EAL



PHASE I GEOENVIRONMENTAL ASSESSMENT INCLUDING PHASE 1 COAL MINING RISK ASSESSMENT

AT

YSGOL I D HOOSON, HEOL CARADOC, RHOSLLANERCHRUGOG, WREXHAM LL14 2DS

16TH OCTOBER 2024

Prepared For:
Wrexham County Borough Council,
Crown Buildings,
31 Chester Street,
Wrexham,
LL13 8BG,

Contractor:
Read Construction Holdings Ltd
Enterprise Centre
Blast Road
Brymbo
Wrexham
LL11 5BT

Prepared By:
Catherine Kenny
Reviewed By:
Chris Eccles

DISTRIBUTION LIST

Issued To	Title / Company / Location	Email
Darren Brimble	Read Construction	Darren.Brimble@readconstruction.co.uk

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Prepared By	C Kenny		
Job Title	Consultant Engineering Geologist		
Qualifications	BSc(Hons) MSc FGS CGeol		
Signature	[redacted]		
Authorised By	C Eccles		
Job Title	Consultant Engineering Geologist		
Qualifications	BEng MSc FGS CGeol CSci CEnv SiLC RoGEP Adviser, DoWCoP QP020		
Signature	[redacted]		

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1.0 INTRODUCTION

1.1. Background

Eccles Associates Limited (EAL) has been commissioned by Read Construction, who are acting as Project Manager/Contractors on behalf of Wrexham County Borough Council, hereafter referred to as "the Client", to undertake a Phase I study to be followed by a Phase II ground investigation to determine the shallow ground conditions for both geotechnical and geoenvironmental purposes, and to undertake both coal mining and geoenvironmental risk assessments. This report presents the Phase 1 study.

1.2. Proposed Development

It is understood that the proposed development comprises single storey extensions to the existing school building, as shown in Figure 1:

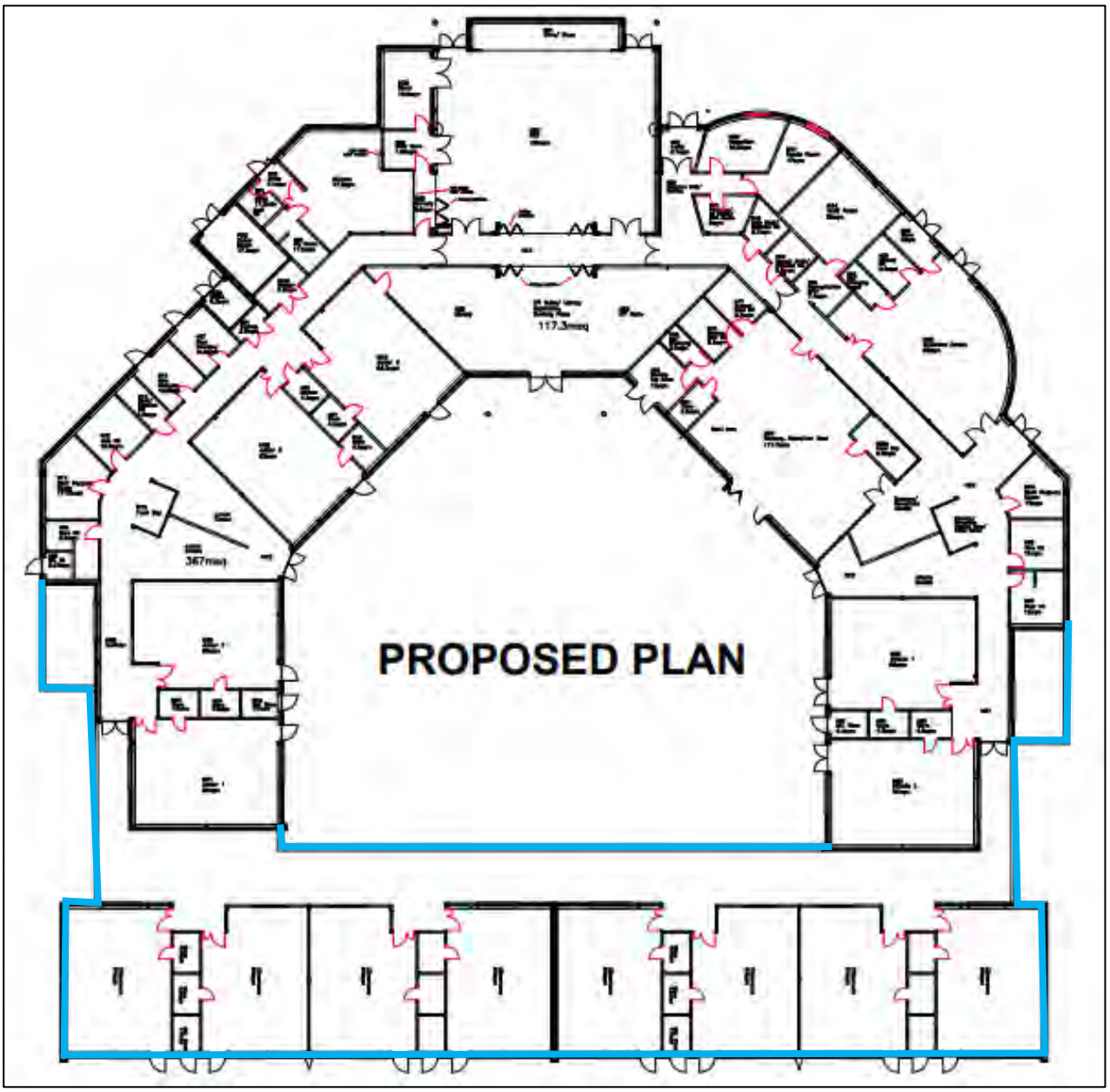


Figure 1: Proposed Development (Blue outline) (Based on drawing provided by Read Construction)

In addition to this there are new all weather sports pitches to be constructed on existing playing fields to the southeast of the new buildings but their locations have yet to be finalised.

1.3. Objectives

The purpose of this report is to provide a Phase 1 geoenvironmental assessment and a Phase 1 coal mining risk assessment for the site and to provide information for the design of an appropriate Phase 2 intrusive investigation.

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including but not limited to:

- The Welsh Government: Planning Policy for Wales (Ed 12, July 2024);
- BS 10175:2011+A2:2017: "*Investigation of potentially contaminated sites. Code of practice - Code of practice.*"
- BS5930:2015+A1 2020: "*Code of practice for site investigations*;"
- NHBC Standards, 2024;
- The Building Regulations 2010. Part C (HM Government 2013); and
- BS8004: 2015: "Code of Practice for Foundations".

1.4. Confidentiality

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

1.5. Limitations

The full limitations of this report are presented in Appendix I.

The findings and conclusions of this report have been set out and recommendations given for the proposed construction. If there is a subsequent change in the proposed use, the assessments and conclusions should be reviewed to determine whether they are still applicable for the revised end use.

2.0 SITE SETTING

2.1 Site Details

A Site Location Plan is presented below. The site is located on the west side of the village of Rhosllanerchrugog approximately 6km south west of Wrexham, within the historic county of Denbighshire.

