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Former Caewern Care Home, Neath
Proposed Residential Development
Geo-Environmental and Geotechnical Assessment

Report Reference: ESP.7828b.3558

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Former Caewern Care Home, Neath
Proposed Residential Development
Geo-Environmental and Geotechnical Assessment

Prepared for:
Linc Cymru Housing Association
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Report Reference: **ESP.7828b.3558**

Revision	Status	Date	Written by	Checked by	Approved by
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Executive Summary

Linc Cymru Housing Association are proposing to redevelop the subject site for residential purposes. ESP have undertaken a series of investigations at the site and have prepared this geo-environmental and geotechnical assessment of potential ground hazards and recommendations for the development now proposed. The key potential land quality issues identified by the assessment are summarised below:

	Potential Hazard	Anticipated Risk	Discussion
Site Setting	*Site Status.* *(Section 2.1)*	-	*The site is currently occupied by the now disused and part derelict, former care home building, Caewern House, on elevated ground in the north-west. Gardens and woodland are present on lower lying ground to the east.*
	Identified Ground Conditions. *(Section 4.1)*	-	*The investigation has indicated a veneer of Made Ground over superficial deposits, of glacial origin or substantially weathered bedrock, over Coal Measures. Workings within the Swansea Four Feet seam have been identified beneath the site.*
	Groundwater Conditions. *(Section 4.2)*	-	*The main groundwater body has been established at around 43.6m OD, i.e. around 11m beneath the upper level and 6.5m below the lower level. A perched water body was also identified at 2.3m depth beneath the upper level.*
	Historical Land Use. *(Section 2.3)*	-	*The existing Caewern House is believed to date from the 1860s. It was extended in the 1960s.*
Geo-environmental	*Potential Contamination Sources* *(Section 5.1)*	*Low*	*No contaminative former use has been identified for the site. Made Ground has been identified across the site, and the presence of a former heating oil tank within one of the buildings cannot be discounted. Asbestos is anticipated within the buildings.*
	Chronic Risks to Human Health *(Sections 4.4.3 and 6.1.2)*	*Moderate*	*The levels of arsenic and lead are elevated above GAC within the shallow soils across the site. A clean cover layer is recommended to mitigate risks.*
	Risks to Controlled Waters *(Section 6.2)*	*Low*	*Based on the findings of the investigation, we consider that the risk to controlled waters to be low.*
	Hazardous Ground Gas *(Section 6.3)*	*Moderate*	*There is the potential for hazardous gas being generated from the shallow Made Ground and mine workings. Monitoring of installed wells is ongoing. Basic radon protection is required.*
	Other Hazards *(Section 6.1.1)*	*High*	*Asbestos is anticipated within the old building construction (Caewern House).*
Geotechnical	*Abandoned Mine Workings and/or Old Mine Entries* *(Section 7.2.1)*	*Moderate/ High*	*A subsidence risk is present due to workings within the Swansea Four Feet seam. Stabilisation of the workings within the proposed building footprints will be required.*
	Non-conventional foundations *(Sections 7.3 and 7.4)*	*Low to Moderate*	*Conventional spread foundations are likely feasible. These would need deepening to mitigate shrinkage and swelling risks. Reinforced foundations would be required in areas of filling. Suspended floor slabs are likely to be required.*
	Shrinkage or Swelling *(Section 7.2.3)*	*Low*	*Laboratory testing has indicated the shallow soils to be of low to medium shrinkage/swelling potential. However, trees will be removed in south-west area. Foundations will need deepening within the zone of influence of trees in fine-grained founding strata.*
	Sulphate Attack on Buried Concrete *(Section 6.4.2)*	*Low*	*Based on laboratory testing, we consider that the site would be classified as Design Sulphate Class DS-1 and Aggressive Chemical Environment for Concrete Class AC-1.*
	Soakaway Feasibility *(Section 7.8)*	-	*Low infiltration rates identified to date. Further testing will be required to satisfy SABS requirements.*
	Other Hazards *(Section 7.2.2)*	*Moderate*	*Stability of downslopes to be considered in design of scheme.*
Others	*UXO* *(Section 2.9.5)*	-	*No further assessment required.*
	Flooding *(Section 2.5)*	*Low*	*The site is not indicated to be within the zone of flooding from rivers or the sea.*
	Further Investigation Required?	*Yes*	*See Section 8.0 for details.*

Note: The above is intended to provide a brief summary of the conclusions of the assessment. It does not provide a definitive assessment and must not be referenced as a separate document. Refer to the main body of the report for details.

1 Introduction

1.1 Background

Linc Cymru Housing Association (hereafter known as the Client) are proposing to redevelop the subject site for residential purposes. The site is located on the eastern side of Dwr-y-Felin Road in the northern margins of Neath, and the location is shown in Insert 1 in Section 2.1.

The proposed development comprises a new block of 32 flats on elevated ground in the north-west of the site (on the location of the existing Caewern House – Block 1), two blocks of 8 flats on lower lying land to the south-west (Blocks 2 and 3), and one three bed house, and two terraces of five, two bed houses straddling a downslope between the two levels on the site. We are not sure of the proposed site levels, particularly in the area of the current low-lying ground in the east/south. The proposed layout is shown on Figure 1.

The Earth Science Partnership Ltd (ESP), Consulting Engineers, Geologists and Environmental Scientists, have previously undertaken a number of intrusive investigations and assessments at the subject site for different developments in 2013, 2016 and 2019 (ESP, 2013, 2016 and 2019) – for ease of reference, a summary of these investigations is included in Section 2.2 of this report. These previous investigations and the results of a new, targeted, intrusive investigation have been evaluated and assessed with regards to the now proposed development.

Based on the above, we understand that the proposed structures would be classified as Geotechnical Category 2 (BS5930:2015), i.e. conventional structures, with no exceptional risk.

1.2 Objective and Scope of Works

The objective of this assessment was to review the previously obtained and new geotechnical and geo-environmental information and to provide an evaluation of the ground conditions and ground hazards with regards to the newly proposed development.

We are not aware of any ground hazard related planning conditions relating to the development.

The contract was awarded on the basis of a competitive tender quotation. The terms of reference for this assessment are as laid down in the Earth Science Partnership proposal of 15th March 2021 (ref. db/7828b.lt1) and the investigation and assessment were undertaken in June and July 2021.

1.3 Report Format

This report includes the desk study and field reconnaissance reports (Section 2), a Conceptual Model for the site (Section 3), and assessment of geo-environmental risks and possible remedial actions required (Sections 4 and 5).

An assessment of geotechnical risks, including a full assessment of the geotechnical conditions (foundation and floor slab options, the feasibility of soakaways, etc.), is presented as Section 6. The report concludes with a summary of any further surveys/ investigations/ assessments recommended (Section 7).

The assessment of the potential for hazardous substances (contamination) or conditions to exist on, at or near the site at levels or in a situation likely to warrant mitigation or consideration appropriate to the proposed end use has been undertaken using the guidance published by CIRIA (2001). This is discussed in more detail in Section 5.5 and in Appendix A.

This report is issued as a digital version only.

1.4 Limitations of Report

This report represents the findings of the brief relating to the proposed end use and geotechnical category of structure(s) as detailed in Section 1.1 above. The brief did not require an assessment of the implications for any other end use or structures, nor is the report a comprehensive site characterisation and should not be construed as such. Should an alternative end use or structure be considered, the findings of the assessment should be re-examined relating to the new proposals.

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

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

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

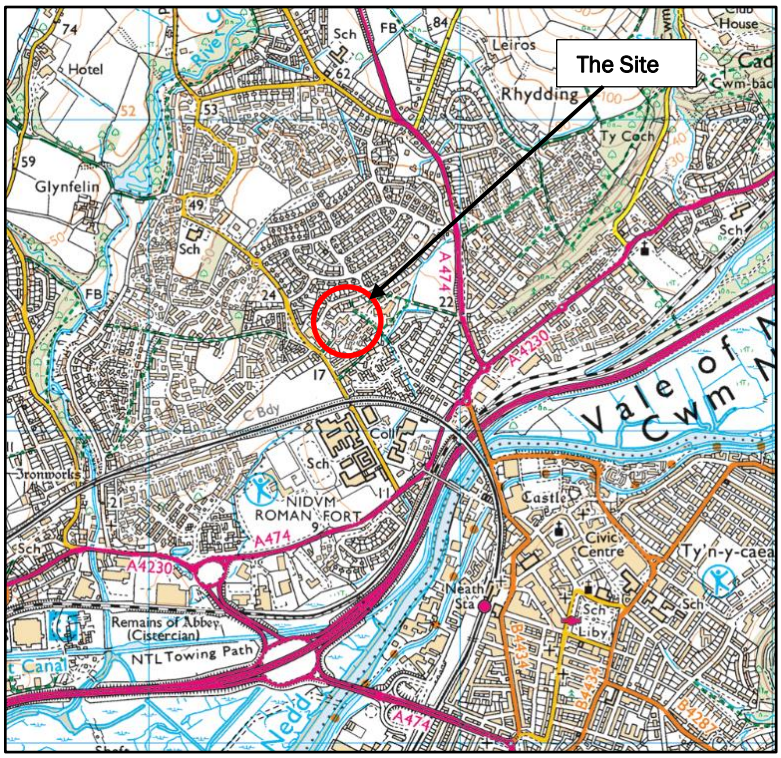
2 Desk Study and Field Reconnaissance Visit

The information presented in the following sections was obtained as part of the previous assessments (see Section 2.2) from desk-based research of sources detailed in the text, including historical maps (Appendix B), an environmental data report (Appendix C), and a mining report obtained from the Coal Authority (Appendix D).

The site description is largely based on a field reconnaissance and site inspection visit made at the site on 14th May 2021 during dry and sunny weather.

2.1 Site Location and Description

The site is located to the east of Dwr-y-Felin Road in Neath. The National Grid Reference of the centre of the site is (SS) 274615 198346, the postcode SA10 7RH. A Site Location Plan is presented in Insert 1 below.



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

The site is roughly trapezoidal in shape and is around 120m in length (south-west to north-east) by between 30 and 70m in width (north-west to south-east) covering an area of approximately 0.6ha.

The full site boundaries are shown on Figures 1 and 2. It is bordered by:

- To the north: residential properties on Heol Illtyd amongst other roads;
- To the east and south: by gardens and residential properties on Twyn Teg., with Dwr-y-Felin road some 100m south; and
- To the west: by a residential care home, constructed in 2015, followed by Dwr-y-Felin Road.

The site basically comprises two levels, with the now derelict, former Caewern House care home located on the elevated, 'upper level' in the north-west (see Figure 2). This comprises a large, three-storey, masonry built building, with more modern single and two-storey extensions, located on a relatively flat plateau area, surfaced with tarmacadam and was most recently used as car parking, with garden areas to the east and north-east (also at the elevated level). A boiler room and possible plant room are located within the single-storey part of Caewern House, on the north-eastern side of the main building, with walkways around the north of the building bounded by a brick retaining wall of around 2m height, supporting the elevated northern margins of the site. No access was available into the boiler and plant rooms during the investigations. Anecdotal evidence suggests that Caewern House may have a basement.

Lawned garden areas lie to the north-east of Caewern House at a similar elevation to the building plateau, rising to some 3m above the plateau on the northern and north-western boundaries. Small brick built outbuildings, apparently formerly used as sheds or garden workshops are located to the east of Caewern House.

A grassed downslope to the south-east of Caewern House falls down to a lower-lying garden and wooded area in the south-west/east of the site – see Figure 2.

Access to the site is gained via a tarmacadam driveway to the south-west leading up from Dwr-y-Felin Road. The gardens to the south-east of this driveway comprise woodland (in the south/south-west) and open, overgrown, lawned areas in the east/north-east, with many shrubs and some trees. The gardens in the east/south-east of the site are lower-lying relative to the plateau on which Caewern House has been built, with grassed banks leading up to the tarmacadam surfaced areas around the building – these banks are supported in places by low (less than 1m height), masonry retaining walls.

A topographic survey for the site indicates that the plateau around the main building is at around 55m OD, falling towards the drive to the south-west. The low-lying lawned garden area to the south-east of Caewern House is shown to be at an elevation of around 53.6m OD, falling to 51m OD at the south-eastern boundary, with the more elevated northern margins at around 58m OD. The grassed bank leading up to Caewern House from the low-lying gardens is therefore, around 1.5 to 2.0m in height, and the proposed housing is to be constructed across a downslope currently of around 3 to 4m height.

We are not aware of a tree survey having been undertaken at the site but, from site observations, the majority of trees appear to be coniferous species. A tree survey should be completed by a specialist arboriculturist prior to development.

Site observations and the utility plans obtained as part of this assessment indicate that the site is crossed by the following services:

- An underground gas pipe extending east from Dwr-Y-Felin Road along the entrance driveway and enters the existing Caewern House centrally on the east side;
- Underground and overhead BT cables extending east from Dwr-Y-Felin Road along the entrance driveway and enters the existing Caewern House in the west; and
- A low voltage underground electricity cable trending west from the north of the site, entering the existing Caewern House in the north.

We are not aware that these services have been disconnected and they should be assumed to be live unless otherwise confirmed by utility providers.

2.2 Previous Assessments

2.2.1 Context

ESP have undertaken three previous assessments at the site as summarised in the following sections. The desk study information obtained in these assessments has been further reviewed with regards to the currently proposed development, as part of this current assessment. For ease of reference, copies of the historical maps are included as Appendix B of this report, along with the environmental data report (Appendix C), a mining report obtained from the Coal Authority (Appendix D) and a preliminary UXO assessment (Appendix E).

The salient previous investigation point positions are presented on Figure 3, and the trial pit and borehole records are included as Appendices F1 (trial pits), F2 (Windowless sample boreholes) and F3 (rotary drillholes). The results of previous soakaway testing and groundwater/gas monitoring are included as Appendices G1 and G2. The results of previous laboratory testing are included as Appendices H1 and H2.

2.2.2 Geo-environmental Desk Study Assessment, 2013

A desk study based assessment of geotechnical and geo-environmental ground hazards for a previously proposed development over a wider site area (including the new care home fronting onto Dwr-y-Felin Road to the north-west of the site entrance (report ref. 5186e.1909). No intrusive investigation was undertaken as part of this assessment.

2.2.3 Geo-environmental and Geotechnical Assessment, 2013

An intrusive investigation and assessment concentrating mainly on the now built care home fronting onto Dwr-y-Felin Road to the north-west of the site entrance (report ref. 5186e.1952), i.e. outside the subject site boundary. However, some investigation was also undertaken on the subject site itself, notably the construction of rotary, open-hole drillholes immediately to the south of the Caewern House building (at the higher level – DH7), and in the lower-lying, wooded, south-west of the site (DH6). The objective of drillhole was to investigate for the presence of abandoned mine workings identified beneath the care home to the west, and a gas monitoring well was installed and monitored.

In addition, trial pits were excavated on the lower-lying car park area in the south-west of the subject site (TP7a and TP7b).

2.2.4 Preliminary Coal Mining Risk Assessment, 2016

A desk study based coal mining risk assessment for a previously proposed development, and undertaken to meet the requirements of the Coal Authority (report ref. 6346h.2616). No intrusive investigation was undertaken as part of this assessment.

2.2.5 Geotechnical and Geo-environmental Assessment, 2016

An intrusive investigation and assessment for the proposed refurbishment of Caewern House and the construction of residential blocks on the remainder of the site (report ref. 6346h.2634). The investigation included the excavation of trial pits across the site (TP1 to TP4), and the construction of windowless sample boreholes (WS1 and WS2) on the higher ground. Soakaway infiltration testing was also undertaken in the lower-lying garden area in the east of the subject site (TP1b). Geotechnical and geo-environmental laboratory testing and monitoring of the previously installed gas well was also undertaken.

2.2.6 Geotechnical and Geo-environmental Assessment, 2019

A further assessment of the existing desk study and investigation information was undertaken for an alternate development on the site. No additional desk study or investigation information was obtained as part of this assessment.

2.3 Site History

2.3.1 Published Historical Maps

The site history has been assessed from a review of available historical Ordnance Survey County Series and National Grid maps, obtained during an investigation for the care home built in 2015 to the west, but including the subject site (ESP, 2013). For ease of reference, extracts from the historical maps are presented in Appendix B and the salient features shown on and around the subject site since the First Edition of the County Series maps are summarised in Table 1 below.

Table 1: Review of Historical Maps

Date	On-Site	In Vicinity of Site
1877 – 1951	The house *Cae-wern* is shown in the north-west of the site and appears to be the large masonry building remaining on site. A driveway is shown accessing the house from Heol Dwr-y-Felin to the south west, but also running on past the house to access a possible farm to the north.	The site is located in a rural setting around 170m north of the main railway. Heol Dwr-y-Felin is shown to the west, although then line of the road is slightly further west than the present day, with the trees on the field boundary probably on the line of the present-day road. The farms Ffrwd Vale and Waun-cierch are shown 100m to the south and 280m to the west. Two old mine shafts are indicated 160m north-west and 500m west of the site. An old quarry is shown around 500m to the east.
1965 – 1968	No significant changes within the site by 1965, but by 1967, the extension to the north-west of Caewern had been built, including cutting into elevated north-western margins.	The 1965 edition shows the housing development to the north of the site, including Heol Illtyd. To the south west, Dwr-y-Felin Road had been re-aligned to its present position and housing developments constructed further south west.
1977 – present day.	At this time, the site was broadly in its present layout.	Further residential developments are encroaching towards the site from the east and south, with the current developments around the site shown by 1986.

In summary, the site appears to have been developed as Caewern House and its associated grounds by the 1870s and, excluding some small extensions to the building, has not been significantly further developed since.

The care home which occupied Caewern House appears to have closed in 2019/2020, and the house is now empty and somewhat derelict.

2.3.2 Other Sources

Anecdotal evidence suggests that Caewern House was built in the 1860s as a colliery manager's house, and was used during World War II by the Ministry of Defence (MoD) as a control centre.

2.3.3 Archaeological Setting

A full archaeological assessment was not included within the brief, but we have not been advised of, or identified, any obvious evidence of any significant archaeological features on the site.

2.4 Contact with Regulatory Bodies & Local Information Sources

No pertinent information was obtained on the site during the previous assessment (ESP, 2013). The regulatory bodies have not been contacted as part of this current assessment.

2.5 Hydrology

2.5.1 Surface Water Features

The nearest major surface water feature to the site is the River Neath, which flows north-east to south-west some 500m south-east of the site at its closest point. The historical maps show several streams to have formerly flowed broadly from north to south in the area of the site, including one along the north-eastern boundary. This stream appears to still flow in open channel to the south-east of the site (south of Twyn Teg), but it is no longer evident to the north of this. Therefore, it is presumably culverted near and to the north of the site.

2.5.2 Surface Water Abstractions

The environmental data report (Appendix C) indicates that there are no surface water abstractions within 250m of the site.

