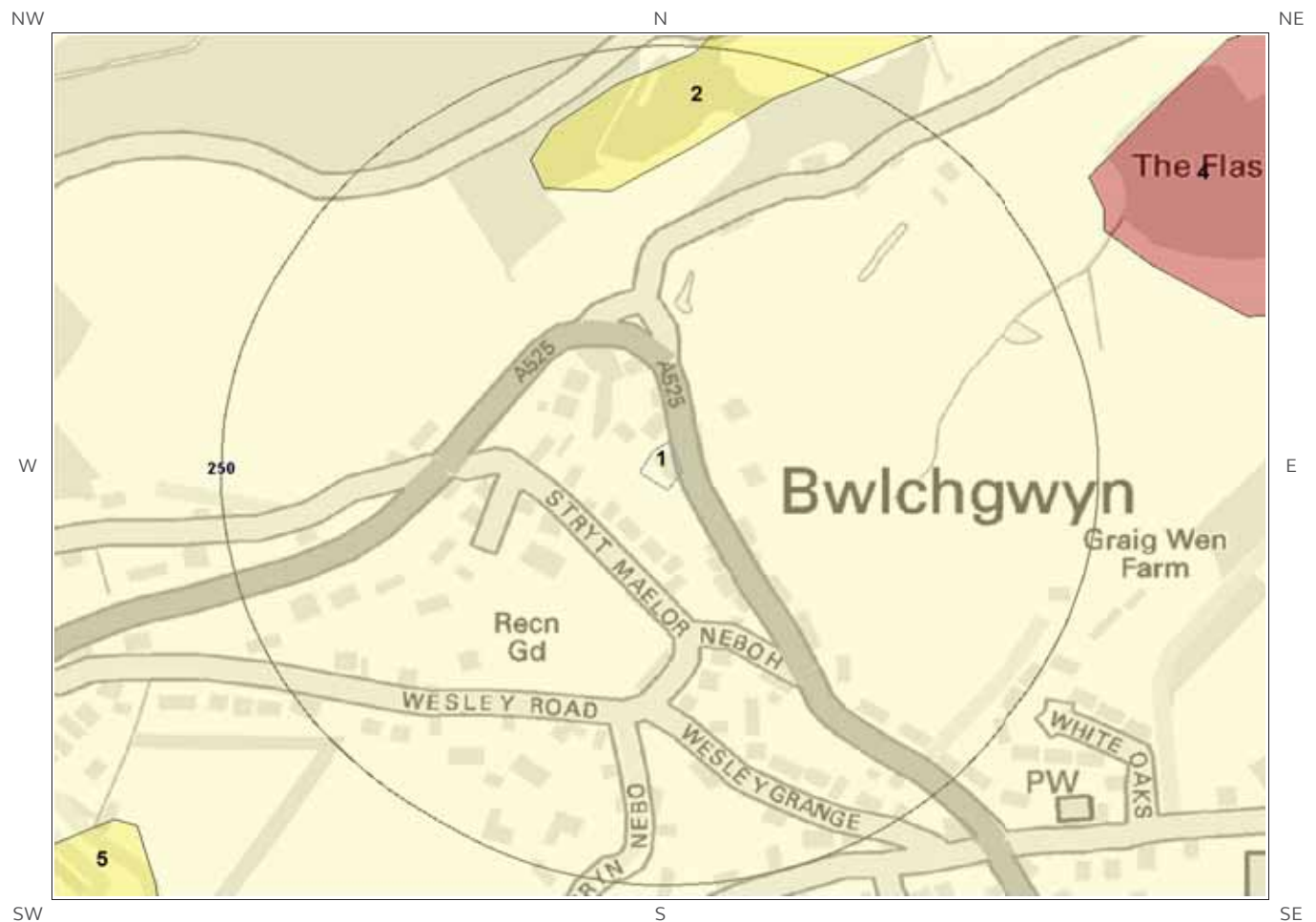
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4.3 Ground Dissolution Soluble Rocks Map



4.4 Compressible Deposits Map

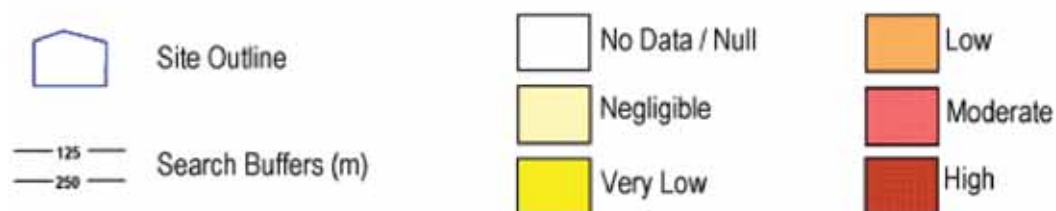


Compressible Deposits Legend

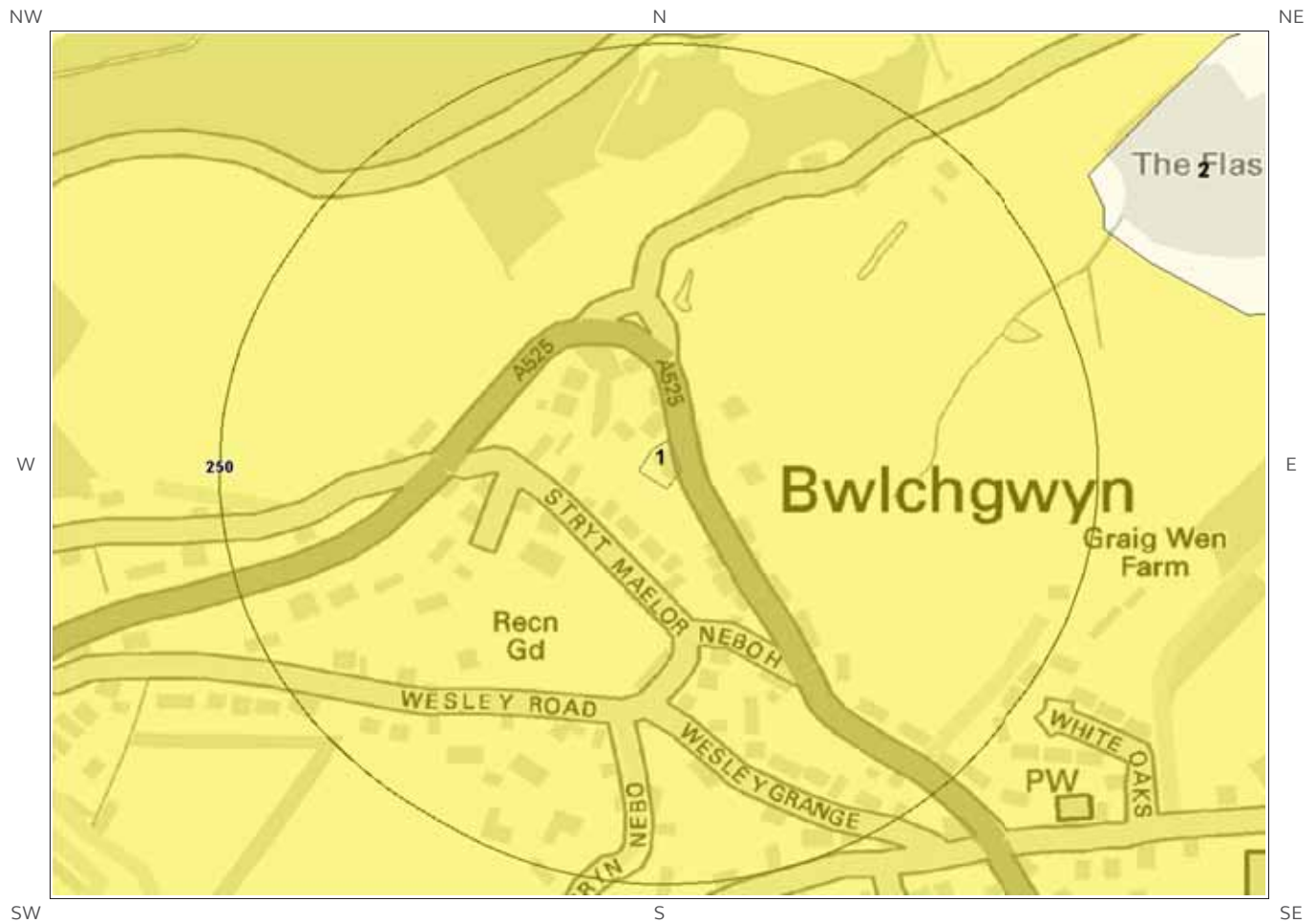
Mapping
sourced from



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4.5 Collapsible Deposits Map

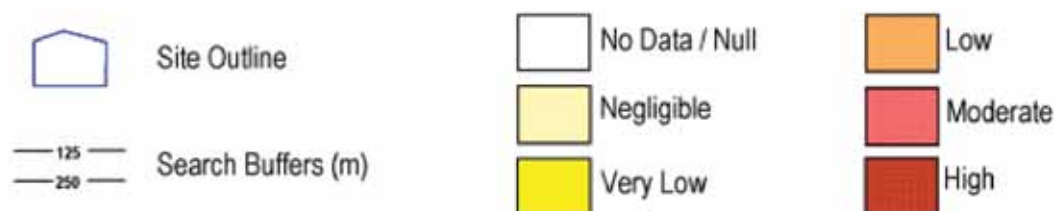


Collapsible Deposits Legend

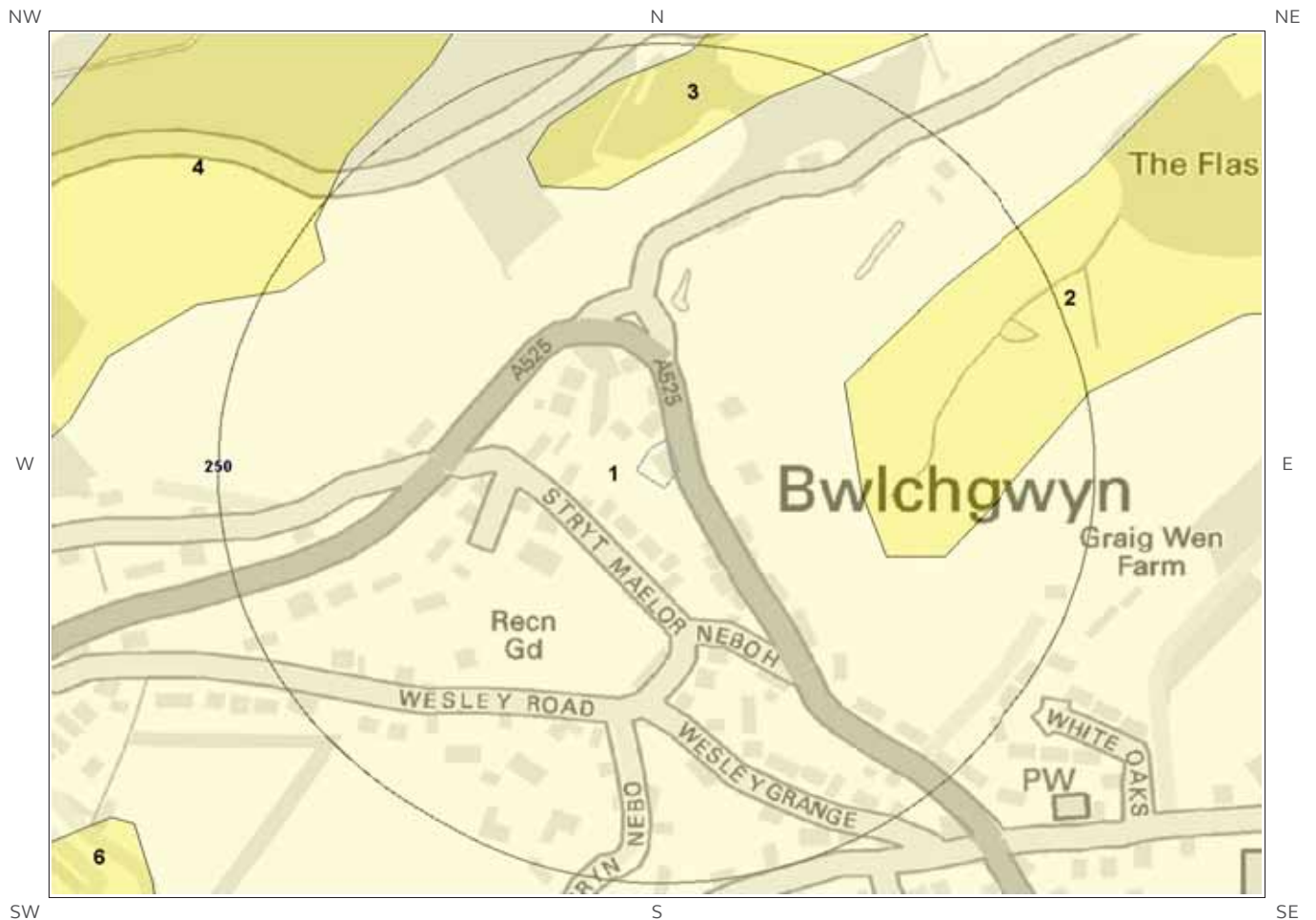
Mapping
sourced from



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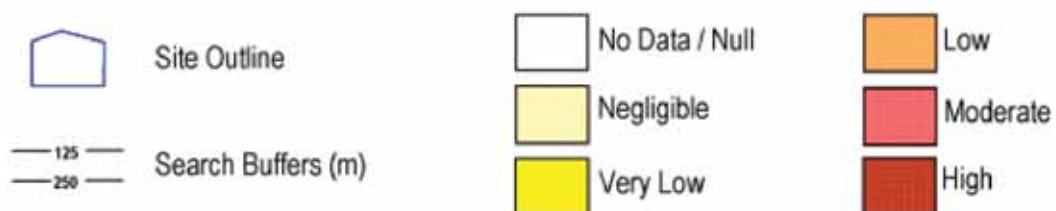
4.6 Running Sand Map



Running Sand Legend



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4 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site** boundary? Very Low

4.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

4.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This includes an automatically generated 50m buffer zone around the site

4.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible ground identified. No special actions required to avoid problems due to compressible ground. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible ground.

4.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

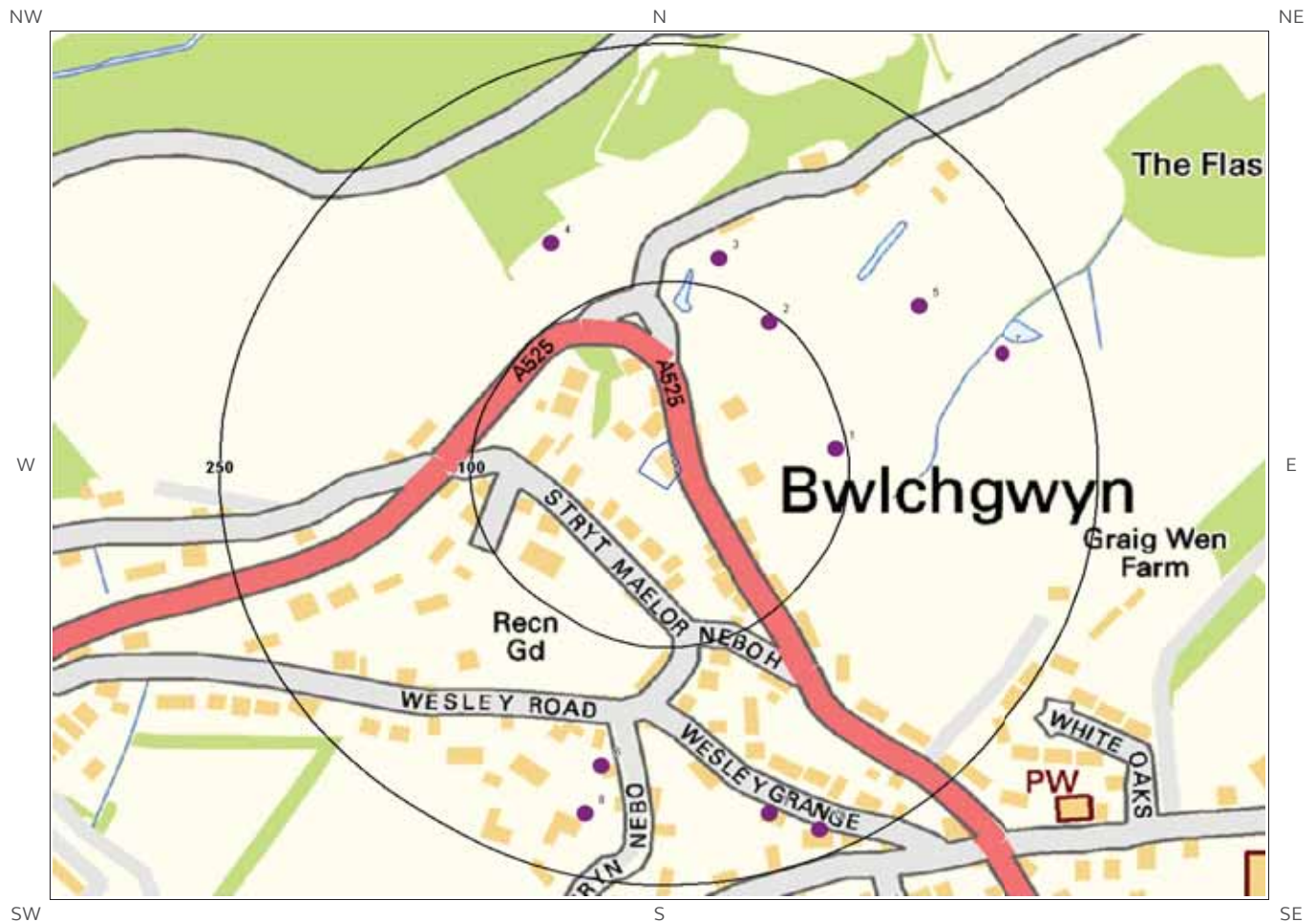
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

4.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5 Borehole Records Map



Borehole Records Legend



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5 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:

