

Engineering Desk Study

Site at Bontnewydd, Caernarfon, Cymru



Report Status

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Appointment

Soil and Structures Ltd were instructed by Kingscrown Land & Commercial Ltd (*the Client*) in October 2022 to prepare an Engineering Desk Study (*the Report*) to support the development of a parcel of land in Bontnewydd, Caernarfon, Cymru (*the Site*).

Development proposals include for; construction of mixed terraced and semi-detached residential dwellings with associated hard and soft landscaping areas.

Reliance on the advice presented herein rests solely with the Client.

Scope and Context

The Engineering Desk Study offers advice in relation to a wide range of ground-related hazards potentially affecting the proposed development of the Site.

The legal context of this advice relates to an assessment of:

- i) Potential ground-related hazards that may affect the development (including coal mining related risk) that is governed by health and safety law (various acts and regulations); and,
- ii) The suitability of the Site for its proposed end use that is rooted within national planning policy guidance (the Planning Policy Wales) that is governed by planning law (various acts). The assessment of ‘suitability’ relates specifically to ground-related hazards of contamination, pollution and ground gases as set out within both the Environment Protection Act 1990 : Part 2A (2012) and Environment Agency guidance ‘Land Contamination Risk Management’ (LCRM) (2020) that also applies to Wales.

For further information on the context and scope of the Engineering Desk please refer to the Annexes.

Background to this Report

This Report is not preceded by existing ground-related reporting for the Site.

References

The Engineering Desk Study has been written with reference to various sources of information. These are either appended or included as footnotes at the base of each respective page.

Reference is also made to the ‘Engineer’ within this Report that relates to the appointed design engineer (structural and/or civil).

1.0 The Site and Proposed Development

1.1 The Site

Location and size: The Site comprises the existing plot east of Pwllheli Road, Bontnewydd, Caernarfan (Figure 1) that covers an area of around 0.35 ha.

Access: The Site is accessible on foot and by vehicle via a gated entrance off the road to the south (unnamed).

Surface cover: The surface of the Site is grass covered.

Topography: The Site has a topography that falls from around 40 mAOD in the south-east corner to between 35 and 36 mAOD along northern boundary of the Site along Afon Bueno.

Utilities: Existing utility alignments cross the Site including an above ground power line running north-east to south-west across the Site's south-eastern corner.

Existing reports: No existing ground-related reports have been located on the planning portal or made available for review.

Existing structures: At the point of issue, the Site is occupied by an open grassed field.

1.1 The Proposed Development

Development proposals include for; construction of mixed terraced and semi-detached residential dwellings (Figure 1) with associated hard and soft landscaping areas.

An appreciation of the construction processes is essential for development-related risk assessments given the groundworks stand to meaningfully alter the level of risk, e.g. potentially harmful soils being removed or moved by earthworks, or potentially unstable slopes being removed.

To enable this development, the following groundworks will be required, N.B. listing is outline only.

- > **Enabling:** Shallow surface strip of topsoil.
- > **Utility Excavations:** Excavation of drainage and other utility alignments.
- > **Foundations:** Construction of sub-structure (foundations and ground floor slabs) followed by super-structures.
- > **Surfacing:** Formation of new hardstanding and soft landscaping areas.

In relation to human health risk assessment, the development comprises a change of use from agricultural land to residential.



Figure 1: Development Plan Extract
> Extract from Client supplied 'Site Layout Feasibility Sketch' (appended)
> Approximate Site boundary illustrated by the red line.

2.0 Site Setting

2.1 History

The Site has been subject to one phase of use since the 1870s (the date of the earliest available ordnance survey mapping):

- > **The first phase** (Figure 2 with additional historical mapping plans appended): occurred between the 1870s and the present day when the Site was occupied by a field.

Evidence of potentially harmful material and evidence of potentially gas generating material: Through this phase of use it is considered unlikely that potentially harmful or degradable material would have been introduced into the Site's soils.

Evidence of mining activities: No evidence of coal mining features, e.g. old shafts or soughs, is recorded on the Site or immediately around this Site over this period.