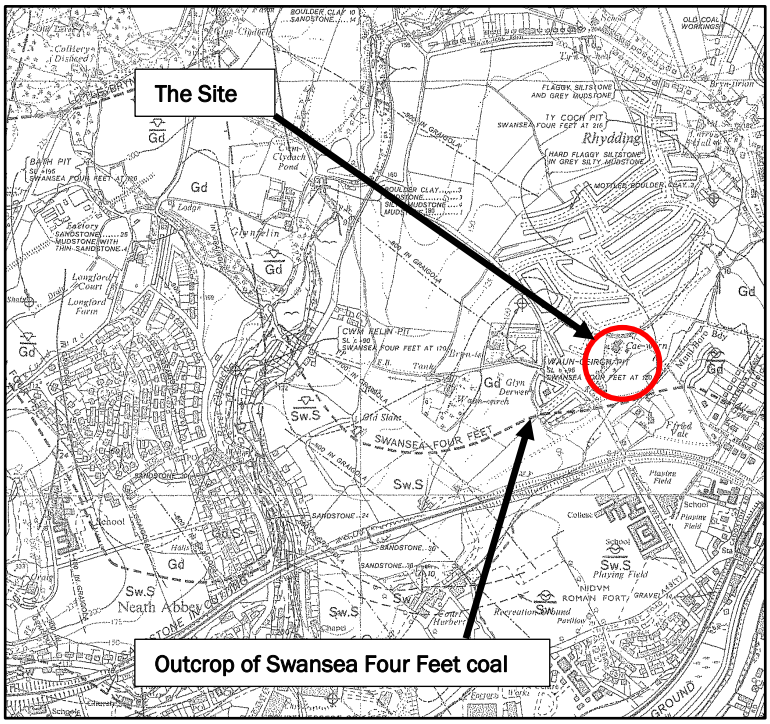
2.5.3 Flooding (Rivers and Seas)

From a review of the environmental data report (Appendix C), the site is not indicated to be within the zone of flooding from rivers or seas.

2.6 Published Geology

The published geological map for the area (1:10,560 scale, SS79NW) indicates the site to be underlain by bedrock of the Grovesend Beds of the Upper Coal Measures with no significant superficial deposits. Fluvio-Glacial Gravels are shown just to the east, and may extend to beneath the site itself.

An extract of this geological map is presented as Insert 2 below. Reference to the up-to-date mapping published on the website of the British Geological Survey (BGS, 2021) shows a similar succession.



Insert 2: Extract from BGS Geological Map Sheet SS79NW, original 1:10,560 scale.
Reproduced with permission (BGS licence number: C15/05 CSL)

The Coal Measures bedrock comprises an interbedded succession of sandstone, siltstone and mudstone, with coal seams and associated seat earths.

The conjectural outcrop of the Swansea Four Feet coal seam is indicated on the geological map some 40m south of the site (as shown in Insert 2). Regional dips on the bedrock are to the north, so the seam would be expected to potentially underlie the lower part of the site at shallow depth. The succession shown on the geological sheet suggests that the Swansea Four Feet seam is four feet (1.2m) in thickness in the area.

An ESP investigation of the care home site immediately to the west identified that this seam had been considerably worked. See Sections 2.9.2 and 6.2.1 for further discussion on the mining hazard.

2.7 Hydrogeology

2.7.1 Aquifer Classification

The environmental data report (Appendix C) indicates that the Upper Coal Measures comprises the main aquifer in the vicinity, which is classified by Natural Resources Wales as a Secondary A Aquifer. The Fluvio-glacial Gravels are also likely to be classed as a Secondary A aquifer.

Secondary A Aquifers generally correspond with the previously classified minor aquifers, and comprise permeable layers capable of supporting water at a local, rather than strategic, scale and in some cases form an important base flow to rivers. Secondary A Aquifers are sensitive to pollution.

2.7.2 Abstractions and Groundwater Vulnerability

The environmental data report (Appendix C) indicates that there are no groundwater abstractions or Source Protection Zones within 250m of the site.

The groundwater vulnerability is shown in the environmental data report to be 'minor aquifer high'.

2.7.3 Groundwater Movement

Groundwater movement within the Fluvio-glacial Gravels and highly weathered bedrock (gravel and cobbles) will be controlled by intergranular flow, whilst within the Coal Measures it will be controlled by fracture flow.

It should be appreciated that in former mining areas, such as this, groundwater conditions may still be changing in response to the cessation or reduction in pumping from underground coal workings.

2.8 Environmental Setting

2.8.1 Summary of Environmental Data

The site exists in a historically rural setting, and current urban setting. An environmental data report was obtained for the site in 2013 and is presented in Appendix C, and the data therein is summarised in Table 2 below and, where salient, discussed in Section 2.8.2.

Table 2: *Summary of Environmental Data*

Feature	On the Site	In the Immediate Vicinity
Environmentally Sensitive Sites [2]	None identified.	None identified within 250m.
Potentially Contaminative Land Use	None identified.	An electrical sub-station is present on the eastern boundary, outside of the study area.
Historical Tanks, PFS, Garages, Energy Facilities	None identified.	None identified within 250m.
Potentially Infilled Land	None identified in environmental data rpt	One recorded within 250m of the site. See Section 2.7.2.
IPPC Authorisations	None identified.	None recorded within 250m of the site.
Discharge Consents	None identified.	None identified within 250m.
Radioactive Substance Sites	None identified.	None recorded within 250m of the site.
Enforcements	None identified.	None identified within 250m.

Table 2: Summary of Environmental Data (cont.)

Feature	On the Site	In the Immediate Vicinity
Pollution Incidents	None identified.	None identified within 250m.
Contaminated Land under Part 2A EPA 1990.	None identified.	Two recorded within 250m of the site. See Section 2.7.2.
Waste Management Facilities	None identified.	None identified within 250m.
Current Industrial/ Commercial Sites	None identified.	One recorded within 250m of the site.

Notes to Table 2:

1. Full details of features presented in environmental data report (Appendix C).
2. Sensitive land uses include Sites of Special Scientific Interest, Nature Reserves, National Parks, Special Areas of Conservation, Special Protection Areas, Ramsar sites, World Heritage sites and Ancient Woodland.
3. Nitrate vulnerable areas relate to the agricultural use of fertilizers and are not considered further in this assessment.

2.8.2 Further Discussion on Salient Environmental Features

The following environmental features have been identified in the vicinity of the site:

Potentially Infilled Land

A filled former pit is identified on the 1992 historical map some 170m to the north-west, immediately adjacent to Dwr-y-Felin Road. Reference to the historical map (Appendix B) does not clearly identify the feature. Further infilled land in the form of an old stream is shown along the north-western boundary.

Potentially Contaminated Land:

The electricity sub-station is identified on the northern boundary. Historical mining and quarrying are identified some 170m to the north-west, associated with the infilled land discussed above, and the railway some 200m to the south.

Current Industrial/Commercial Sites:

A meat suppliers is recorded on the residential estate some 200m to the south-east – given its location, this is likely to be company registered address.

2.8.3 On-Site Bulk Liquid Storage

A boiler room and suspected plant room are located within the outbuildings to the north-east of the existing Caewern House. No access was available to these rooms during our site reconnaissance.

Available utility records show a gas supply to Caewern House, which suggests that recently the building was heated by gas. However, we cannot discount that previously the building was heated by oil, and an oil tank could remain/was formerly present within these rooms.

2.8.4 On-Site Bulk Materials and Waste Storage

The field reconnaissance visit indicated no evidence of significant recent materials or waste storage on the site.

2.9 Preliminary Geotechnical Risk Register

2.9.1 Summary of Potential Geotechnical and Geomorphological Hazards

The potential for various geotechnical and geomorphological hazards at the site is provided in the environmental data report (Appendix C). The potential hazards are listed in Table 3 below, along with any salient further information on the potential hazard identified by ESP in the preparation of this report. Where a potential hazard has been identified, it is discussed further in subsequent sections.

Table 3: Preliminary Geotechnical Risk Register

Ground Stability Hazard	Potential[1]	ESP Comment
Coal Mining	The site is located in an area of past coal mining	**See Section 2.9.2.**
Mining (non-coal)	No hazard	No further information identified to contradict data report.
Shrinking or Swelling Clays	Very Low	No further information identified to contradict data report.
Landslides/ Slope Instability	Low	**See Section 2.9.3.**
Ground Dissolution (Soluble Rocks)	No Hazard	No further information identified to contradict data report.
Compressible Ground	No Hazard	No further information identified to contradict data report.
Collapsible Ground	Very Low	No further information identified to contradict data report.
Running Sand	No Hazard	No further information identified to contradict data report.
Sulphate/Pyritic Ground	Not reported.	**See Section 2.9.4.**
Unexploded Ordnance	Not Reported	**See Section 2.9.5.**

Notes to Table 3:
1. Potential as reported in environmental data report (Appendix C)
2. Salient hazards discussed in following sections.

2.9.2 Past Coal Mining

A Preliminary Coal Mining Risk Assessment (CMRA) was completed for the site by ESP (ESP, 2016). A mining report obtained from the Coal Authority is presented as Appendix D, and the findings of the previous CMRA are summarised below.

The Coal Authority (CA) reports that there are recorded mine workings within four seams of coal beneath the site, from shallow (defined by the CA as less than 30m) to 280m depth. Dependant on the type and quality of overlying bedrock, any abandoned mine workings within 30m of the site surface could pose a subsidence risk to the development, due to the potential for void migration.

Based on the information available from the Coal Authority, it is likely that backfilled workings and/or void spaces associated with the Swansea Four Feet are likely to be present of depths of within 30m in the location of the existing Caerwern House and its' ground in the north portion of the site. There is a potential for the workings to be shallower below the south (currently undeveloped portion) and below the site access road.

Given the available desk study information, we consider that the risk from mining subsidence is potentially **High**.

2.9.3 Landslides/Slope Instability

The environmental data report indicates the risk from large scale landsides at the site to be low, and we have not identified any further information to contradict this.

However, as discussed in Section 2.1, the site comprises a series of levels separated by grassed and wooded slopes. The overall elevation change across the site is some 9m, with individual banks/slopes up to 4 to 5m in height.

The proposed development is shown to include the housing accommodation straddling the slope down to the lower-lying garden areas in the east, and we consider that the potential for localised instability should be considered in design. We consider that the potential instability hazard at the site is **Moderate.**

2.9.4 Pyritic Ground

The environmental data report does not consider the potential risk from sulphate rich or pyritic ground. The weathered Coal Measures bedrock soils underlying the site can contain elevated levels of pyrite, which could oxidise to sulphates.

Given the above, we consider that the potential for sulphate/pyrite attack on buried concrete would be **Moderate.**

2.9.5 Unexploded Ordnance

The environmental data report does not consider the potential risk from unexploded ordnance at the site.

The Swansea and Neath area was heavily bombed during World War II, and reference to UXO risk maps available on-line suggests that the site is located within a Moderate risk region with regards to the risk from buried unexploded ordnance. The anecdotal evidence that Caewern House was used as a control centre during the war could have made it a particular target to the Luftwaffe. A preliminary risk assessment for the site has been obtained and is presented in Appendix E.

The preliminary risk assessment concludes that '*a detailed desk study, whilst always prudent, is likely to do no more than confirm a low UXO hazard level for the site*'.

2.10 Radon Hazard

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

The environmental data report (Appendix C) indicates that the site lies in a radon affected area as defined by the Health Protection Agency, with between 3% and 5% of properties above the action level.

Given the currently available information, the risk from radon is considered **Moderate** and basic protection measures will be required.

3 Exploratory Investigation (2021)

3.1 Investigation Points

3.1.1 Introduction

This phase of intrusive investigation was undertaken between 13th May and 1st July 2021 in accordance with BS5930:2020 and BS10175:2017, and was designed to investigate both geo-environmental and geotechnical hazards identified in the desk study (Section 2). It comprised trial pitting, rotary open hole drilling, soakaway infiltration testing and gas and groundwater monitoring.

The exploratory holes were supervised and logged by an engineering geologist in general accordance with BS5930:2020, BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2018, and BS EN ISO 14689:2018, along with published weathering schemes.

Descriptions and depths of the strata encountered are presented on the trial pit and drillhole records in Appendices I and J. The results of the in-situ testing and monitoring are presented in Appendices K and L. The investigation point positions (from this phase and previous phases) are shown on Figure 3.

The ground levels indicated on the investigation point records are approximate only and have been interpolated from the topographical survey. The coordinates shown on the investigation point records are approximate only and have been interpolated from the topographical survey/recent Ordnance Survey maps.

3.1.2 Investigation Strategy

The investigation strategy was generally designed in accordance with BS10175:2017, taking into account the additional potential for geotechnical hazards to be present, and was also designed considering the proposed development. The locations and objectives of the investigation points are summarised in Table 4 below.

Table 4: *Placement Rationale for Investigation Points (ESP, 2021)*

Point ID	Location	Placement Rationale
BH01, BH02, BH03	Lower-lying south-east area.	To investigate the depth to shallow coal/mine workings associated with the Swansea Four Feet seam.
BH04, BH05	Upper levels (adjacent to Caewern House)	To investigate the depth to shallow coal/mine workings associated with the Swansea Four Feet seam.
TP201, TP202, TP203	Lower-lying south-east area.	To identify shallow soils beneath lower-lying area and to provide soakaway test pit.
TP204, TP205, TP206	Upper levels (adjacent to Caewern House)	To identify shallow soils beneath upper area.
HP01	Lower-lying south-east area.	To identify shallow soils beneath lower-lying area, where access for an excavator was not possible.

Notes to Table 4:
1. Recent (ESP, 2021) phase of investigation only.
2. Investigation Point positions shown on Figure 3.
3. TP: Trial pits. BH: Rotary open hole drillhole. HP: Hand excavated pit.

3.1.3 Trial Pits

Six trial pits (TP201 to TP206) were excavated across the site on 13 and 14 May 2021 using a JCB 3CX excavator. The trial pits were excavated to depths of between 1.8 and 2.0m on the lower-lying part of the site (TP201 to TP203), and between 2.5 to 3.3m beneath the upper level of the site adjacent to Caewern House (TP204 to TP206). The tarmacadam surface on the upper level was broken out prior to the excavation of the pits using a hydraulic breaker. The trial pit records are presented as Appendix I.

Disturbed samples were collected from the trial pits for laboratory testing as shown on the trial pit records.

On completion, the trial pits were backfilled with arisings in layers compacted with the excavator bucket. The tarmacadam surface was not reinstated. The arisings were left slightly proud of the adjacent surface to allow for future settlement.

3.1.4 Rotary Open-hole Drillholes

Five 100mm diameter rotary percussive open-hole drillholes (BH01 to BH05), were constructed to depths of between 30.0 and 31.5m between 28th June and 1st July 2021. The borehole records are presented as Appendix J.

At the commencement of each borehole, the tarmacadam was removed (where present) and a service inspection pit was excavated by hand to a depth of 1.2m. The ODEX 115 system of simultaneous drilling and casing was used in the superficial deposits, and the depth of casing in each drillhole is shown on the drillhole records.

Given that the objective of the drillholes was to intercept coal seams/workings, they were constructed under license to the Coal Authority (Permit ref. 22074). In accordance with Coal Authority requirements, given the proximity to occupied properties, water was used as a flushing medium to keep the drill bits cool and return chippings to the surface, and the levels of ground gas were recorded at the drillhole during the drilling works. The levels of gas recorded during drilling are presented on the drillhole records.

The drillholes were constructed with the objective of locating the rock-head profile and the depth to coal seams or possible abandoned workings. During the drilling process, the rock chippings returned to the surface were described by the driller and the rate of progress monitored. When large voids were encountered (such as abandoned workings), the drilling rotation was stopped, and the drill rods lowered down the hole and the estimated depth of void recorded. It should be noted that, although adequate for identification purposes, the nature of the drilling method does not permit an accurate description of the strata.

On completion, gas monitoring wells were installed in BH01, BH04 and BH05 (see Section 3.2 for details). The remainder of the boreholes were backfilled with bentonite/cement as required by the Coal Authority.

3.1.5 Soakaway Infiltration Testing

Soakaway infiltration tests were undertaken in general accordance with BRE Digest 365 (2016) in the three trial pits excavated on the lower level of the site (TP201, TP202, TP203). The results of the infiltration testing, and the calculated infiltration rates, are presented in Appendix K. The positions of the test pits are shown on Figure 3.

At each position, the test pit was excavated to a depth of around 2m, where excavation became difficult in suspected bedrock. Clean water was added from a large capacity bowser and the water level monitored as it percolated into the soil.

The infiltration rate was calculated from the time taken for the water to fall between the 75% and 25% full level. Where insufficient time was available for the water level to fall to the 25% full level, but a significant drop in water level was recorded, the infiltration rate can be estimated by extrapolating the test results. However, where the water level only dropped marginally during the available test period (e.g. not as far as the 75% full level), we consider that there is insufficient data to allow a valid extrapolation with any confidence and no infiltration rate can be estimated.

Sufficient time and water were available to repeat the test (a total of three fills) in Test Pits TP201 and TP203, although water levels did not fall to the 25% level in any of the tests. Due to no fall in water level in TP202, only one fill was undertaken.

Herras fencing was erected around the test pits during the testing to protect site workers/ the general public. On completion of the testing in each pit, any remaining water was removed from the test pit and it was backfilled with the excavated arisings.

3.2 Instrumentation

3.2.1 Gas Well Installations

A 50mm diameter monitoring well was installed in selected boreholes in accordance with BS8576:2013 in order to allow monitoring of hazardous ground gases. The wells, comprising slotted plastic pipe with a gravel surround (the response zone), bentonite seals above the response zone, and a lockable vandal proof cover, were installed as detailed on the borehole records and summarised in Table 5 below.

Table 5: *Gas Well Installations*

Well ID	Date of Installation	Response Zone depth	Response Zone Stratum
BH01	28-6-2021	20.6-21.6m	Open workings within Swansea Four Feet seam.
BH04	30-6-2021	1.0 – 2.5m	Made Ground
BH05	1-7-2021	1.0 – 2.5m	Weathered Coal Measures bedrock
Notes to Table 5: 1. Details of each monitoring well are presented on the individual borehole records (Appendix J).			

3.2.2 'Spot' Gas Monitoring

Monitoring of the installed gas wells (including the preciously installed well in DH07) has been undertaken on a 'spot' monitoring basis (periodic visits to monitor gas levels at the time of the visit).

CIRIA C665 (Wilson et al, 2007) provides guidance on the number and frequency of monitoring visits required for installed gas wells. These depend on the gas generation potential of the source and the sensitivity of the development to gas risk and are designed as a typical minimum only.

The most significant source in the vicinity of the site in terms of gas risk is the open coal workings beneath the site, which is classified as being of very low gas generation potential, but of moderate to high gas risk to development (if not flooded). The proposed development of residential properties is classified as of high sensitivity in terms of gas risk. Therefore, based on the guidelines in CIRIA C665, a minimum of six monitoring visits are required over a 3 month period.

To date, the installed wells have been monitored for levels of groundwater and ground gas on one occasion on 19th July 2021. Further monitoring is ongoing. The results of the 'spot' gas and groundwater monitoring undertaken to date are presented in Appendix L.

During each visit, Gas Data LMSxi G3.18e portable monitoring equipment was used to measures levels of the following ground gases within the airspace in the wells and the flow rates from the wells:

- Methane - total and percentage of Lower Explosive limit (LEL);
- Carbon dioxide;
- Oxygen; and
- Hydrogen sulphide.

The percentage of nitrogen is also calculated by difference. The equipment uses infra-red methane (CH_4) and carbon dioxide (CO_2) detectors, coupled with pressure (barometric and well), temperature and flow sensors. A photo-ionisation detector (PID) with a 10.6eV lamp was used during the monitoring to measure the levels of volatile organic compounds present in the well.

Following measurement of gas levels and flow rates, the well cap was removed, and groundwater levels were measured using a dipmeter from the site surface.

3.3 Sampling Strategy

3.3.1 Soil Sampling

Soil samples were collected from the exploratory holes as discussed in the previous sections. The sampling procedures were selected on the basis of the suitability for the laboratory testing proposed (see Sections 3.5 and 3.6).

A non-targeted, random sampling strategy was used to obtain representative information on soil contamination across the site as a whole. However, the existing Caewern House building constrained sampling positions, therefore a regular grid sampling pattern could not be adopted.

Environmental samples (denoted as ES on the exploratory holes records) were collected for possible geo-environmental laboratory testing and generally comprised a plastic tub, an amber glass jar and an amber glass vial. The sample containers provided clean by the testing laboratory appropriate for the proposed testing to be scheduled. Immediately after collection the samples were placed in sealed cool boxes with ice packs where they remained during storage and transport to the laboratory.