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ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	93.0	E	326430 353580	SJ25SE19	39.62	UNITED STEEL 9
2	95.0	NE	326390 353660	SJ25SE1720	-1.0	BWLCHGWYN, TRIAL SHAFT
3	118.0	N	326360 353700	SJ25SE1719	-1.0	BWLCHGWYN, TRIAL SHAFT
4	143.0	NW	326260 353710	SJ25SE1718	-1.0	BWLCHGWYN, TRIAL SHAFT
5	171.0	NE	326480 353670	SJ25SE1721	-1.0	BWLCHGWYN, TRIAL SHAFT
6	179.0	S	326290 353380	SJ25SE1729	-1.0	BWLCHGWYN SHAFT
7	205.0	E	326530 353640	SJ25SE24	48.62	UNITED STEEL 14
8	211.0	S	326280 353350	SJ25SE1715	-1.0	BWLCHGWYN, TRIAL SHAFT
9	214.0	S	326390 353350	SJ25SE1716	-1.0	BWLCHGWYN, TRIAL SHAFT
10	233.0	SE	326420 353340	SJ25SE1717	-1.0	BWLCHGWYN, TRIAL SHAFT

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

- #1: scans.bgs.ac.uk/sobi_scans/boreholes/145020
- #2: scans.bgs.ac.uk/sobi_scans/boreholes/146862
- #3: scans.bgs.ac.uk/sobi_scans/boreholes/146861
- #4: scans.bgs.ac.uk/sobi_scans/boreholes/146860
- #5: scans.bgs.ac.uk/sobi_scans/boreholes/146863
- #6: scans.bgs.ac.uk/sobi_scans/boreholes/146871
- #7: scans.bgs.ac.uk/sobi_scans/boreholes/145025
- #8: scans.bgs.ac.uk/sobi_scans/boreholes/146857
- #9: scans.bgs.ac.uk/sobi_scans/boreholes/146858
- #10: scans.bgs.ac.uk/sobi_scans/boreholes/146859

6 Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary:

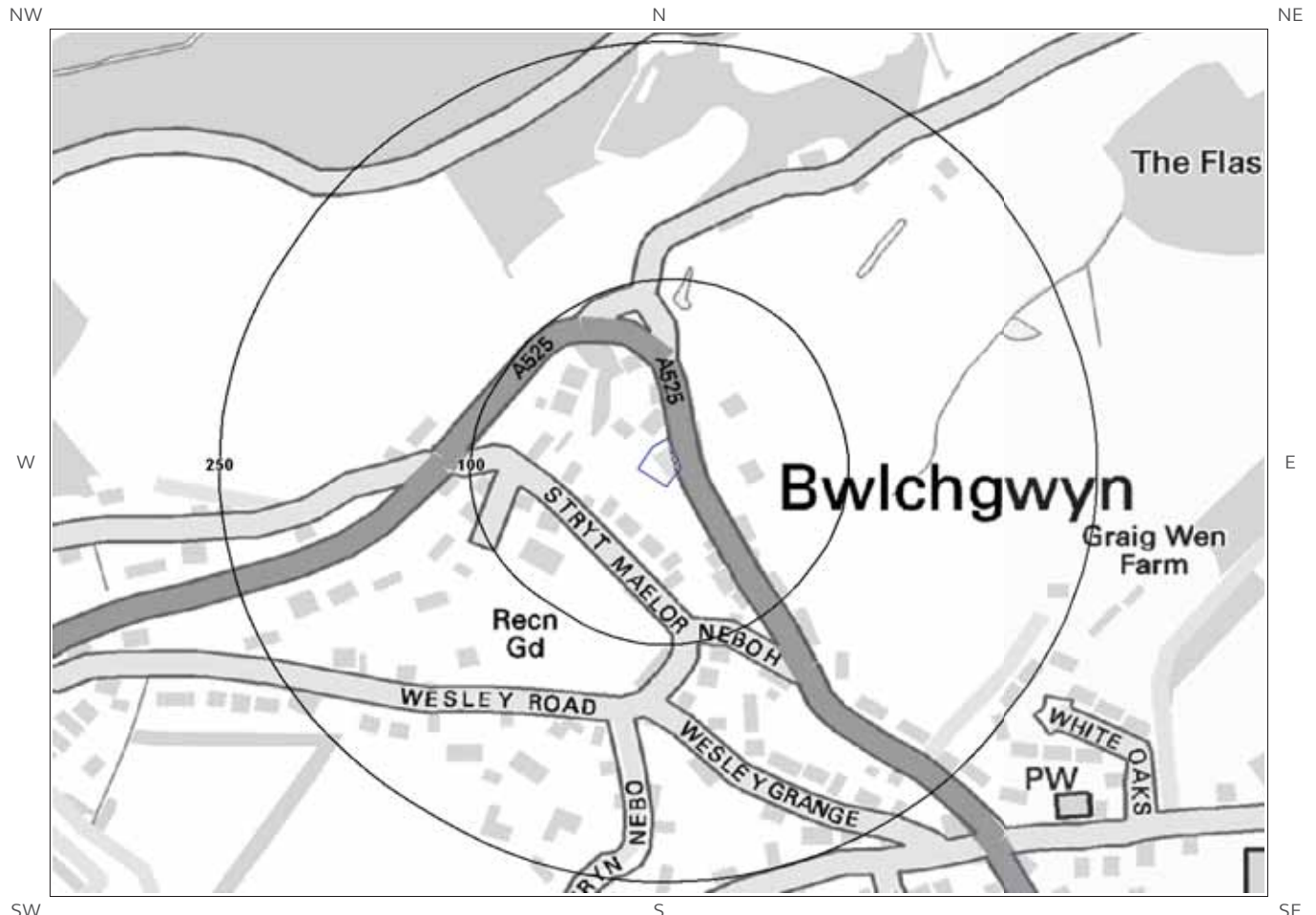
16

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geosight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	300 - 600 mg/kg
55.0	S	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	600 - 1200 mg/kg
56.0	N	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	300 - 600 mg/kg
63.0	S	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	600 - 1200 mg/kg
106.0	E	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	300 - 600 mg/kg
130.0	N	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	300 - 600 mg/kg
150.0	NE	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	300 - 600 mg/kg
162.0	E	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	300 - 600 mg/kg
165.0	NW	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	300 - 600 mg/kg
170.0	E	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	300 - 600 mg/kg
175.0	E	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	600 - 1200 mg/kg
182.0	E	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	300 - 600 mg/kg
196.0	NE	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	300 - 600 mg/kg
222.0	W	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	600 - 1200 mg/kg
225.0	S	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	<15 mg/kg	600 - 1200 mg/kg
228.0	NW	RuSoilExAs	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	300 - 600 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

7 Railways and Tunnels Map



Railways and Tunnels Legend



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	Site Outline		Underground or Partially Underground Railway / Subway System		Railway Track (OpenStreetMap)
	Search Buffers (m)		Railway Tunnel (OS Mapping)		High Speed 2
			Abandoned or Dismantled Railway (OpenStreetMap)		Crossrail 1
			Railway Track (OS Mapping)		Railway and/or Tunnel Feature from Historical Mapping

7 Railways and Tunnels

7.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? No

Have any historical railway or tunnel features been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

7.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels Map.

7.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels Map.

7.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com



British Geological Survey Enquiries

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Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries



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LE12 6HX



The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk



Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
<https://www.gov.uk/government/organisations/public-health-england>
Email: enquiries@phe.gov.uk
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Contact Details



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Standard Terms and Conditions

1 Definitions

In these terms and conditions unless the context otherwise requires:

“Beneficiary” means the person or entity for whose benefit the Client has obtained the Services.

“Client” means the party or parties entering into a Contract with Groundsure.

“Commercial” means any building or property which is not Residential.

“Confidential Information” means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

“Support Services” means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

“Contract” means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

“Third Party Data Provider” means any third party providing Third Party Content to Groundsure.

“Data Reports” means reports comprising factual data with no accompanying interpretation.

“Fees” has the meaning set out in clause 5.1.

“Groundsure” means Groundsure Limited, a company registered in England and Wales under number 03421028.

“Groundsure Materials” means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

“Intellectual Property” means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

“Mapping” means a map, map data or a combination of historical maps of various ages, time periods and scales.

“Order” means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.

“Ordnance Survey” means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

“Order Website” means the online platform through which Orders may be placed by the Client and accepted by Groundsure.

“Report” means a Risk Screening Report or Data Report for Commercial or Residential property.

“Residential” means any building or property used as or intended to be used as a single dwelling.

“Risk Screening Report” means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.

“Services” means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.

“Site” means the area of land in respect of which the Client has requested Groundsure to provide the Services.

“Third Party Content” means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.

“User Guide” means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.

2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure.

Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1 The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1 The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.

4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;

(i) the Beneficiary,
(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),
(iv) the first purchaser or first tenant of the Site, and
(v) the professional advisers and lenders of the first purchaser or tenant of the Site.

4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1 Groundsure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together “Fees”).

5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client (“Payment Date”). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.

5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to

(i) full payment of all relevant Fees and
(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.

6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure

acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.

6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.

6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.

7.4 Groundsure shall not be liable for

(i) loss of profits;

(ii) loss of business;

(iii) depletion of goodwill and/or similar losses;

(iv) loss of anticipated savings;

(v) loss of goods;

(vi) loss of contract;

(vii) loss of use;

(viii) loss or corruption of data or information;

(ix) business interruption;

(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;

(xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;

(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;

(xiii) loss or damage to a computer, software, modem, telephone or other property; and

(xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.

7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.

8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.

9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event
(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.

12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.

12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.

12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.

12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.

12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

- (i) the Client or Beneficiary's failure to provide facilities, access or information;
- (ii) fire, storm, flood, tempest or epidemic;
- (iii) Acts of God or the public enemy;
- (iv) riot, civil commotion or war;
- (v) strikes, labour disputes or industrial action;
- (vi) acts or regulations of any governmental or other agency;
- (vii) suspension or delay of services at public registries by Third Party Data Providers;
- (viii) changes in law; or
- (ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner.

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law

Site Details:

WESTMINSTER ARMS, RUTHIN
ROAD, WREXHAM, LL11 5UT

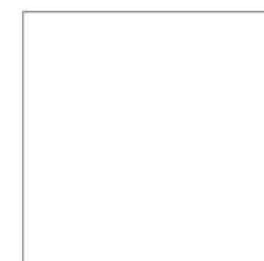
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Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1873

Scale: 1:2,500

Printed at: 1:2,500



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

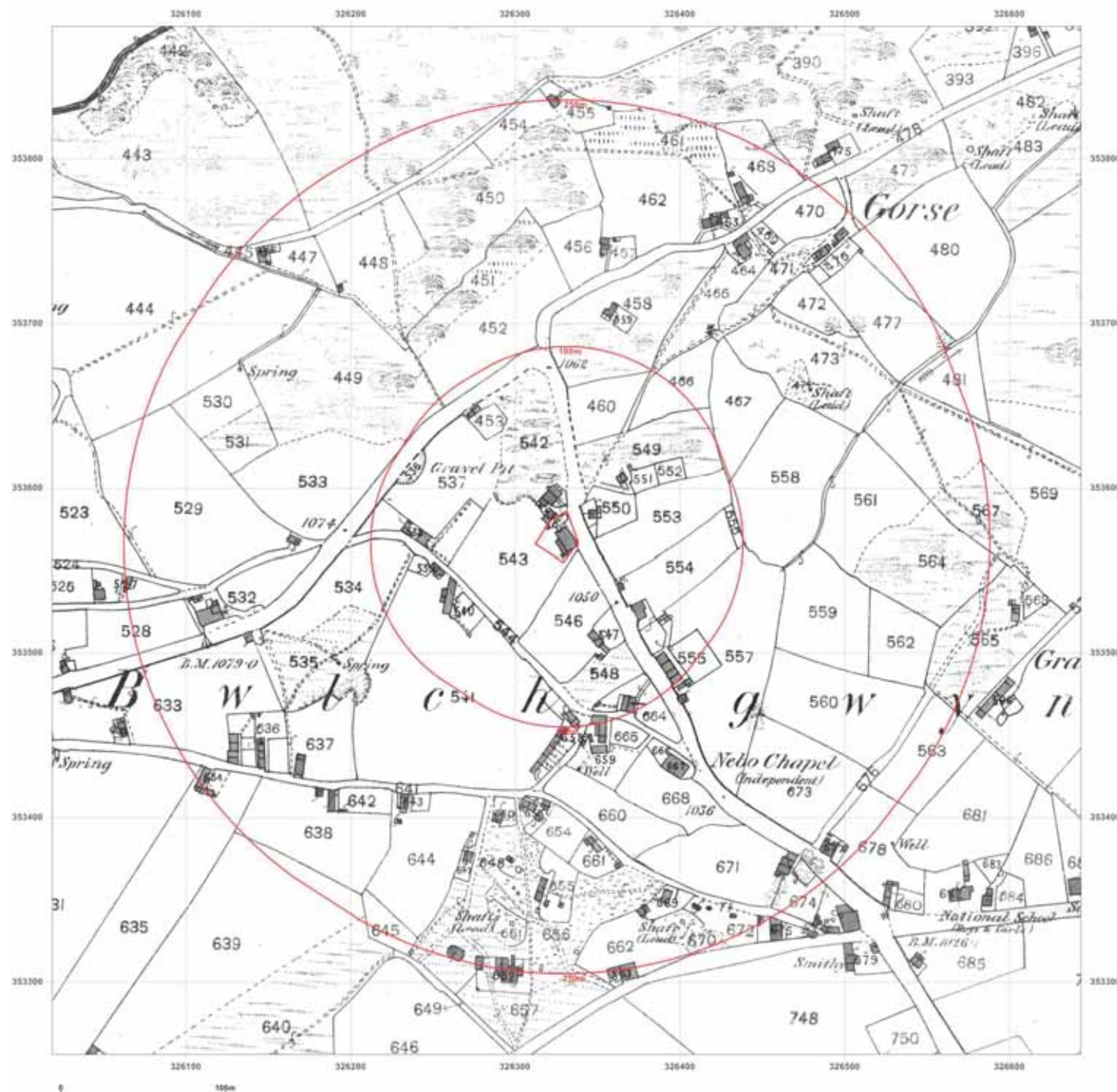


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1899

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1899
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A