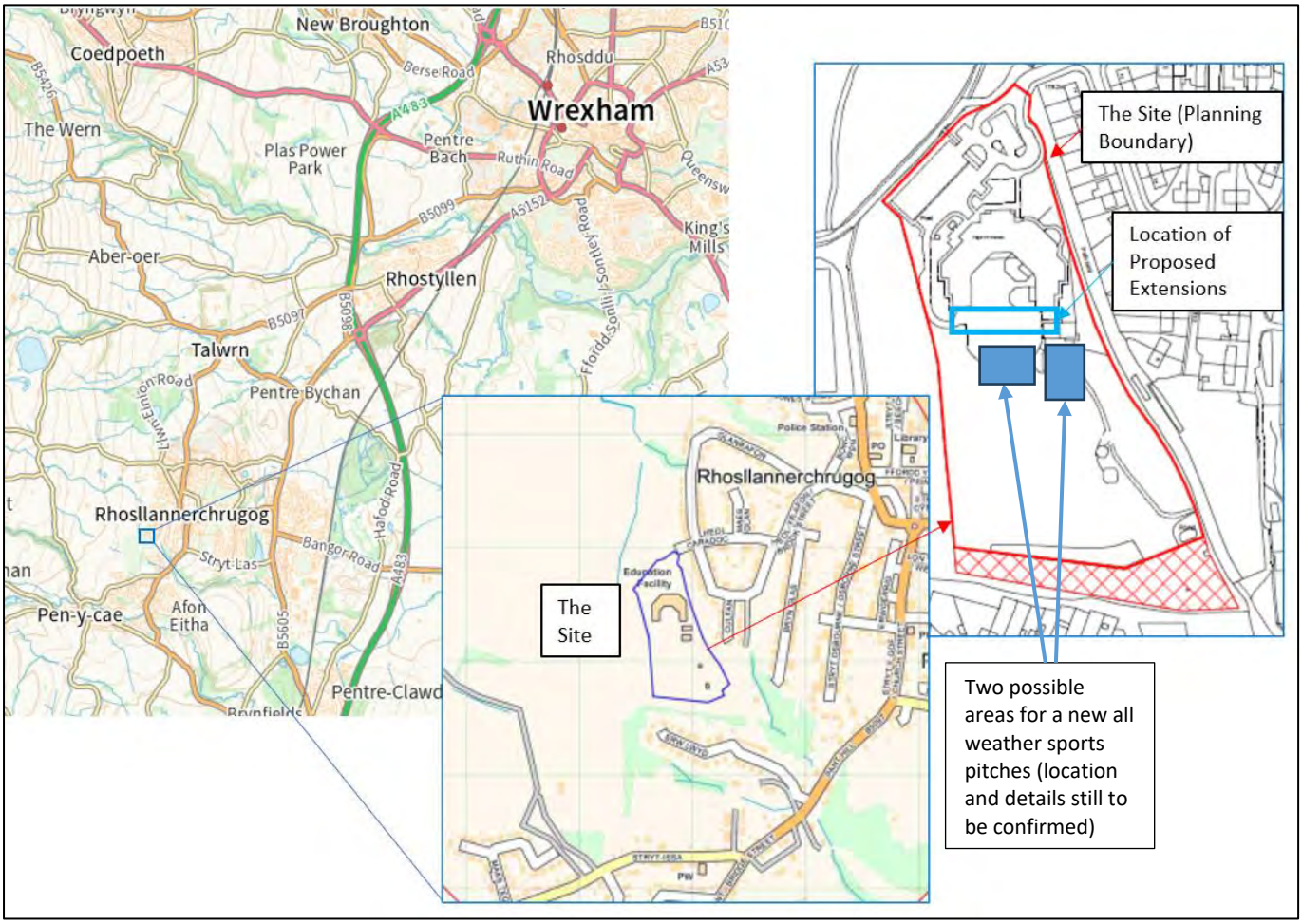


Figure 2 Site Location

Table 1: Site Summary	
Site Address	Ysgol I D Hooson, Heol Caradoc, Rhosllanerchrugog, Wrexham LL14 2DS
National Grid Reference	E: 328779, N: 346061
Site Area	The Planning Boundary is 2.43 Ha, with the proposed area of the extensions comprising approximately 70m x 15 m (0.1ha)

The site was visited by EAL on 11th October 2024. Photographs of the site are presented in Appendix II.

At the time of the visit, the single storey school building occupied a generally level area and was surrounded by asphalted car parking to the northern elevation. To the south, the location of the proposed extensions was mainly occupied by an asphalted playground area. At the south east end of the existing building two temporary classroom units were present with small fenced garden areas. South of the asphalted playground, grassed playing fields are connected to the site by a gentle grassed slope of approximately 1m-1.5m height. Patches of poor grass growth were noted just below the slope crest, it is understood that playground equipment has been recently removed from here.

There are several inspection covers for drainage, including a large rainwater attenuation tank. Electric lighting is also present.

The field boundaries are vegetated with various shrubs and trees. A small willow is noted in the eastern side of the site in the garden area, and various trees are present on the site boundary close to the eastern limit of the proposed extension.

There was some patchy waterlogging in the grass, after recent heavy rain. There was no evidence of any depressions, surface disruption to the asphalt or other indications of surface instability.

There were no sources of contamination such as fuel tanks, suspected asbestos, ground stains or odours.

2.2 Site History

A brief review of the site's history from historical maps provided by Groundsure and other historical sources has been undertaken. The maps are presented in Appendix III, with some extracts in Figure 3.

The area has a long history of mining, predating the historical maps. Online sources indicate that the development of the village can be attributed largely to the coal seams. The burgesses of Holt were granted the right to dig for coal at Rhos in their borough charter of 1563. A coal mining community was established during the 18th century, and grew substantially from the 1840s onwards.

The earliest available map of the site (1873) shows the site as agricultural land with two field boundaries within the site. Mining was already old and abandoned in the area: "Old shaft (coal)" is indicated within a spoil heap at the south west corner of the site. The northern sector also includes two spoil heaps and a possible small pond. "Pant Brick Works" is shown adjacent to the site to the west, together with pits and spoil heaps. A brick and tile works with kilns and a smithy is shown around 300m north and another brick works, later labelled Rhosllanerchrugog Brick Works, is shown approximately 500m north. There are several coal shafts shown within 250m and further afield in all directions. A gas works is shown 250m NW. By 1898, the gas works is no longer shown, and a mineral railway from Pant Brick Works is adjacent to the NW boundary of the site and along the eastern boundary.

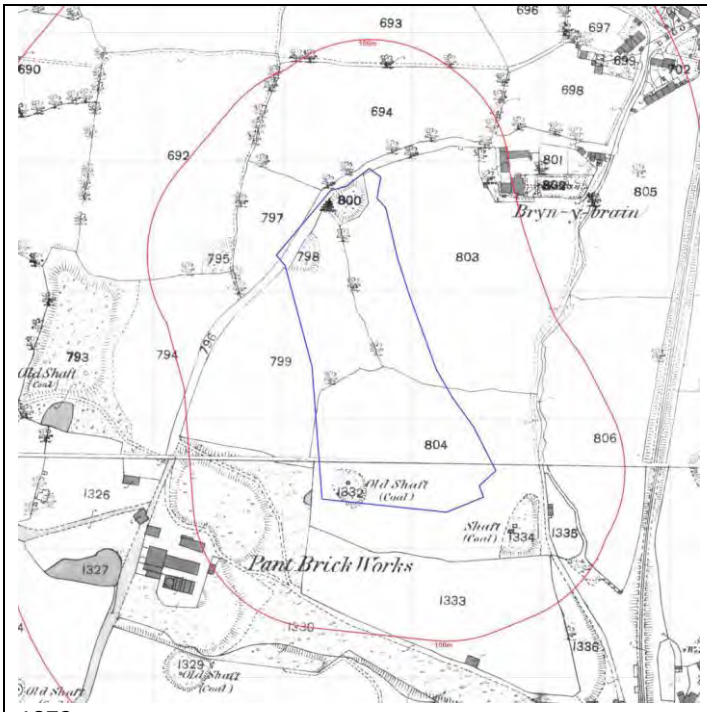
By 1900, the coal shaft within the site is no longer labelled but the spoil heap, and the ones in the north of the site, remain. Pant Brick Works to the east has expanded, with an increased mound and additional tanks/ kilns, covering the area of a former pit. By 1909, an additional mineral railway line on an embankment is shown through the NW sector of the site.

By 1974, the mineral railways are shown as dismantled and Pant Brick Works is no longer indicated, although a building remains, and the outline of the former pits are visible.

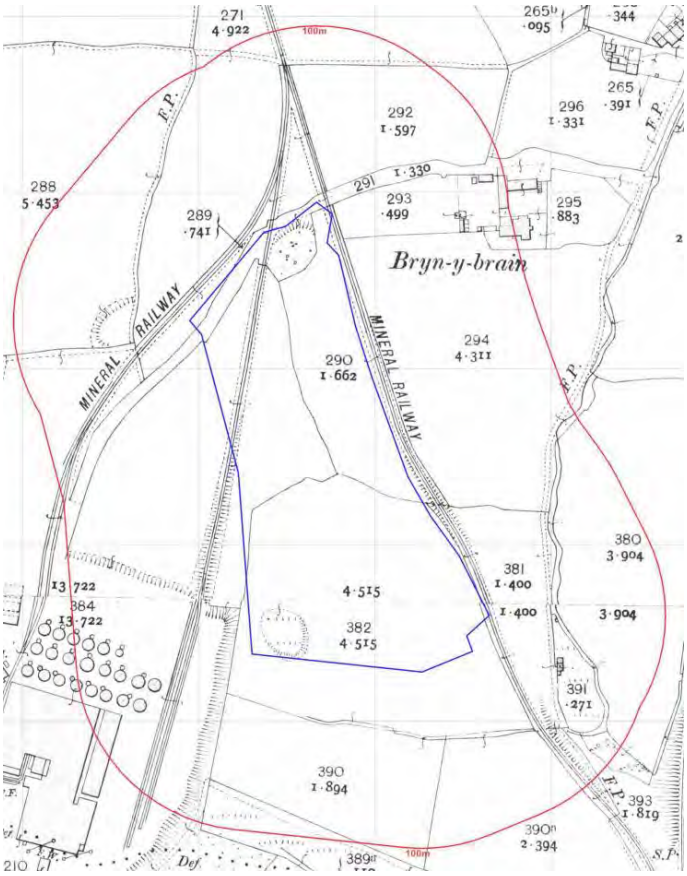
Between the maps of 1982 and 1988, the housing along Fford Mynydd Isa / Erw Lwyd to the south of the site is constructed.

More recent aerial photography from 2001 shows the site as agricultural land with crops. There is no evidence for the mine shafts or spoil heaps, although the northern sector of the site appears to have a variation on the crop growth.