Samples for logging and geotechnical laboratory testing purposes were collected at regular intervals within the exploratory holes.

3.3.2 Soil Sample Quality

Samples of soil recovered from investigations are classified as Classes 1 to 5 in terms of quality and depend on the investigation and sampling method, the particle size of the strata sampled, and the presence of groundwater. Class 1 and 2 samples are those in which there has been no or only slight disturbance of the soil structure, with moisture contents and void ratios being similar to the in-situ soil. Class 3 and 4 samples contain all the constituents of the in-situ soil in their original proportions, and the soil has retained its original moisture content, but the structure of the soil has been disturbed. In Class 5 samples, the soil structure and original layering cannot be identified, and the water content may have changed from that in-situ. The category and class of samples are discussed further in BS EN ISO 22476:2006, EN 1997-2:2007 and BS5930:2015.

In general terms, disturbed samples recovered from trial pits (bulk bags and small tubs) are classed as Class 3 (if dry), Class 4 (fine soil below the water table), or Class 5 (coarse soils from beneath the water table). Cutting relatively undisturbed block samples from trial pit walls provides Class 1 or 2 samples, provided that they are collected, preserved and transported in an appropriate manner.

3.4 Evidence of Site Hazards Found During Site Works

With regard to potential hazards identified in the desk study and Preliminary Risk Assessment, the following observations were made.

3.4.1 Site Stability

No evidence of geotechnical hazards was identified in the shallow exploratory holes. Open cavities were identified in BH01 and BH03.

3.4.2 Site Evidence of Contamination

No direct visual/olfactory evidence of contamination was identified in the exploratory holes. However, Made Ground was present across the site, including fragments of building materials such as brick, glass and plastic, which can contain elevated levels of contaminants such as metals and polyaromatic hydrocarbon (PAH) compounds.

3.5 Geotechnical Laboratory Testing

Geotechnical laboratory testing was undertaken on samples from the suitable quality classes recovered from the exploratory holes in order to obtain information on the geotechnical properties on the soils beneath the site.

The following tests were undertaken by a UKAS accredited laboratory on samples selected by ESP in accordance with the methodologies presented in BS1377:1990. The results are presented in Appendix M.

- Natural moisture content.
- Atterberg limits.

Selected samples were also analysed for soil sulphate and pH value in accordance with the analytical methods specified in BRE Special Digest SD1 (BRE, 2005). Due to the potential presence of pyrite in the soils, these samples were also analysed to determine the levels of total sulphur, acid soluble sulphate in accordance with the analytical methods specified in BRE Special Digest SD1 (BRE, 2005). The results are presented in Appendix N.

3.6 Geo-environmental Laboratory Testing

Laboratory testing has been undertaken to identify the levels of selected contaminants within samples of soil. The geo-environmental analyses were carried out by a UKAS accredited testing laboratory with detection limits being generally compatible with the relevant guideline values adopted in the assessment (see Section 4.4.2).

To allow an assessment of the potential chronic risks posed to human health, a total of two additional samples of the Made Ground and one sample of the near-surface natural soils have been analysed for a range of determinands typically present on brownfield sites in the UK.

The general suite of geo-environmental laboratory testing undertaken comprised:

- Arsenic, barium, beryllium, boron, cadmium, total chromium, chromium VI, copper, lead, mercury, nickel, selenium, vanadium, zinc;
- US EPA 16 polyaromatic hydrocarbon (PAH) compounds;
- Total monohydric phenols;
- Total cyanide, asbestos qualitative screen (presence or absence);
- Soil organic content, pH value;

The geo-environmental soil test results are presented in Appendix N.

4 Conceptual Ground Model

4.1 Geology

The strata identified beneath the two levels (upper and lower) on the site are discussed in the following sections.

4.1.1 Upper Level

The exploratory holes have identified the upper level of the site to be generally underlain by Made Ground overlying probable weathered Upper Coal Measures bedrock.

Made Ground: encountered in most exploratory holes on the upper level around Caewern House to depths of between 0.8 and 1.3m. The tarmacadam or grassed surface was generally underlain by a brown, sandy clay of soft-to-firm or firm consistency or a pink/red, very sandy gravel, with fragments of gravel and man-made materials such as brick, ceramic tile, glass, clinker and ash. In TP4, excavated on the plateau immediately to the east of Caewern House, the Made Ground comprised tarmacadam and 150mm of concrete, over brown, very clayey, sandy, angular gravel and cobbles to a depth of 1.3m, with 0.8m of similar soils in the adjacent TP206. Whole bricks, and fragments of brick and glass were identified in this area. TP205, just to the south, identified 1.1m of sandy, gravelly, subangular to subrounded cobbles.

Glacial Diamicton/Weathered Bedrock: encountered beneath the Made Ground around Caewern House as a brown mottled orange and red, gravelly, sandy silt and clay of firm consistency, with some angular to subangular cobbles and boulders. These soils may represent soils of glacial origin however, given the angularity of the cobbles and boulders, we cannot discount that the stratum comprises weathered bedrock. SPT N-values recorded in this stratum were between 20 and 38 at 1.2m, but exceeded 50 with depth.

Laboratory testing within the fine-grained strata beneath the upper level indicated liquid limits of 31 to 56%, plastic limits of 15 to 27% and natural moisture contents of 20 to 33%. The modified plasticity index (after the coarse-grained particles have been removed) of 14 to 20% suggests that the soils are of low to medium shrinkage and swelling potential and would be classified as clays of highly variable low to high plasticity (CL to CH).

Coal Measures Bedrock: encountered from depths of between 5.1 and 11.0m below the upper level, comprising predominantly siltstone, mudstone and sandstone. A thin coal seam of 300 to 700mm thickness was encountered at depths of between 12.0 and 14.8m depth beneath the upper level. In DH07, workings within the Swansea Four Feet seam were identified at 31.7m depth beneath the upper level, comprising an open void of 1.5m height.

4.1.2 Lower Level

The exploratory holes have identified the lower level of the site to be generally underlain by Topsoil overlying probable weathered Upper Coal Measures bedrock. Made Ground was identified in some pits.

Made Ground: identified to depths of 1.4m (TP1b) and 0.6m in HP01, as a brown sandy, gravelly clay of soft to firm consistency, and dark blackish brown clayey sandy gravel with rare ash and clinker.

Topsoil: encountered across the lower levels as a 150 to 200mm thick surface layer of sandy, clayey silt, with some fragment of wood and some roots.

Glacial Diamicton/Weathered Bedrock: encountered generally as a brown/grey, sandy, clayey angular, coarse, sandstone gravel, with some angular fine medium gravel and sandstone cobbles, or a brown, gravelly, sandy clay of firm consistency, with some angular to subangular cobbles and boulders. These soils may represent soils of glacial origin however, given the angularity of the cobbles and boulders, we cannot discount that the stratum comprises weathered bedrock. SPT N-values recorded in this stratum were between 12 and 40, but exceeded 50 with depth.

Laboratory testing within the fine-grained strata beneath the lower level generally indicated a liquid limit of 46%, a plastic limit of 22% and a natural moisture content of 27%. The modified plasticity index (after the coarse-grained particles have been removed) of 22% suggests that the soils are of medium shrinkage and swelling potential and would be classified as clays of intermediate plasticity. However, at 1.4m in TP202, a significantly wetter and more plastic clay was identified, with a natural moisture content of 79%, a liquid limit of 83%, and a plasticity index of 48%.

Coal Measures Bedrock: encountered from depths of between 4.0 and 6.5m below the lower level, comprising predominantly siltstone, mudstone and sandstone. A thin coal seam of 200 to 400mm thickness was commonly encountered at depths of between 10.6 and 11.6m, although absent in BH01 and at 5.6m depth in DH6). Workings within the Swansea Four Feet seam were identified at between 20.1 and 29.0m depth beneath the upper level, comprising broken ground and an open void within an apparent collapsed roof in BH01 and BH03. A 1.5m height of void and backfilled workings was identified in DH1 in the south-west. A 2.5m thick band of solid coal was encountered at 24.5m depth in DH6, which probably represents a pillar in the surrounding workings.

4.2 Conceptual Ground Model - Hydrogeology

No groundwater was identified at shallow depth in any of the exploratory holes on the upper level. Groundwater inflows were recorded at depths of between 1.6 and 2.4m beneath the lower level. The main groundwater table appears to have been encountered at depths of 6.7 and 8.5m (in BH01 and BH02) beneath the lower level.

Monitoring of the well previously installed in Drillhole DH7 identified standing water levels of between 11.0 and 11.5m depth.

Recent monitoring has recorded groundwater at 6.3m depth in BH01 (around 43.6m OD), 11.1m depth in DH7 (around 43.6m OD), and 2.3m depth in BH04 (around 52.6m OD).

Based on the available information, we consider that the main groundwater body beneath the site is at around 43.6m OD within the weathered bedrock. A shallower perched eater body is also likely to be present beneath the upper level, as identified in BH04.

4.3 Excavation Instability

During the excavation of the trial pits, some spalling of the pit walls was experienced, particularly within the Made Ground strata.

4.4 Chronic Risks to Human Health – Generic Assessment of Risks

4.4.1 Assessment Methodology

The long-term risks to health have been assessed using methodologies and frameworks determined by the Environment Agency within documents SR2, SR3, SR4 and the CLEA Technical Review published to support the Contaminated Land Exposure Assessment Model (CLEA). Where applicable, reference has been made to the supporting toxicological reports (TOX Series) and the Soil Guideline Value reports (SGV Series).

It is assumed that the reader is familiar with the above documents, and it is not intended to repeat these described methodologies in detail, for further information, please refer directly to the specific documents.

In order to provide an initial 'screen' to identify elevated levels of contaminants, a Generic Quantitative Risk Assessment (GQRA) has been undertaken using the most appropriate Generic Assessment Criteria (GAC) determined by assessment of exposure frequency/duration relevant to the critical receptor.

4.4.2 Assessment Criteria

In 2013, CL:AIRE published the Category 4 Screening Levels (C4SL – CL:AIRE, 2013) for use in Part 2A determinations. The C4SL are designed to be more pragmatic, but still strongly precautionary, assessment criteria compared to the previous assessment criteria (SGV – see below) used to assess chronic human health risks. The C4SL have been calculated for a limited number of contaminants at this stage, and range of land uses including residential, commercial and public open space, but are based on a 'low level' of risk rather than the 'minimal level' of risk adopted by the Environment Agency in preparing their Soil Guideline Values (SGV). The C4SL have also only been published for a limited number of contaminants commonly identified in contaminated land risk assessments at present (arsenic, cadmium, chromium VI, lead, benzene, benzo[a]pyrene). However, the C4SL have been published for a range of land uses, including residential, commercial, allotments and two types of public open space.

The C4SL are designed for use in deciding whether land is suitable for use and definitely not contaminated, and DEFRA and the Welsh Government have recommended that they be used in assessing human health risks during the planning regime (i.e. as part of standard development investigations). The Welsh Local Government Association and Natural Resources Wales (WLGA/NRW) have confirmed that, '*where the site conditions are applicable to the land use scenarios adopted in their calculation, the C4SL levels can be used as screening tools*' for development site risk assessments (WLGA/NRW, 2017). The C4SL have also been accepted by the NHBC for use as generic screening levels on residential developments in England and Wales (NHBC, 2014). Given this, where available and applicable, the C4SL have been adopted as the Generic Assessment Criteria in this assessment.

Where no C4SL is currently available, the Suitable For Use Levels (S4ULs) published in January 2015 by the Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM) (Nathanail et al, 2015) have been adopted. These assessment criteria adopt updated toxicological data and exposure models, and the same 'minimal level' of risk as the SGV (i.e. unlike the C4SL).

The S4ULs have been published for a large number of contaminants typically found on brownfield sites in the UK, and for the same range of land uses as the C4SL, i.e. including public open space scenarios.

Where no C4SL or S4UL is available, the Soil Guideline Values (SGV) published by the Environment Agency have been adopted as the Generic Assessment Criteria (GAC) – note several SGV have been withdrawn since originally published. However, the SGV are only available for a limited number of contaminants for three proposed land uses (residential, commercial and allotments – and not public open space).

For more exotic, predominantly organic, compounds no SGV, S4UL or C4SL assessment criteria have been published. In this instance, GAC published by CL:AIRE and the Environmental Industries Commission (CL:AIRE/EIC, 2010) have been adopted. These GAC have also been developed using the CLEA UK software based on a 'minimal level' of risk and for the same land use scenarios as the SGVs (i.e. not public open space).

Details of the Generic Assessment Criteria (GAC) adopted for each contaminant are presented on the assessment tables in the following section.

The proposed development comprises a mix of residential flat and housing accommodation. The external areas around the three blocks of flats are landscaped, and we consider that the GAC appropriate for public open space around residential properties are appropriate for an assessment of risks in these areas. The houses are shown with private gardens, therefore, the GAC for the residential land use with plant uptake have been adopted in this assessment for these areas.

The GAC for most organic compounds are dependent on the organic content of the soil. Analysis has shown that the soil organic content in the soils analysed ranged from 1.0 to 5.4%. Therefore, for the purposes of this assessment, GAC for a soil organic content of 1% has been adopted. This is considered a conservative approach for the majority of the soils at the site.

4.4.3 Generic Quantitative Risk Assessment

The results of testing in all phases of investigation have been used in the assessment. The samples analysed for soil contaminants comprised six samples of Made Ground and six samples of shallow weathered bedrock.

Given the different GAC for the proposed land uses, we have undertaken two assessments, one for the area around the flats, and one around the houses. At this stage, all samples in each area have been considered as one averaging area. If any exceedances are identified, a statistical analysis based on specific averaging areas may be undertaken to further assess the risks. The risks from asbestos are considered further in Section 4.4.4.

The results of the Generic Quantitative Risk Assessment around the houses are presented in Table 6a overleaf. The results for the area around the blocks of flats are presented in Table 6b. It should be appreciated that if the development were to change, the following assessment should be reviewed and, if necessary, updated.

Table 6a: Generic Assessment of Human Health Risks (houses)

Determinand	Range Recorded	GAC	Source of GAC	Exceedances
Metals and Semi-metals				
Arsenic	4.1 - **160mg/kg**	37mg/kg	C4SL[2]	**7 of 12**
Barium[6]	28 - 710mg/kg	1,300mg/kg	CL:AIRE/EIC[5]	None of 12
Beryllium	0.2 – 1.5mg/kg	1.7mg/kg	S4UL[4]	None of 12
Boron	0.2 – 0.6mg/kg	290mg/kg	S4UL[4]	None of 12
Cadmium	0.1 – 2.0mg/kg	26mg/kg	C4SL[2]	None of 12
Chromium (total)[7]	12 - 59mg/kg	910mg/kg	S4UL[4]	None of 12
Chromium (hexavalent)	<1.0mg/kg	21mg/kg	C4SL[2]	None of 12
Copper	15 - 680mg/kg	2,400mg/kg	S4UL[4]	None of 12
Lead	22 - **400mg/kg**	200mg/kg	C4SL[2]	**2 of 12**
Mercury[8]	<0.05 – 0.14mg/kg	40mg/kg	S4UL[4]	None of 12
Nickel	7.5 - 45mg/kg	130mg/kg	S4UL[4]	None of 12
Selenium	<0.5 – 0.8mg/kg	250mg/kg	S4UL[4]	None of 12
Vanadium	16 - 78mg/kg	410mg/kg	S4UL[4]	None of 12
Zinc	30 - 970mg/kg	3,700mg/kg	S4UL[4]	None of 12
Polyaromatic Hydrocarbons (PAH)				
Acenaphthene	<0.03mg/kg	210mg/kg	S4UL[4,9]	None of 12
Acenaphthylene	<0.03mg/kg	170mg/kg	S4UL[4,9]	None of 12
Anthracene	<0.03mg/kg	2,400mg/kg	S4UL[4,9]	None of 12
Benzo(a)anthracene	<0.03 – 0.16mg/kg	7.2mg/kg	S4UL[4,9]	None of 12
Benzo(a)pyrene	<0.03 – 0.11mg/kg	5mg/kg	C4SL[2,9]	None of 12
Benzo(b)fluoranthene	<0.03 – 0.23mg/kg	2.6mg/kg	S4UL[4,9]	None of 12
Benzo(ghi)perylene	<0.03 – 0.09mg/kg	320mg/kg	S4UL[4,9]	None of 12
Benzo(k)fluoranthene	<0.03 – 0.09mg/kg	77mg/kg	S4UL[4,9]	None of 12
Chrysene	<0.03 – 0.24mg/kg	15mg/kg	S4UL[4,9]	None of 12
Dibenzo(a,h)anthracene	<0.03mg/kg	0.24mg/kg	S4UL[4,9]	None of 12
Fluoranthene	<0.03 – 0.32mg/kg	280mg/kg	S4UL[4,9]	None of 12
Fluorene	<0.03mg/kg	170mg/kg	S4UL[4,9]	None of 12
Indeno(123-cd)pyrene	<0.03 – 0.09mg/kg	27mg/kg	S4UL[4,9]	None of 12
Naphthalene	<0.03mg/kg	2.3mg/kg	S4UL[4,9]	None of 12
Phenanthrene	<0.03 – 0.18mg/kg	95mg/kg	S4UL[4,9]	None of 12
Pyrene	<0.03 – 0.26mg/kg	620mg/kg	S4UL[4,9]	None of 12
Other Organic Compounds				
Phenol	<0.3 – 0.5mg/kg	280mg/kg	S4UL[4,9]	None of 12

Notes to Table 6a:

1. Assessment for residential land use with home-grown produce uptake (apart from barium – see Note 6 below).
2. C4SL: Category 4 Screening Level, published by CL:AIRE.
3. SGV: Soil Guideline Value published by Environment Agency.
4. S4ULs Suitable 4 Use Levels. Copyright Land Quality Management Limited, reproduced with permission; Publication No. S4UL3156. All Rights Reserved.
5. CL:AIRE/EIC GAC published by CL:AIRE and Environment Industries Commission.
6. GAC for barium for residential use without plant uptake. No GAC published for plant uptake risk drivers.
7. In the absence of Chromium VI, all chromium present likely to be Chromium III. GAC for Chromium III adopted.
8. GAC for inorganic mercury adopted.
9. GAC for organic compounds based on 1% soil organic content.
10. Exceedances highlighted in red and bold.
11. Laboratory results presented in Appendices H2 and N.

From Table 6a, it is clear that the levels of most determinands are below their respective guideline values. However, elevated levels of arsenic have been identified in the Made Ground soils across the upper level of the site and in HP01 on the lower level, and within the weathered bedrock in BH02 in the lower eastern area. The levels of lead also exceeded the GAC in the Made Ground in WS2 and TP204, both in the upper area.