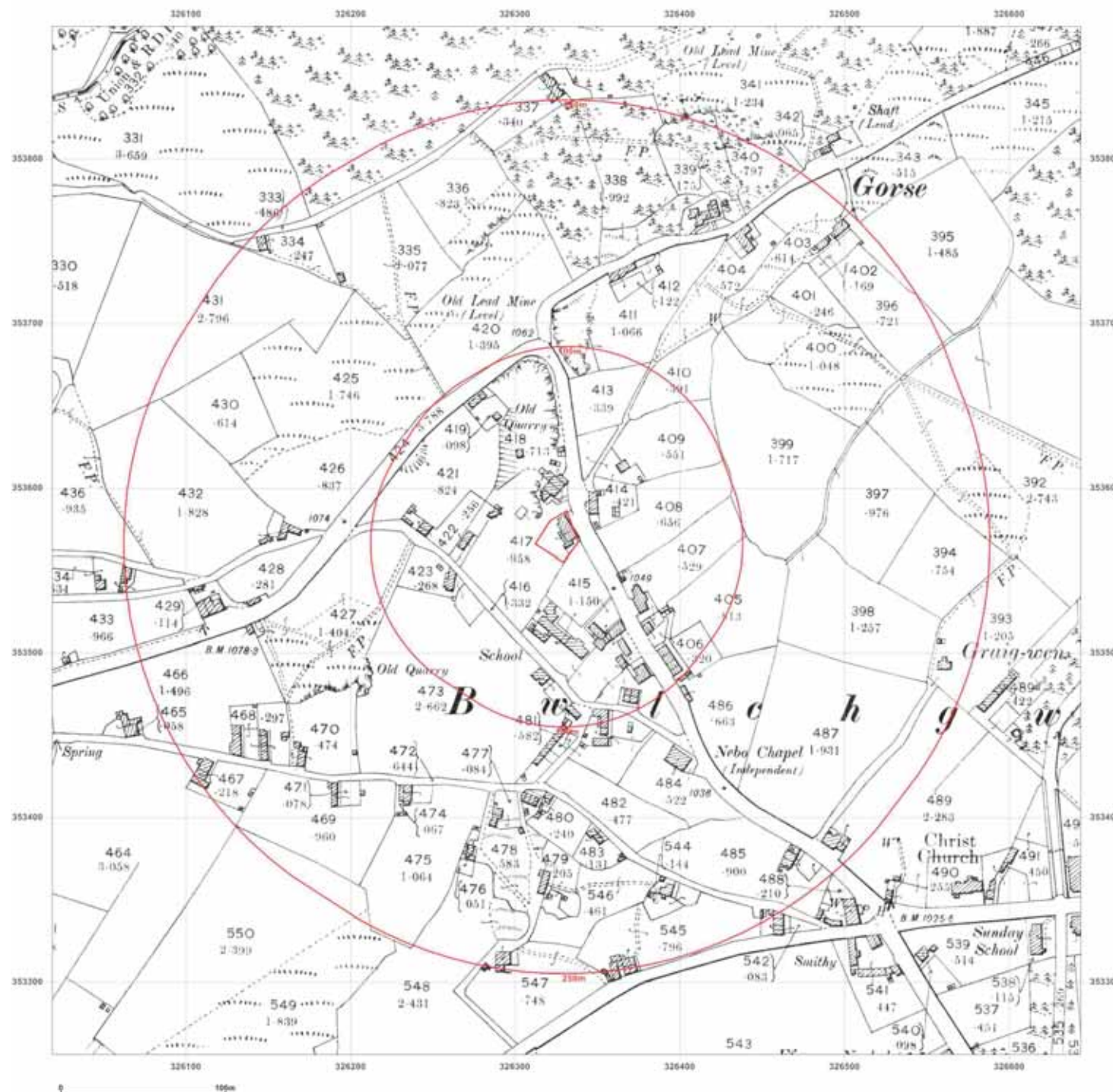


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1912

Scale: 1:2,500

Printed at: 1:2,500



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

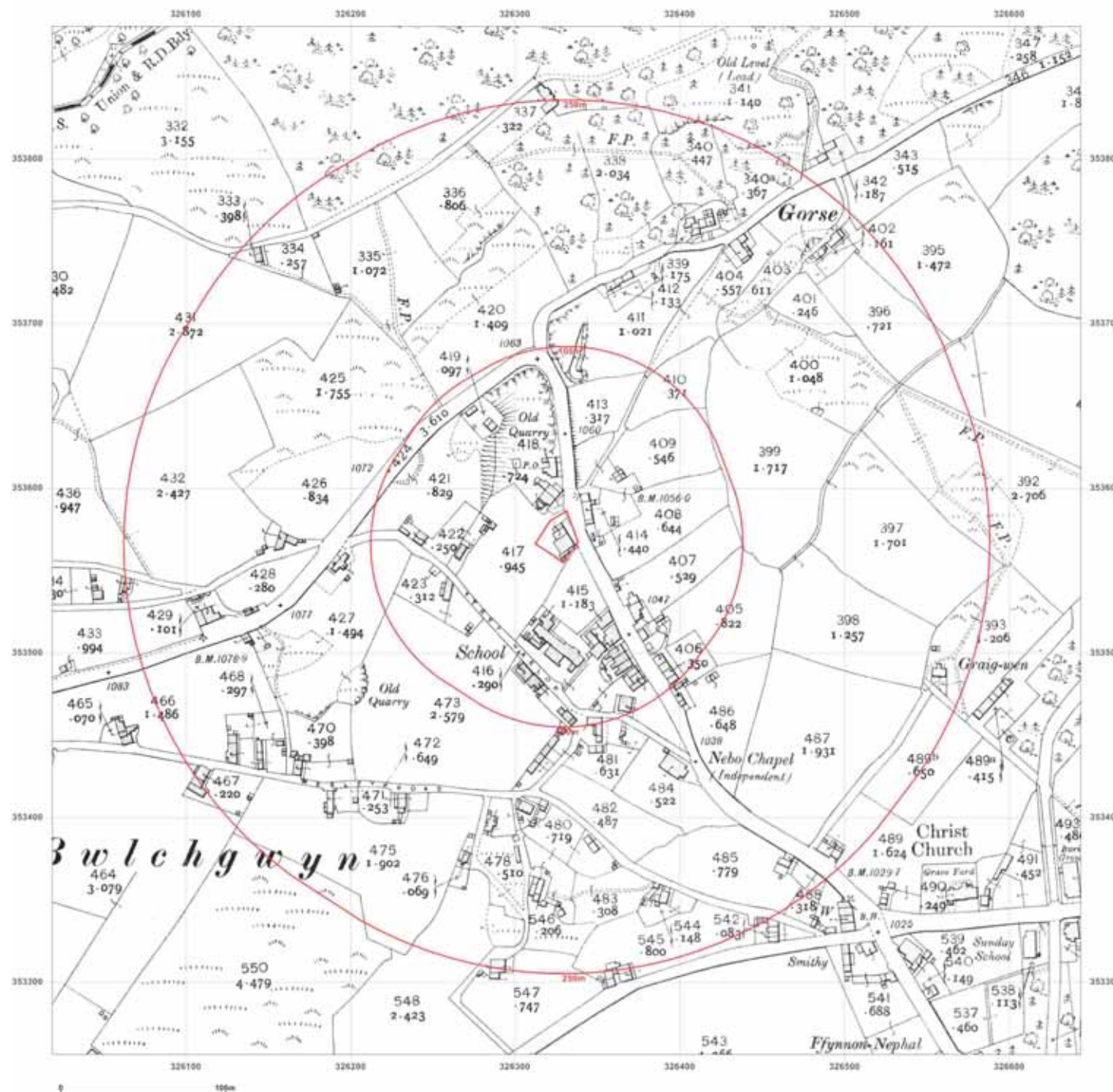


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1962

Scale: 1:2,500

Printed at: 1:2,500



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

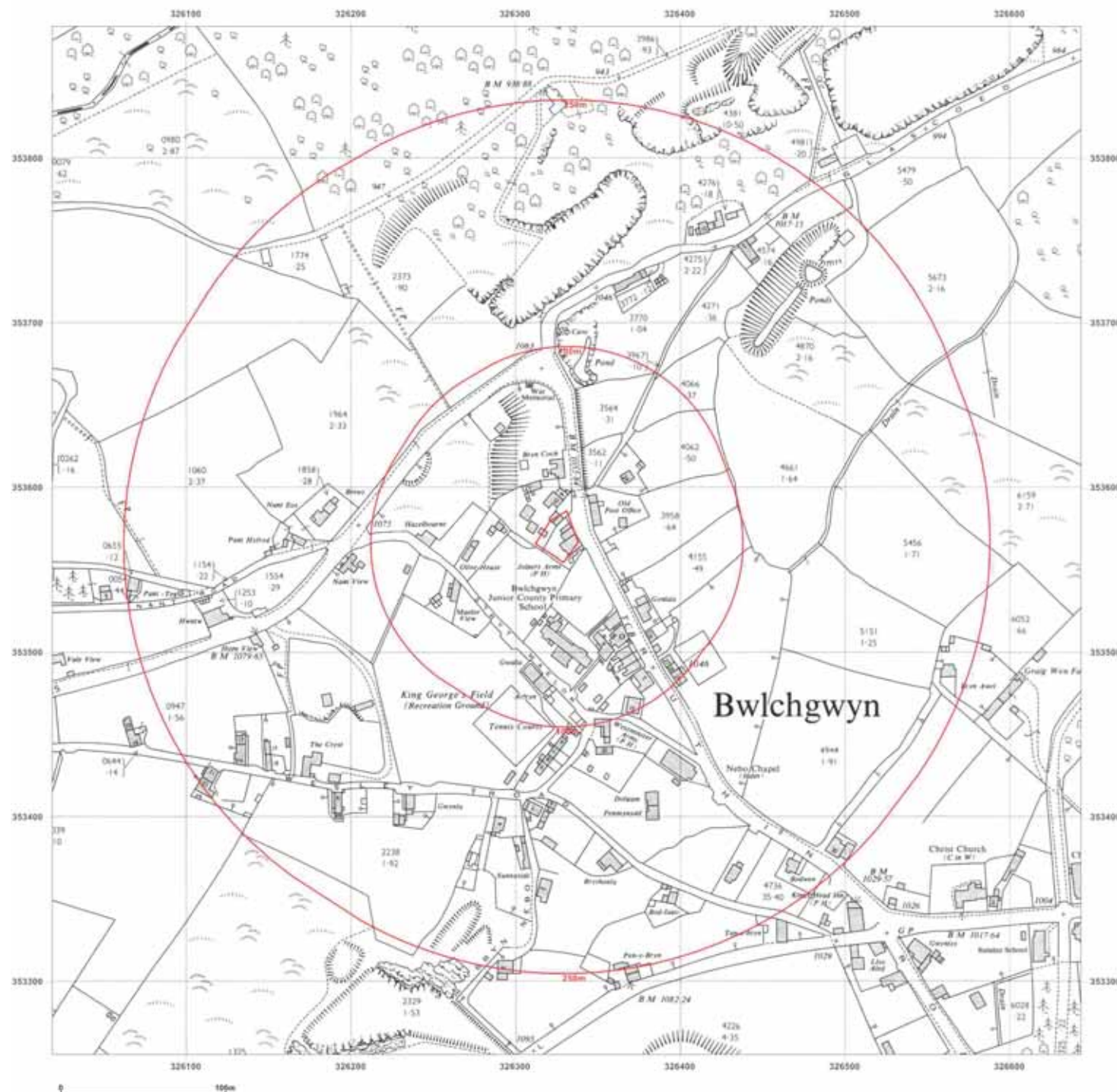


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1964

Scale: 1:2,500

Printed at: 1:2,500



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

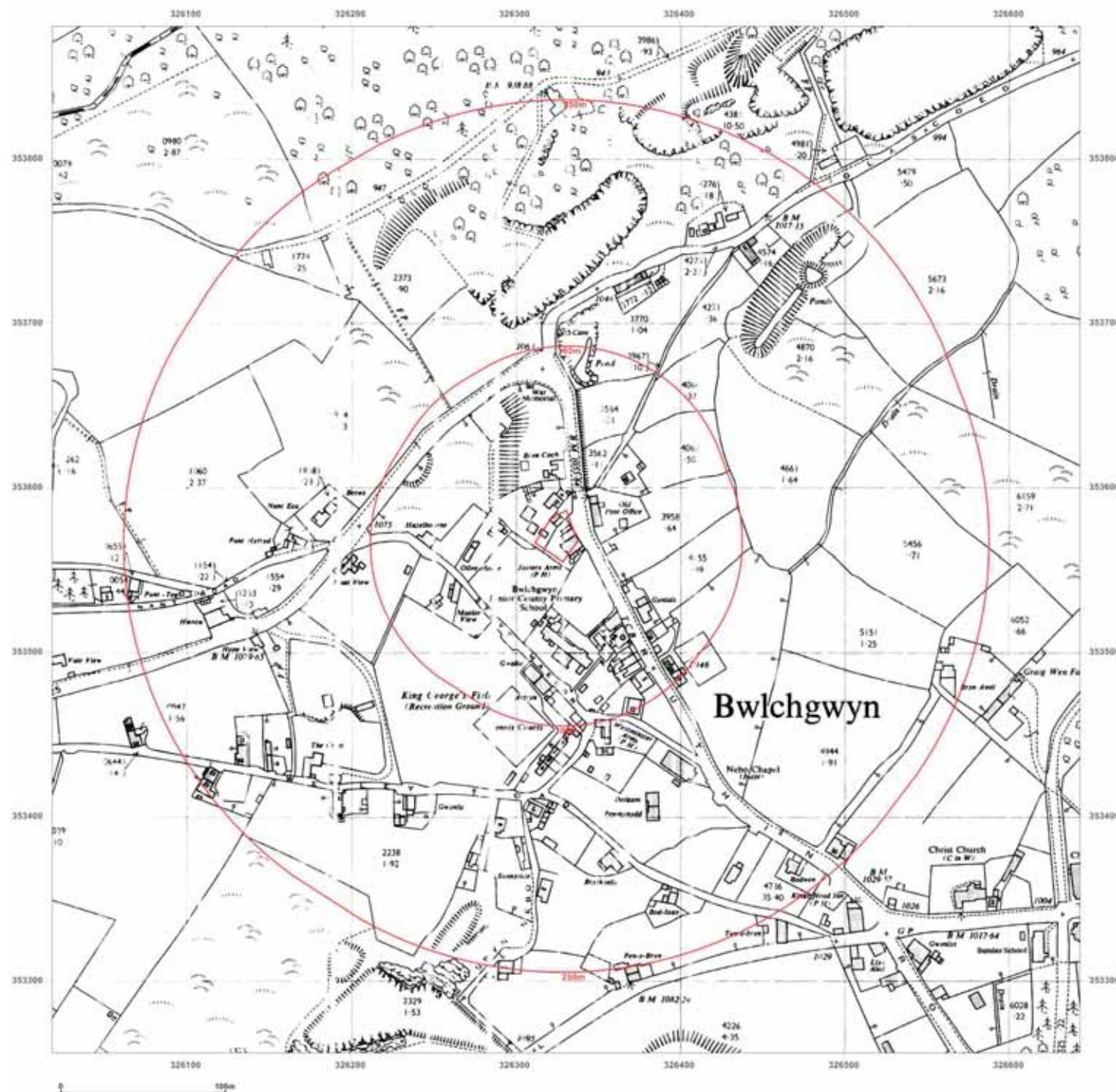


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1984

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1984
Levelled 1959

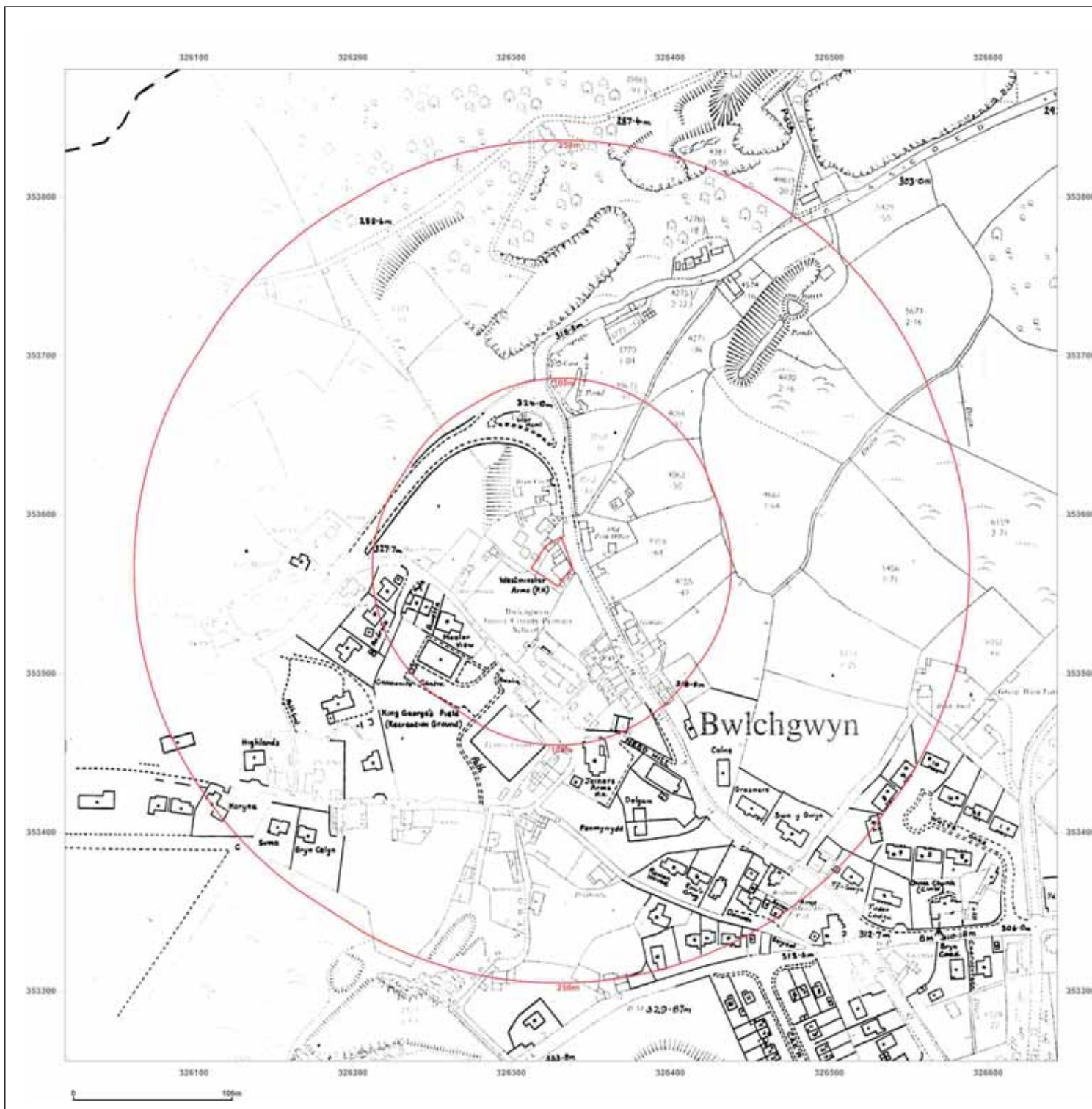


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1993

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

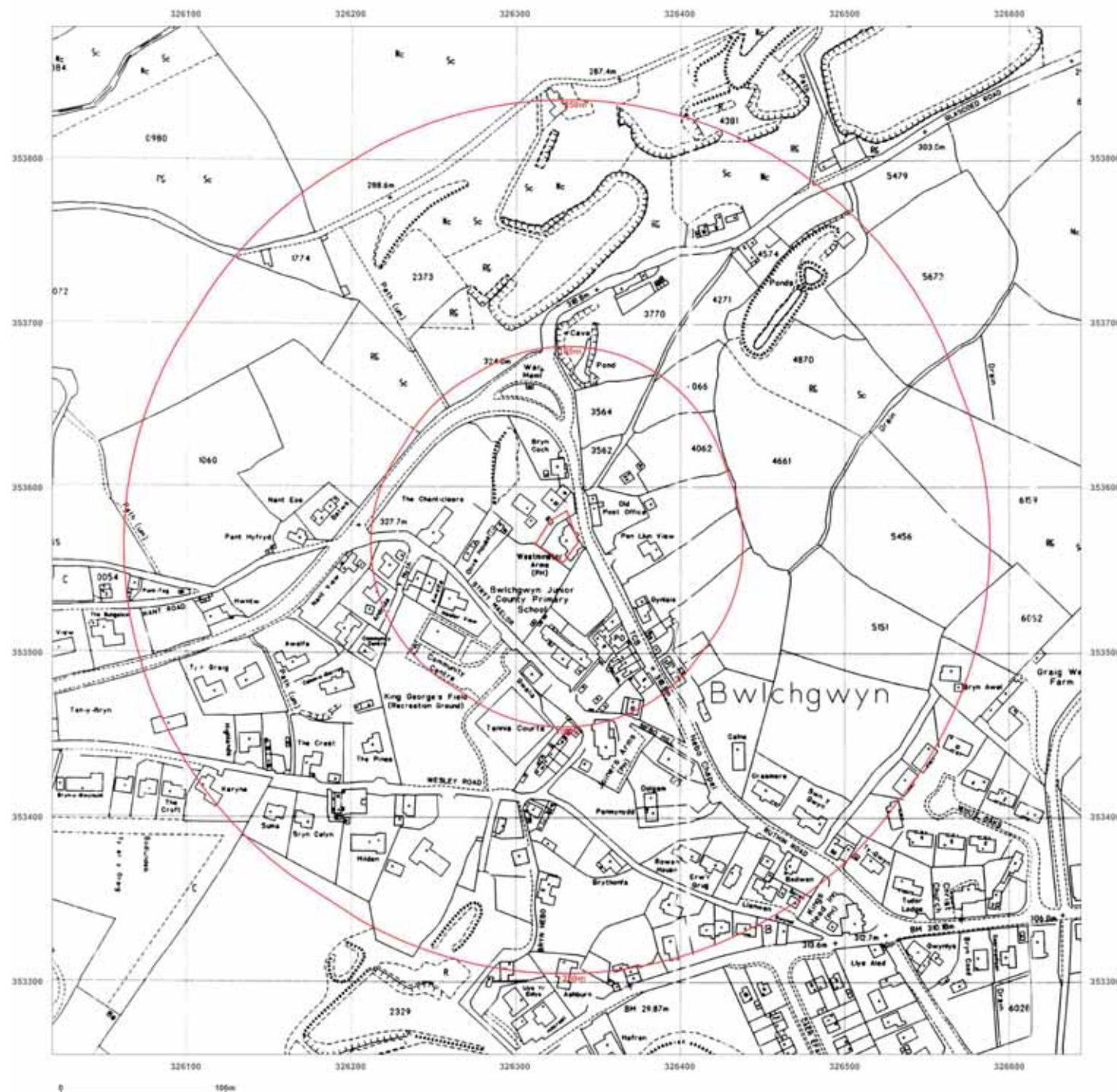


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1872-1874

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1874
Revised 1874
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1872
Revised 1872
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1874
Revised 1874
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1872
Revised 1872
Edition N/A
Copyright N/A
Levelled N/A