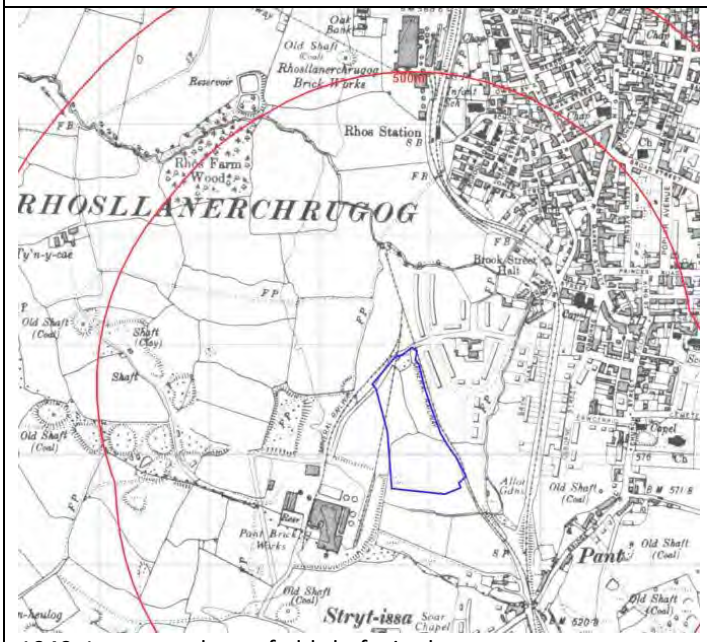
Information provided by the Client indicates the school was built in September 2007.



1873



1912: Mineral railways and mounded material at Pant



1949: Large numbers of old shafts in the area



2001

Figure 3: Historical Extracts:

2.3 Geology

Information about the geology of the site has been taken from Groundsure, and from the British Geological Survey (BGS) maps. memoirs and databases available online. Extracts from the maps are shown as Figure 4.

Groundsure and BGS 1:10,000 scale information indicates the NW sector of the site to be covered by made ground. The BGS note this as "*Mainly colliery spoil and embankments*". It is anticipated that this is waste from the coal shafts, general colliery spoil and Pant Brick Works. Below the made ground, natural glacial till is present, with rocks of the Carboniferous Pennine Lower Coal Measures Formation at depth.

One inferred coal seam (Nant Coal) is shown at subcrop at the northern end of the site, with The Ruabon Yard Coal just to the north of the site boundary. Seams dip east and south east. Three shafts are shown within the site with several others close to the boundaries. A fault is present to the east.

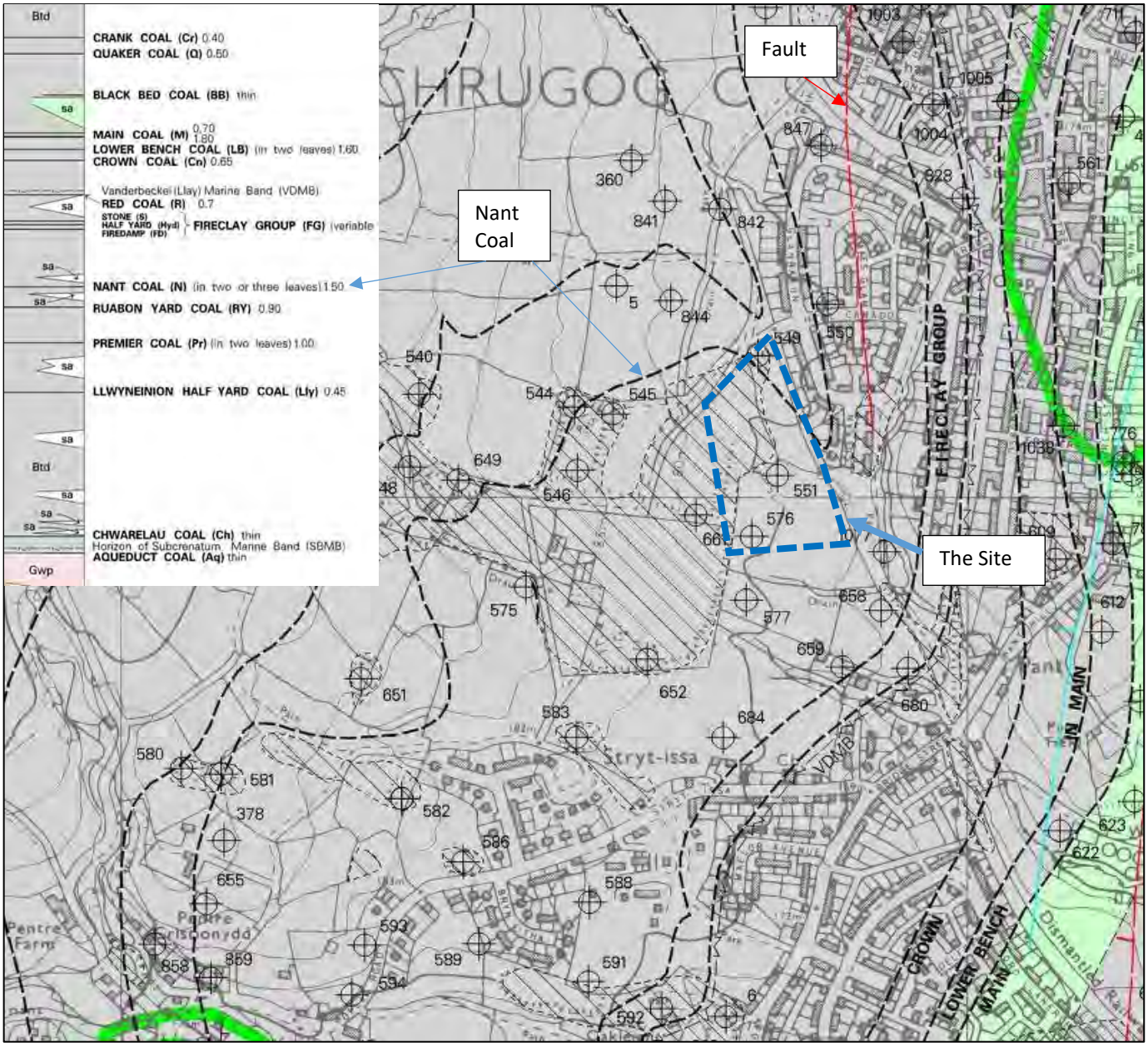


Figure 4: BGS Sheet SJ24NE (1996) extracts and stratigraphic column

Coal Seams below the site are therefore expected to comprise:

Table 2: Summary of Coal Seams		
Seam	**Depth below Nant Seam (m)***	**Thickness (m)**
Nant / Soft 5 Quarters	Subcrop	1.5
Ruabon Yard / Yard / Soft 5 Quarters	10	0.9
Premier	26	1.0
Llwyneinbon Half Yard	50	0.45

**Scaled from stratigraphic column*

There are a number of BGS boreholes around the site, illustrated in Figure 5, however, useful information is limited.

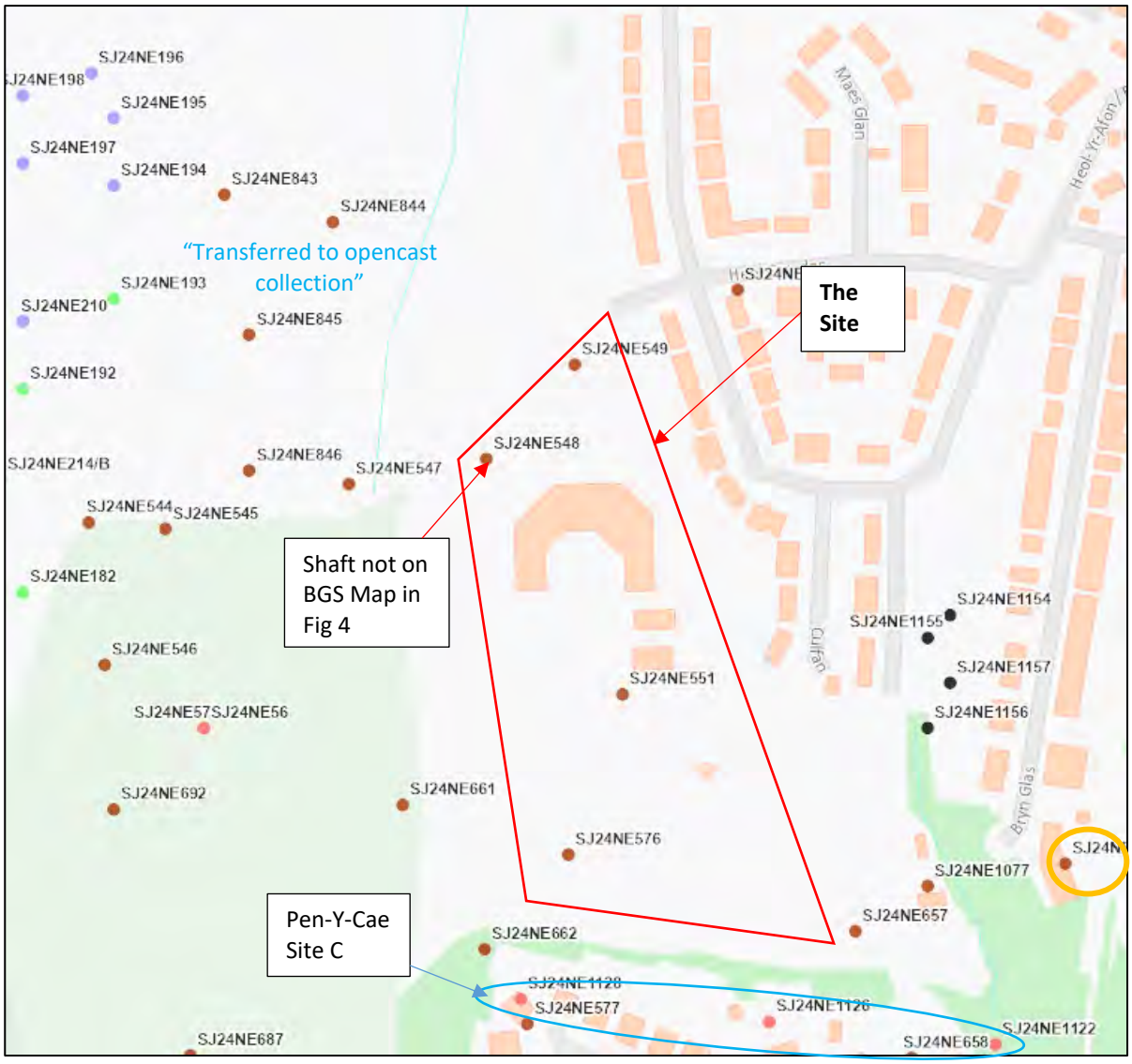


Figure 5: BGS Boreholes

The holes within the site and adjacent to the boundaries all refer to shaft records for which there are no stratigraphic details. All the shafts within the site are labelled as "Pant Colliery" with details taken from the Mining Records Office plans for Rhos Farm. The shafts are labelled as "No trace, presumed filled 5/68". Record SJ24NE576 is additionally noted as present on the 1874 OS sheet and is labelled "Depression visible, presumed filled 5/68". Records are presented in Appendix V.