Table 6b: Generic Assessment of Human Health Risks (flats)

Determinand	Range Recorded	GAC	Source of GAC	Exceedances
Metals and Semi-metals				
Arsenic	4.1 - **160mg/kg**	79mg/kg	C4SL[2]	**4 of 12**
Barium	28 - 710mg/kg	1,300mg/kg	CL:AIRE/EIC[5]	None of 12
Beryllium	0.2 – 1.5mg/kg	2.2mg/kg	S4UL[4]	None of 12
Boron	0.2 – 0.6mg/kg	21,000mg/kg	S4UL[4]	None of 12
Cadmium	0.1 – 2.0mg/kg	220mg/kg	C4SL[2]	None of 12
Chromium (total)[5]	12 - 59mg/kg	1,500mg/kg	S4UL[4]	None of 12
Chromium (hexavalent)	<1.0mg/kg	23mg/kg	C4SL[2]	None of 12
Copper	15 - 680mg/kg	12,000mg/kg	S4UL[4]	None of 12
Lead	22 - **400mg/kg**	630mg/kg	C4SL[2]	None of 12
Mercury[6]	<0.05 – 0.14mg/kg	120mg/kg	S4UL[4]	None of 12
Nickel	7.5 - 45mg/kg	230mg/kg	S4UL[4]	None of 12
Selenium	<0.5 – 0.8mg/kg	1,100mg/kg	S4UL[4]	None of 12
Vanadium	16 - 78mg/kg	2,000mg/kg	S4UL[4]	None of 12
Zinc	30 - 970mg/kg	81,000mg/kg	S4UL[4]	None of 12
Polyaromatic Hydrocarbons (PAH)				
Acenaphthene	<0.03mg/kg	15,000mg/kg	S4UL[4,9]	None of 12
Acenaphthylene	<0.03mg/kg	15,000mg/kg	S4UL[4,9]	None of 12
Anthracene	<0.03mg/kg	74,000mg/kg	S4UL[4,9]	None of 12
Benzo(a)anthracene	<0.03 – 0.16mg/kg	29mg/kg	S4UL[4,9]	None of 12
Benzo(a)pyrene	<0.03 – 0.11mg/kg	10mg/kg	C4SL[2,9]	None of 12
Benzo(b)fluoranthene	<0.03 – 0.23mg/kg	7.1mg/kg	S4UL[4,9]	None of 12
Benzo(ghi)perylene	<0.03 – 0.09mg/kg	640mg/kg	S4UL[4,9]	None of 12
Benzo(k)fluoranthene	<0.03 – 0.09mg/kg	190mg/kg	S4UL[4,9]	None of 12
Chrysene	<0.03 – 0.24mg/kg	57mg/kg	S4UL[4,9]	None of 12
Dibenzo(a,h)anthracene	<0.03mg/kg	0.57mg/kg	S4UL[4,9]	None of 12
Fluoranthene	<0.03 – 0.32mg/kg	3,100mg/kg	S4UL[4,9]	None of 12
Fluorene	<0.03mg/kg	9,900mg/kg	S4UL[4,9]	None of 12
Indeno(123-cd)pyrene	<0.03 – 0.09mg/kg	82mg/kg	S4UL[4,9]	None of 12
Naphthalene	<0.03mg/kg	4,900mg/kg	S4UL[4,9]	None of 12
Phenanthrene	<0.03 – 0.18mg/kg	3,100mg/kg	S4UL4,9	None of 12
Pyrene	<0.03 – 0.26mg/kg	7,400mg/kg	S4UL4,9	None of 12
Other Organic Compounds				
Phenol	<0.3 – 0.5mg/kg	760mg/kg	S4UL[4,9]	None of 12

Notes to Table 6b:

1. Assessment for public open space around a residential land use – with no home-grown produce uptake.
2. C4SL: Category 4 Screening Level, published by CL:AIRE.
3. SGV: Soil Guideline Value published by Environment Agency.
4. S4ULs Suitable 4 Use Levels. Copyright Land Quality Management Limited, reproduced with permission; Publication No. S4UL3156. All Rights Reserved.
5. CL:AIRE/EIC GAC published by CL:AIRE and Environment Industries Commission.
6. GAC for barium for residential use without plant uptake. No GAC published for plant uptake risk drivers.
7. In the absence of Chromium VI, all chromium present likely to be Chromium III. GAC for Chromium III adopted.
8. GAC for inorganic mercury adopted.
9. GAC for organic compounds based on 1% soil organic content.
10. Exceedances highlighted in red and bold.
11. Laboratory results presented in Appendices H2 and N.

From Table 6b, it is clear that the levels of most determinands are below their respective guideline values. However, elevated levels of arsenic have been identified in the Made Ground soils in WS2, TP4 and TP204, all on the upper level. The GAC for arsenic was also exceeded within the weathered bedrock in BH02 in the lower eastern area.

4.4.4 Asbestos

No evidence of asbestos was identified in the shallow soil samples analysed from across the site (areas of both houses and flats).

4.4.5 New Planting

Soil contamination can have a deleterious impact on the health of new plants. Such 'phytotoxic' effects can include inhibited growth, nutrient deficiencies and discolouration of vegetation.

However, the potential impact on planting is difficult to quantify partly due to differing abilities of various plants to tolerate different soil conditions.

Contaminants are taken up by plants in a number of ways, the principal mechanism being via root uptake, but also including adsorption to roots. The impact on contaminants on plant growth depends on a number of factors, including the plant species, the soil type, the soil pH, the availability of the contaminant, and the impact of other external stresses on the plant such as drought.

The British Standard for the provision of Topsoil (BS3882:2007) provides guidance on acceptable levels of copper, nickel and zinc within a growing medium, which vary with soil pH value. ICRCL 70/90 (1990) discussing the restoration of metalliferous mining sites also provides 'threshold trigger levels' for a number of metals and fluoride, below which there should be no impact on plant growth. Finally MAFF (1998) provides assessment criteria for the assessment of the impact of a number of metals on the growth of plants. For the purposes of this assessment, we have adopted the BS3882 guidance values in the first instance, followed by the MAFF published guidelines, and finally the ICRCL 'trigger values'.

For this assessment, all areas of the site have been considered as one, and the assessment along with the assessment criteria adopted is presented in Table 7 below:

Table 7: Summary of Geo-environmental Soil Results – New Planting

Determinand	Range Recorded	GAC	Source of GAC	Exceedances
Metals and Semi-metals				
Arsenic	4.1 - 160mg/kg	250mg/kg	MAFF[1]	None of 12
Cadmium	0.1 -2mg/kg	3mg/kg	ICRCL[2]	None of 12
Chromium (total)[6]	12 - 59mg/kg	400mg/kg	MAFF[1]	None of 12
Copper	15 - **680mg/kg**	135mg/kg (pH 6-7)	BS3882[3]	**6 of 12**
Lead	22 - 400mg/kg	300mg/kg	MAFF[1]	None of 12
Mercury	<0.05 - 0.14mg/kg	1mg/kg	MAFF[1]	None of 12
Nickel	7.5 - 45mg/kg	75mg/kg (pH 6-7)	BS3882[3]	None of 12
Zinc	30 - **970mg/kg**	200mg/kg (pH 6-7)	BS3882[3]	**4 of 12**

Notes to Table 7:
1. MAFF: Ministry of Agriculture, Fisheries and Food guideline for maximum permissible concentrations in agricultural soils.
2. ICRCL: ICRCL 70/90.
3. BS3882:2007 – values dependent on soil pH values.
4. Laboratory test results presented in Appendices H2 and N.

The testing has indicated levels of copper and zinc to be present at concentrations which could be potentially phytotoxic to new planting. This should be considered in designing the planting/ landscaping regime for the development.

4.5 Hazardous Ground Gas

4.5.1 Degradation of Organic Materials

No large fragments of organic materials were identified in the near-surface Made Ground. However, the measured organic content of these soils (up to 5%) is relatively high and, could be indicative of a potential source of hazardous ground gas. See Section 5.3.1.

Monitoring to date of the installed wells has indicated low levels of methane in the shallow soils.

4.5.2 Mine Gases

Gas wells were installed with a response zone within the abandoned mine workings at 30m depth beneath the site and were monitored previously. A summary of all the monitoring results is shown in Table 8 below.

Table 8: Summary of Gas Monitoring Data (2013 and 2016)

Well	Response Zone Depth[1] (m)	No visits	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Gas Flow (L/hr)	Water depth (m)	Atmospheric pressure
DH7 (2013)	29.0 – 32.0	4	nd	nd - 0.5	13.5 – 20.4	-0.1 – 0.4	11.0 – 11.3	1001-1024
DH7 (2016)	29.0 – 32.0	3	nd – 0.4	nd – 3.2	13.7 – 21.0	-0.9 – 0.4	11.5	1002 - 1021

Notes to Table 8:
1. DH7 installed with response zones into void and probable backfilled workings of Swansea Four Feet seam.
2. nd – not detected with instrument (<0.2% for methane, <0.1% for carbon dioxide).

Recent monitoring has identified methane levels of 1.1% were recorded in the mine workings in BH01, and levels of carbon dioxide up to 1.5%.

During the monitoring in 2013, levels of volatile organic compounds (VOCs) of up to 16ppm were recorded. During the subsequent monitoring, no volatile organic compounds were recorded.

A more comprehensive assessment of gas risks will be presented in the gas addendum report on the completion of monitoring.

4.6 Sulphate Attack

The assessment of the concrete protection against sulphate attack has been undertaken in accordance with BRE SD1 (2005).

4.6.1 Classification of Site

Due to the presence of Made Ground on the site, we consider that it should be considered as 'brownfield' in terms of concrete classification.

4.6.2 Groundwater Setting

As shallow groundwater has been identified at depths as shallow as 1.6m beneath the lower level, we have considered the groundwater to be mobile in undertaking this assessment.

4.6.3 Sulphate Levels

Laboratory test results indicate the levels of water soluble sulphate (as SO_4) in the shallow soils to be between less than 10 and 41mg/l. As levels of water soluble sulphate are less than 3,000mg/l, there is no need to consider the levels of magnesium present in the soils. Levels of acid soluble sulphate were between 0.02 and 0.05% and total sulphur were recorded between 0.01 and 0.04%. From these results, the calculated levels of total potential sulphate are between 0.03 and 0.12%, and oxidisable sulphides are between 0 and 0.07%. As the levels of oxidisable sulphide are well below 0.3%, pyrite is unlikely to be present.

pH values in the shallow soils varied between 6.8 and 7.8, indicating near neutral/slightly alkaline soil conditions to exist. As the pH levels all exceed 5.5, there is no need to further assess the soils for the types of acids present (e.g. hydrochloric and nitric acids).

4.6.4 Foundation Concrete Design:

Using the above results, we consider that the following characteristic values are applicable for the shallow soils at the site (all as S04):

Water soluble sulphate:	28mg/l;
Total potential sulphate:	0.09%; and
pH value:	6.8.

5 Geo-Environmental Risk Assessment

5.1 Soil Contamination Sources

Although no contaminative former use has been identified for the site, as discussed in Section 2.7.3, the potential for an existing or former heating oil tank within the suspected plant or boiler rooms cannot be discounted. No access could be gained to confirm this.

Given the age of the building, it is possible that asbestos containing materials (ACM) could have been used during refurbishment of the Caewern House building. We, therefore, consider that a potential source of asbestos contamination is likely to exist within the buildings on site.

Made Ground has been identified beneath the elevated north-western part of the site. Testing has indicated levels of contaminants to generally be below Generic Assessment Criteria for the proposed development. However, unacceptably elevated levels of arsenic and lead with respect to houses with private gardens were recorded within the Made Ground beneath this elevated area. The levels of arsenic were also elevated relative to the proposed flat developments in this elevated area. Some elevated levels of arsenic, relative to a housing use, were also identified beneath the lower lying eastern part of the site.

5.2 Sources of Hazardous Ground Gas

Although some methane and carbon dioxide were recorded within the wells installed in the abandoned mine workings, the levels and flow rates were low, and a significant mine gas source is not likely to be present.

The measured organic content of the Made Ground at the site is relatively high (up to 5%), and could be indicative of a potential source of hazardous ground gas.

As discussed in Section 2.9, basic radon protection is required for the development.

5.3 Potential Receptors

As discussed in Section 1.1, the proposed site development will comprise a refurbishment to the existing Caewern House, along with the construction of new residential dwellings, with private gardens and amenity areas. The site is located above a Secondary A Aquifer (the Upper Coal Measures).

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

- Future residents, the critical receptors being young children playing in private garden areas.
- Construction and maintenance workers.
- Buried concrete (foundations, drainage etc.).
- The groundwater within the Upper Coal Measures strata beneath the site (classified as a Secondary A Aquifer).

5.4 Potential Migration Pathways

Based on the Conceptual Site Model discussed in the previous sections, the following are considered the most likely migration pathways with regard to any contamination or hazardous ground gas present beneath the site.

Site Users:

- Ingestion of soils and inhalation of dust in garden areas.
- Ingestion of soils and inhalation of dust in landscaping areas around flats.
- Ingestion of edible plants and dust associated with such plants, in garden areas.
- Dermal contact with contaminated soils.
- Exposure to asbestos containing materials within the shallow soils.
- Chronic (long term) exposure to unacceptable levels of radon.

Construction and Maintenance Workers:

- Exposure to asbestos containing materials within the existing Caewern House buildings.
- Exposure to asbestos containing materials within the shallow soils.
- Ingestion of soils and inhalation of dust across site.
- Dermal contact with contaminated soils.

Groundwater:

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

Buildings:

- Sulphate attack on buried concrete (foundations, drainage etc.).

5.5 Risk Evaluation and Plausible Pollutant Linkages

5.5.1 Introduction to Risk Evaluation Methodology

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

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

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

The methodology described above has been used to establish Plausible Pollutant Linkages (PPL) based on the Conceptual Site Model generated for the site and proposed development, and to evaluate the risks posed by those linkages, using information known about the site, at this desk study stage. This is presented as Table 9 in Section 4.5.2 below.

5.5.2 Tabulated Risk Assessment and Plausible Pollutant Linkages

Table 9: Risk Evaluation & Relevant Pollutant Linkages (RPL)

Source	Pathway	Receptor	Classification of Consequence	Classification of Probability	Risk Category	Further Investigation or Remedial Action to be Taken
Potential contaminants in shallow soils	Direct contact/ inhalation/ ingestion of contaminated soil or dust	Site Users (residents)	Medium – potential for chronic levels.	Likely[2]	Moderate Risk	See Section 6.1.2 for further discussion.
	Direct contact/ inhalation/ ingestion of contaminated soil or dust	Construction/ Maintenance Workers	Minor – standard PPE likely to be sufficient	Likely[2]	Low Risk	See Section 6.1.4 for further discussion.
	Leaching of soil contaminants	Impact on Groundwater	Medium – site lies on Secondary A aquifer	Low likelihood[2]	Moderate/Low Risk	See Section 6.2 for further discussion.
	Leaching of soil contaminants	Impact on Surface Water	Minor – site distant from a river	Low likelihood[2]	Moderate/Low Risk	
Asbestos in existing buildings	Ingestion of fibres	Refurbishment/ Construction Workers	Medium – potential for chronic levels	Low Likelihood[3]	Moderate/Low Risk	See Section 6.1.1 for further discussion.
Asbestos in shallow soils	Ingestion of fibres	Construction/ Maintenance Workers	Medium – potential for chronic levels	Unlikely[3]	Low Risk	See Section 6.1.1 for further discussion.
Soil sulphate	Aggressive groundwater	Buried Concrete	Mild – damage to structures	Unlikely[4]	Low Risk	See Section 6.4.2 for further discussion.
Hazardous Ground Gas/ Vapours	Asphyxiation/ poisoning, injury by explosion	Site Users / Visitors	Severe	Unlikely[5]	Moderate/Low Risk	See Section 6.3 for further discussion.
	Damage through explosion	Buildings	Severe		Moderate/Low Risk	
	Asphyxiation/ poisoning, injury by explosion	Construction/ Maintenance Workers	Severe		Moderate/Low Risk	
Radon Gas	Migration into Buildings	Site Users (residents)	Medium – potential for chronic levels	Likely[6]	Moderate Risk	Basic radon protection required.

Notes to Table 9:

1. Methodology and details of risk consequence, probability and category based on CIRIA C552 (2001) and presented in Section 4.5.1.
2. Elevated levels of arsenic and lead identified within the Made Ground at the site – see Section 3.5.3.
3. No ACM identified in shallow soils tested – see Section 3.5.4.
4. Low levels of sulphate identified in the samples tested. – see Section 3.7.
5. Low levels of hazardous gas recorded in abandoned mine workings beneath the site – see Section 3.6.
6. Basic radon protection measures are required - see Section 2.9.

6 Remedial Strategy for Contamination Risks

The following recommendations are based on interpretations made from the site investigation data obtained to-date, and do not form a full Options Appraisal. If at any stage of the construction works, contamination or a potential for such contamination is identified that is different to that presented within this report, all of the following should be reviewed, and the advice of a geo-environmental specialist sought immediately. The site comprises two levels – we have made assumptions on the future changes in level which will be required to develop the site as shown on Figure 1, and these assumptions should be reviewed once the final design is confirmed.

For the purposes of this assessment, we assume that the ground levels on the upper level around Caewern House will remain similar to the present, and that the lower-lying area to the east of Caewern House will be filled to provide a development platform for the construction of the houses. We also assume that the levels in the south-west of the site (the two blocks of flats) will remain similar to the present.

6.1 Risks to Health

6.1.1 Asbestos

No evidence of asbestos was detected within the soils analysed from beneath the site. If any suspected asbestos containing materials (ACM) are identified during development, the advice of a suitably qualified specialist should be sought immediately. Any identified ACM would need to be removed from site by a licensed specialist contractor.

Given the age of Caewern House (reportedly built in the 1860s), it is likely that asbestos containing materials (ACM) would have been used in refurbishment. We recommend that a full asbestos survey is undertaken within the building and the outbuildings, prior to demolition and redevelopment. Any asbestos materials identified would need to be removed (if required) by a licensed contractor.

The following sections presume that any risks from asbestos materials within the soils beneath the site are mitigated.

6.1.2 Site End Users

The levels of arsenic and lead within the Made Ground have been found to be elevated above the Generic Assessment Criteria in several exploratory holes.

Where hard surfacing is to be constructed, such as around the flats replacing Caewern House, this should be sufficient to mitigate risks from these metals in the shallow soils. However, these metals could pose an unacceptable risk to residents/site users around the flats and the houses on the upper level in areas of gardens and landscaping. We recommend that a clean cover layer of a minimum of 600mm thickness is placed in garden and landscaped areas across the upper levels of the site. The soils used within this cover layer should be certified clean and inert and they should not include excavated Made Ground from elsewhere on the site due to the elevated levels of arsenic.

The proposed housing units are shown to straddle the existing slope down to the lower level, some 3 to 4m below, which we assume will be filled to provide a suitable development platform. Provided that the upper layers of this fill is certified clean and inert, the risks from the elevated levels of arsenic and lead in the soils beneath the lower lying area should be mitigated.

No elevated levels of contaminants relative to a flat accommodation use have been identified in the south-west of the site. Therefore, we do not consider that any risk mitigation is likely to be required in the areas of landscaping around these two blocks.

During refurbishment, if an existing above ground oil tank is identified in the area of plant and boiler room, or evidence is identified of a former oil tank, further sampling and analysis of the shallow soils in this area should be undertaken to confirm the levels of petroleum and polyaromatic hydrocarbons and the risks to future site users.

The Materials Management Plan for the development should incorporate a remedial strategy and implementation plan. Such works should be supervised and validated by a geo-environmental specialist. On completion, a validation report should be prepared to demonstrate to regulators and insurance providers that the risk has been successfully mitigated.

6.1.3 New Service Connections

The current water industry guidance for the suitability of pipe materials on potentially contaminated sites (Blackmore et al, 2010) has onerous requirements and it is likely/possible, based on this guidance, that the levels of contaminants on site may prevent the use of plastic pipework. We recommend that enquiries are made to the local water authority to confirm their requirements for underground service materials for this development.

6.1.4 Risk to Construction and Maintenance Workers

Short term (acute) risks to construction and maintenance workers are generally poorly understood within the industry, certainly when compared to the volume of research undertaken on long term risks. However, we anticipate that the levels of contamination at the site are not likely to pose a severe acute risk to construction workers or future maintenance workers. Ground workers would need to undertake their own assessment of the risks to their workers.

We recommend that construction workers adopt careful handling of the potential contaminants and good standards of personal hygiene should be adopted to reduce the risk of possible ingestion and skin contact should any hotspots be encountered. The contractor should comply with the appropriate current Health and Safety at work legislation.

A copy of this report and these recommendations should be included in the Health and Safety File for the development and provided to all future ground workers, including utility companies so that they may undertake their own assessment of risks to their operatives.