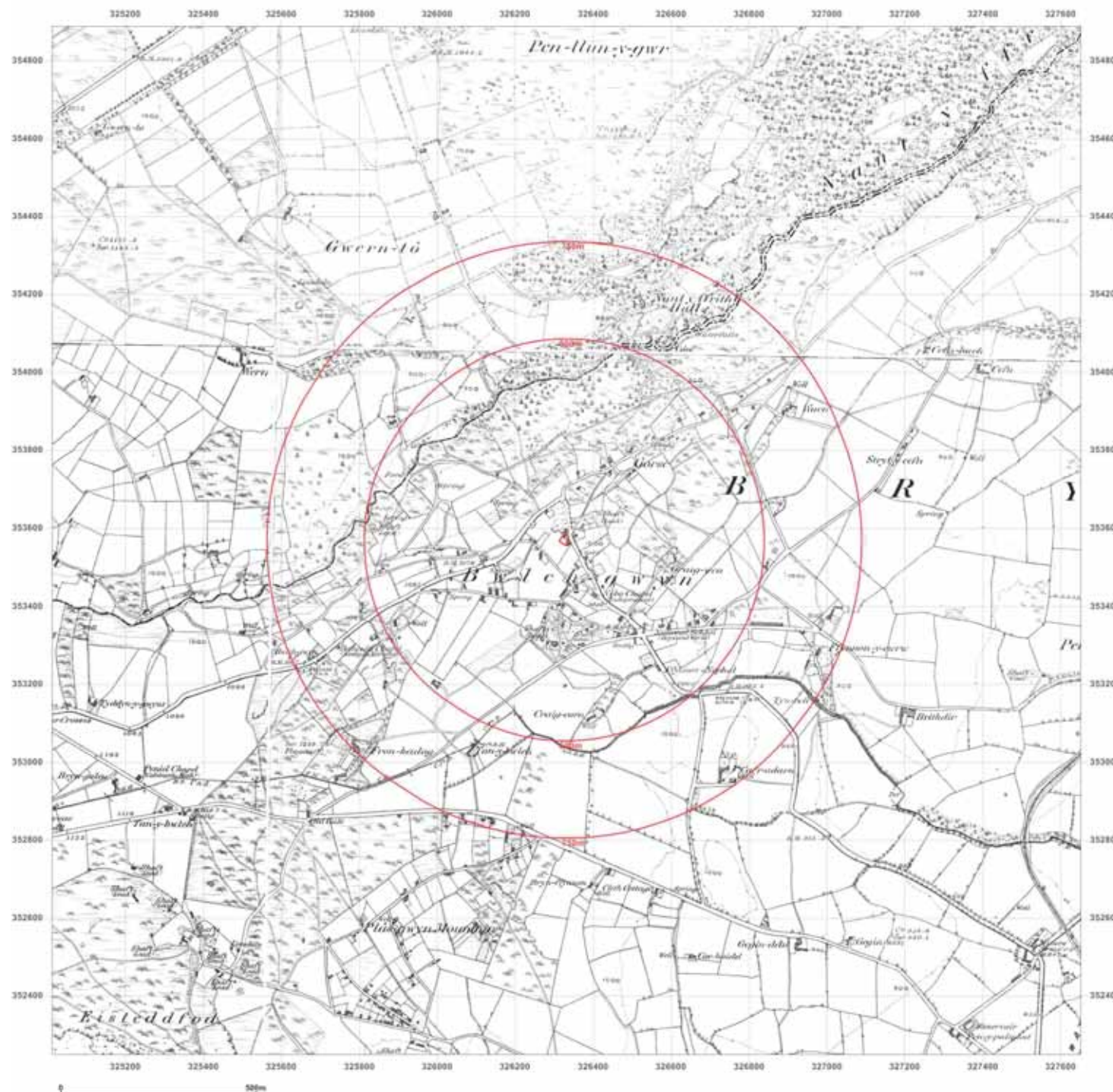


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1900

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1872
Revised 1900
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1871
Revised 1900
Edition N/A
Copyright N/A
Levelled N/A

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

Surveyed 1870
Revised 1900
Edition N/A
Copyright N/A
Levelled N/A

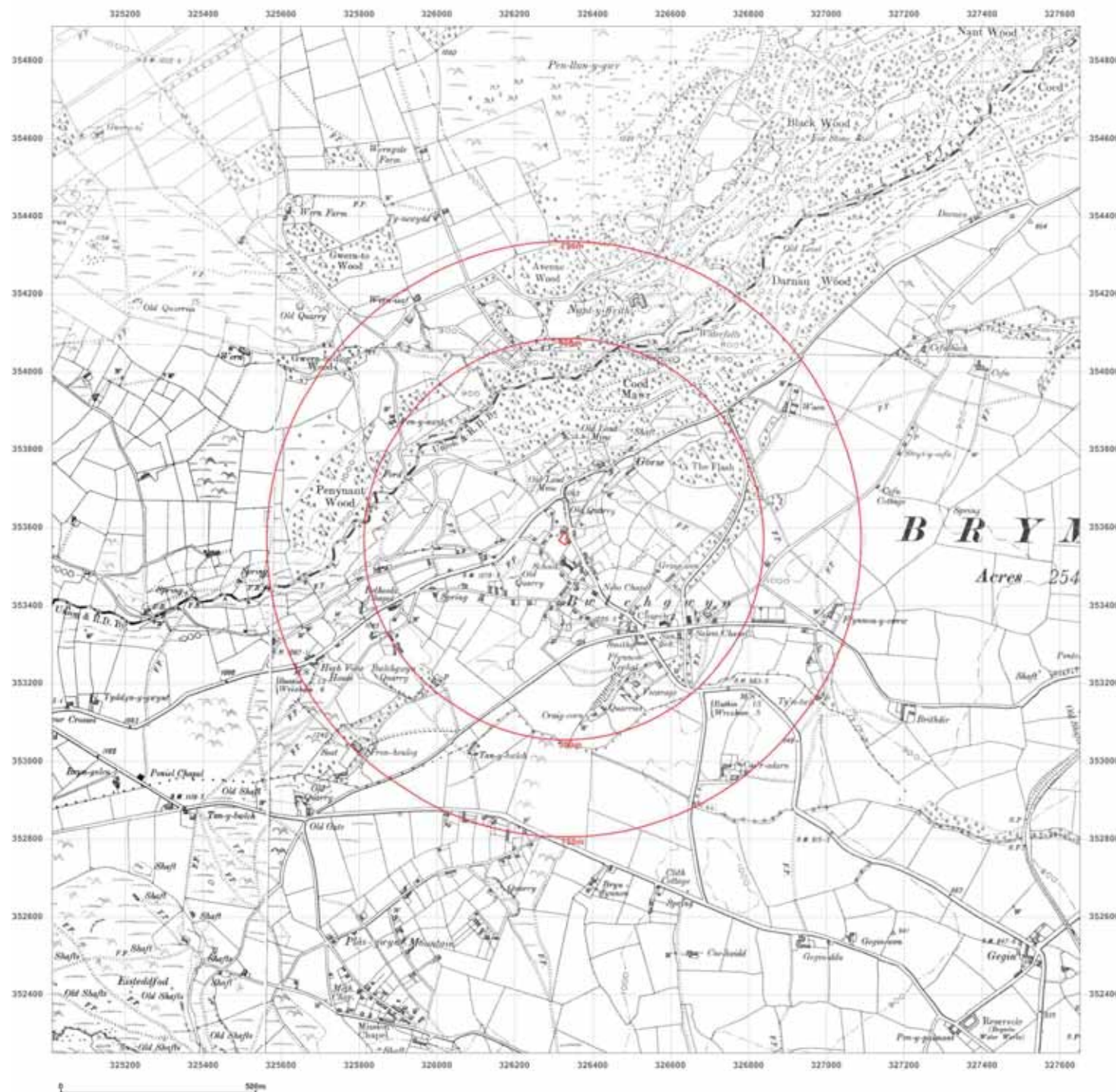


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1910-1914

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1871
Revised 1914
Edition 1914
Copyright N/A
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Surveyed 1871
Revised 1914
Edition 1914
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Revised 1914
Edition 1914
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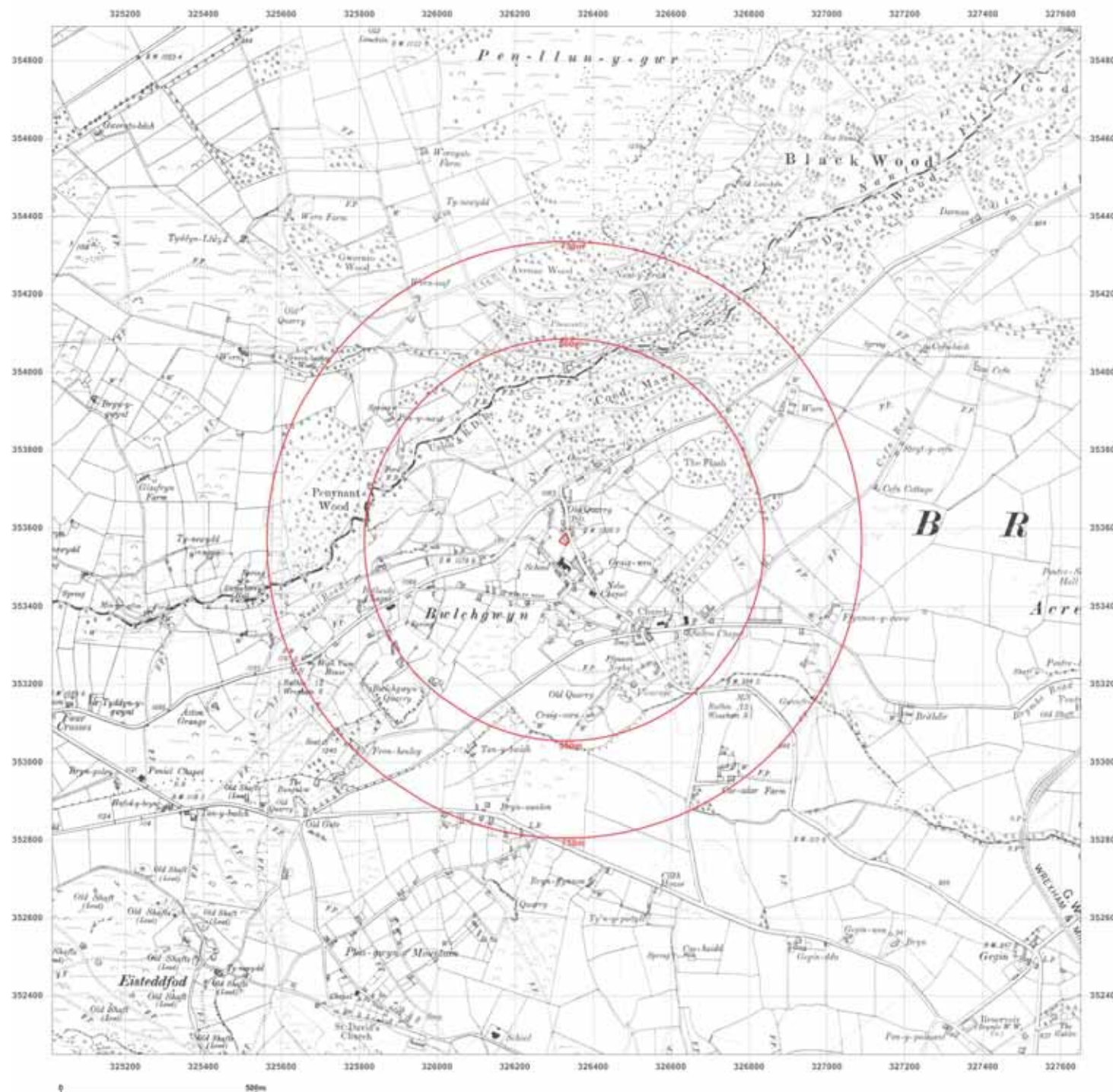


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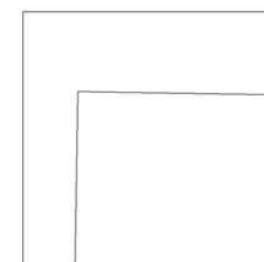
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Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1871
Revised 1938
Edition 1938
Copyright N/A
Levelled N/A

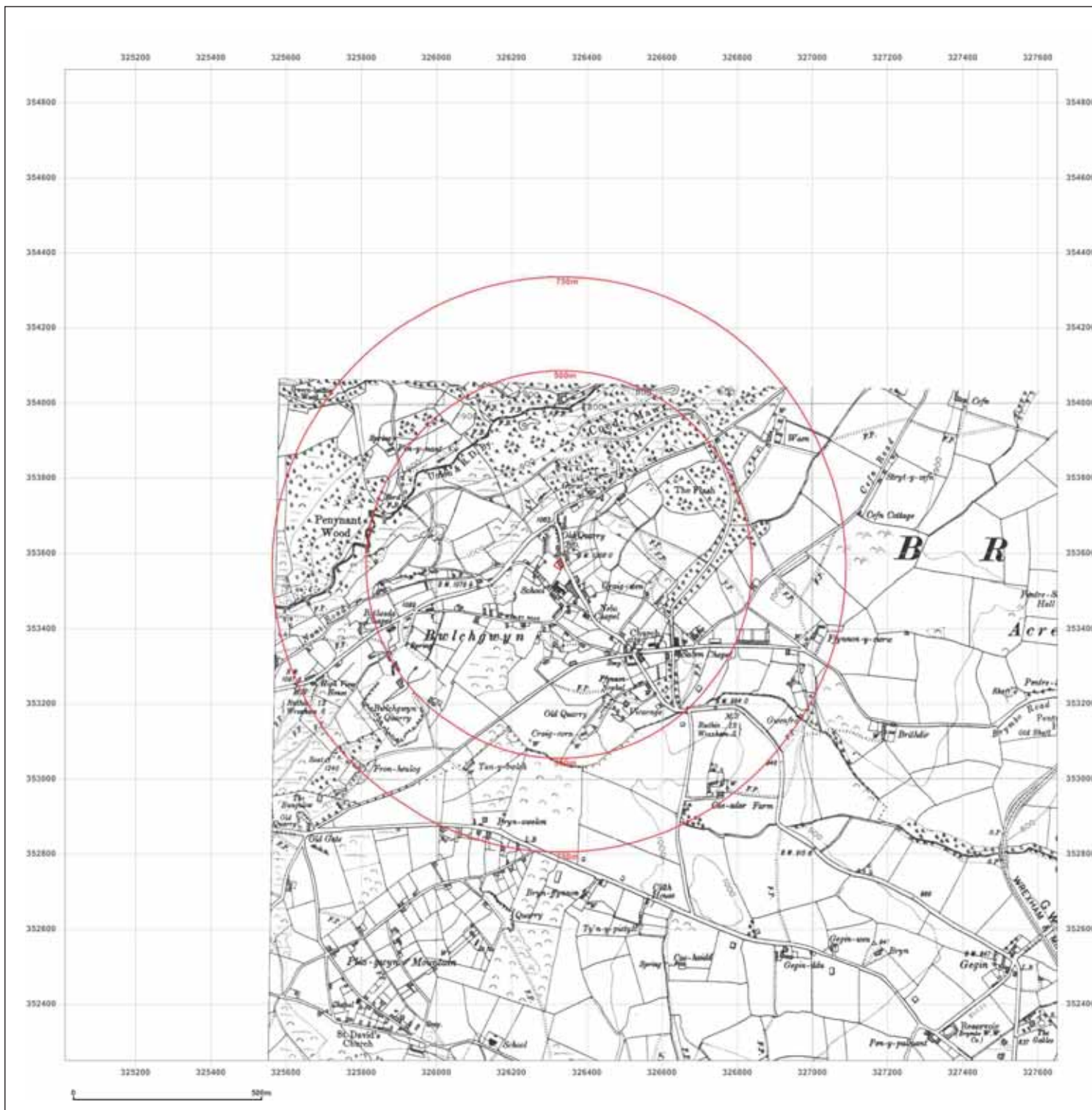


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: County Series

Map date: 1949

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1871
Revised 1949
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1871
Revised 1949
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1871
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Copyright N/A
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Surveyed 1871
Revised 1949
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Levelled N/A