Evidence of unexploded ordnance: *Military land use:* There is no evidence of the Site having been put to a military land use since the 1850s. *History of bombing:* Whilst North Wales was targeted¹ there is no evidence of Caernarfon being directly targeted during the Second World War with no evidence found through web-searches.

The surrounding area is currently characterised by land uses consistent with a predominantly rural economy with isolated heavy industries, e.g. corn mill and woollen factory to the south (Figure 2).

Widespread metalliferous mining occurred in this region of Wales however, as a broad-based rule, unless coal, ironstone and fireclay, the potential for mining instability is limited unless mine entries are present on Site for which there is no evidence on Site.

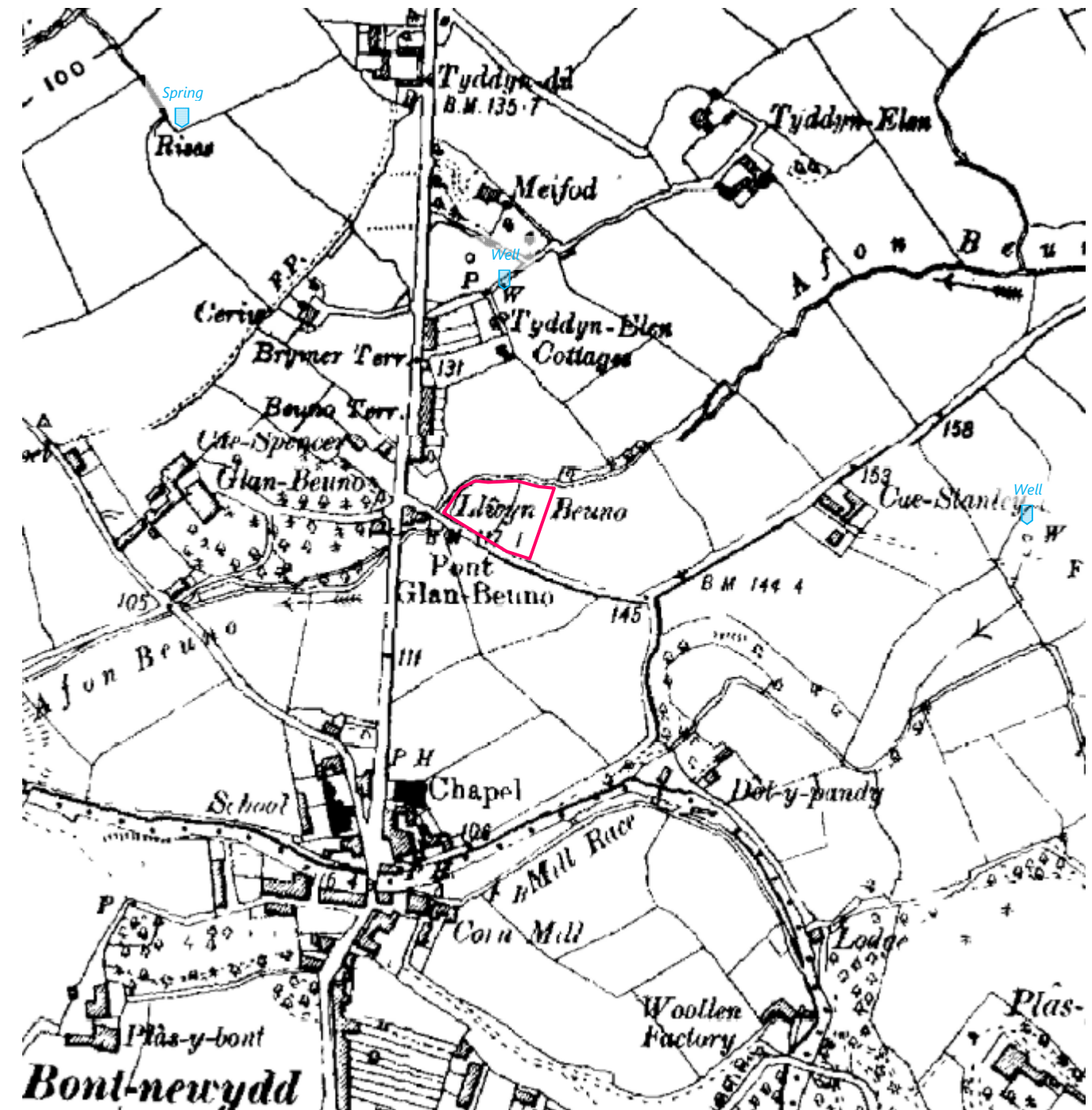


Figure 2: First Phase of Use - extract from appended 1919-1920 Ordnance Survey mapping

- > Approximate Site boundary identified by pink line
- > Key hydrogeological features identified in blue.

¹ [BBC - When bombs dropped on Bangor, Llandudno and Holyhead](#)

2.2 Geology

Recorded geology: The Site is underlain by Till (*Clay and silty clay, commonly pebbly and sandy, stiff, possibly interbedded with sand and gravel-rich lenses and rare peat.*²) with some Alluvial deposits potentially present locally to Afon Beuno (not mapped). The underlying bedrock is split between the Nant Ffrancon Subgroup (siltstone) and the Fachwen (sandstone and siltstone) the boundary of which is split by a fault.

Structural geology: A fault is recorded running across the Site in a north-east to south-west direction.

Exploratory holes: Exploratory hole records not available for the Site or local area.

Geological mapping confidence: The geological mapping records offers reasonable confidence in the geological succession beneath the Site however, intrusive investigation would be recommended to confirm this.