6.1.5 General Public/Neighbouring Properties

We do not anticipate any significant risks to the general public from the development of the site. However, careful dust control measures should be adopted during construction to minimise the risk (and nuisance) to the general public and neighbouring residents.

6.2 Risks to Controlled Waters

No specific assessment of the risks to controlled waters has been undertaken to date. However, the following points are considered salient.

- No past contaminative use has been identified at the site.
- Made Ground has been identified on the site.
- The levels of soil contaminants are generally low, with some elevated arsenic and lead.
- The proposed development comprises a residential development which will include areas of car parking which are anticipated to be hard surfaced – surface drainage from these areas could contain leached oils and fuels from vehicle spills and leaks.
- Soakaways are being considered for the development.
- The site is underlain by fine- and coarse grained weathered bedrock which contains a medium to high fine-grained fraction in its upper layers.
- The bedrock beneath the site is classified as a Secondary A aquifer. Groundwater is anticipated within the weathered bedrock at depths below 6m (beneath the lower level).

Given the above, we consider that the overall risk to controlled waters from the development of the site is likely to be low. Some risk mitigation is likely to be required where soakaways are used to dispose of surface water run-off – see Section 6.8 for further discussion.

6.3 Risks from Ground Gas

6.3.1 Risk to the Development – Degradation of Organic Material

The risks from hazardous shallow and mine gas, and any risk mitigation required, will be evaluated in our Ground Gas Addendum report on completion of the monitoring.

6.3.2 Risk to the Development – Radon

As discussed in Section 2.9, basic radon protection is required.

6.4 Risks to Property

6.4.1 Spontaneous Combustion

No evidence of combustible materials has been identified in the shallow soils. Therefore, the risk from spontaneous combustion is considered to be low.

6.4.2 Sulphate Attack on Buried Concrete

From Section 5.7, the following characteristic values are applicable for the shallow soils at the site (all as SO_4):

Water soluble sulphate:	28mg/l;
Total potential sulphate:	0.09%; and
pH value:	6.8.

Based on these characteristic values, we consider that the site would be classified as Design Sulphate Class DS-1 and Aggressive Chemical Environment for Concrete Class AC-1, allowing for mobile groundwater.

6.5 Risks to New Planting

As discussed in Section 3.5.5, analysis of the shallow soils has indicated the levels of copper and zinc to be above the respective assessment criteria. Therefore, phytotoxic impact on future planting could occur. A landscaping specialist should be consulted with regards to future planting

6.6 Re-Use of Materials/Disposal of Excess Arisings

6.6.1 General Comments on Re-use/Disposal

All soils or other materials excavated from any site are generally classified as waste under the Waste Framework Directive (European Union, 2008) and their re-use is controlled by this legislation.

If the soils are to be re-used on site (e.g. within the red-line planning boundary), provided that they are 'uncontaminated' or other naturally occurring deposits and they are certain to be used for the purposes of construction in their natural state on the site from which they are excavated, they may be excluded from waste regulation (Duckworth, 2011). A Materials Management Plan (MMP) may be required – further guidance can be provided by this office once proposals have been finalised. However, if they are man-made or contaminated materials, their use on the site may be limited.

If the soils are to be removed from site, they are automatically classified as waste, and they may only be:

- Disposed at a licensed landfill;
- Disposed at a licensed, permitted soil treatment centre; or
- Removed to a Receiver Site for beneficial re-use.

In Scenarios 1 and 2, the materials must be transferred by a licensed waste carrier and the waste producer (the developer) must ensure that the destination landfill or treatment centre is a legitimate operation (e.g. by requesting a copy of the Environmental Permit before releasing the soils). Prior to removal from site, the excavated arisings would need to be classified as either 'hazardous' or 'non-hazardous' waste based on the hazard that they pose– a WM3 assessment (note that this is a different assessment to the risk assessments reported on in earlier sections of this report). This can commonly be undertaken on the results of soils testing undertaken during the investigation, although further sampling and testing may be required.

Only once the soils have been classified under the WM3 assessment, would Waste Acceptability Criteria (WAC) testing then be required to determine the type of landfill in which the arisings could be disposed in Scenario 1. Further testing and assessment may also be required by the soil treatment centre in Scenario 2.

In Scenario 3, management of soils could be undertaken via an Environmental Permit or Exemption. However, these can take time and are costly to arrange. Therefore, in certain circumstances, it is permissible to use the protocols laid down in the CL:AIRE Definition of Waste, Development Industry Code of Practice (DoWCoP, Duckworth, 2011) to classify the arisings and put a management plan in place to control the use. This involves approval of the proposals by a Qualified Person and is generally more efficient (in terms of time and cost) to implement.

Further guidance on the legislative requirements of the re-use/disposal of materials generated by the development can be provided by this office once the development proposals have been finalised.

6.6.2 WM3 Assessment

Should there be any cut and filling on the site, a WM3 assessment would need to be completed to determine the suitability for re-use of the excavated soils in terms of hazardous/non-hazardous waste. This should be undertaken on samples of soils which are to be re-used on site/removed from site. Such an assessment can be completed by this office once the design has been finalised.

6.6.3 Landfill Disposal

Four samples of the shallow soils have been analysed for Waste Assessment Criteria (WAC) and the results are presented in Appendix N. The samples analysed comprised probable glacial soils in TP201 and TP203, and the Made Ground in TP204 and TP206.

The results suggest that the probable glacial soils would be classed as suitable for disposal at an ‘inert’ landfill, whilst the elevated levels of total organic carbon (TOC) suggest that the Made Ground would not be suitable for disposal at an inert landfill, and may need to be disposed of at a hazardous waste landfill (TP204) and a Stable Non-reactive hazardous waste landfill (TP206).

A WM3 hazardous/non-hazardous classification, which as discussed in the previous section is the first step in evaluating disposal options for soils off-site, and should also be undertaken.

6.6.4 Imported Materials

Any soils or materials to be imported to site (including Topsoil) should be certified clean and inert, and suitable for use. An appropriate number of samples (depending on the volume of soils imported) should be analysed for an appropriate suite of contaminants, and verification certificates should be provided. Further guidance can be provided by this office once the design is finalised.

7 Geotechnical Comments

7.1 Site Preparation and Earthworks

7.1.1 Unexploded Ordnance

As discussed in Section 2.8.5, a specialist sub-consultant has concluded that no further assessment of the UXO risk is required.

7.1.2 Invasive Plants

No evidence of invasive plants such as Japanese Knotweed/Himalayan Balsam etc. was identified on the site during the site visits. However, parts of the site are heavily overgrown, and we cannot discount the presence of such plants on site. We recommend a specialist survey prior to development.

7.1.3 Existing Foundations and Services

Old foundations will be present in the areas where buildings are to be demolished. Anecdotal evidence suggests that Caewern House may contain a basement, but its extent is not known at present. Such a basement could pose a hazard to the proposed new flat development in the area, and its extent and depth should be investigated further.

All old foundations and other substructures, including any basement, identified during development should be grubbed up within the zone of influence of the development as part of the site preparation works.

Caewern House is currently linked to gas, electric and telecom services. Mains water and drainage is also likely to be present. It is not known if these have been disconnected. An old land drain was identified in the base of TP1a in the lower lying area. A further network of land drains is likely to be present and may provide a seepage path into excavations. The land drains should be diverted where they enter foundation excavations.

7.1.4 New Services

For new services, flexible pipework and connections should be provided as a safeguard against potential settlements. Consideration could be given to increasing the gradients on sewage connections to mitigate against possible settlements.

7.1.5 Earthworks

Given the existing topography, we consider that some earthworks will be required to provide development platforms for the proposed development layout.

In particular, the lower-lying area to the east of Caewern House will need to be fully filled by 3 to 4m to create a development platform at around the same elevation as the ground around Caewern House for the housing units, or a cut-fill exercise will be required to provide a platform at a lower elevation.

Fill imported to site should be suitable for use in the development both in terms of contaminant levels (see Section 6.1.2) and geotechnical properties. The fill will not only be used to raise site levels, but it would also be prudent to design it so that it provides a suitable foundation stratum for the dwellings (see also Section 7.3.4). Sufficient classification testing should be undertaken to categorise the soils and allow a suitable compaction method to be selected.

Placement and compaction should be undertaken to an appropriate specification (note that the Specification for Highway Works is not designed to accommodate structural loadings), and an appropriate in-situ testing regime undertaken to demonstrate that the fill complies with the design requirements and is suitable as a structural fill beneath foundations. The surface organic layer on the lower lying areas and existing slopes should be removed prior to filling, and the fill benched into the existing slopes.

If a cut-fill exercise is to be undertaken, further geotechnical investigation should be undertaken in the area of proposed cut/ground lowering to confirm that the existing soils are suitable for use in the fill (both in terms of contamination levels and geotechnical properties). Placement, compaction and compliance testing should be undertaken as discussed above.

Further guidance on a suitable specification, and compliance testing can be provided by this office once the design is finalised.

7.2 Geotechnical Hazards

7.2.1 Coal Mining Hazard

As discussed in Section 2.8.2, the Coal Authority (CA) reports that there are recorded mine workings within four seams of coal beneath the site, from shallow (defined by the CA as less than 30m) to 280m depth.

Rotary drilling undertaken at the site has identified the presence of voided/backfilled workings probably within the Swansea Four Feet coal seam at depths of around 22 to 25m beneath the lower-lying south-west of the site, and at 31m depth beneath Caewern House on the upper level. A thinner, 'unnamed' seam was also recorded at 5.6m depth beneath the lower lying area and at 13m depth beneath Caewern House. The identified workings within the Swansea Four Feet seam were stabilised by drilling and grouting on the recently built care home site to the west (fronting on to Dwr y Felin Road). The findings of the investigation with regards to mine workings are summarised in Table 10 below.

Table 10: Summary of Findings of Rotary Drillhole Investigation

Drillhole	Drillhole Elevation (m OD)	Depth to bedrock	Depth to Upper Seam	Bedrock Cover	Depth to Swansea Four Feet	Elevation of Swansea Four Feet	Bedrock Cover
DH1	50.0	4.6m	Not identified.	n/a	22.0m (1.5m void)	28.0m OD	17.4m
DH6	50.2	5.4m	5.6m (200mm)	0.2m	24.5m (2.5m coal pillar)	25.7m OD	19.1m

Table 10: Summary of Findings of Rotary Drillhole Investigation (cont.)

Drillhole	Drillhole Elevation (m OD)	Depth to bedrock	Depth to Upper Seam	Bedrock Cover	Depth to Swansea Four Feet	Elevation of Swansea Four Feet	Bedrock Cover
DH7	54.7	11.0m	13.0m (700mm)	2.0m	31.5m (1.5m void and backfill)	23.2m OD	20.5m
BH01	49.9	4.0m	Not identified	n/a	20.1m (2.9m void and broken ground)	29.8m OD	16.1m
BH02	52.2	6.5m	10.6m (400mm)	4.1m	28.3m (1.2m backfill)	23.9m OD	21.8m
BH03	52.5	5.0m	11.6m (400mm)	6.6m	29.0m (1.6m void and backfill)	23.5m OD	24.0m
BH04	54.9	5.1m	14.8m (300mm)	9.7m	-	-	-
BH05	54.5	5.5m	12.0m (600mm)	6.5m	-	-	-

Notes to Table 10:
1. Drillhole positions shown on Figure 3, and drillhole records presented in Appendix F3 and J.
2. Drillhole elevations estimated from topographic survey.

In South Wales, a common rule of thumb successfully used to assess subsidence risks above abandoned coal workings considers that the risk is low where the thickness of bedrock cover above workings is ten times (or more) the height of the workings. From the above, the ratio of bedrock cover to height of workings beneath the lower lying south-western area of the site (proposed flats) is between 5.6 (BH01) and 11.6 (DH1). Beneath the lower-lying garden area (proposed houses) the ratio was between 15 and 18.2, and beneath the upper area in the north-west around Caewern House, the ratio was 13.7.

During the stabilisation of the workings within the Swansea Four Feet seam beneath the recently built care home to the west of the site (fronting onto Dwr-y-Felin Road), the workings were up to 2.8m in height (similar to that identified in BH01), and commonly between 1.5 and 2.0m in height. Substantial quantities of grout were required in places to achieve successful stabilisation (suggesting extensive workings). Therefore, the presence extensive voids/backfilled workings in excess of 2m height within the same Swansea Four Feet seam cannot be discounted beneath the subject site.

Based on a maximum void height of 2.8m, the resulting bedrock cover to void height ratios above the horizon of the Swansea Four Feet seam varied between 5.8 and 8.6 across the site. If a 2m void were present, the ratios varied between 8.1 and 12.0.

Given the above, and that we cannot discount that workings of significant height (more than 2m) could be present, we consider that there is possibly insufficient bedrock over above the workings in the Swansea Four Feet seam to mitigate subsidence risks. Therefore, we consider that the risk from subsidence above workings within the Swansea Four Feet seam across the site would be **Moderate to High**, and risk mitigation would be required to stabilise the workings.

We recommend that a grid of rotary drillholes be constructed across the footprints of the proposed structures, and pfa:cement grout injected into the workings to stabilise them. Gravel may be required where open cavities are present. Careful consideration should be made over the timing of stabilisation works for the houses, which are proposed to straddle the existing downslopes. Angled injection holes could be undertaken from the existing levels, or vertical drillholes could be constructed from the prepared development platform. A permit would need to be obtained from the Coal Authority for these works. Further guidance on the design of the stabilisation works can be provided by this office once the design is finalised.

7.2.2 Slope Instability

As discussed in previous sections, the site comprises a series of levels separated by grassed and wooded slopes. The overall elevation change across the site is some 9m, with individual banks/slopes up to 4 to 5m in height.

The investigation has identified that the soils within the slopes comprise a surface layer of around 1.0m of mixed fine and coarse-grained Made Ground, over glacial soils which predominantly comprise coarse-grained deposits in a dense state. Around Caewern House, TP4 indicated the Made Ground to be in excess of 1.3m in thickness.

The in-situ Made Ground materials are likely to be only marginally stable and are unlikely to be able to stand at slope angles greater than at present. In addition, loading of such materials in an untreated state (e.g. by raising ground levels above them) could lead to instability and failures in the resulting development. Therefore, prior to filling above such materials, their long terms stability should be considered, and appropriate actions taken to ensure stability in the long term. These may include compaction of suitable Made Ground materials prior to filling, or possibly their excavation and replacement with suitable coarse-grained fill.

If the lower-lying area is to be raised by filling to create a development platform, the risks of instability in the existing slopes are likely to be mitigated provided that the filling is adequately designed, including the removal of organic surface layers and the benching of the fill into the existing slopes. However, a slope is anticipated on the south-western side of the filled area, down to the rear of Block 2 to the south-west. This slope should be designed to ensure that the stability of the new houses at the crest and Block 2 at the toe are not compromised.

We recommend that, once the design is finalised, the stability of the slopes is reviewed to ensure the long term stability of the development is not compromised.

7.2.3 Shrinkage/Swelling

The investigation has identified fine-grained soils at shallow depth across the site. There are also a considerable number of trees and shrubs on site, particularly across the lower lying area, some of which will be removed as part of the development.

Laboratory testing has indicated soils of low to medium shrinkage and swelling potential at shallow depth beneath the upper level. The shallow fine-grained soils beneath the lower level are generally of medium shrinkage and swelling potential. However, in TP202, a clay of apparently high shrinkage and swelling potential was identified.

Based on the low volume change potential, within the zone of influence of trees which are to be removed for the development, the minimum foundation depth would need to be 1.0m below existing ground level, increasing with depth in accordance with NHBC/BRE guidelines closer to the tree positions. This will be particularly pertinent in the area of the two blocks of flats in the south-west of the site where a number of mature trees will need to be removed for the development. A tree survey, including identification of tree species and current height, should be undertaken to allow an assessment of the most economical foundation design, particularly in this south-western area. We also recommend further sampling in the area of the western block to investigate for the presence of the clays of high shrinkage and swelling potential identified in TP202.

Where site levels are to be raised, possibly by 3 to 4m in the area of the proposed houses, the shrinkage and swelling potential within the underlying in-situ soils should not impact on the new structures, including the soils with a high potential identified in TP202.

However, the shrinkage/ swelling potential of any fine-grained fill used in the raising of site levels would need to be considered in the design of foundations.

7.3 Foundation Design and Construction

We understand that the site is being considered for potential development as low-rise residential or commercial purposes and the comments and recommendations in this report assume that the development will involve the construction of typical two-storey structures of conventional load-bearing brickwork construction.

7.3.1 Mining Subsidence Risk

As discussed in Section 7.2.1, the abandoned mine workings within the Swansea Four Feet seam beneath the site would need to be stabilised prior to development to mitigate subsidence risks.

7.3.2 Block 1 (flats)

The proposed Block 1, comprising flats accommodation, will occupy part of the footprint of the existing Caewern House. As discussed in Section 2.1, there is anecdotal evidence of a basement beneath Caewern House and further investigation should be undertaken to establish the depth and extent of any such basement. The presence of this basement will impact on the foundation solution for Block 1.

Where a basement is not present, we consider that conventional mass concrete spread foundations would be suitable for use for the new structure. The foundations should be taken down beneath the Made Ground to the Glacial Diamicton/weathered bedrock strata, generally identified at depths of 0.8 to 1.1m beneath the upper level. However, in TP4, the Made Ground was found to extend to more than 1.3m depth – this trial pit is some 8m from the south-eastern wall of the proposed structure, but we cannot discount that the deeper Made Ground extends beneath Caewern House to the area of the proposed footprint. Foundations of 1.0m depth or more will generally mitigate risks from shrinkage and swelling (see Section 7.2.3), however, localised deepening of foundation will be required within the zone of influence of trees.

We consider that a presumed bearing value of 120kPa may be adopted within the fine- and coarse-grained glacial/weathered bedrock stratum to maintain total and differential settlements within tolerable limits.

If a basement is identified beneath the existing Caewern House and within the footprint of the proposed structure, any loose fill should be removed, and the basement side walls/basal slab grubbed up to at least 1m below the base of proposed foundations to prevent the formation of hard spots beneath new foundations. The resulting void should be backfilled with suitable granular fill compacted to a suitable specification. Provided a suitably compacted fill is placed, we consider that reinforced spread foundations may be adopted for the structure, possibly at a nominal depth of 650mm.

However, care should be taken in foundation design to mitigate differential settlement risks between such foundations constructed on compacted fill within the former basement and those in natural soils outside the basement. Further guidance can be provided by this office once the presence of the size and depth of the basement has been established.

The potential impact on the stability of the downslope to the east of Caewern House from foundations constructed at the upper level should be considered in the design.

7.3.3 Blocks 2 and 3 (flats in SW of site)

The proposed Blocks 2 and 3 will be constructed in the south-western margins of the site in an area of existing woodland, and a number of mature trees will need to be removed for development.

We consider that mass concrete spread foundations are likely to be suitable for use for the proposed structures. We consider that a presumed bearing value of around 125kPa should maintain total and differential settlements to less than 25mm.

Several mature trees will need to be removed to allow the construction of the structure, and some swelling could be expected in potentially medium shrinkage and swelling fine-grained soils present, or if the high shrinkage and swelling fine-grained soils identified in TP202 extend into this area.

Given the number of existing trees, we consider that the two blocks will lie completely within the zone of influence of trees, and foundations may therefore need to be taken to depths in excess of 1m. However, the investigation points in the area (TP7 and TP201) have suggested that the soils are predominantly coarse-grained with a minor proportion of fine soils. Therefore, the risks from shrinkage and swelling may be less than if fine-grained soils were present, and foundations at shallower depth may be appropriate.

We recommend further specific investigation in this area to establish the nature of the shallow soils, the proportion of fines present and the plasticity, and hence the shrinkage and swelling potential.