Holes to the north west are marked as "Transferred to Opencast Collection". Holes to the east are confidential records.

Stratigraphic information is available for holes approximately 0.2km south of the proposed extensions, on the site adjacent to the southern site boundary. Records SJ24NE1128, 1126 and 1122 (shown in blue on Figure 5) are from Pen-Y-Cae Site C, drilled in August 1973, and correspond to Boreholes 7, 5 and 1 from the investigation, respectively (see records in Appendix V). The ground conditions are summarised in Table 3:

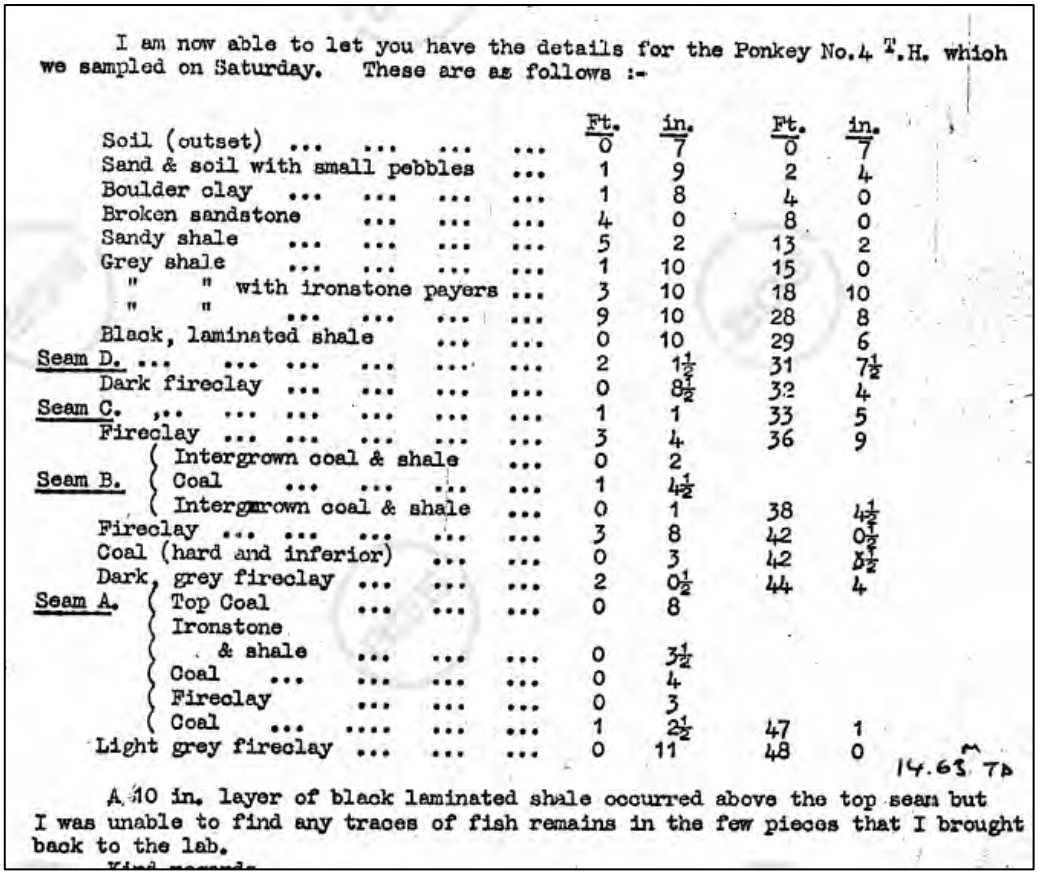
Table 3: Summary of Available Stratigraphic Information

BGS Hole	Report BH no	Strata
SJ24NE1128	BH7	Topsoil to 1 foot 6 (0.46m) Sandy clay, sand and gravel to 50 feet (15.24m) Shale to base at 100 feet (30.48m)
SJ24NE1126	BH5	Topsoil to 1 foot 6 (0.46m) Sandy clay to 74 feet (22.56m) Shale to base at 120 feet (36.58m)
SJ24NE1122	BH1	Ashes "Probably part of the old railway embankments" to 2 foot 6 (0.76) Sandy clay, sand and gravel to 45 feet (13.72m) Shale with ironstone bands to 100 feet (30.48m)

The report noted that no old workings were proved in any of the eight holes drilled, with only one trace of coal noted (in BH6). *"It is possible that the shale proved in all the holes is that which overlies the Nant Seam and the trace of coal in No 6 Borehole could be a trace of the Firedamp Seam".*

Notably, the report states "*Some idea of the depths of these seams may be obtained when the five shafts, present on the site, are drilled in preparation for grouting*". It is assumed that shaft stabilisation and grouting was carried out for the housing site.

Record SJ24NE1144, circled in yellow on Figure 4, approximately 0.2km SE of the extensions, is a record of a hole drilled in August 1944. Drift was 1.22m thick and seams of coal and fireclay were present from 9.64m bgl. From the geological map, these may be the Fireclay Group of coals. An extract from the record is presented as Figure 6.



I am now able to let you have the details for the Ponkey No.4 T.H. which we sampled on Saturday. These are as follows :-

		Ft.	in.	Ft.	in.
	Soil (outset)	0	7	0	7
	Sand & soil with small pebbles	1	9	2	4
	Boulder clay	1	8	4	0
	Broken sandstone	4	0	8	0
	Sandy shale	5	2	13	2
	Grey shale	1	10	15	0
	" " with ironstone payers	3	10	18	10
	" "	9	10	28	8
	Black, laminated shale	0	10	29	6
Seam D.		2	1½	31	7½
	Dark fireclay	0	8½	32	4
Seam C.		1	1	33	5
	Fireclay	3	4	36	9
Seam B.	Intergrown coal & shale	0	2		
	Coal	1	4½		
	Intergrown coal & shale	0	1	38	4½
	Fireclay	3	8	42	0½
	Coal (hard and inferior)	0	3	42	3½
	Dark grey fireclay	2	0½	44	4
Seam A.	Top Coal	0	8		
	Ironstone & shale	0	3½		
	Coal	0	4		
	Fireclay	0	3		
	Coal	1	2½	47	1
	Light grey fireclay	0	11	48	0

14.63 m TD

A 10 in. layer of black laminated shale occurred above the top seam but I was unable to find any traces of fish remains in the few pieces that I brought back to the lab.

Kind regards

Figure 6: Extract from BGS BH Record SJ24NE1144

2.4 Mining

A consultant's mining report is presented in Appendix VI.

Coal Authority and Groundsure information indicates a high density of mining features around the site, as illustrated in Figure 7. Groundsure list 17 records of mainly coal shafts and brick pits, within 500m.