Geological hazards: Based on this recorded geology, the potential for geological hazards to adversely impact the Site (dissolution, collapse, compressible) is considered generally low however the Till deposits do give rise to a potential shrink-swell hazard and the increasingly steep slope towards the river (Afon Beuno) a potential slope instability hazard (if and where cut into).

Coal and non-coal mining: No coal or non-coal mining is recorded below the Site^{3,4} that is expected to affect surface stability.

Mineral resources: The Till is not considered to be of economic value for recovery nor the bedrock deposits (if present at shallow depths).

2.3 Recorded Hydrogeology & Hydrology

A water catchment is divided into two main elements; groundwater (hydrogeology) and surface water (hydrology). The groundwater regime is primarily governed by the geology and the surface water regime by the topography and surface cover. For any given site, these regimes are likely to influence each other and be influenced by off-site factors, e.g. groundwater levels being 'recharged' higher up a catchment.

The Site's groundwater regime is influenced by: its low elevation; proximity to the River Beuno (Afon Beuno); 'soft' cover across the entire Site that is to be reduced as part of the proposed development with a net decrease in direct infiltration to ground; variably permeable Alluvial deposits (Secondary A)⁵; variably permeable bedrock deposits (Secondary A)⁵; and, the Site not being located within a Source Protection Zone (SPZ)⁵; and, historic 'wells' serving local communities (Figure 2) suggesting groundwater rests at least 1 m below ground level.

The Site's surface water regime is influenced by the increasingly steep gradient falls towards the north and north-west, resulting in a tendency surface water run-off towards Afon Beuno.

Afon Beuno is the closest surface water course to the Site flowing along the northern and north-western boundaries.

The Site is classified as being at low risk with respect to surface water flooding with areas of low to high risk river flooding along the Site's northern and north-western edges (along the course of the Afon Beuno)⁶.