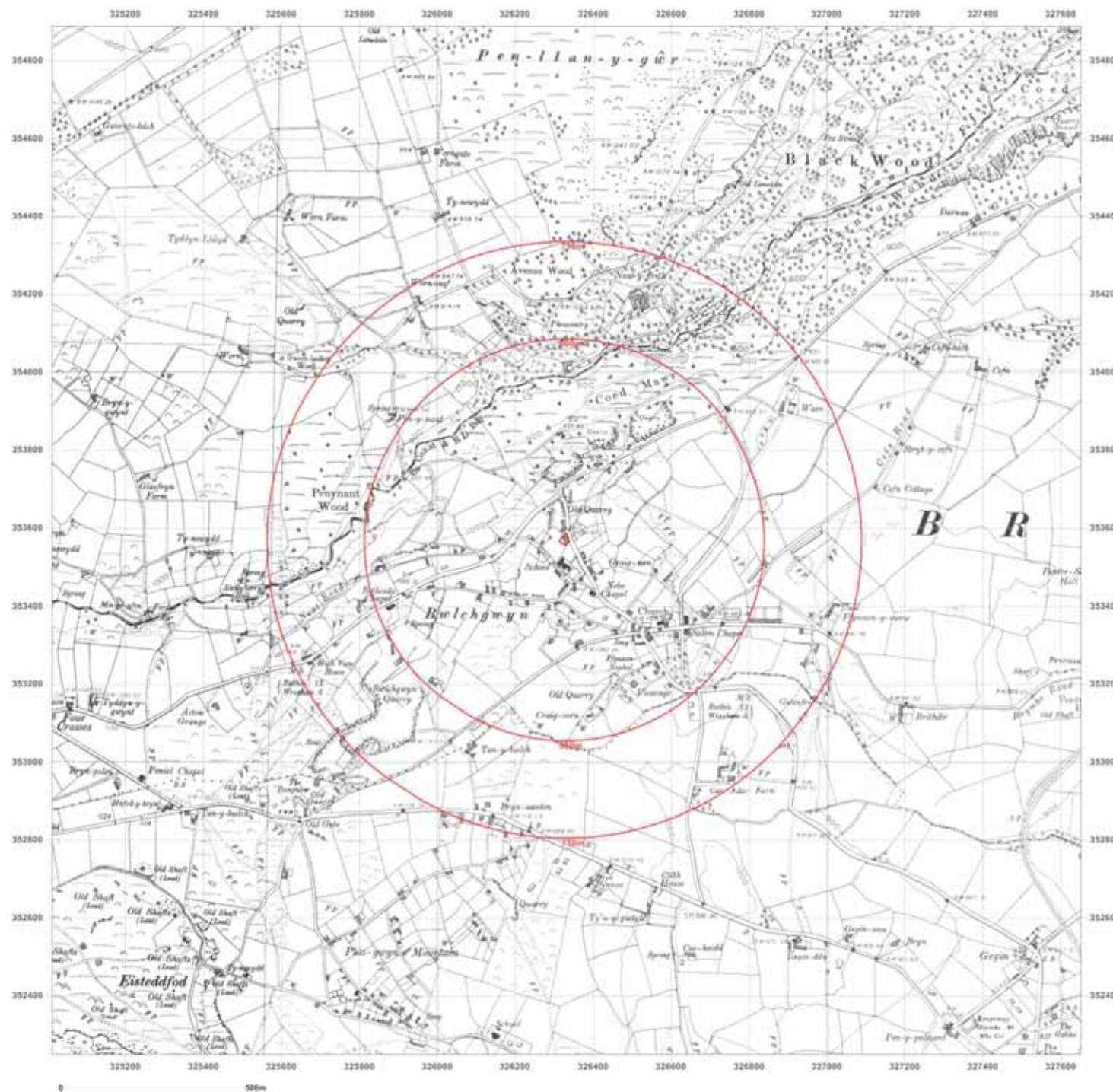


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: Provisional

Map date: 1960

Scale: 1:10,560

Printed at: 1:10,560



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

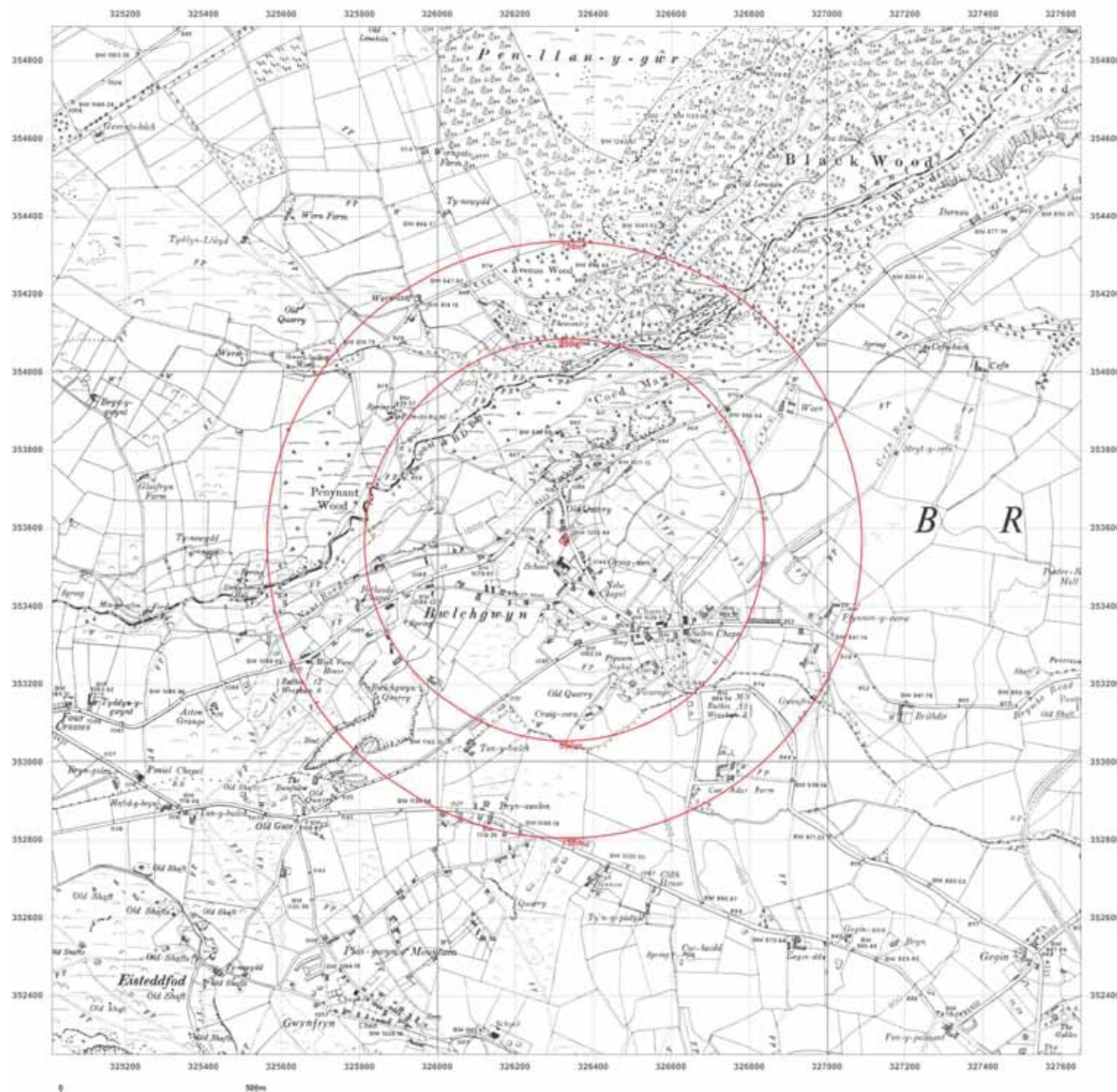


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1974

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1970
Revised 1974
Edition N/A
Copyright N/A
Levelled N/A

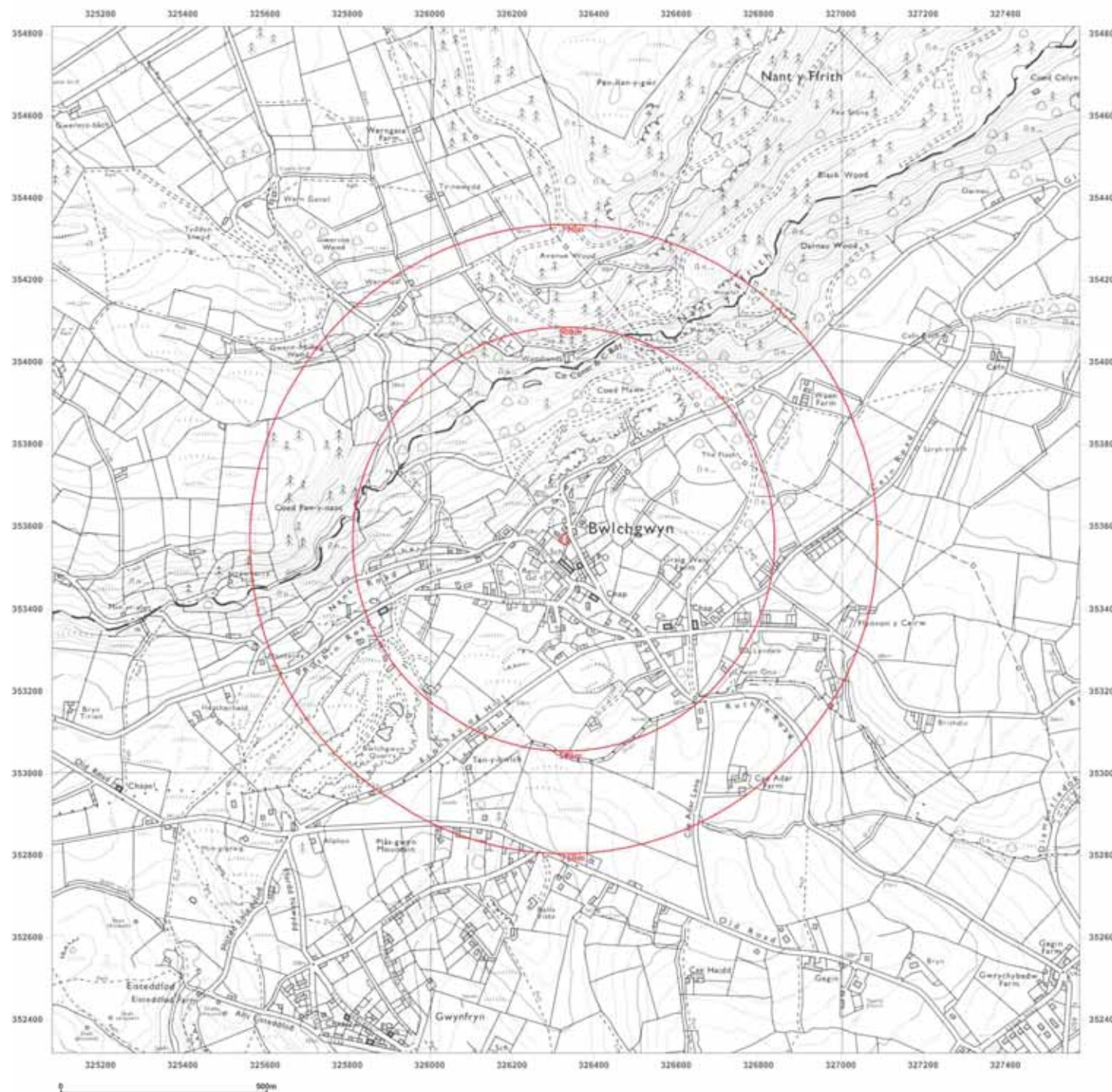


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1985

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1970
Revised 1985
Edition N/A
Copyright N/A
Levelled N/A

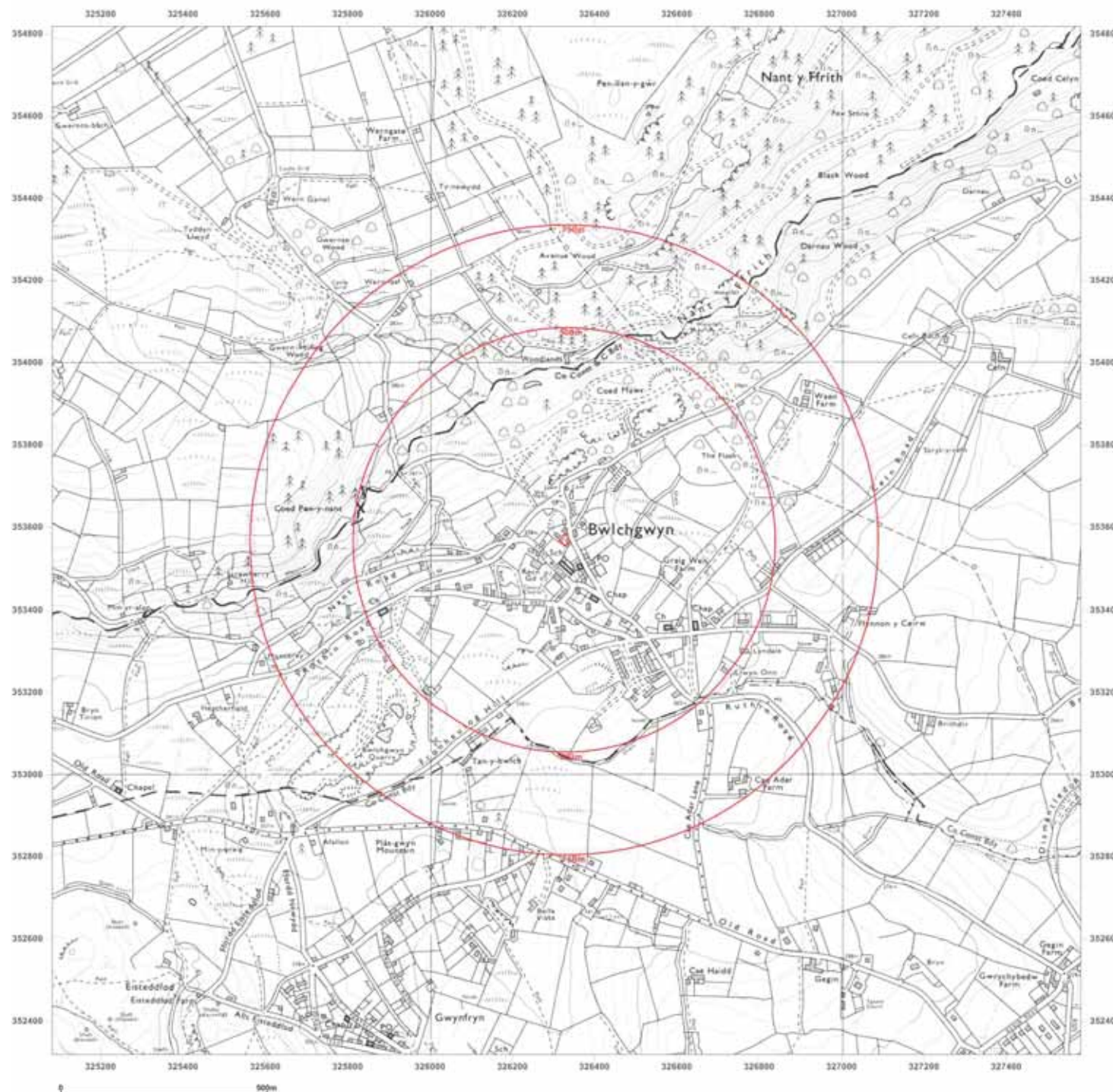


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 1989

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1983
Revised 1989
Edition N/A
Copyright N/A
Levelled N/A

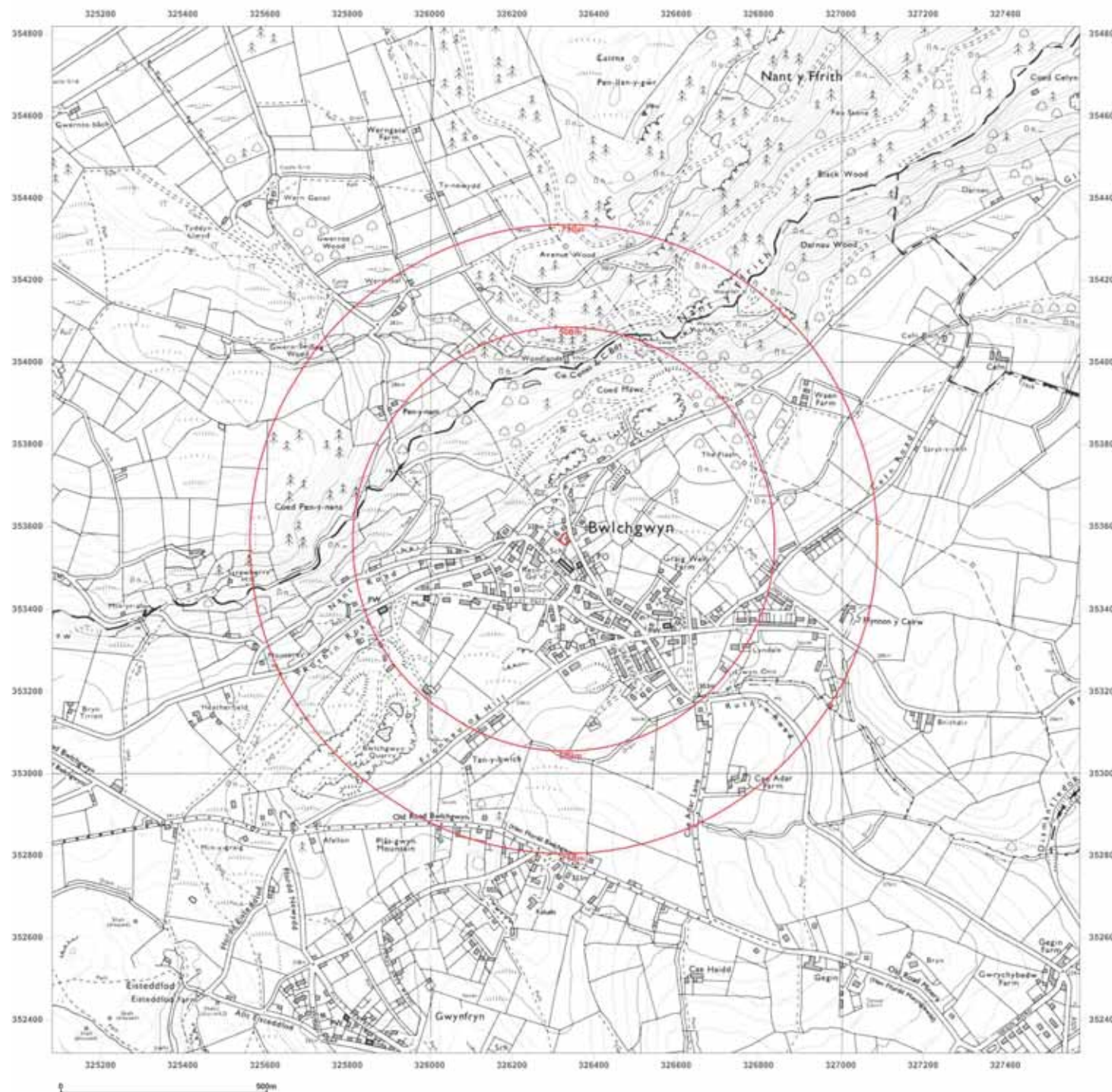


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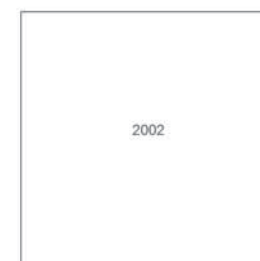
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Grid Ref: 326331, 353568