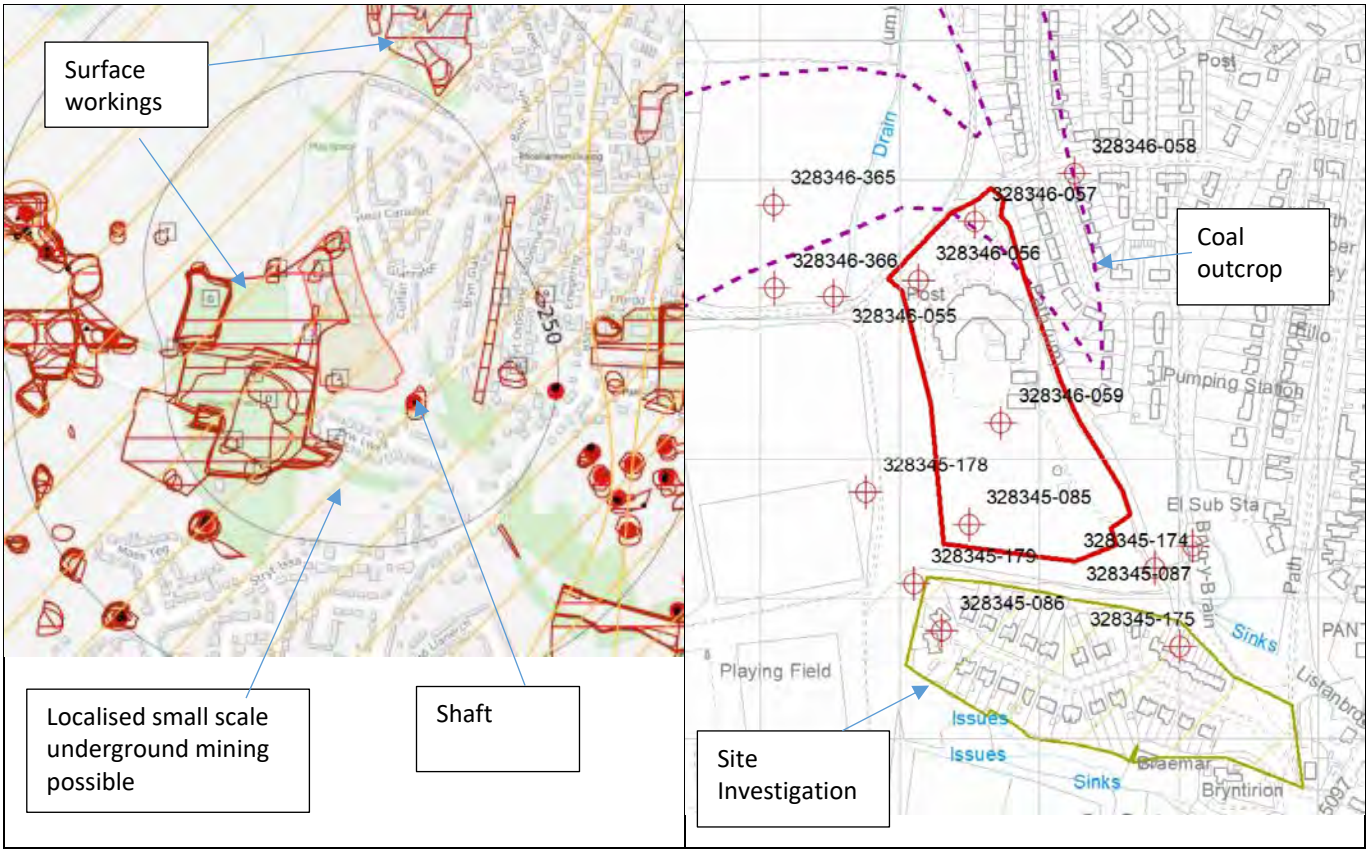


Figure 7: Groundsure (left) and Coal Authority (Right) Mining Data

The site investigation held by the Coal Authority is believed to be Pen-Y-Cae Site C as detailed on the BGS database. BGS records suggest that drilling and grouting was carried out.

Mine entries are within the site and close to the boundaries. The shafts 328345-175 and 328345-086, within the area of site investigation to the south of the site, are the only ones with any details, and were grouted and plugged in 1981 by NKC Geotech to an unknown specification.

Anecdotal evidence from the school suggests that mine entry 328346-055 was located by Carillion after the construction of the school in 2007 but sometime before 2013 when one of the visiting engineers fell into it. It is understood that he was unharmed, and that the shaft was infilled. No further details are available.

Other anecdotal evidence suggests that the National Coal Board (NCB) visited the site in 1968 and visible depressions were noted at shaft 328345-085, and that this, along with 328346-056 and 328346-059 were supposed to have been infilled in 1975 but no records of the treatment are held by the Coal Authority.

Mining is recorded up to between 1850 and 1868 at three depths between 56m and 71m below the site by the Coal Authority. The depth of mining is based on algorithms related to the mining plans. However, the recorded mining here is very old, and the plans are of very poor quality, so the depths of mining cannot be fully relied upon. A summary from the Coal Authority report in Appendix VI is as follows:

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	WALL AND BENCH	Coal	7H2Q	56	Beneath Property	6.0	East	110	1860
unnamed	HALF YARD / QUEEN	Coal	381B	69	Beneath Property	7.0	East	50	1868
unnamed	WALL AND BENCH	Coal	7H24	71	Beneath Property	6.0	East	110	1850

The Wall and Bench may be an old name for a seam not currently shown on the stratigraphic column, or it may be two seams, recorded on the same abandonment plan. The Half Yard may refer to the Llwyneinbon Half Yard, or the Half Yard Seam which is part of the Fireclay Group, although this is above the sub-cropping Nant Coal in the geological sequence.

An abandonment plan search has uncovered a series of plans (CA reference 14896, 6 sheets) of very poor quality showing patchy workings below the site area from the early 1850s, and possibly much older. These ancient records are not necessarily surveys of mines completed prior to abandonment, so the workings may be much more extensive. It is believed that they are at about 56m depth, but the depth could be anywhere from around 45m to 65m in reality. Mine entries are shown associated with these plans, and also with another plan, CA Reference 14889. Copies of the plans showing the mine entries were ordered and are presented in Appendix VII and summarised in Figure 8 and 8a.

The exact locations of the mine entries are difficult to ascertain using the plans, but a best fit approximation of the site boundary is shown. It should be noted that the positions of the shafts are slightly shifted from the Coal Authority information using this method, and that two additional possible shafts are shown within the school field. It is considered that the Coal Authority has the most accurate location information, given that they have visited the site when the mine shaft locations were evident at surface.

A Geophysical survey undertaken in 2006 prior to the construction of the school has also been provided by the Client (Appendix VIII) which shows the plotted positions of the mineshafts on the site from geophysical survey results, and other geophysical anomalies that were detected (the other geophysical anomalies are unlikely to be mineshaft related and will have been assessed during the development of the current school so no further assessment of these are proposed).

Figure 8a shows the shaft information from all of the sources.

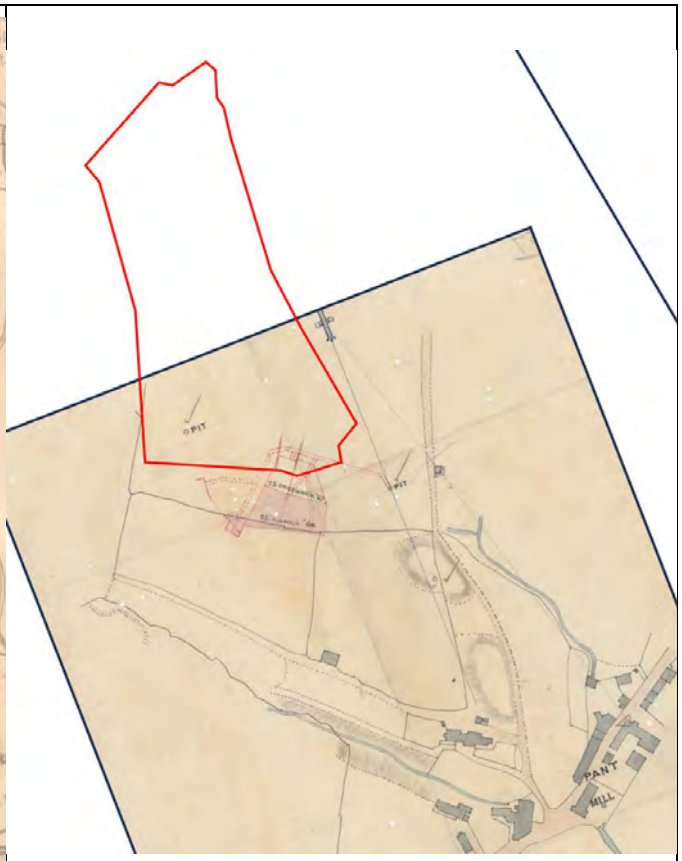
CA information for Plan 14889 (Pant Colliery) states “seam un named”.

The underground mining shown on plan 14896 (Rhos Farm Colliery) is noted by the CA in the “Yard (Probably Ruabon Yard), Lower Yard (Probably Ruabon Yard), Wall And Bench.” However, these seam names could just be much older names for other seams. A fault is shown in an approximate NNE/SSW orientation passing though the easternmost corner of the site noted as “fault *rises** 6 yards” (*this word is not very legible; it is estimated to say rises). A second, parallel, fault labelled the same is present to the south east.

There is a stratigraphic column on plan 14896 which described the old names for the seams, from top to base of sequence as: “New Coal – stone coals” “Dirty Coal” (40 yards deep -36.5m) “Yard Coal” (80+ yards deep, map is damaged here – 73+m) and “Wall and Bench Coal” (100 yards deep – 91m) in between beds of shale, sandstone, “rock”, “Clunch” (an old name for a type of mudstone called seatearth), and fireclay.