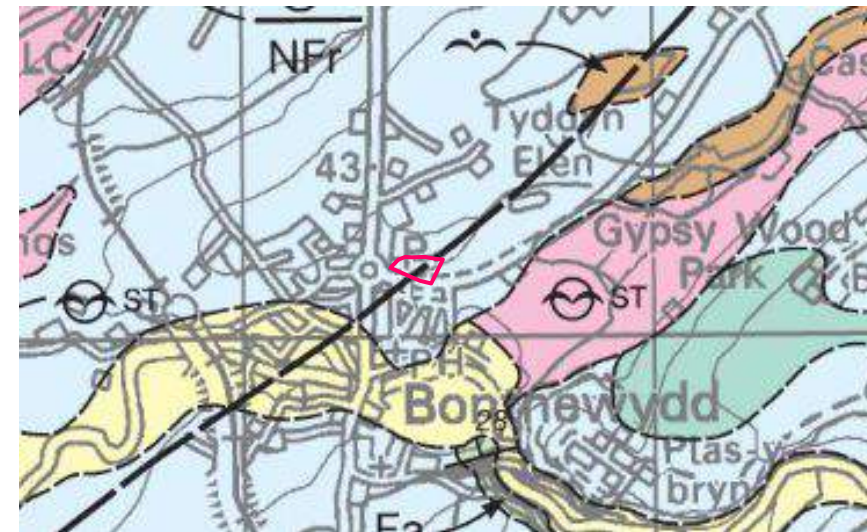


Figure 3: BGS Geological mapping extract (reproduced under Open Government license v3.0)

> Approximate Site boundary identified by pink line.

2.4 Environmental Setting

The environmental setting relates to land designations either on-site or within the surrounding area that have the potential to influence or present a risk to the proposed development.

Landfills (historic and active) are not recorded within 250 m of the Site^{7,8}, the distance across which viable pathways for gas migration are more likely.

Historic infilled land, e.g. ponds and quarries (excluding landfills detailed above) are not evidenced on Site or within 100 m of the Site.

Historic and current industrial sites are present locally to the Site. No current industrial Sites are recorded adjacent to the Site or within 100 m of the Site.

Statutory protected areas, e.g. SSSI are not recorded on the Site⁸.

Radon is emitted from naturally sources within a range of geologies. The Public Health England data⁹ indicates between 1 to 3 % of dwellings are expected to be above the Action Level (200 Bq m⁻³). This translates to a low potential of the Site being affected by radon.

3.0 Ground Conditions

Anticipated ground conditions: The Site characterisation (Section 2.0) indicates the presence of three main materials beneath the Site: (1) Till deposits likely characterised by cohesive (clay) soils but local granular (sand and gravel) soils commonly with 'moderate' strength but can vary; underlain by, (2) weathered siltstone or sandstone bedrock at unknown but likely 'deep' (>3.0 m) depth. The bedrock deposits, if encountered, will vary across the fault,

The Preliminary Ground Model for the Site (plan and profile) is presented in Section 4.0 and includes further commentary on the ground conditions.

² <https://www.bgs.ac.uk/Lexicon/>

³ [Interactive Map Viewer | Coal Authority \(bgs.ac.uk\)](#)

⁴ [GeolIndex - British Geological Survey \(bgs.ac.uk\)](#)

⁵ [Geocortex Viewer for HTML5 \(cyfoethnaturiolcymru.gov.uk\)](#)