Map Name: 1:10,000 Raster

Map date: 2002

Scale: 1:10,000

Printed at: 1:10,000

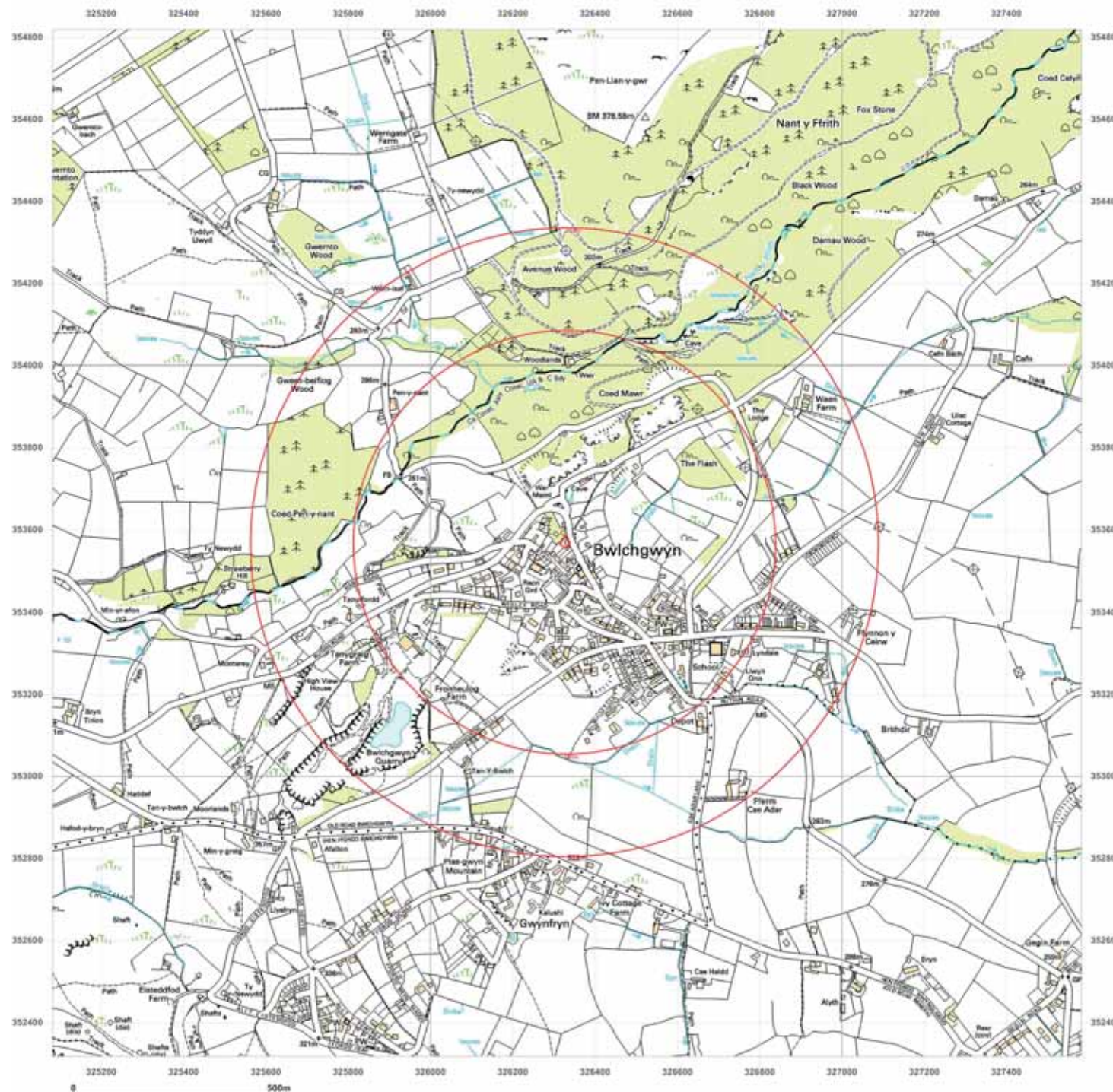


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000

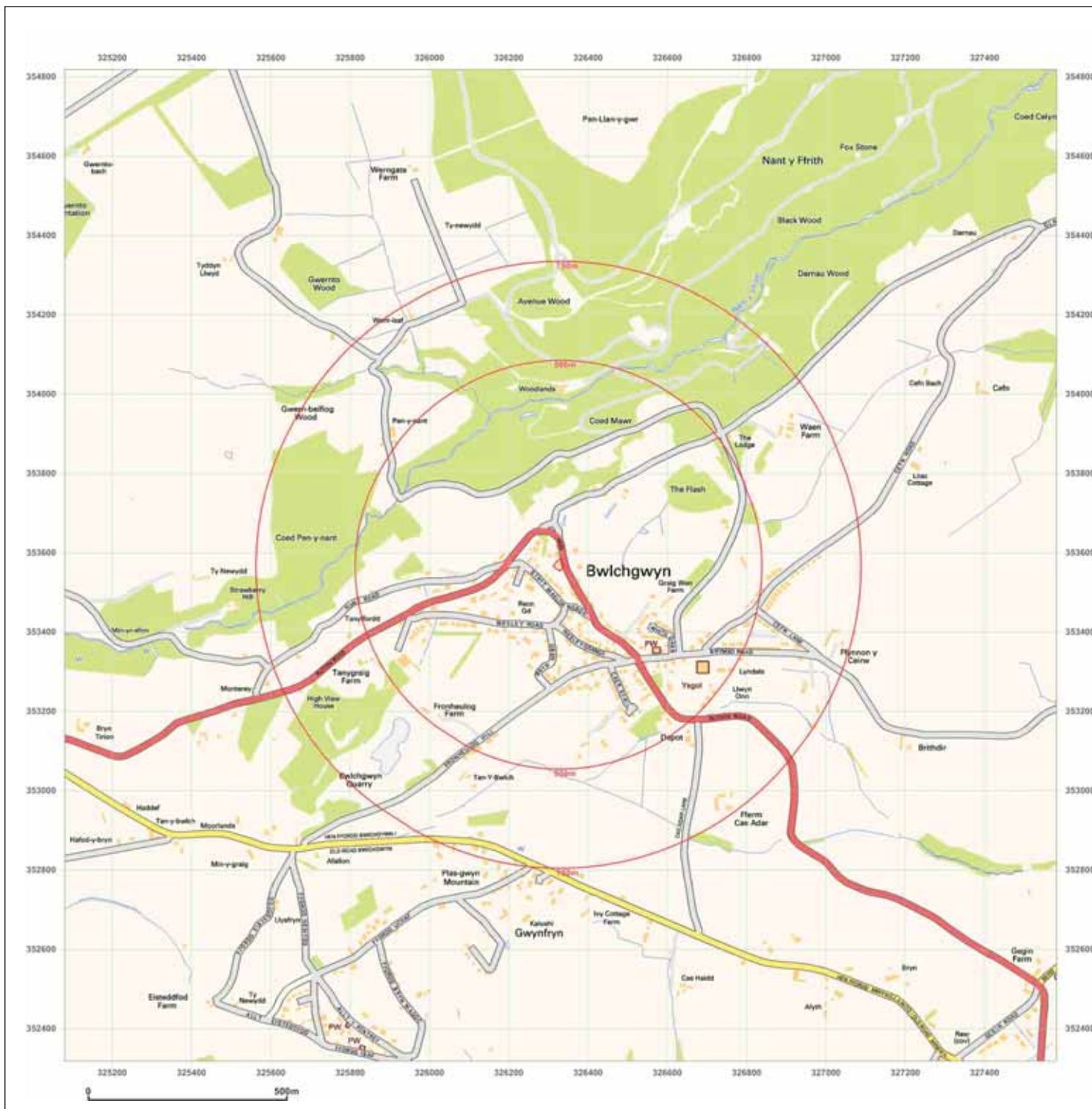


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Client Ref: PO14287
Report Ref: HMD-147-2166818
Grid Ref: 326331, 353568

Map Name: National Grid

Map date: 2014

Scale: 1:10,000

Printed at: 1:10,000

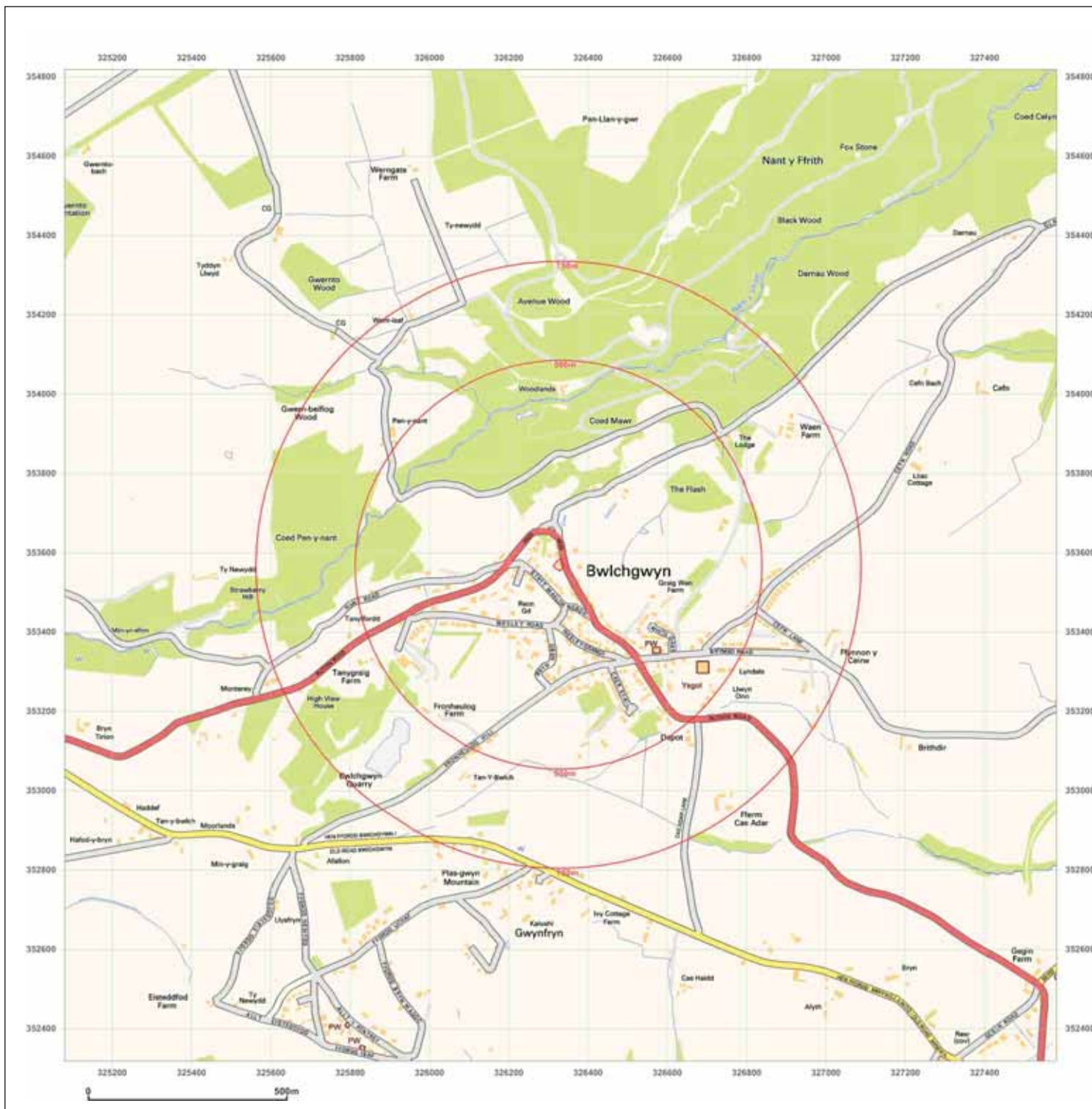


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The Coal
Authority

Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848 DX 716176 MANSFIELD 5

ETSOS
WILLOW MILL
UNIT 2-5 FELL VIEW
CATON
LANCASTER
LANCASHIRE
LA2 9RA

Our reference:	51000747829001
Your reference:	ATD-1887907-W897
Date of your enquiry:	20 January 2015
Date we received your enquiry:	20 January 2015
Date of issue:	20 January 2015

This report is for the property described in the address below and the attached plan.

Residential Coal Authority Mining Report

RUTHIN ROAD, BWLCHGWYN, WREXHAM, CLWYD, LL11 5UT

This report is based on and limited to the records held by, the Coal Authority, and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Coal mining	See comments below
Brine Compensation District	No

Information from the Coal Authority

Underground coal mining

Past

According to the records in our possession, the property is not within the zone of likely physical influence on the surface from past underground workings.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

However, reserves of coal exist in the local area which could be worked at some time in the future.
No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

Coal mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

Opencast coal mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The 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

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional Remarks

This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006. The Coal Authority owns the copyright in this report. The information we have used to write this report is protected by our database right. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes. Where this Report is for a residential property, insurance is included to cover any loss in property value caused by any changes in the information contained in this report. Please see the attached certificate of insurance for the terms and conditions of this insurance. The insurance does not cover non-residential property or interpretive reports.

Location map



Approximate position
of property



Enquiry boundary

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Ordnance Survey Licence number: 100020315

Key

Approximate position of enquiry
boundary shown



Policy Summary – Coal & Brine Search Report Insurance

This is a summary of the policy and does not contain the full terms and conditions of the cover which can be found in the policy document. It is important that you read the policy document carefully when you receive it.

Name of the Insurer

The insurer is Aviva Insurance Limited. Registered in Scotland No. 2116. Registered Office: Pitheavlis Perth PH2 0NH. Authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority.

The Coal Authority

The Coal Authority, a NDPB (non-departmental public body) sponsored by DECC (Department for Energy and Climate Change) 200 Lichfield Lane Mansfield Nottinghamshire NG18 4RG is responsible for producing the coal & brine search report, issuing the policy, collecting the premium and declaring the existence of the policy to Aviva Insurance Limited.

Type of Insurance and Cover

- The policy is evidenced by the policy that is attached to the coal & brine search report provided by The Coal Authority in respect of a search in form CON29M (2006).
- Where a coal & brine search report has been obtained in connection with a sale of the property, cover is provided for the benefit of a purchaser and their lender; in the case of a re-mortgage or where the existing owner chooses to obtain a coal & brine search report, cover is provided for the benefit of the owner and their lender.
- The policy offers protection against loss sustained by the owner of the property if any new problems or adverse entries are revealed in a subsequent coal & brine search report which were not revealed by the original report to which the policy was attached.

Significant features or benefits under the policy and the term/duration of the policy

- Cover is provided for loss that you suffer up to an amount of £50,000.00.
- For the purposes of the policy loss includes:-
 - any reduction in the market value of the property directly attributable to changes in the information revealed in the coal & brine search report compiled against the property; and
 - all other costs and expenses incurred which we have agreed, in writing, to cover.
- A single premium has been paid in respect of the cover provided under the policy; the policy remains in effect until you sell the property, or if you are the lender, the debt secured by the mortgage has been repaid.
- You cannot transfer the benefits of the policy to anyone else. However, if you die whilst you still have the benefit of the cover provided by the policy, the benefit will pass to your estate and beneficiaries.

Significant or unusual Exclusions or Conditions under the policy

- Full details can be found in the Cover and Exclusions sections of the policy.
- The policy does not cover your costs in relation to the loss of a transaction for the sale or purchase of the property.
- The property must be an existing (i.e. it must have been lived in) single residential house, flat or maisonette in the United Kingdom.
- The policy does not cover loss relating to structural or other physical damage caused to the property by subsidence, flooding or otherwise.
- The policy does not cover you for any loss in relation to any matter revealed in the coal & brine search report to which the policy is attached nor in relation to any matter that you were otherwise aware of on or before the policy was issued.

Cancellation Rights

You have the statutory right to cancel your policy within 14 days either from the day of purchase of the policy or the day on which you receive your policy, whichever is the later. If you wish to cancel and the insurance cover has not yet commenced, you will be entitled to a full refund of the premium paid.

How to claim

If you need to make a claim please write to Aviva Legal Indemnities, PO Box 6, 14 Surrey Street, Norwich, NR1 3NS, quoting your policy number. Telephone 0800 158 2236. Please enclose your policy and the coal & brine search report attached to it together with the subsequent coal & brine search report giving rise to the claim.

Telephone Call Recording

For your and our joint protection telephone calls may be recorded and/or monitored.

If You Have a Complaint

We hope that you will be very happy with the service that we provide. However, if for any reason you are unhappy with it, we would like to hear from you. In the first instance, please contact The Legal Indemnity Manager. You can write to Aviva Legal Indemnities at, PO Box 6, 14 Surrey Street, Norwich, NR1 3NS, or telephone 0800 158 2236, whichever suits you. We are covered by the Financial Ombudsman Service. If you have complained to us and we have been unable to resolve your complaint, you may refer it to this independent body. Following the complaints procedure does not affect your right to take legal action. The full complaints procedure is set out in the policy.

Financial Services Compensation Scheme

We are members of the Financial Services Compensation Scheme (FSCS). You may be entitled to compensation from this scheme if we cannot meet our obligations, depending on the type of insurance and the circumstances of your claim.

Further information about the scheme is available from the FSCS website www.fscs.org.uk, or write to Financial Services Compensation Scheme, 10th Floor, Beaufort House, 15 St. Botolph Street, London, EC3A 7QU.

Coal & Brine Search Report Insurance Policy

We welcome you as a Policyholder of Aviva, a worldwide organisation offering you a local insurance service for your personal and business requirements. This Policy is your evidence of insurance and may be required in the event of a claim.

Property: RUTHIN ROAD, BWLCHGWYN, WREXHAM, CLWYD, LL11 5UT

Definitions

You/Your means the person insured by this Policy. You may be

- The person who asked for the Coal & Brine Search Report in connection with your purchase of the Property (and your mortgagee)
- The person who purchased the Property (and your mortgagee) if the person selling the Property has asked for a Coal & Brine Search Report for the benefit of the purchaser as part of a seller's pack or if the Property has been purchased by way of auction
- The owner of the Property (and your mortgagee) if you are re-mortgaging the Property or the owner of the Property who has chosen to obtain a Coal & Brine Search Report.

We/Us/Our means the insurer, Aviva Insurance Limited, Registered in Scotland No. 2116, Registered Office: Pitheavlis Perth PH2 0NH. Authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority.

TCA means The Coal Authority a NDPB (non-departmental public body) sponsored by DECC (Department for Energy and Climate Change) 200 Lichfield Lane Mansfield Nottinghamshire NG18 4RG. TCA is responsible for producing the Coal & Brine Search Report, issuing this Policy, collecting the Premium and declaring the existence of this Policy to us.

Coal & Brine Search Report means the attached Coal & Brine Search Report that TCA has prepared for the Property following a Coal Mining & Brine Subsidence Search providing information compiled from

- TCA's records in relation to past, present and future underground and opencast coal-mining activity, shafts and adits (vertical and horizontal entries to mines), coal-mining geology, coal-mining related hazards, coal-mining subsidence and mine gas and
- The records of the Cheshire Brine Subsidence Compensation Board in relation to Cheshire Brine.

Effective Date means the date of the Coal & Brine Search Report attached to this Policy.

Limit of Cover means an amount of £50,000.

Market Value means the value determined by a Surveyor appointed following agreement by you and us (or appointed by an arbitrator in the absence of such agreement).