7.3.4 Housing Blocks

Two blocks of houses are proposed straddling the existing downslopes of 3 to 4m height at the site. We have assumed that the lower site levels will be raised by filling (see Section 7.1.5), so the foundations of the new structures will be constructed within placed fill materials. As discussed in Section 7.1.5, the fill should be designed to accommodate structural foundations. We consider that provided the fill is suitable and adequately compacted, reinforced spread foundations are likely to be suitable for the proposed dwellings and a presumed bearing value of 100kPa should be achievable within the fill. Again, provided the fill is suitable and adequately compacted, settlements should be within tolerable limits.

Consideration should be given to the possible impact from foundation loadings on the stability of the anticipated slope down to the rear of Block 2 on the south-western side of the filled area beneath the houses.

The north-eastern of the two housing blocks is shown to be founded partly on the anticipated fill and partly on shallow soils beneath the upper level.

We consider that beneath the upper level, the glacial gravels (or possibly weathered bedrock) encountered at 300mm depth in WS1 and 1.1m depth in WS2 and likely to prove a suitable founding stratum for spread foundations, with a presumed bearing value of 120kPa. However, care should be taken in foundation design to mitigate differential settlement risks between such foundations constructed in natural soils and those constructed in the fill materials used to raise site levels. We recommend that foundations are reinforced, and the bearing value may need to be reduced to 100kPa to mitigate such risks.

7.3.5 General Foundation Comments

For all spread foundation options, the formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by lean mix concrete or suitable compacted granular material. We recommend that a blinding layer of concrete be placed on the formation after excavation and inspection in order to protect the formation against softening and disturbance.

7.4 Floor Slab Foundations

7.4.1 Block 1 (Caewern House)

Given the thickness of Made Ground exceeds 600mm beneath the upper level of the site, a suspended floor slab is likely to be required to satisfy NHBC requirements.

7.4.2 Blocks 2 and 3 (SW)

The option for using cast in-situ ground bearing floor slabs for these blocks will depend on the proportion of fines present within the shallow soils in the vicinity and, hence, the likelihood for swelling once the trees have been removed. We recommend that this is confirmed by further investigation in the area. For preliminary design purposes, we recommend that allowance is made for suspended floor slabs with a suitably dimensioned sub-floor void.

7.4.3 Housing Blocks

Given the existing sloping ground profile within the footprint of the proposed flats accommodation, we consider that an allowance should be made for the adoption of a suspended floor slab for these structures, particularly where they are to be founded partly on fill and partly on natural soils. However, if the fill used to raise site levels is suitable and compacted to a suitable specification, it may be possible to demonstrate to the NHBC that a ground bearing floor slab may be suitable for dwellings with footprints completely constructed on fill material.

7.4.4 Hazardous Ground Gas Risk Mitigation

As discussed in Sections 4.5.1 and 4.5.2, monitoring for hazardous ground gas is ongoing and the potential requirements for risk mitigation within the floor slab construction will be reported in the Ground Gas Addendum report to be completed on completion of the monitoring.

Basic radon protection is required for the structures.

7.5 Retaining Wall Design

7.5.1 New Retaining Walls

From the proposed layout, we are not aware of any proposed retaining walls. Further guidance can be provided by this office, if retaining walls are to be included.

7.5.2 Existing Retaining Wall

We recommend that a structural inspection/survey is undertaken on the retaining wall to the north-west of Caewern House.

7.6 Pavement Design

We understand that vehicle parking areas are proposed across the site.

7.6.1 Preliminary Design CBR Value

No California Bearing Ratio (CBR) tests have been undertaken to date. However, we consider that CBR values in excess of 5% are likely to be feasible where the near-surface soils comprise coarse grained strata, but CBR values should be limited to 3% where fine-grained in-situ soils are present within the formation. The CBR values of the fill materials will depend on its nature and geotechnical properties.

Actual design values should be determined for designated areas as required.

7.6.2 Susceptibility to Frost Action

The coarse-grained weathered bedrock/glacial soils are not expected to be frost susceptible.

7.7 Excavation and Dewatering

It is anticipated that excavation throughout most of the site will be within the capabilities of conventional mechanical excavators. Old foundations beneath Caewern House are not expected to be substantial, but a basement may be present. The requirement for high capacity excavators cannot be discounted.

Due to access constraints, the investigation was undertaken using a small tracked excavator, which did not have sufficient capacity to excavate the weathered bedrock. Larger capacity excavators may be required to excavate deep trenches into this stratum (e.g. drainage).

The coarse-grained Made Ground materials should be considered potentially unstable, even in shallow excavations. Excavation support should be provided as appropriate.

Groundwater monitoring within an installed well has suggested that the main groundwater body is located well below the likely depth of excavation. However, perched water bodies cannot be discounted in the shallower soils. Where such perched water ingress occurs, it is likely that pumping from screened sumps within shallow excavations will be adequate.

7.8 Soakaway Drainage

7.8.1 Context

Under new sustainable urban drainage (SUDS) protocols, sustainable drainage must be considered in every future development, and used wherever possible. This will commonly include soakaways.

7.8.2 Soakaway Design

Soakaway infiltration tests have been undertaken in the lower lying area in the south east of the site (TP1a, TP203) and the wooded area in the south-west (TP7a, TP201, TP202).

During the testing, the water level in TP1a did not fall in four hours, and within TP7a it fell by only 600mm in nearly four and a half hours and did not fall to the 25% full level.

Within TP201, the water fell by less than 1m, and only to around the 50% full level in over 20 hours (over a period of three fills). Within TP202, the water fell by only 10mm in 26 hours. Within TP203, the water fell by around 1m (just above the 25% full level) in just over 3 hours in all three fills and, in Fill One, the water level fell no further in a further 15.5 hours.

Therefore, no infiltration rate could be calculated, and insufficient data was obtained from most tests to allow an effective extrapolation of the data. However, in TP203, a tentative extrapolation of the test data suggests an infiltration rate of around 10^{-6}m/s, however, we recommend that this rate be used in design, without further confirmatory testing, with extreme caution.

The infiltration test stratum comprised the coarse-grained weathered bedrock/glacial Diamicton, however, the proportion of the fine fraction was apparently significant. Experience has demonstrated that a proportion of fine particles of more than 10% is sufficient to fill the pore throats between the larger particles and, therefore, can have a significant impact on the infiltration rate.

It is possible that there may be a reduction in the proportion of fines with depth and, therefore, a more suitable infiltration stratum may be present at greater depth within the weathered bedrock. Further testing could also be undertaken at a greater depth - this is likely to require a higher capacity excavator to achieve sufficient depth into the bedrock to facilitate the testing.

7.8.3 Soakaway Location

We recommend that any soakaways are located at least 5m away from the toe and crest of slopes and retaining walls.

8 Recommendations

We consider that the following further investigation and assessment would be required or prudent prior to development:

- Ongoing programme of gas monitoring (Section 4.5.1 and 4.5.2);
- Asbestos survey of Caewern House prior to demolition (Section 6.1.1);
- Further investigation and sampling around any above ground tanks (Section 6.1.2);
- Preparation of Materials Management Plan for re-use of soils or imported soils (Sections 6.1.2 and
- Consideration of potential phytotoxic effects on landscaping (Section 6.5);
- WM3 assessment on any excavated soils to be re-used or disposed of off-site (Section 6.6.2);
- Certification and compliance testing of imported soils (Sections 6.6.3 and 7.1.5);
- A specialist invasive plant survey prior to development (Section 7.1.2);
- Further investigation for reported basement beneath Caewern House (Section 7.1.3);
- Appropriate design and preparation of Specification for filling to raise site levels in eastern areas (Section 7.1.5);
- Stabilisation of abandoned mine workings by pfa:cement grouting (Section 7.2.1);
- Assessment of stability of slopes on final development (Section 7.2.2);
- Tree survey (whole site) and further specific investigation around Blocks 2 and 3 to assess shrinkage and swelling potential (Section 7.2.3 and 7.3.3);
- Investigation of CBR values in areas of proposed hard standings (Section 7.6.1); and
- Further soakaway testing at greater depth, if soakaway discharge required (Section 7.8.2).

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Plates

Plate 1: Photograph showing the existing Caewern House and downslope area taken from the lower carpark.

Plate 2: Photograph of the downslope area along with the lower carpark, taken from the front of Caewern House.

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Plate 3: TP201 showing inflow of water rising to 1.1m.

Plate 4: TP201 showing inflow of water rising to 1.1m.

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Plate 5: TP202 Spoil after excavation, displaying the Weathered Grovesend Formation bedrock encountered.

Plate 6: View of TP202 after excavation.

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Plate 7: View of TP203 after excavation showing water inflow.

Plate 8: TP203 Spoil after excavation, displaying the Weathered Grovesend Formation bedrock encountered.

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Plate 9: View of TP204 after excavation

Plate 10: View of TP204 after excavation with measuring tape showing 3.3m depth.

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Plate 11: TP205 Spoil after excavation, displaying the gravel fill and Weathered Grovesend Formation bedrock encountered.

Plate 12: View of TP205 after excavation.

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Plate 13: TP206 Spoil after excavation, displaying the Weathered Grovesend Formation bedrock encountered.

Plate 14: View of TP206 after excavation.

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Plate 15: HP01 Spoil after excavation, displaying large boulders retrieved from the upper 600mm of material encountered.

Plate 16: View of HP01 after excavation.

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Plate 17: View of the KLEMM Rotary borehole rig, in position on BH01.

Plate 18: View of access road up to the existing Caewern House building.

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Figures

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ENGINEERS
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SCIENTISTS

Legend

Site Information

- - - Site Boundary

SCALE: 1:450 (approx. @ A3)

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PROPOSED RESIDENTIAL DEVELOPMENT, CAEWERN HOUSE, NEATH

FIGURE 1:

PROPOSED DEVELOPMENT PLAN

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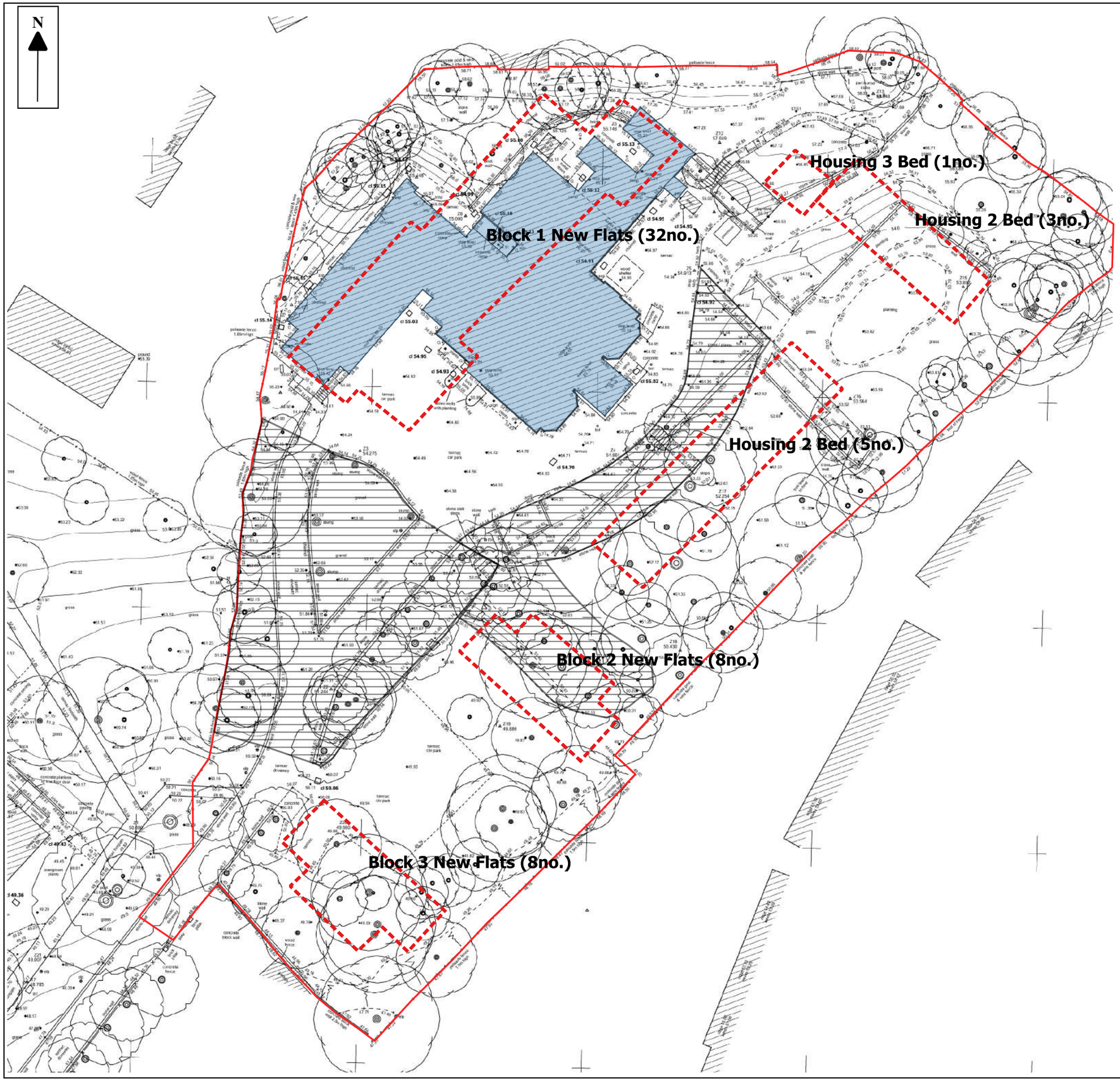
7828b.3558



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Legend

Site Information

- Site Boundary
- Proposed Buildings
- Location of existing Caewern House
- Areas of downslope

SCALE: 1:450 (approx. @ A3)

PROJECT:

PROPOSED RESIDENTIAL DEVELOPMENT, CAEWERN HOUSE, NEATH

FIGURE 2:

SITE PLAN

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Legend

Site Information

- Site Boundary
- Proposed Buildings
- Location of existing Caewern House
- Line of Section Fig 4a and 4b

Investigation Points

- Windowless Sample Borehole Locations (ESP, 2016)
- Trial Pit Locations (ESP, 2016)
- Rotary Drillholes (ESP, 2013)
- Soakaway Pit Locations (ESP, 2021)
- Rotary Borehole Locations (ESP, 2021)
- Hand Dug Pit Location (ESP, 2021)
- Trial Pit Locations (ESP, 2021)

SCALE: 1:450 (approx. @ A3)

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT, CAEWERN HOUSE, NEATH

FIGURE 3:
INVESTIGATION POINT PLAN

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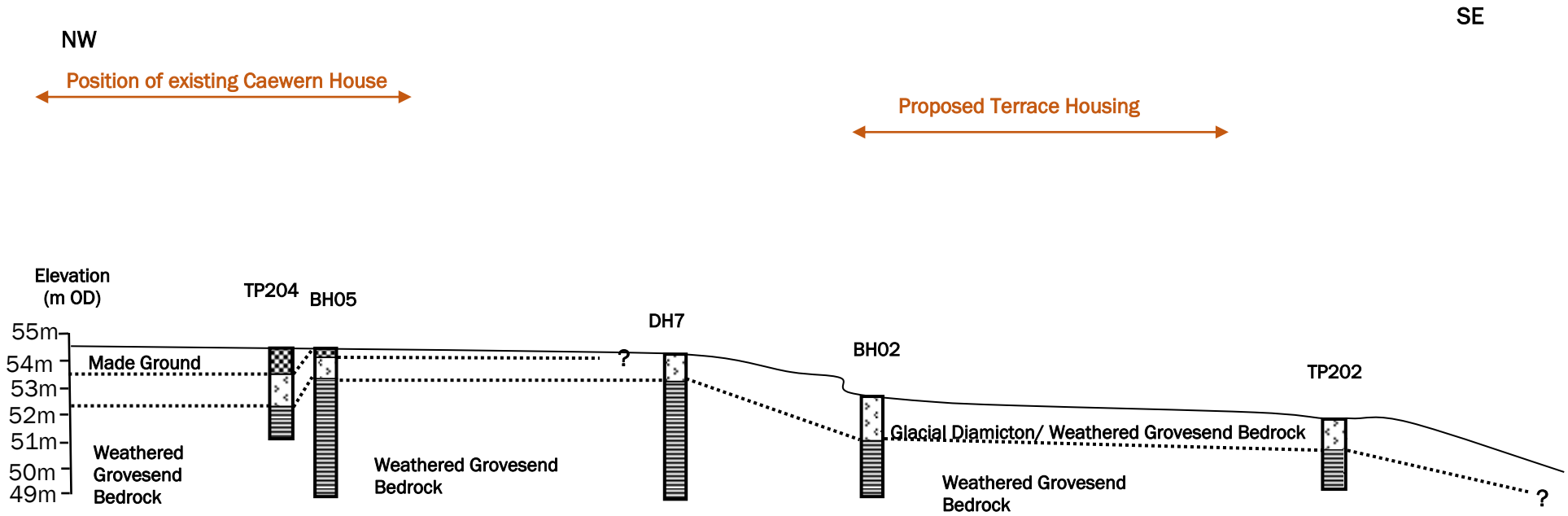

Line of Section shown of Figure 3.

Exploratory Hole

Made Ground

Glacial Diamicton/ Weather Grovesend Formation Bedrock

Weathered Grovesend Formation Bedrock

PROJECT:	PROPOSED RESIDENTIAL DEVELOPMENT CAEWERN HOUSE, NEATH
SCALE:	1:225 (approx. @A4)
FIGURE 4a:	CONCEPTUAL GROUND MODEL – Shallow Soils

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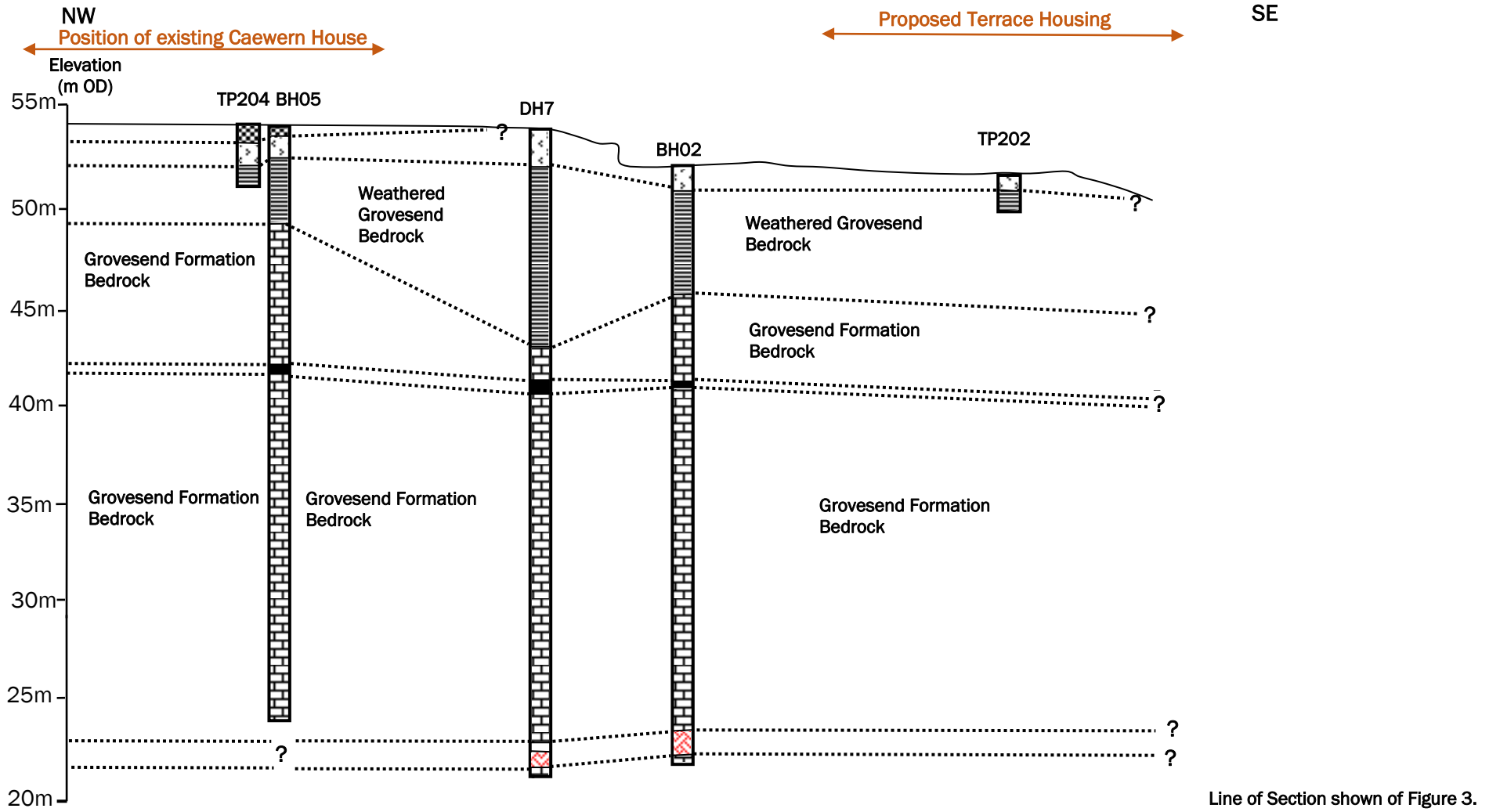

Line of Section shown of Figure 3.