Plan 14896 Rhos Farm: showing shafts, with approximate site location indicated



Plan 14889 with approximate site location , underground workings and shafts



Close up of Plan 14889 showing possible shafts (white dots) with approximate site location

Figure 8: Abandonment Plans extracts

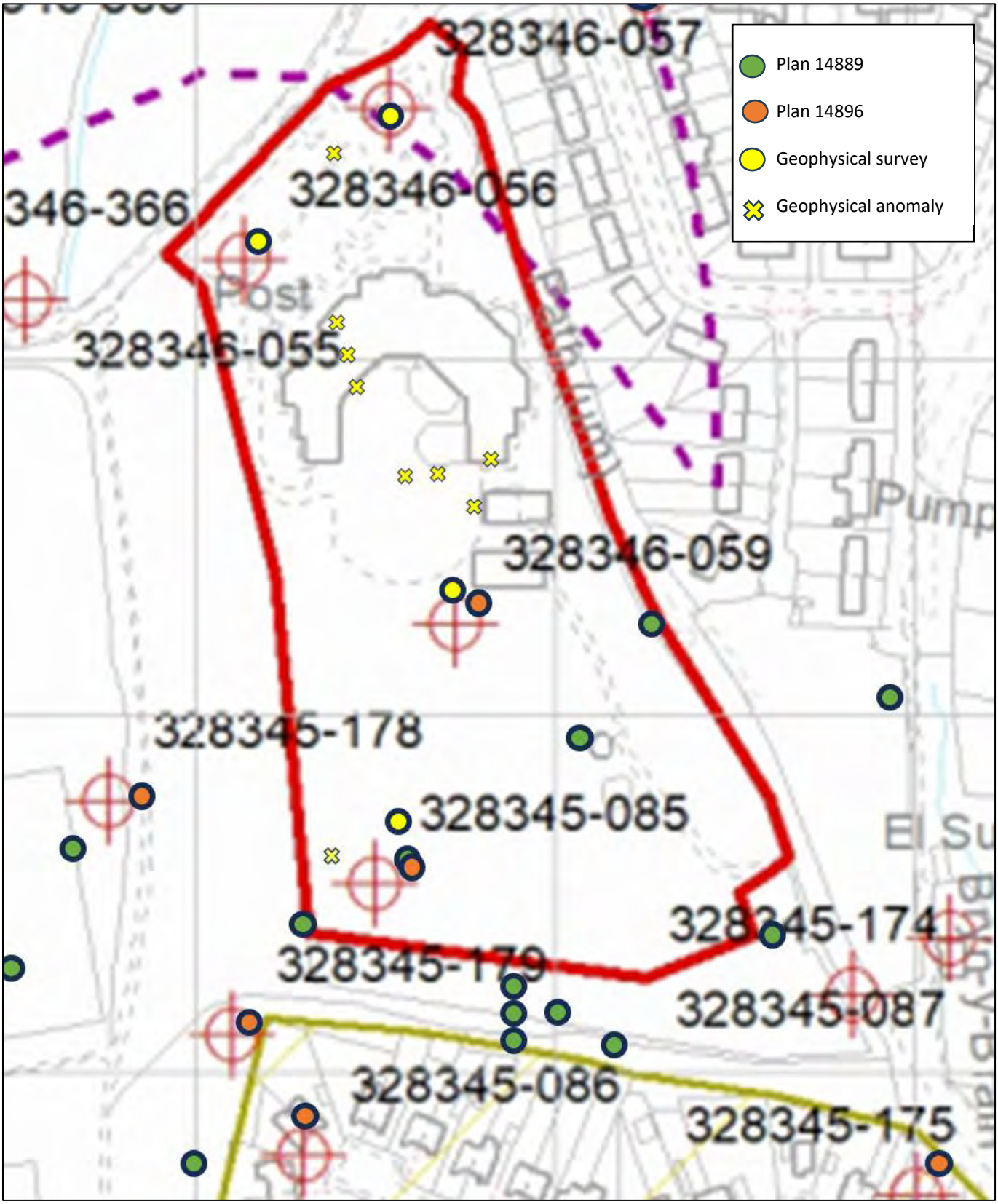


Figure 8a: Abandonment Plan Shafts and geophysical survey plotted against Coal Authority Information: Note uncertainty in shaft locations, and two additional possible shafts within school field

2.5 Geoenvironmental Information

Environmental information for the site is presented below.

Table 4: Data Summary: Environmental Setting

	Data Source	Data Summary
Historical Industrial Land Use	Groundsure Report GS-98G-HF6-5R6-GHF	The NW sector of the site was once within the curtilage of the Pant brickwork Mineral railways were once present to the eastern boundary and within the NW sector. Within 200m, tramway sidings, brick works, waste heaps, tanks and coal shafts are present. A gas works was 204m NE
Petrol Stations and Garages	Groundsure Report GS-98G-HF6-5R6-GHF	The closest historical garage is 276m East (1963-1999) None (current or recent) within 500m
Licenced Sites	Groundsure Report GS-98G-HF6-5R6-GHF	No COMAH sites, regulated explosives sites, consents to store hazardous substances, IPC records, sites registered as contaminated land (under Part 2A of the Environmental Protection Act), licenced industrial activities, pollutant release or radioactive substance authorisations within 500m
Licenced Discharges	Groundsure Report GS-98G-HF6-5R6-GHF	There are no active discharges within 200m. Expired licences exist for storm water overflow/ unspecified to the Pant Brook Avon Soch.
Pollution Incidents	Groundsure Report GS-98G-HF6-5R6-GHF	One significant incident of sewage materials 12/07/2002: Not anticipated to have had an ongoing detrimental effect on the site, and is downstream, and 22 years ago.
Landfill and Waste	Groundsure Report GS-98G-HF6-5R6-GHF	No active or historical landfills are noted within 500m There are no licenced waste sites within 500m
Unexploded Ordnance Risk	https://zeticauxo.com/	Low risk indicated
Radon	https://www.ukradon.org/information/ukmaps Groundsure Report GS-98G-HF6-5R6-GHF	For the area of the site where the extensions are proposed, the maximum radon potential is 1% to 3% . Radon protection measures are not required. The southern area of the site, at the southern end of the field, will require basic protection measures, should any structures be proposed here.
Aquifers	Groundsure Report GS-98G-HF6-5R6-GHF	Aquifer (drift) – Secondary (low vulnerability, thickness >10m) Aquifer (solid) – Secondary A (low vulnerability – well connected fractures)

Groundwater Abstraction	Groundsure Report GS-98G-HF6-5R6-GHF	The site is not within a source protection zone around a groundwater abstraction borehole. Active potable abstraction from coal measures rock is listed 1.5km N (annual volume 272760m3) Dewatering at Hafod Quarry is listed 1.86km east. An incomplete historical record exists for an abstraction from a 35 foot deep 8 ft diameter well located 1.3km SW of the site.
Hydrology	OS Maps Groundsure Report GS-98G-HF6-5R6-GHF	The nearest surface water feature is a watercourse approximately 29m NW of the site The closest active surface water abstraction is from Pen y Cae Reservoirs, 1.4km SW, for potable water. Comments on flood risk are outside the scope of this report, however the site is not indicated to be within a flood zone.
Ecology and Environmental Designations	Groundsure Report GS-98G-HF6-5R6-GHF	There are no Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas, National or Local Nature Reserves, Biosphere reserves, Forest parks, Green Belt or RAMSAR sites within 900m of the site. Ancient Woodland is 493m W.
Archaeological & Building Heritage	Groundsure Report GS-98G-HF6-5R6-GHF	There are no Areas of Outstanding Natural Beauty, National Parks, Heritage Sites, scheduled ancient monuments, and the site does not contain any listed buildings

3.0 HAZARD ASSESSMENT & PRELIMINARY CONCEPTUAL SITE MODEL

3.1 Hazards Identified with the Proposed Development

The hazard identification is based on the assumptions presented below:

- The site will be a school development;
- It is possible that children may play in the soil, or that the school may choose to grow their own vegetables
- Drinking water will be from mains supply.

For these reasons, comparison to guidelines for "residential with gardens" is considered appropriate for modelling purposes.

3.2 Potential Sources of Contamination

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:
  - Asbestos in existing buildings and made ground on site from previous development: Highly unlikely as the site was greenfield/1850s-1860s colliery prior to development in 2007.
  - Made Ground from former development: Possibly some made ground was imported to correct levels for the development: as this is a modern construction it is not anticipated that the made ground would contain any contaminants.
  - Made ground from former railway embankments: Possible ashy fill: metals, metaloids, hydrocarbons, PAH.
  - Mining spoil heaps: Metalloids, metals.
  - Radon gas (southern section of playing fields only).
  - Potential for elevated sulphate/sulphides.

- Potential Off-site Sources of Contamination:
  - Former brick pit to the west: Mounds of material present since prior to first edition map, no indication of infilling from historical maps or from environmental records: Gas risk very low
  - Historic mining spoil heaps in the area
  - Historic Gasworks: Not considered high risk, 200m NE, closed 126 years ago
  - Radon gas (southern end of field only -basic radon protection required – no structures are currently proposed here so the risk is considered minimal)

3.3 Potential Receptors of Contamination

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

Table 5: Identified Potential Sensitive Receptors	
A	Humans – Pre development completion, i.e. working on site during demolition and construction, Children playing on the current field and playground areas
B	Humans on the site post construction: Children playing on the fields
C	Off-site Human Health receptors: Adjacent residential properties
D	Surface Waters: Drain 30m NW Reservoirs for potable water 1.4km SW
E	Groundwater –Secondary aquifer drift and bedrock Active potable abstraction 1.5km north

F	Local flora and fauna during and post demolition and construction.
G	Building structure and services.

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

3.4 Identification of Pathways

Pathways to Human Health
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.

Inhalation or ingestion of dust and water could occur during the construction and development phase at the site. Pathways from dermal contact with soil and groundwater may also arise. It is considered that the risk of short term exposure for ground workers and other construction workers is low.

Post construction, the site will be covered by buildings/hardstanding, but playing fields will be located to the south. This is significant in that a number of potential pathways are possible such as long term direct contact and dust inhalation/ingestion, and contaminant uptake by home grown vegetables.