Period of Insurance means the period from the Effective Date until

- You sell the Property or
- The debt secured by the mortgage is repaid if you are a mortgagee.

Premium means the total amount of £0.95p paid in consideration of the cover provided by this Policy which includes Insurance Premium Tax at the appropriate rate.

Property means the property the address of which appears at the top of this Policy and in respect of which TCA has provided the attached Coal & Brine Search Report.

Surveyor means a person approved by us who has one or more of the following qualifications: FRICS or MRICS.

Cover

Subject to the terms and conditions of this policy and provided TCA has collected the Premium we will cover you up to the Limit of Cover for all claims made during the Period of Insurance in respect of

- The loss in Market Value of the Property directly attributable to any changes in the information revealed in a subsequent coal & brine search report which was not revealed in the Coal & Brine Search Report attached to this Policy which was carried out on the Effective Date, such loss in Market Value to be calculated at the date of the subsequent coal & brine search report, and
- All other costs and expenses which we have agreed in writing to cover.

Exclusions

1. We will not pay more than the Limit of Cover in total for any loss in Market Value of the Property and costs and expenses covered by this Policy. You cannot claim the benefit of more than one policy provided by us in this form in relation to the Property.
2. We will not be responsible for any loss you might suffer:
 - i. if at the date of the claim you are not the legal or beneficial owner of the Property
 - ii. if the Property is not a single private home in the United Kingdom which is used only for residential purposes
 - iii. in relation to loss of a transaction for the sale or for the purchase of the Property nor for any costs incurred by you in relation to the loss of such transaction
 - iv. in respect of structural or other physical damage caused to the Property by subsidence flooding or otherwise
 - v. as a result of any change in information in response to questions 3(a) 3(b) 8(a) or 8(b) of a Coal Mining & Brine Subsidence Search (form CON29M (2006)).For the avoidance of doubt this Policy does not provide buildings or contents insurance cover.
3. We will not be responsible for any loss which happens as a result of
 - i. an entry on any subsequent coal & brine search report after the Effective Date if this entry also appears on the attached Coal & Brine Search Report
 - ii. any problem revealed by the first coal & brine search report after the Effective Date if you or your legal representative knew about the problem on or before the Effective Date
 - iii. any change to the Coal Mining & Brine Subsidence Search (form CON29M (2006)) made after the Effective Date which affects our responsibility under this Policy if we would not have been responsible for the loss before such change
 - iv. any change in the interpretation of data upon which the Coal & Brine Search Report was produced provided such data remains unchanged.
4. We will not be responsible for any loss for which TCA or the Cheshire Brine Subsidence Compensation Board may be required to pay by law.

Conditions

1. You cannot transfer the benefit of this Policy to anyone else. If you die during the Period of Insurance the benefit of the Policy will pass to your estate and beneficiaries.
2. If you receive information about any claim, loss or incident for which we may be responsible under this Policy you must contact us as soon as possible as set out below in the section; How to claim.
3. If there is any claim under this Policy which is also covered by any other insurance we will pay no more than our rateable proportion of the loss and any costs and expenses connected with it.
4. You agree to do and permit to be done all things that we consider necessary to minimise loss under the Policy. We will be responsible for any expense incurred in complying with this Condition.
5. You must not make any offer promise or payment or incur any costs or expenses unless we have agreed in writing to cover such costs and expenses.
6. If there is a claim under this Policy we have the right to instruct a Surveyor to assess the Market Value of the Property.
7. Where we have accepted a claim and there is disagreement over the amount to be paid the dispute can be referred to an agreed arbitrator (or in the absence of an agreement an arbitrator appointed by the President of the Chartered Institute of Arbitrators) in accordance with the law at the time.

Cancellation Rights (Statutory Cooling Off Period)

You have the right to cancel your policy within 14 days from the day of purchase of the policy or the day on which you receive your policy, whichever is the later. If you wish to cancel and the insurance cover has not yet commenced, you will be entitled to a full refund of the premium paid.

Customers with Disabilities

This policy and other associated documentation are also available in large print, audio and Braille. If you require any of these formats, in the first instance, please contact Aviva Legal Indemnities, PO Box 6, 14 Surrey Street, Norwich, NR1 3NS, quoting your policy number. Telephone 0800 158 2236.

Data Protection Act – Information Uses

For the purposes of the Data Protection Act 1998, the Data Controllers in relation to any personal data you supply are Aviva Insurance Limited and The Coal Authority.

Insurance Administration

Your information may be used for the purposes of insurance administration by the insurer, its associated companies and agents by reinsurers and TCA. It may be disclosed to regulatory bodies for the purposes of monitoring and/or enforcing the insurer's compliance with any regulatory rules/codes. Your information may also be used for research and statistical purposes and crime prevention. It may be transferred to any country, including countries outside the European Economic Area for any of these purposes and for systems administration. Where this happens, we will ensure that anyone to whom we pass your information agrees to treat your information with the same level of protection as if we were dealing with it.

If you give us information about another person, in doing so you confirm that they have given you permission to provide it to us and for us to be able to process their personal data (including any sensitive personal data) and also that you have told them who we are and what we will use their data for, as set out in this notice.

In the case of personal data, with limited exceptions, and on payment of the appropriate fee, you have the right to access and if necessary rectify information held about you.

Information may also be shared with other insurers either directly or via those acting for the insurer (such as loss adjusters or investigators).

Fraud Prevention and Detection

In order to prevent and detect fraud we may at any time:

- Share information about you with other organisations and public bodies including the Police;
- Undertake credit searches and additional fraud searches;
- Check and/or file your details with fraud prevention agencies and databases, and if you give us false or inaccurate information and we suspect fraud, we will record this.

We can supply on request further details of the databases we access or contribute to.

We and other organisations may also search these agencies and databases to:

- Help make decisions about the provision and administration of insurance, credit and related services for you and members of your household;
- Trace debtors or beneficiaries, recover debt, prevent fraud and to manage your accounts or insurance policies;
- Check your identity to prevent money laundering, unless you furnish us with other satisfactory proof of identity.

Use of Language

Unless otherwise agreed, the contractual terms and conditions and other information relating to this contract will be in English.

How to claim

If you need to make a claim please write to Aviva Legal Indemnities, PO Box 6, 14 Surrey Street, Norwich, NR1 3NS, quoting your policy number. Telephone 0800 158 2236. Please enclose your policy and the Coal & Brine Search Report attached to it together with the subsequent coal & brine search report giving rise to the claim.

Please be aware of the Conditions of this Policy.

Telephone Call Recording

For your and our joint protection telephone calls may be recorded and/or monitored.

Choice of Law

The law of England and Wales will apply to this contract unless at the date of the contract you are a resident of Scotland or Northern Ireland in which case the law of that country will apply.

Our Promise of Service

Our goal is to give excellent service to all our customers but we recognise that things do go wrong occasionally. We take all complaints we receive seriously and aim to resolve all our customers' problems promptly. To ensure that we provide the kind of service you expect we welcome your feedback. We will record and analyse your comments to make sure we continually improve the service we offer.

What will happen if you complain

- We will acknowledge your complaint promptly.
- We aim to resolve all complaints as quickly as possible.

Most of our customers' concerns can be resolved quickly but occasionally more detailed enquiries are needed. If this is likely, we will contact you with an update within 10 working days of receipt and give you an expected date of response.

What to do if you are unhappy

If you are unhappy with any aspect of the handling of your insurance we would encourage you, in the first instance, to seek resolution by contacting The Legal Indemnity Manager. You can write to Aviva Legal Indemnities at, PO Box 6, 14 Surrey Street, Norwich, NR1 3NS, or telephone 0800 158 2236, whichever suits you, and ask your contact to review the problem.

If you are unhappy with the outcome of your complaint you may refer the matter to the Financial Ombudsman Service at: The Financial Ombudsman Service, South Quay Plaza, 183 Marsh Wall, London E14 9SR. Telephone: 0800 023 4567 (free from landlines) or 0300 123 9123. Or simply log on to their website at www.financial-ombudsman.org.uk.

Whilst we are bound by the decision of the Financial Ombudsman Service, you are not. Following the complaints procedure does not affect your right to take legal action.

Financial Services Compensation Scheme

We are members of the Financial Services Compensation Scheme (FSCS). You may be entitled to compensation from this scheme if we cannot meet our obligations, depending on the type of insurance and the circumstances of your claim.

Further information about the scheme is available from the FSCS website www.fscs.org.uk, or write to Financial Services Compensation Scheme, 10th Floor, Beaufort House, 15 St. Botolph Street, London, EC3A 7QU.

APPENDIX D

Laboratory Chemical Test Results



Chris Eccles
TerraConsult Ltd
Bold Business Centre
Bold Lane
Sutton
St Helens
Merseyside
WA9 4TX



QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 15-31718

Site Reference: Westminster Arms

Project / Job Ref: 2295

Order No: 14224

Sample Receipt Date: 26/05/2015

Sample Scheduled Date: 26/05/2015

Report Issue Number: 1

Reporting Date: 01/06/2015

Authorised by:

Russell Jarvis
Director

On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director

On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
QTS Environmental Report No: 15-31718	Date Sampled	22/05/15	22/05/15	22/05/15	22/05/15	22/05/15
TerraConsult Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Westminster Arms	TP / BH No	TP1-ES1	TP2-ES1	TP3-ES1	TP4-ES1	Stockpile-ES1
Project / Job Ref: 2295	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 14224	Depth (m)	0.20	0.20	0.20	0.35	None Supplied
Reporting Date: 01/06/2015	QTSE Sample No	149968	149969	149970	149971	149972

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected				Not Detected
pH	pH Units	N/a	MCERTS	7.6	7.8	6.6	6.9	6.9
Total Cyanide	mg/kg	< 2	NONE	< 2		< 2	< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	NONE				3224	
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.09		0.09	0.16	0.16
Organic Matter	%	< 0.1	MCERTS				1.3	
Total Organic Carbon (TOC)	%	< 0.1	MCERTS				0.8	1.3
W/S Chloride (2:1)	mg/kg	< 1	MCERTS				11	
Arsenic (As)	mg/kg	< 2	MCERTS	15	34	11	53	12
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3	0.7	0.3	1.2	0.6
Chromium (Cr)	mg/kg	< 2	MCERTS	15	13	17	16	19
Copper (Cu)	mg/kg	< 4	MCERTS	42	43	35	98	37
Lead (Pb)	mg/kg	< 3	MCERTS	1140	1400	479	4020	737
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	1.6	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	18	10	27	9	22
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	68	99	71	280	141
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2		< 2	< 2	< 2
DRO (C10 - C24)	mg/kg	< 6	MCERTS				47	
Oil (C25 - C40)	mg/kg	< 6	MCERTS				79	
Mineral Oil (C10 - C40)	mg/kg	< 10	MCERTS				52	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Wioletta Goral

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis ⁽⁵⁾



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 15-31718	Date Sampled	22/05/15	22/05/15	22/05/15	22/05/15	
TerraConsult Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Westminster Arms	TP / BH No	TP1-ES1	TP3-ES1	TP4-ES1	Stockpile-ES1	
Project / Job Ref: 2295	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 14224	Depth (m)	0.20	0.20	0.35	None Supplied	
Reporting Date: 01/06/2015	QTSE Sample No	149968	149970	149971	149972	

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Coronene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7	< 1.7	< 1.7	< 1.7	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 15-31718	Date Sampled	22/05/15				
TerraConsult Ltd	Time Sampled	None Supplied				
Site Reference: Westminster Arms	TP / BH No	TP4-ES1				
Project / Job Ref: 2295	Additional Refs	None Supplied				
Order No: 14224	Depth (m)	0.35				
Reporting Date: 01/06/2015	QTSE Sample No	149971				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	4			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	12			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	22			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	18			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	56			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	26			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	26			
Total >C5 - C35	mg/kg	< 42	NONE	81			

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 15-31718	Date Sampled	22/05/15				
TerraConsult Ltd	Time Sampled	None Supplied				
Site Reference: Westminster Arms	TP / BH No	TP4-ES1				
Project / Job Ref: 2295	Additional Refs	None Supplied				
Order No: 14224	Depth (m)	0.35				
Reporting Date: 01/06/2015	QTSE Sample No	149971				

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2				
Toluene	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene	ug/kg	< 2	MCERTS	< 2				
p & m-xylene	ug/kg	< 2	MCERTS	< 2				
o-xylene	ug/kg	< 2	MCERTS	< 2				
MTBE	ug/kg	< 5	MCERTS	< 5				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 15-31718	
TerraConsult Ltd	
Site Reference: Westminster Arms	
Project / Job Ref: 2295	
Order No: 14224	
Reporting Date: 01/06/2015	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
149968	TP1-ES1	None Supplied	0.20	12.2	Light brown clayey gravel with rubble
149969	TP2-ES1	None Supplied	0.20	9.8	Light brown clayey gravel with rubble
& 149970	TP3-ES1	None Supplied	0.20	9.8	Green gravelly clay with rubble
149971	TP4-ES1	None Supplied	0.35	10.9	Brown clayey gravel with rubble
149972	Stockpile-ES1	None Supplied	None Supplied	16.4	Black gravelly clay

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/5}

& samples received in inappropriate containers for hydrocarbon analysis



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Soil Analysis Certificate - Methodology & Miscellaneous Information				
QTS Environmental Report No: 15-31718				
TerraConsult Ltd				
Site Reference: Westminster Arms				
Project / Job Ref: 2295				
Order No: 14224				
Reporting Date: 01/06/2015				

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

APPENDIX E

Summary of Chemical Test Results of Soil Samples

TerraConsult

Site: Westminster Arms

CHEMICAL STATISTICAL ANALYSIS - based on CLEA v1.06 (Sandy Loam 1% SOM)

Job No: 2288

Analyte	Limit of Detection	Statistical Analysis					SGV / GAC		SGV / GAC		SGV / GAC		pC4SL		pC4SL		pC4SL		LQM/CIEH S4UL		LQM/CIEH S4UL		LQM/CIEH S4UL								
		TerraConsult	TerraConsult	TerraConsult	TerraConsult	TerraConsult	Statistical Results		Statistical Results		Criteria Source		Screening Criteria		Screening Criteria		Criteria Source		Screening Criteria		Screening Criteria		Criteria Source								
		Light brown clayey gravel with rubble	Light brown clayey gravel with rubble	Green gravelly clay with rubble	Brown clayey gravel with rubble	Black gravelly clay	n	Standard Deviation	Minimum	Average	Maximum	Maximum	Residential With Veg. Uptake Tier I Screening Criteria	Pass/ Fail	Maximum	Residential Without Veg. Uptake Tier I Screening Criteria	Pass/ Fail	Source of Screening Criteria	Source of Toxicological Data	Residential with Home Grown Produce	Pass / Fail	Residential without Home Grown Produce	Pass / Fail	Source of Screening Criteria	Source of Toxicological Data	Residential with Home Grown Produce	Pass / Fail	Residential without Home Grown Produce	Pass / Fail	Source of Screening Criteria	Source of Toxicological Data
		22/05/15	22/05/15	22/05/15	22/05/15	22/05/15																									
		TP1-ES1	TP2-ES1	TP3-ES1	TP4-ES1	Stockpile-ES1																									
		0.20	0.20	0.20	0.35																										
Asbestos Screen	Positive / Negative	Not Detected				Not Detected		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Metals																															
Arsenic (total)	<2 mg/kg	15	34	11	53	12	5	18	11	25	53	53.0	32	Fail	53.00	35	Fail	SC050021*	SC050021	37	Fail	40	Fail	CLEA v1.06	Defra 2014	37	Fail	40	Fail	CLEA v1.06	LQM/CIEH 2014
Cadmium (total)	<0.5 mg/kg	0.3	0.7	0.3	1.2	0.6	5	0	0	1	1	1.2	10	Pass	1.20	17.7	Pass	SC050021*	SC050021	22	Pass	150	Pass	CLEA v1.06	Defra 2014	11	Pass	85	Pass	CLEA v1.06	LQM/CIEH 2014
Chromium (total) (III for S4ULs)	<2 mg/kg	15	13	17	16	19	5	2	13	16	19	19.0	3010	Pass	19.00	3010	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	910	Pass	910	Pass	CLEA v1.06	LQM/CIEH 2014
Copper (total)	<4 mg/kg	42	43	35	98	37	5	26	35	51	98	98.0	2330	Pass	98.00	6200	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	2400	Pass	7100	Pass	CLEA v1.06	LQM/CIEH 2014
Lead (total)	<3 mg/kg	1140	1400	479	4020	737	5	1423	479	1555	4020	4020	N/A	-	4020	N/A	-	-	-	210	Fail	330	Fail	CLEA v1.06	Defra 2014	-	-	-	-	-	-
Mercury (total inorganic)	<1 mg/kg	1	1	1	1.6	1	5	0.27	1	1	2	1.6	170	Pass	1.60	238	Pass	SC050021*	SC050021	-	-	-	-	-	-	40	Pass	56	Pass	CLEA v1.06	LQM/CIEH 2014
Nickel (total)	<3 mg/kg	18.0	10.0	27.0	9.0	22.0	5	7.73	9	17	27	27.0	130	Pass	27.00	127	Pass	SC050021*	SC050021	-	-	-	-	-	-	180	Pass	180	Pass	CLEA v1.06	LQM/CIEH 2014
Selenium (total)	<3 mg/kg	3	3	3	3	3	5	0.00	3	3	3	3.0	350	Pass	3.00	595	Pass	SC050021*	SC050021	-	-	-	-	-	-	250	Pass	430	Pass	CLEA v1.06	LQM/CIEH 2014
Zinc (total)	<3 mg/kg	68	99	71	280	141	5	88	68	132	280	280.0	3740	Pass	280.00	40300	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	3700	Pass	40000	Pass	CLEA v1.06	LQM/CIEH 2014
Inorganic																															
pH Value	pH Units	7.6	7.8	6.6	6.9	6.9	5	0.51	6.6	7	7.8	7.80	-	-	7.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (total)	<1 mg/kg	2.0		2.0	2.0	2.0	4	0.00	2	2	2.0	2.00	-	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate (2:1)	<0.005 g/l	0.09		0.09	0.16	0.16	4	0.04	0.09	0	0	0	-	-	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate (total)	<200 mg/kg				3224		1	-	3224	3224	3224	3224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic																															
Soil Organic Matter	<0.1 %				1.3		1	-	1.3	1	1.30	1.30	-	-	1.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOC	<0.1 %				0.8		2	-	0.8	1	1.30	1.30	-	-	1.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol (Total Monohydric)	<2 mg/kg	2.0		2.0	2.0	2.0	4	0.00	2	2	2.0	2.00	210	Pass	2.00	310	Pass	CLEA v1.06	SC050021	-	-	-	-	-	-	280	Pass	750	Pass	CLEA v1.06	LQM/CIEH 2014
PAH																															
Naphthalene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	1.54	Pass	0.1	1.64	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	2.3	Pass	2.3	Pass	CLEA v1.06	LQM/CIEH 2014
Acenaphthylene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	168	Pass	0.1	1950	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	170	Pass	2900	Pass	CLEA v1.06	LQM/CIEH 2014
Acenaphthene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	205	Pass	0.1	2020	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	210	Pass	3000	Pass	CLEA v1.06	LQM/CIEH 2014
Fluorene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	163	Pass	0.1	1850	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	170	Pass	2800	Pass	CLEA v1.06	LQM/CIEH 2014
Phenanthrene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	92	Pass	0.1	837	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	95	Pass	1300	Pass	CLEA v1.06	LQM/CIEH 2014
Anthracene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	2260	Pass	0.1	19800	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	2400	Pass	31000	Pass	CLEA v1.06	LQM/CIEH 2014
Fluoranthene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	257	Pass	0.1	972	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	280	Pass	1500	Pass	CLEA v1.06	LQM/CIEH 2014
Pyrene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	563	Pass	0.1	2330	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	620	Pass	3700	Pass	CLEA v1.06	LQM/CIEH 2014
Benz(a)anthracene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	3.1	Pass	0.1	3.71	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	7.2	Pass	11	Pass	CLEA v1.06	LQM/CIEH 2014
Chrysene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	6	Pass	0.1	8.84	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	15	Pass	30	Pass	CLEA v1.06	LQM/CIEH 2014
Benzo(b)fluoranthene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	5.6	Pass	0.1	7	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	2.6	Pass	3.9	Pass	CLEA v1.06	LQM/CIEH 2014
Benzo(k)fluoranthene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	8.5	Pass	0.1	10	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	77	Pass	110	Pass	CLEA v1.06	LQM/CIEH 2014
Benzo(a)pyrene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	0.83	Pass	0.1	1	Pass	CLEA v1.06	LQM 2009	5.0	Pass	5.3	Pass	CLEA v1.06	Defra 2014	2.2	Pass	3.2	Pass	CLEA v1.06	LQM/CIEH 2014
Indeno(123cd)pyrene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	3.2	Pass	0.1	4.17	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	27	Pass	45	Pass	CLEA v1.06	LQM/CIEH 2014
Dibenzo(ah)anthracene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	0.76	Pass	0.1	0.87	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	0.24	Pass	0.31	Pass	CLEA v1.06	LQM/CIEH 2014
Benzo(ghi)perylene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	44	Pass	0.1	46.8	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	320	Pass	360	Pass	CLEA v1.06	LQM/CIEH 2014
Coronene	<0.1 mg/kg	0.1		0.1	0.1	0.1	4	0.00	0.1	0	0.1	0.1	88.1	Pass	0.1	88.9	Pass	CLEA v1.06	LQM 2009	-	-	-	-	-	-	-	-	-	-	-	-
Total Oily Waste PAHs	<1 mg/kg	1.0		1.0	1.0	1.0	4	0.00	1.0	1	1.0	1.0	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dutch 10 PAHs	<1 mg/kg	1.0		1.0	1.0	1.0	4	0.00	1.0	1	1.0	1.0	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total EPA-16 PAHs	<1.6 mg/kg	1.6		1.6	1.6	1.6	4	0.00	1.6	2	1.6	1.6	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total WAC-17 PAHs	<1.7 mg/kg	1.7		1.7	1.7	1.7	4	0.00	1.7	2	1.7	1.7	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTX																															
Benzene	<0.002 mg/kg																														