Exploratory Hole
Made Ground
Glacial Diamicton/Weathered Grovesend Bedrock
Weathered Grovesend Formation Bedrock
Grovesend Formation Bedrock
Coal (Unworked Intermittent Coal Seam)
Backfilled Workings (Swansea Four Feet Seam)
Void (Probable Worked Swansea Four Feet Seam)

PROJECT:	PROPOSED RESIDENTIAL DEVELOPMENT CAEWERN HOUSE, NEATH
SCALE:	1:300 (approx. @A4)
FIGURE 4b:	CONCEPTUAL GROUND MODEL – Mining

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Appendix A- Risk Evaluation Methodology

APPENDIX A
RISK EVALUATION METHODOLOGY

The methodology set out in CIRIA C552 (2001), *Contaminated Land Risk Assessment – A Guide to Good Practice*, has been used to assess whether or not risks are acceptable, and to determine the need for collating further information or remedial action. The following tables have been used to classify the risk for each pathway. Tables A2 to A4 have been revised to include for circumstances where no plausible risk has been identified.

Table A1 - *Classification of Consequence*

Classification	Definition	Examples
Severe	• Short-term (acute) risk to human health likely to result in *Significant Harm*. • Short-term risk of pollution to a sensitive water resource. • Catastrophic damage to buildings/property. • Short-term risk to ecosystem, or organism forming part of that ecosystem.	• High concentrations of Cyanide at surface of informal recreation area. • Major spillage of contaminants from site into controlled water. • Explosion causing building collapse.
Medium	• Chronic damage to human health. • Pollution of sensitive water resource. • A significant change to ecosystem, or organism forming part of that ecosystem.	• Contaminant concentrations exceed assessment criteria. • Leaching of contaminants to Secondary A aquifer. • Death of species within nature reserve.
Mild	• Pollution of non-sensitive water resources. • Significant damage to crops, buildings, structures. • Damage to sensitive buildings, structures or the environment.	• Pollution of Secondary groundwater sources. • Damage to building rendering it unsafe to occupy.
Minor	• Harm, although not necessarily significant harm, which may result in financial loss, or expenditure to resolve. • Non permanent risks to human health (easily prevented by means of PPE). • Easily repairable effects of damage to buildings and structures.	• The presence of contaminants at such concentrations that PPE is required during site works. • The loss of plants in a landscaping scheme. • Discoloration of concrete.

Table A2: *Classification of Probability*

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

Table A3: *Risk Categories – Comparison of consequence against probability*

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk
	No Linkage	No Risk			

Table A4: *Description of Risk Categories*

Classification	Description
Very High Risk	• There is a 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. • The risk, if realised, is likely to result in a substantial liability. • Urgent investigation (if not already undertaken) and remedial action are likely to be required.
High Risk	• 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 already undertaken) is required, and remedial action may be necessary in the short term and are likely over the longer term.
Moderate Risk	• It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either 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 mild. • Investigation (if not already undertaken) is normally required to clarify the risk and to determine potential liability. Some remedial action may be required in the longer term.
Low Risk	• It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	• There is a very low possibility that harm could arise at a receptor. In the event of such harm being realised, it is not likely to be severe.
No Risk	• No risk mitigation required.

Appendix B- Historical Map Extracts

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Electricity Transmission Line
Pole
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

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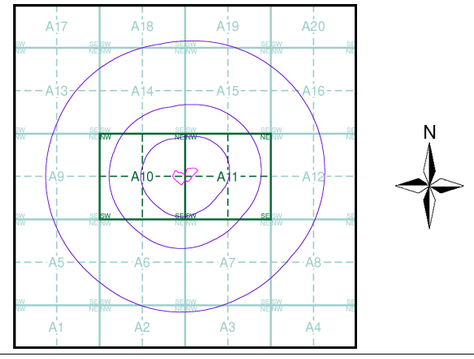
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Glamorganshire	1:10,560	1884	3
Glamorganshire	1:10,560	1900	4
Glamorganshire	1:10,560	1921	5
Glamorganshire	1:10,560	1921	6
Glamorganshire	1:10,560	1935 - 1936	7
Glamorganshire	1:10,560	1938 - 1951	8
Historical Aerial Photography	1:10,560	1945 - 1949	9
Glamorganshire	1:10,560	1951 - 1952	10
Ordnance Survey Plan	1:10,000	1964 - 1965	11
Ordnance Survey Plan	1:10,000	1970 - 1973	12
Swansea	1:10,000	1976	13
Ordnance Survey Plan	1:10,000	1980 - 1983	14
Ordnance Survey Plan	1:10,000	1992	15
10K Raster Mapping	1:10,000	2006	16
10K Raster Mapping	1:10,000	2012	17

Historical Map - Slice A



Order Details

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Customer Ref: 5186e
National Grid Reference: 274590, 198330
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
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Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Fireproof Building
- Prominent Fireproof Building
- Non-fireproof Building
- Non-fireproof Building (non-dwelling)
- Factory, mill, and flour mill, with chimneys
- Factory, mill, and flour mill, without chimneys
- Power Station, drawn to scale
- Hydroelectric Power Station
- Radio Station, drawn to scale
- Telephone Station, drawn to scale
- Abandoned Open-pit Mine or Quarry
- Open-pit Salt Mine
- Pit
- Oil Deposit or Well
- Oil Seepage
- Tailings Pile
- Fuel Storage Tanks
- Natural Gas Tank
- Bench Mark
- Drill Hole
- Burial Mound
- Triangulation Point on Burial Mound
- Single-track Railroad
- Double-track Railroad and Station Building
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Lawns
- Citrus Orchard
- Wet Ground
- Scattered Vegetation

243,8 Values for prominent elevations

186.0 Numbers for spot elevations, depth soundings, contour lines, etc.

0,2 Velocity of the current, width of river bed, depth of river

Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	ъ (–)
Д д (D)	Л л (L)	У у (U)	ы (Y)
Е е (E)	М м (M)	Ф ф (F)	ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale

- Government and Administrative Buildings
- Military and Industrial Buildings
- Military and Communication Areas
- Subway Entrance
- Partly Demolished Buildings
- Demolished Buildings
- Built-Up Area with Fireproof Buildings Predominant
- Built-Up Area with Non-Fireproof Buildings Predominant
- Individual Fireproof Building
- Prominent Industrial Building
- Individual Dwelling, Fireproof
- Ruins of an Individual Dwelling
- Factory or Mill Chimney
- Factory or Mill with Chimney
- Factory or Mill without Chimney
- Mine or Open Pit Mine
- Operating Shaft or Mine
- Non-Operating Shaft or Mine
- Salt Mine
- Tailings Pile
- Pit
- Stone Quarry
- Gas Pump or Service Station
- Fuel Storage or Natural Gas Tank
- Oil or Natural Gas Derrick
- Small Hydroelectric Power Station
- Power Station
- Transformer Station
- Cemetery
- Burial Mound (height in metres)
- Triangulation Point on Burial Mound
- Triangulation Point
- Bench Mark
- Bench Mark (monumented)
- Telegraph Office
- Telephone Station
- Radio Station
- Radio Tower
- Airfield or Seaplane Base
- Landing Strip
- Main Highway
- Highway under Construction
- Improved Dirt Road (former truck road)
- Double-track Railroad with First Class Station
- Dismantled Railroad
- Railroad Under Construction
- Shore Embankment
- River or Ditch with Embankment
- Well
- Water Reservoir or Rain Water Pit
- Spring
- Isobath with value
- Heavy (Index) Contour Line
- Contour Line and Value
- Half Contour Line
- Spot Elevation Value
- Coniferous
- Deciduous
- Mixed
- Scrub

Key to Numbers on Mapping

Historical Mapping & Photography included:

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Glamorganshire	1:10,560	1900	4
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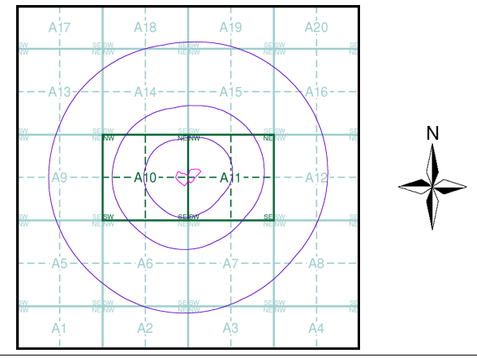
Russian Map - Slice A



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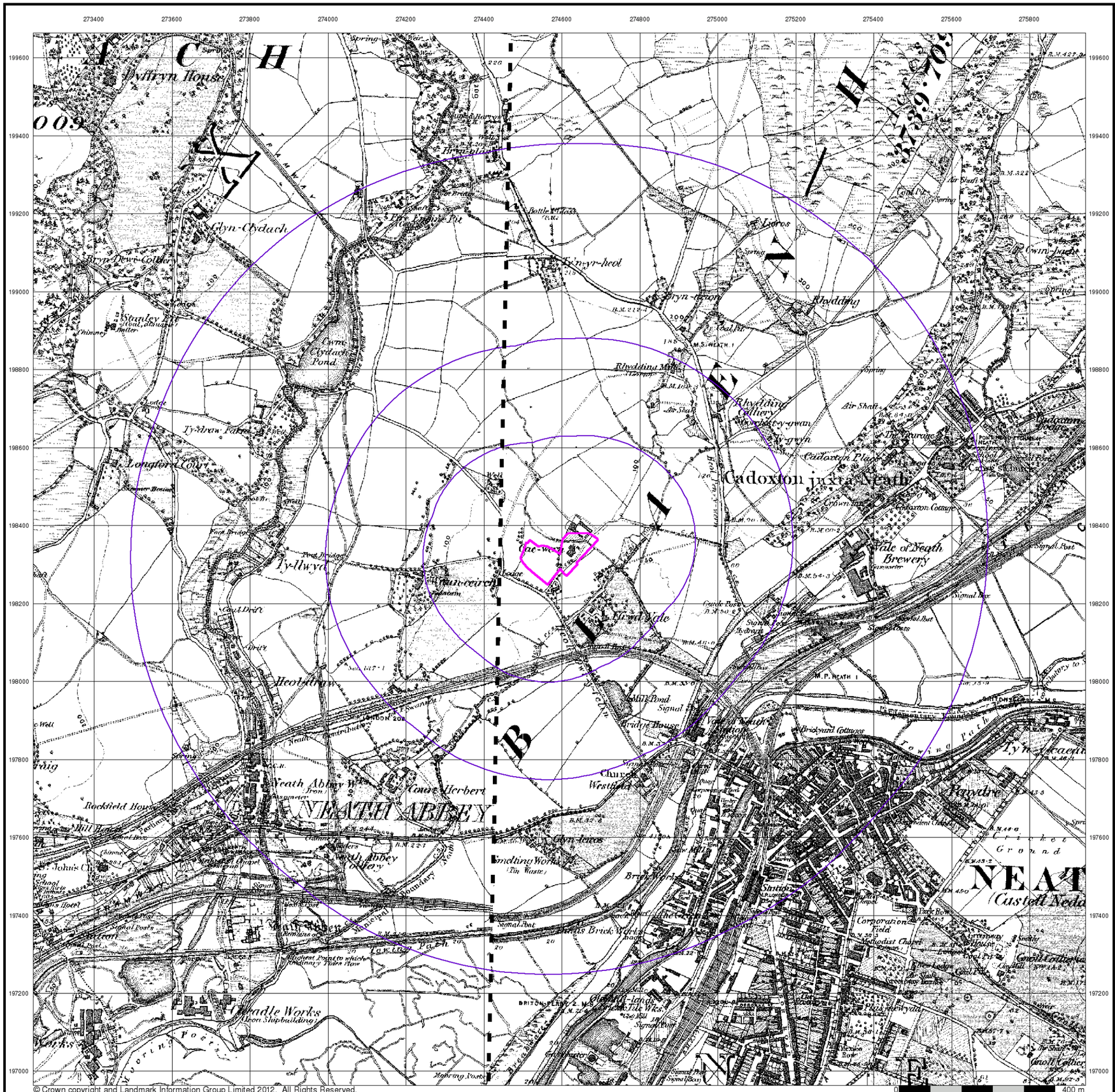

Glamorganshire
Published 1884
Source map scale - 1:10,560

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Map Name(s) and Date(s)

Historical Map - Slice A

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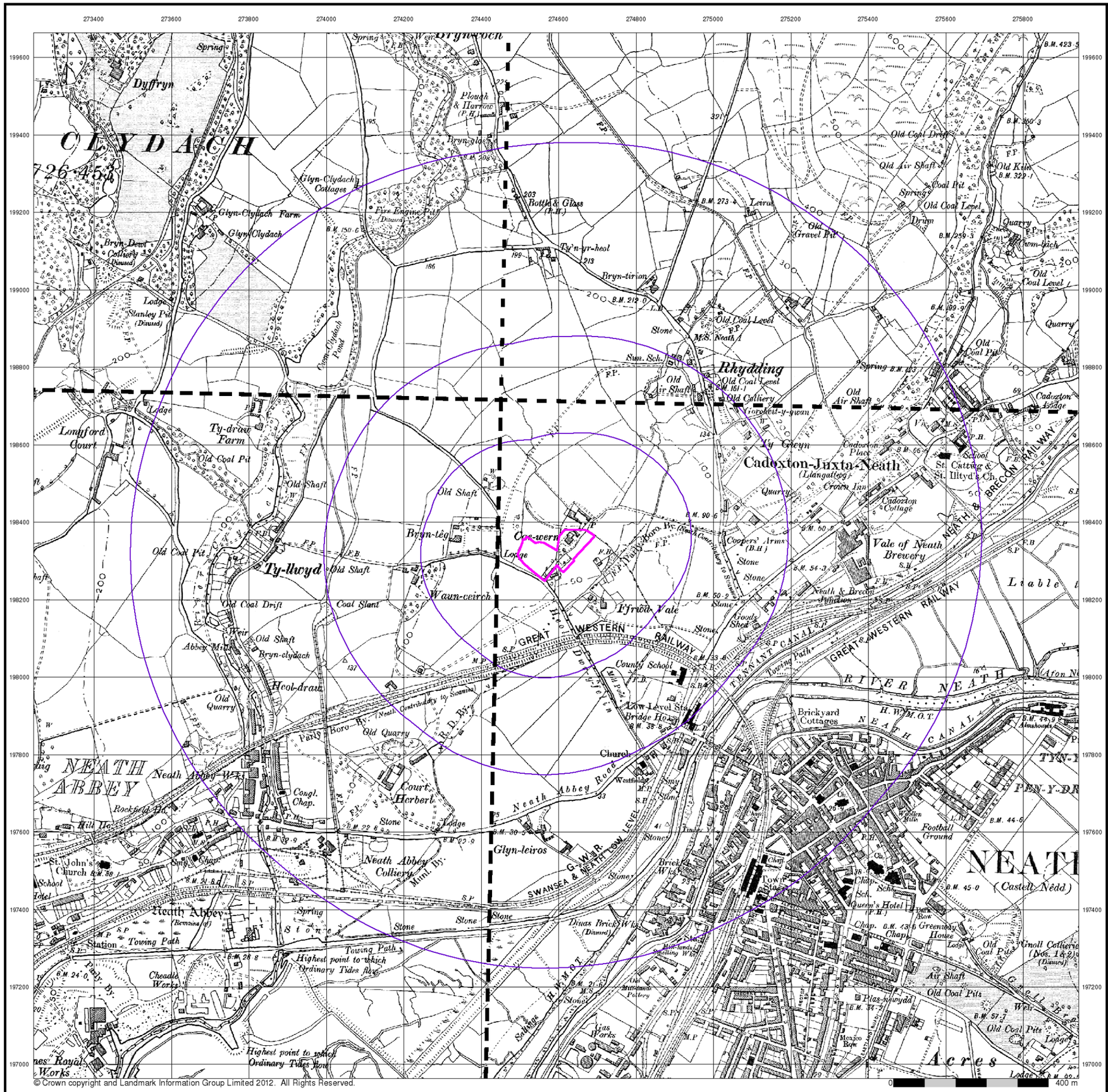

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Glamorganshire

Published 1900

Source map scale - 1:10,560

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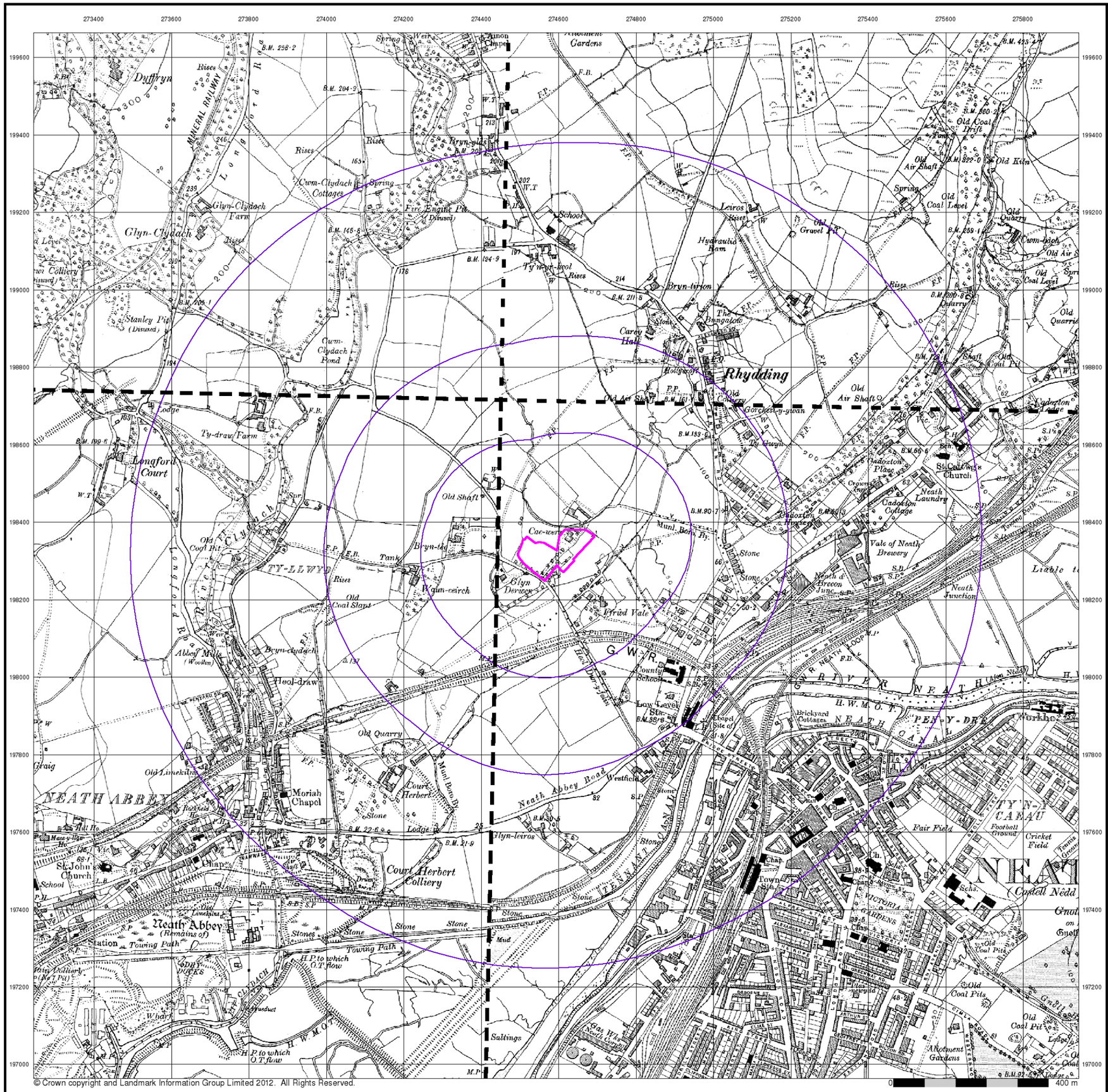