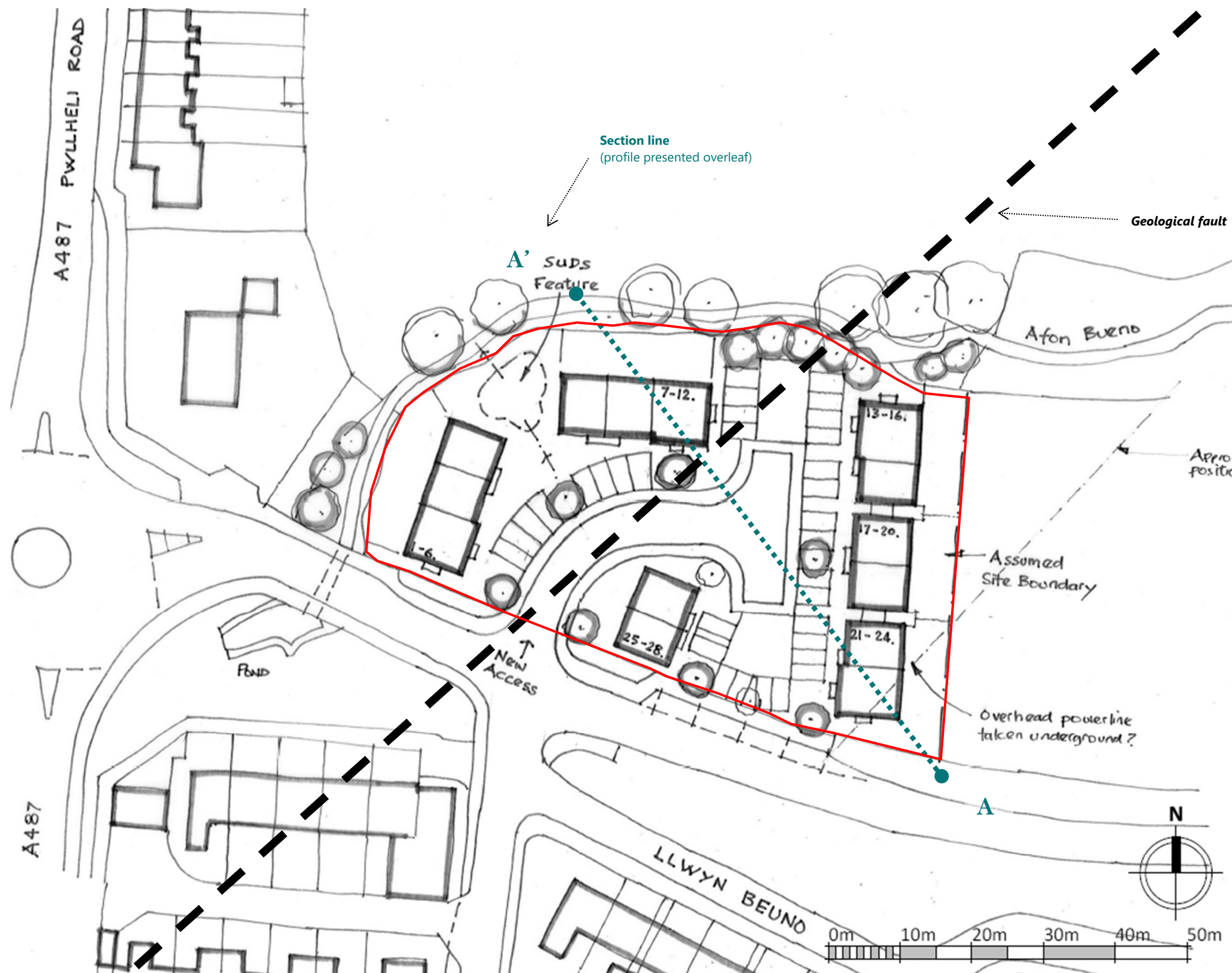
⁶ [Geocortex Viewer for HTML5 \(cyfoethnaturiolcymru.gov.uk\)](#)

⁷ [New map | DataMapWales \(gov.wales\)](#)

⁸ [Geocortex Viewer for HTML5 \(cyfoethnaturiolcymru.gov.uk\)](#)

⁹ [UKradon - UK maps of radon](#)

4.0 Preliminary Ground Model - Plan



General Commentary

- > **Broadly consistent** ground conditions are expected across the Site with Topsoil over Till that is likely present to depths of at least 3 m below ground level.
- > **Groundwater** is expected to be encountered deeper than 3 m of the ground surface but may be present as localised seepages through shallow sand lenses within the Till deposits.

Geotechnical Commentary

- > **Topsoil deposits** (if present) are expected to be recoverable for re-use as landscaping fill.
- > **Till deposits** are likely to be cohesive (clay) but may include variable thickness granular lenses and variable granular content. Their strength characteristics are likely to be 'moderate' and support shallow spread foundations.

The plasticity, sulphate content and pH are recommended for testing.

Environmental Commentary

- > The chemical quality of the shallow soils is not expected to have been degraded.