APPENDIX F

Summary of Guidance for Classification of Soil as a Waste Material

Guidance for Classification of Soil for Off Site Disposal at a Landfill Site

Many site developments create a portion of excess soils and Made Ground which if not re-usable, are required to be disposed off-site at a suitably licensed landfill site. The regulations and associated guidance published by the Environment Agency is relatively complex and lengthy. This guidance provides a summary of the following documents which should be referred to when assessing soil (and common constituents found within Made Ground on remediation sites) for off-site disposal:

- Guidance for Waste destined for disposal in landfills: Interpretation of the Waste Acceptance Requirements of the Landfill (England and Wales) Regulations 2002 (as amended) (EA, 2004);
- Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance Procedures (EA, April 2005);
- WM3 - Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Wastes Version 3 (EA, May 2015);
- Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP4);
- Guidance on Waste Destined for Disposal in Landfill (EA, June 2006);
- Treatment of Non-hazardous wastes for Landfill (EA, February 2007).

It is important to distinguish between the waste classification system and the designation of materials as “suitable for use” on site. A material may be retained on site for an appropriate end use if that end-use is clearly designated and that a site-specific risk assessment ensures that it does not pose a risk to human health or controlled waters. However, if this material is excavated and sent for disposal, the material is then subject to waste management regulations and the two systems cannot be directly correlated. It is therefore important to note that classifying a material as hazardous (should it be excavated and become a waste) does not necessarily indicate that it might not be suitable to be kept on site for re-use. Separate guidance in the form of a Code of Practice (CL:AIRE Version 2, 2011) has been developed jointly between the development industry and the Environment Agency to provide best practice when assessing whether materials are wastes or not, and for determining when waste can cease to be waste for a particular use.

In accordance with the current waste regulations (or Landfill Directive, as they are more commonly known), from 30th October 2007 all waste materials produced from construction sites have to be pre-treated prior to disposal. Pre-treatment includes waste minimisation, recovery (e.g. separation of demolition waste to be used as hardcore) and separation of materials into different waste categories (e.g. separate inert waste from hazardous waste etc). Mixing of different waste types shall be avoided and intentional mixing of inert materials with hazardous waste to ‘dilute it’ and hence change its waste classification, is illegal.

The current waste regulations (based on the EU landfill directive) introduced a two tier classification system for waste materials, defining them as either being hazardous or non-hazardous. Landfills are licensed to take wastes based on a three tier classification system with the non-hazardous waste divided into two sub-categories:

- Non-Hazardous - inert;
- Non-Hazardous - non-hazardous;
- Hazardous.

Waste materials are categorised with a six figure numeric code in the European Waste Catalogue. Commonly found construction and demolition wastes including excavated soil from contaminated sites and Made Ground with their waste codes are summarised below (this is not a comprehensive list):

Waste Code	What is it?	Likely Waste Category–		
		Inert Waste	Non-Hazardous	Hazardous Waste
17 01 01 Concrete	Concrete, possibly with reinforcement (from Construction & Demolition)	✓		
17 01 02 Bricks		✓		
17 01 06* Mixtures of concrete, bricks, tiles & ceramics containing dangerous substances	These are not normally considered hazardous but if they are contaminated (e.g. by asbestos) then could be hazardous – see comment above			✓
17 01 07 Mixtures of concrete, bricks, tiles & ceramics other than those in 17 01 06	This is mixed inerts c.f. 17 09 04	✓		
17 05 03* soils and stones containing dangerous substances				✓
17 05 04 soils and stones other than those mentioned in 17 05 03	Soil and stones only (excluding top soil, peat, soil and stones from contaminated sites)	✓		
17 06 05* Construction materials containing asbestos	e.g. corrugated asbestos sheeting			✓
17 08 02 Gypsum-based construction materials other than those mentioned in 17 08 01	Plaster & plasterboard (although specific disposal requirements are required for high sulphate waste – see EA guidance ‘Understanding the Landfill Directive’ version 1.0 March 2010.		✓	
17 09 01* Construction & demolition wastes containing mercury				✓
17 09 02* Construction & demolition wastes containing PCBs	Waste with more than 50 mg/kg of PCB’s are hazardous			✓
17 09 03* Other mixed construction & demolition wastes containing dangerous substances	Broad range of potentially (see notes below – if asterix the waste is hazardous) hazardous wastes			✓
17 09 04 Mixed construction & demolition wastes other than those mentioned in 17 09 01, 17 09 02 & 17 09 03	Mixed inerts with soil, tarmac, cables, vegetation, plaster, etc. (this waste can only be considered inert if it passes the waste acceptance criteria identified in the regulations).	✓	✓	

Note: all wastes with an asterix code are hazardous regardless of whether they are mirror or absolute entries in the EWC list the decision to with regard to composition must come before applying the code for mirror entries.

Some materials are classified as Inert Waste based in its origin (e.g. 17 01 01 Concrete, or glass) without any requirement for laboratory chemical analysis.

However, most soils will require laboratory testing to confirm whether they are classified as Hazardous Waste. The protocol for assessing these materials and the appropriate threshold values is complicated and are set out in the Environment Agency's "Technical Guidance WM2 Hazardous Waste – Interpretation of the Definition and Classification of Hazardous Waste" Version 3 (2013). If the test results for the waste indicates that it is not hazardous then further analysis of the waste is required to determine whether it is Inert Waste. If the waste does not meet the criteria for either Hazardous or Inert, then it is by default classified as Non-hazardous Waste.

As an alternative location to landfills for off-site disposal of inert and non-hazardous waste, there are a number of sites which have Waste Permit Exemptions that can accept certain categories of inert and non-hazardous wastes. Additionally some quarries can accept certain types of wastes to be used for quarry restoration material. For both alternatives to disposal at landfill sites the material still requires chemical testing as these sites have site specific acceptance criteria for wastes. It should also be noted that these types of site do not incur landfill tax which in the 2015/16 tax year is £2.60 for inactive waste (inert and some types of non-hazardous waste) and £82.60/Tonne for active waste (some types of non-hazardous waste and hazardous waste. Note that the Inland Revenue uses a different classification scheme for waste for tax purposes to the European Waste Classification scheme.

Waste Categorisation

The process of determining the category of wastes is a three stage process:

- Stage 1 – is the waste either Hazardous or Inert by definition without the requirement for chemical analysis (if it is then Stages 2 and 3 are not required);
- Stage 2 - Waste characterisation;
- Stage 3 - WAC classification.

Waste characterisation determines if a waste is hazardous or not. Excavated soil is characterised using a system based on the contaminants present and their hazardous properties. The system uses total concentrations of the contaminants. Thresholds (as a percentage of the waste) have been set for the various hazardous properties.

Fourteen hazardous properties together with other scenarios where material could cause a hazard have been defined:

- Hazardous properties: explosive, oxidising, highly flammable/flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, toxic for reproduction, mutagenic and ecotoxic;
- Substances which can release toxic/very toxic gases in contact with water, acid or air;
- Substances which, after disposal, can yield another substance, e.g. a leachate, which possesses any of the above hazardous properties.

Some of the hazardous properties are sub-divided e.g. there are three categories of carcinogenic, mutagenic and toxic for reproduction substances. The hazardous properties were originally defined in the European Hazardous Waste Directive 91/689/EC. Should a waste contain a contaminant with one or more of the listed hazardous properties at a concentration equal to or above the threshold value for the particular property, then the waste is hazardous. The hazardous properties of a wide range of chemicals are sourced from CHIP4 (2009).

There are many reasons why waste soil is classified as being hazardous but the majority of reasons can be divided into the following four groups:

- Hydrocarbons – this is probably the most common reason for the hazardous classification of soils. For most soils hydrocarbon analysis will be required for both Polycyclic Aromatic Hydrocarbons (PAH) and speciated Petroleum Hydrocarbons (PHCs) but depending on the site's history other groups of organic contaminants may also be included in any analysis suite for soil samples;
- Metals – Particularly sites from former metal processing or mining sites and also some types of ash have metal concentrations that are sufficiently high to characterise materials requiring disposal as hazardous waste.
- Asbestos;
- Anions – e.g. sulphate in plasterboard (there are special disposal requirements for high sulphate waste and specific WAC requirements); it is possible that sulphate salts of metals and semi-metals could make the waste hazardous – the sulphate concentration could possibly be significant under H12, H13 and H14.

The characterisation of wastes with significant metal concentrations involves some processing of the analysis data. The chemical analysis results for inorganic substances are generally reported as total concentrations e.g. total lead, total arsenic, total sulphate etc. However, CHIP4 (2009) deals with the hazardous properties of actual compounds e.g. lead sulphate, arsenic pentoxide, nickel carbonate. Therefore, the total metal results have to be converted into assessed chemical analysis results for the compound most likely to be present in the soil samples. For example, if the sample contains high total lead concentrations and high sulphate concentrations, then the lead is likely to be present in the soil as lead sulphate. The most likely compounds can often be determined from a desk study or previous site uses. If the site has been derelict for a number of years, consideration should be given as to whether water soluble compounds should or should not be chosen, as rainfall could have removed them from the soil (this does not apply if the soil has been taken from below under a concrete slab etc). Chemical knowledge and common sense needs to be used in choosing a suitable compound.

If no data is available, then a worst case scenario has to be assumed and the most hazardous compound likely to be present has to be chosen. For example, metal chromates (lead chromate, nickel chromate) are often the most hazardous compounds formed by many metals, but if the chromium concentrations in the soil are low, chromates are unlikely to be present. It should also be noted that for many of the hazard categories, the cumulative hazard from different compounds is added (e.g. add the concentrations of the copper, lead and zinc compounds together to assess the Hazard Category H14 Ecotoxicity).

If the results of the above assessment determine that the waste is hazardous, it must then be analysed for the Waste Acceptance Criteria (WAC) analysis contained within appropriate Environmental Permitting Regulations (this comprises mainly leachate but also analysis for TOC and Loss on ignition). WAC limit values have been set for the listed determinands. If any of the determinands exceed their limit value, the waste must be pre-treated to reduce concentrations to below the limit values before the waste may be disposed of at a landfill site licensed to take hazardous waste.

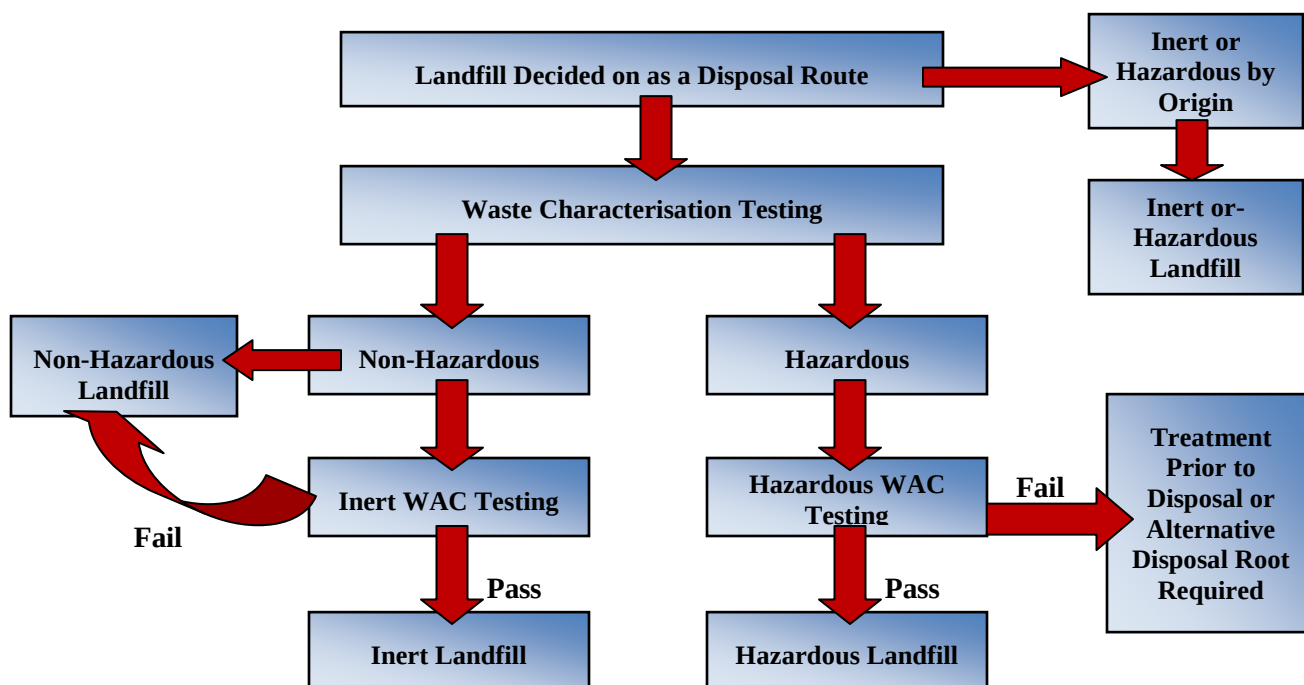
For waste classified as not being hazardous, then there are two options available. Currently, waste correctly characterised as not being hazardous may be disposed of without WAC testing to a non-hazardous landfill. Alternatively WAC testing for Inert Waste can be carried out (this is similar to the list for hazardous waste with the addition of PAH's, BTEX and Mineral Oil). If the results pass the Inert WAC criteria it can be disposed of at an Inert Waste Landfill. If any of the WAC test results exceed the Inert WAC criteria the waste has to be disposed at a non-hazardous landfill. There are WAC limits for non-hazardous waste set

for pH and TOC. If these two criteria are not met then the waste must be pre-treated to so that it meets the criteria before it can be disposed.

If materials fail the WAC criteria they can be pre-treated on site or taken to a soil treatment centre for pre-treatment (such as at the facility run by Biffa at Risley near Warrington). Here the soil's hazardous properties may be reduced (e.g. by bioremediation of hydrocarbons).

It should be noted that in order to dispose of Hazardous Waste, the site must register as a producer of Hazardous Waste with the Environment Agency. When disposing of waste materials to landfill sites the appropriate Duty of Care Waste Transfer procedures must be followed.

Landfilled Waste Decision Tree



Landfill Tax

It should be noted that HM Revenue and Customs (HMRC) classify wastes for tax purposes using a different scheme to the three fold landfill EU Landfill Directive scheme (i.e. the hazardous, non-hazardous and inert). HMRC have a two-fold system for landfill tax. The Standard Landfill Tax is currently £82.60/T and applies to all wastes unless they qualify for the reduced rate of landfill tax of £2.60/T. The wastes that qualify for the reduced rate of Landfill Tax are set out in The Landfill Tax (Qualifying Material) Order 2011 with supplementary information on the interpretation of these regulations in HMRS "Notice LFT1 – A General Guide to Landfill Tax" (May 2012) and HMRC Briefing Notes 15/12 and 18/12.



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