Ground Gas
Gas and vapour including radon could enter buildings through service ducts and trenches.

Pathways to Controlled Waters
Leaching of contaminants could occur through any granular layers in the granular glacial till to groundwater in the till, and then into the bedrock. However, some attenuation in the unsaturated zone is anticipated, and layers of glacial clay are anticipated between the granular material and the bedrock, which will further slow transport of leached chemicals.

There are not any viable overland migration pathways for surface run off to reach any controlled waters receptors.

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

3.5 Conceptual Site Model

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

The model shows the predicted geology and topography, the major on site potential contamination sources and vulnerable receptors, based on data previously presented in the report. The information presented above represents the preliminary conceptual ground model for use in the design of the intrusive investigation, and may need to be revised based on information obtained as part of the intrusive investigation.

The ground model and proposed end use described above should be considered broadly representative of residential end use as defined in SR3 “Updated Technical Model to the CLEA Model” (SC050021/SR3, 2011) for the purpose of this report.

The model is presented in Figure 9.

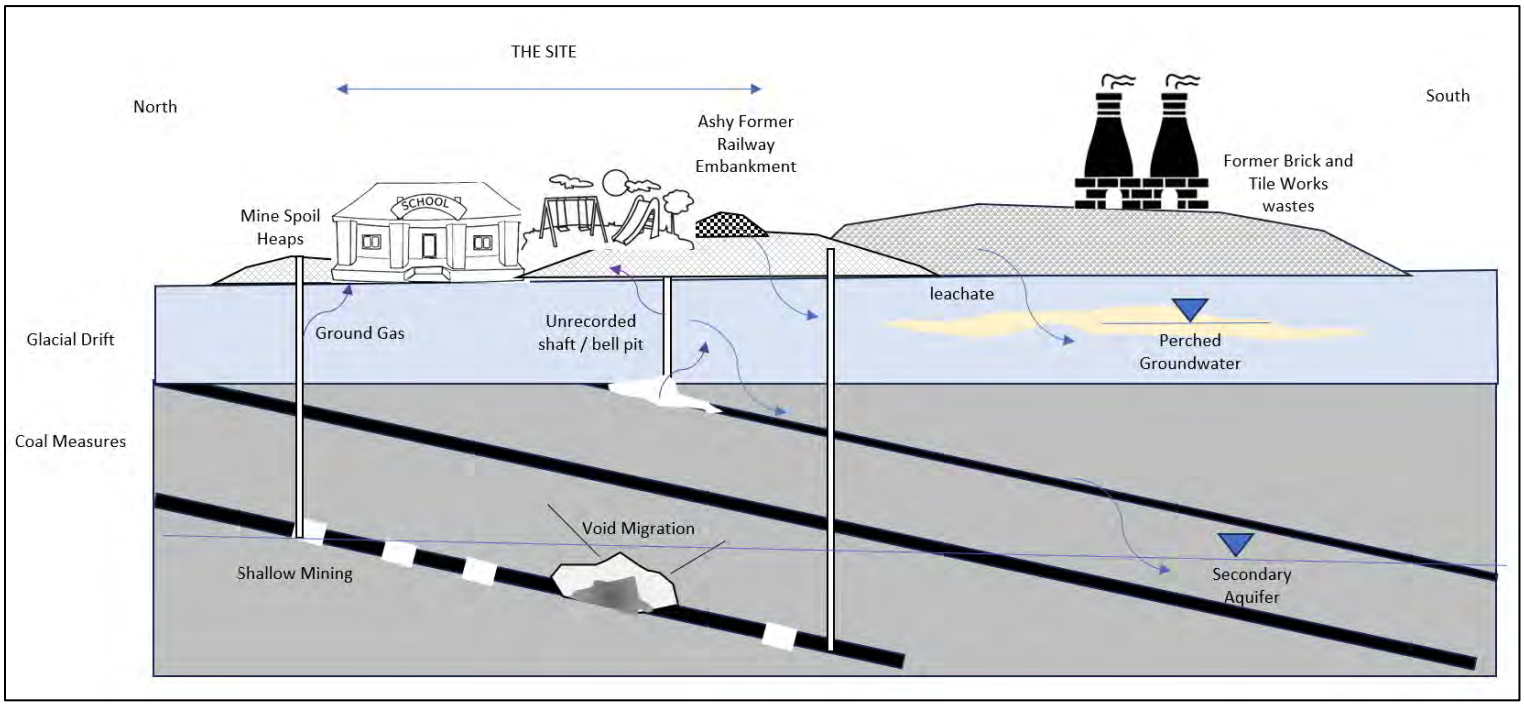


Figure 9: Conceptual Model (not to scale)

4.0 CONCLUSION

4.1 Phase 1 Environmental Risk Assessment

The Phase 1 desk study has shown a generally low environmental risk. It is possible that made ground is present within the site associated with mine waste heaps, an historic railway embankment, and an adjacent brick and tile works. It is possible that ground gas is present associated with the underlying mines. Pathways to human health and environmental receptors exist and a ground investigation is required to characterise the ground and further assess the risks. Characterisation is also required for waste disposal assessment, as the soils are more likely to be non-hazardous than inert or hazardous. There is also a possibility of elevated ground gas concentrations.

4.2 Preliminary Mining Risk Assessment

There has been historic coal mining below and around the site and mine shafts are present with no records of treatment. Coal seams are of a mineable thickness and at shallow depth. The mine abandonment plans are very old and the depths of working calculated by the Coal Authority using an algorithm cannot be relied upon, however it is likely that these recorded workings are too deep to affect the proposed development. However, there is a possibility of unrecorded much shallower workings. Mining records are often incomplete because there was no statutory requirement to keep and deposit plans of mines upon abandonment until the Mining Act of 1872. Much of the mining in the area was already historic by the time of the first edition Ordnance Survey mapping.

Where coal is present at outcrop, there is a potential for ancient drift working to exist, this method dates back to pre-roman times and remained a common form of mining. By the 13th and 14th century, bell pits were also a common form of shallow mining. Bell pits are more common where gently dipping strata are present with a thin or absent cover of drift. The drift thickness is not known for this site but it could be quite shallow. It is possible that some or all of these methods were used on the site prior to the recorded workings.

It is likely that investigations for mine workings and possibly shaft treatment were undertaken for the construction of the new school in 2007. Records of this investigation should be located if possible.

The risk to the project from historic coal mining is therefore medium to high and additional investigation is required to quantify the risk and design any appropriate remediation.

4.3 Preliminary Geotechnical Risk Assessment

Any made ground present is unlikely to be suitable as a bearing stratum for building loads. Loads are not anticipated to be high and it is likely that the glacial soils below the site can be utilised. As made ground is not anticipated to be thick, it is likely that a shallow foundation solution will be possible such as strip footings or pads, taken through the made ground and into competent natural material.

Further investigation is required to assess the strength and bearing capacity of the underlying soils, the presence of groundwater, information for concrete design and to assess options for foundation design. Information for the design of hardstanding areas (CBR) is also required.

Clay soils are anticipated so it is unlikely that permeable paving or soakaway drainage will be suitable, however it is possible that granular horizons exist which could be utilised. Further investigation is required.

Clay soils can also exhibit seasonal movement in the presence of trees. Trees are present close to the eastern boundary of the proposed buildings. Further assessment of the soils is required to assess this risk and design remedial measures, if required.

5.0 PROPOSED SITE INVESTIGATION

5.1 Site Investigation Rationale

It is anticipated that information probably exists for the existing school, which having been built to modern standards in 2007, is likely to have had some level of site investigation, and potentially treatment of mine shafts or shallow mining. The client should try to locate and provide this report as significant cost savings could be made. Assuming that the report is not located, the following investigation was partially provided by Read Construction and EAL have assessed the requirements for mining risk assessment. The following scope is proposed to assess the area for the new extensions and the sports pitch:

- Three rotary boreholes to 45m to investigate potential mining risk and provide information if piling is required. Coal Authority Permit required for this work.
  - Five dynamic sample holes to 5.5m.
  - Groundwater/gas monitoring wells in three of these.
  - Six rounds or water level monitoring and gas monitoring.
  - Infiltration testing in one monitoring well.
  - Six CBR tests using TRRL DCP method for the sports pitches.
  - Percolation testing in three locations at 300 to 400 mm depth to assess feasibility of permeable paving for the sports pitches.
- Geotechnical laboratory testing –
  - 2 no particle size distribution,
  - 8 no. Atterberg limit and water content tests,
  - 2 no. PSD - sieve
  - 9 no. quick undrained triaxial tests,
  - 4 no. BRE pyritic ground suites.
- Chemical laboratory testing –
  - 6 x soil suite
    - pH
    - asbestos,
    - metals (As, Cd, Cr total, Cu, Hg, Pb, Ni Se, Zn),
    - sulphate total & 2:1 water soluble,
    - TOC
    - PAHs (USEPA 16 speciated),
  - 3 x Banded Extractable Petroleum Hydrocarbons
  - 3 x TPH CWG & BTEX
  - 3 x TOC
  - 1 x landfill WAC suite.

Investigation of the potential mine shaft 328346-059 is not proposed at this time as the shaft (+/- 10m departure) is 30m from the proposed buildings.

Should the sports pitch locations be finalised, and be within around 10m of the anticipated locations of the mine shafts, then further investigation would be required to assess if the shaft has been suitably backfilled. It is recommended that this would be carried out as part of a later stage of investigation if this is required.

The Proposed hole locations are shown in Figure 10.

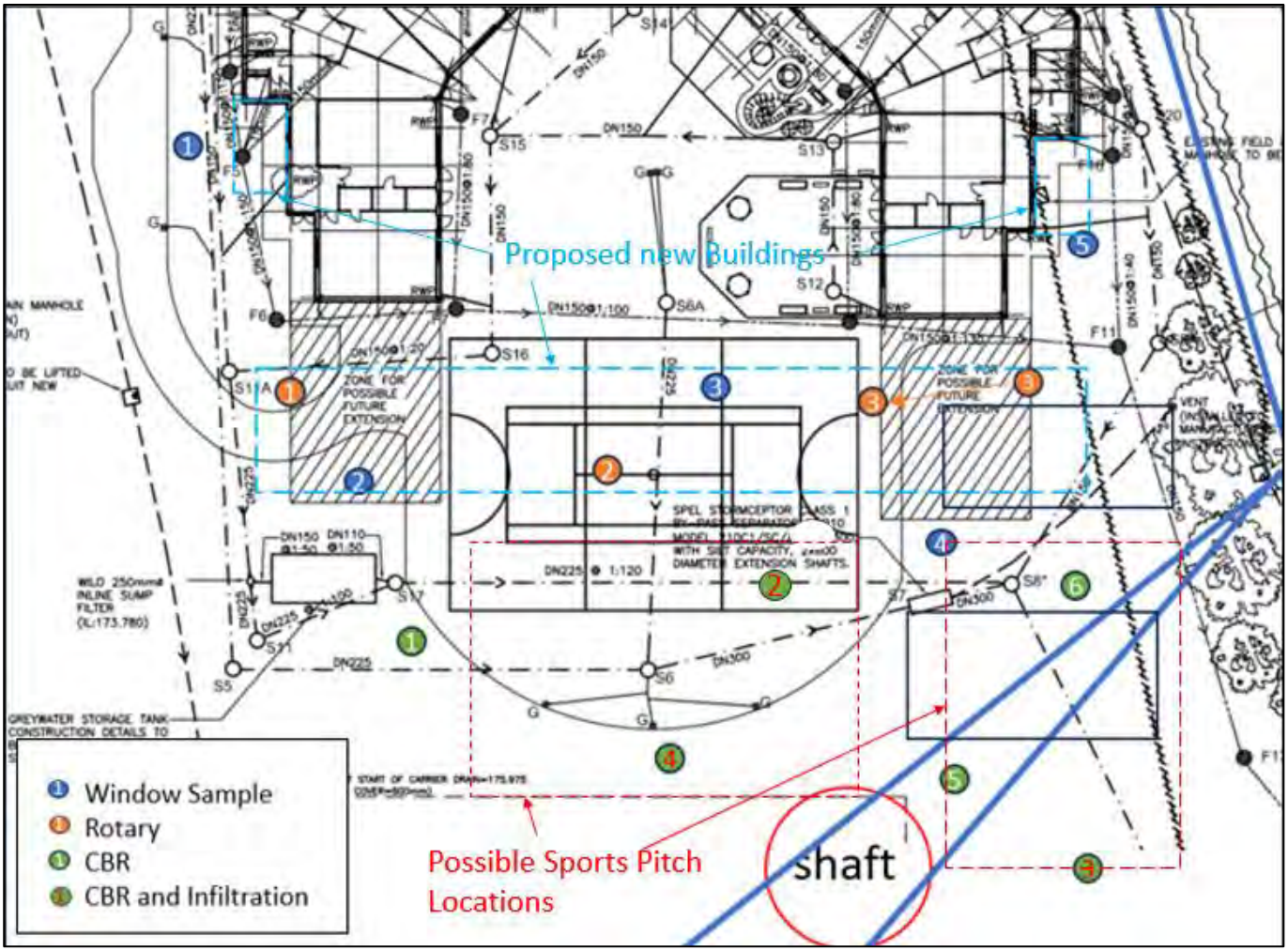


Figure 10: Proposed Exploratory Hole Locations

END OF REPORT

EAL

APPENDIX I – LIMITATIONS

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LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between Eccles Associates Ltd and the Client as indicated in Section 1.0.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency/Natural Resources Wales. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. In addition to the above Eccles Associates Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.

7. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

8. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.

9. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

10. This report presents an interpretation of the geotechnical information established by excavation, observation, and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man-made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently, there may be conditions present not revealed by this investigation.

11. Eccles Associates Ltd cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by Eccles Associates Ltd is owned by them and no such plans or documents may be reproduced, published, or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by Eccles Associates Ltd in this connection without their explicit written agreement there to by Eccles Associates Ltd.

12. Rather, this investigation has been undertaken to provide a preliminary characterisation of the existing sub-surface geotechnical characteristics and make up and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

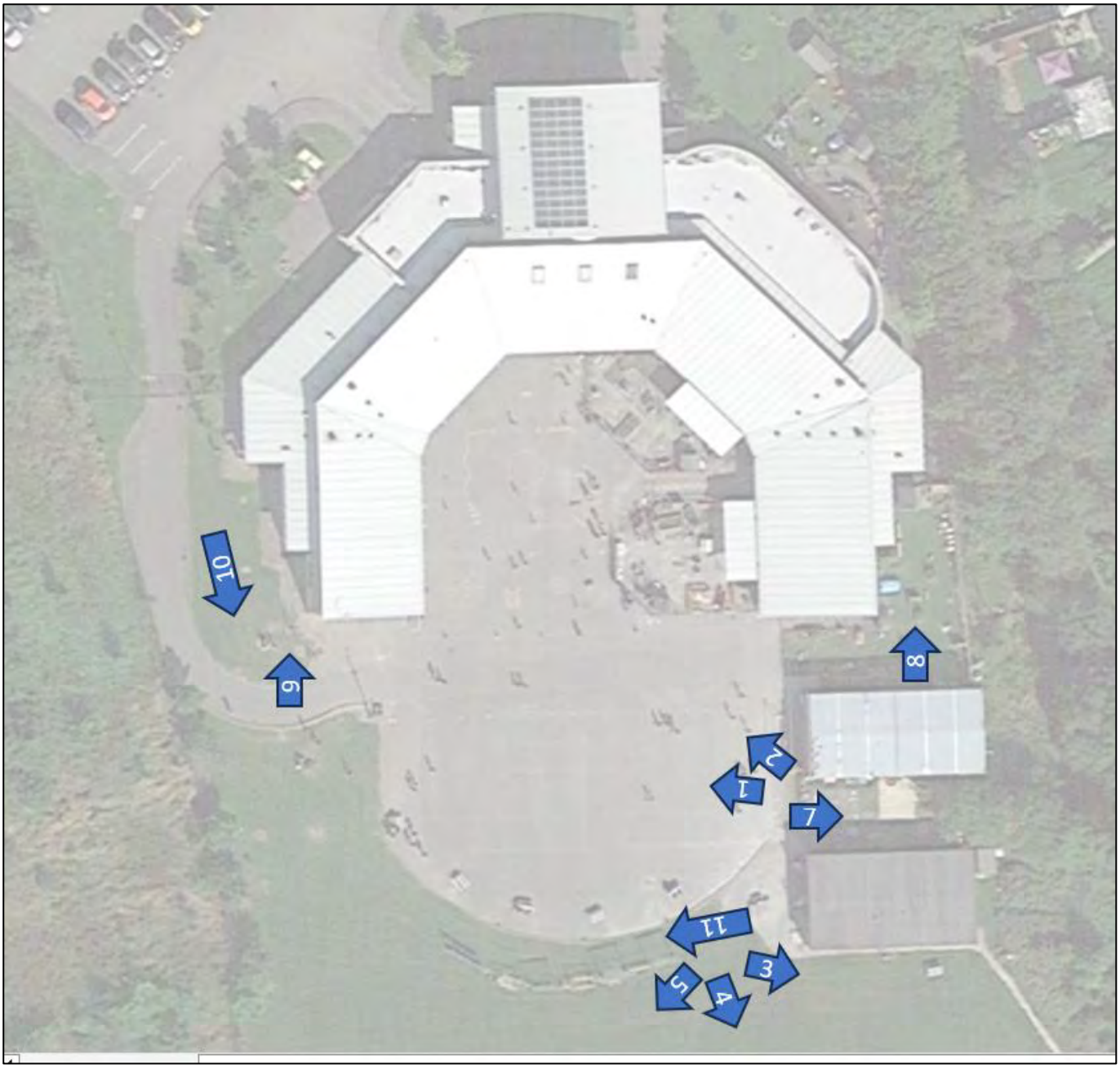
13. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

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APPENDIX II – SITE PHOTOGRAPHS

APPENDIX II SITE PHOTOGRAPHS

LOCATION OF PHOTOGRAPHS





1 Existing Playground and Proposed Extension Location



2



3 Location of suspected Mineshaft



4



5



6 Location of suspected Mineshaft



7: Garden Area between temporaty Classrooms



8 East wing of Building



9 West wing of building and site access



10 Location of attenuation tank (red) and Marks in grass (blue)



11 Marks in grass: former play equipment