Glamorganshire

Published 1921

Source map scale - 1:10,560

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Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

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Slice:	A
Site Area (Ha):	1.33
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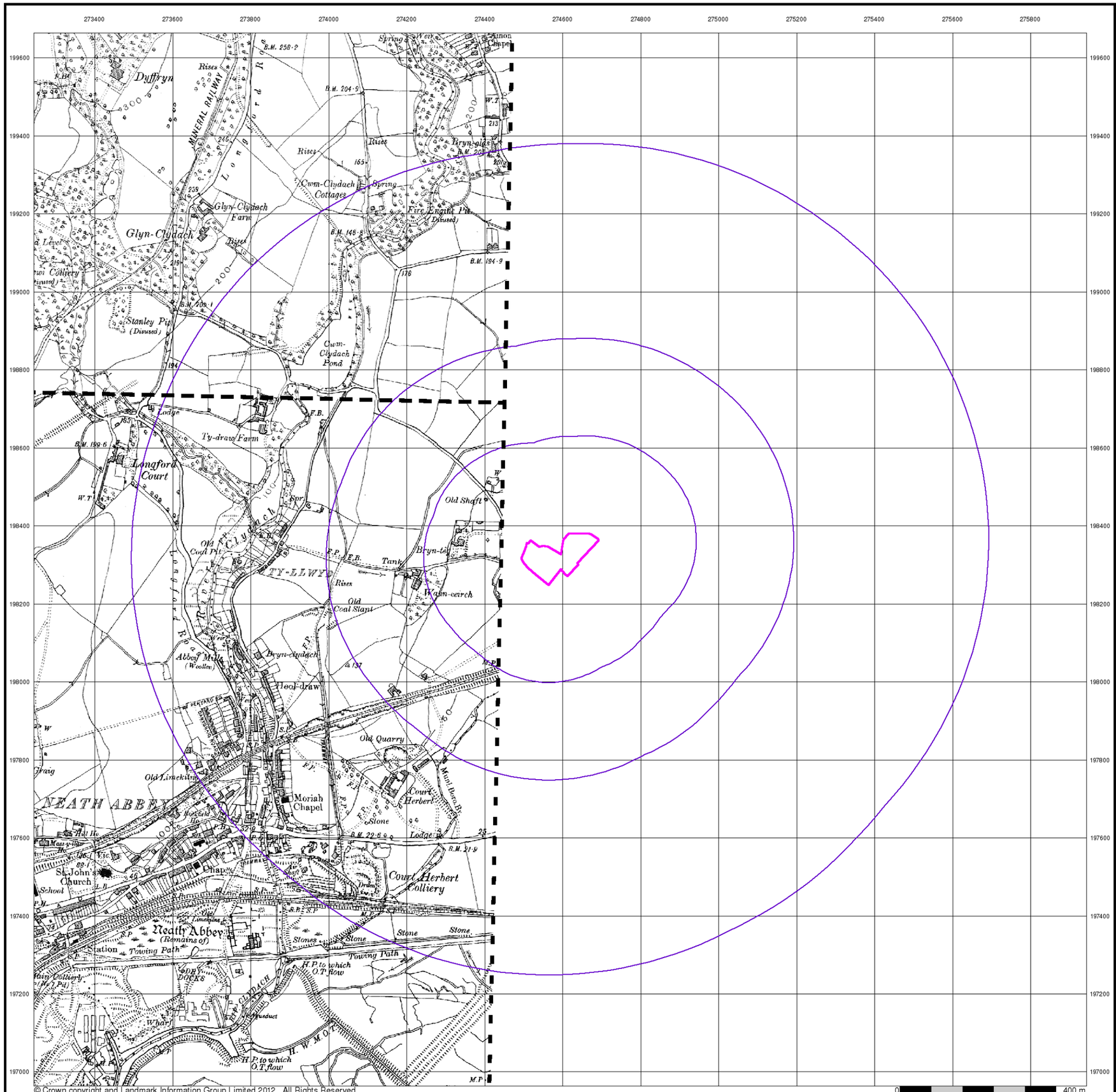

Glamorganshire

Published 1921

Source map scale - 1:10,560

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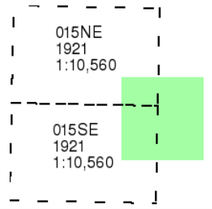
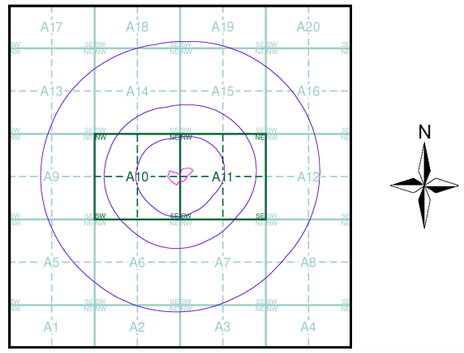
Map Name(s) and Date(s)



Historical Map - Slice A



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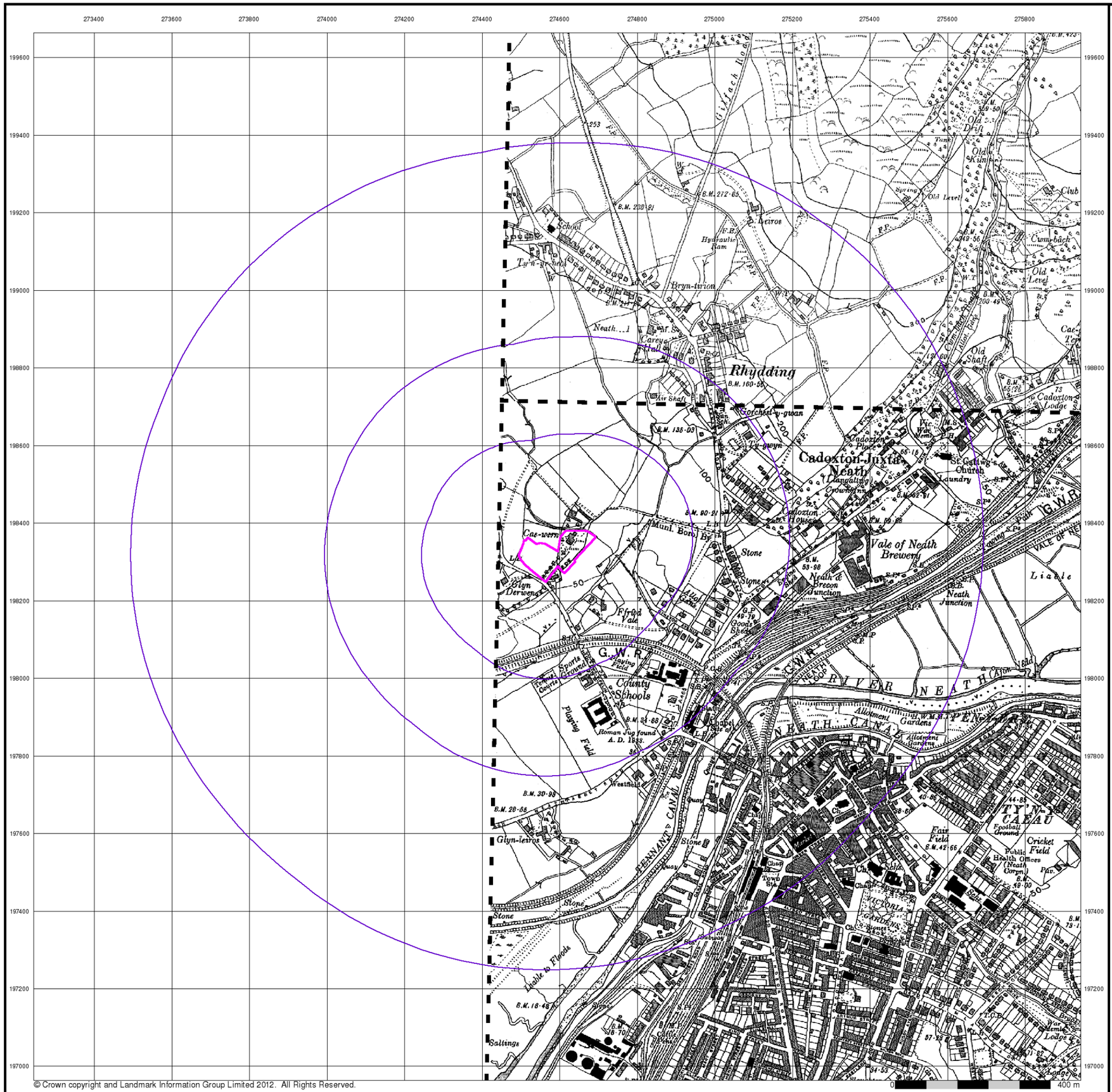
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



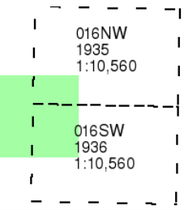
Glamorganshire

Published 1935 - 1936

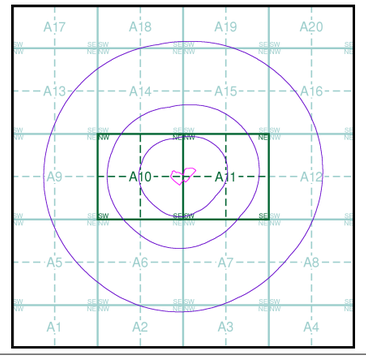
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	1000

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
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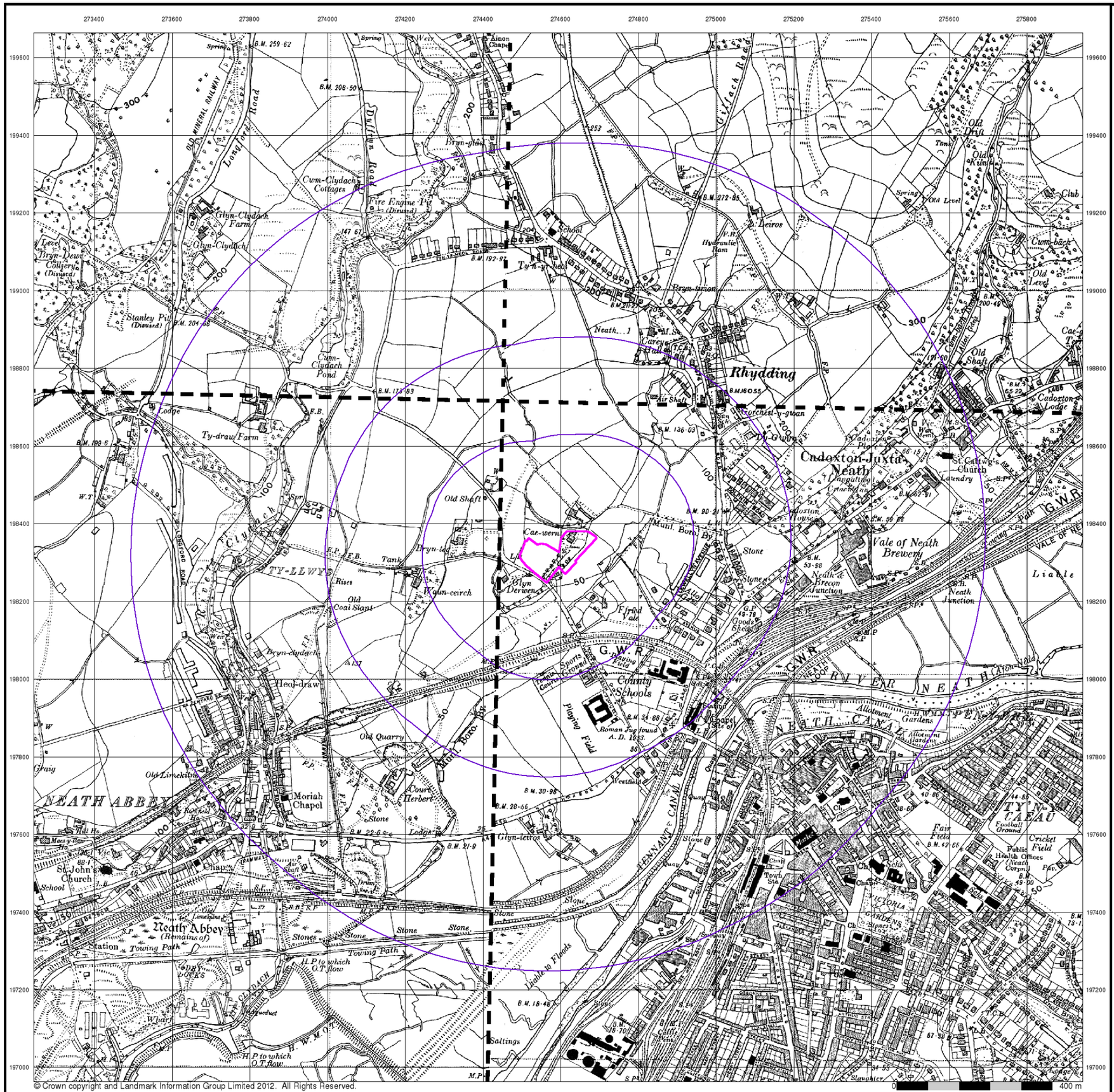

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EARTH SCIENCE PARTNERSHIP ESP

Glamorganshire

Published 1938 - 1951

Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

Order Number:	44003267_2_1
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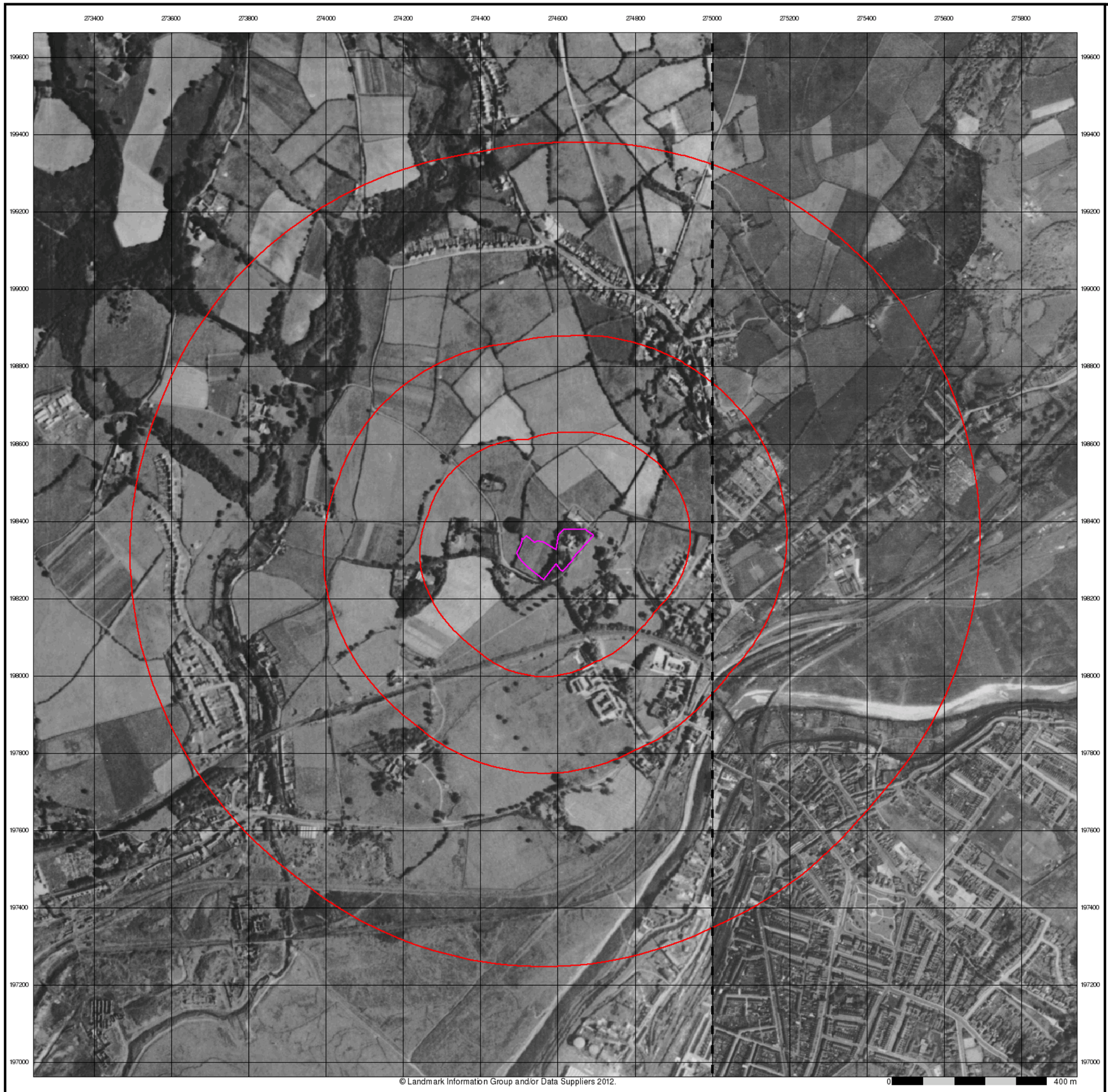


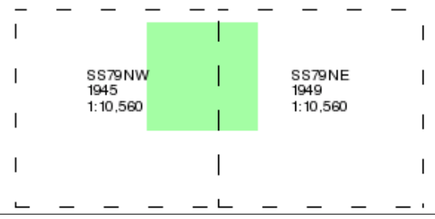
Historical Aerial Photography

Published 1945 - 1949

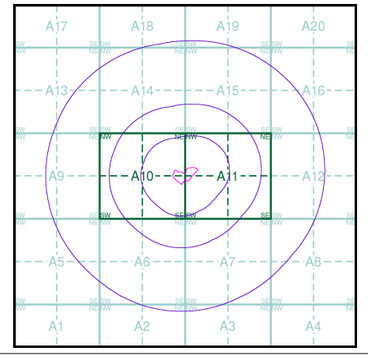
Source map scale - 1:10,560

The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



BRITISH LIBRARY

Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
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Search Buffer (m):	1000

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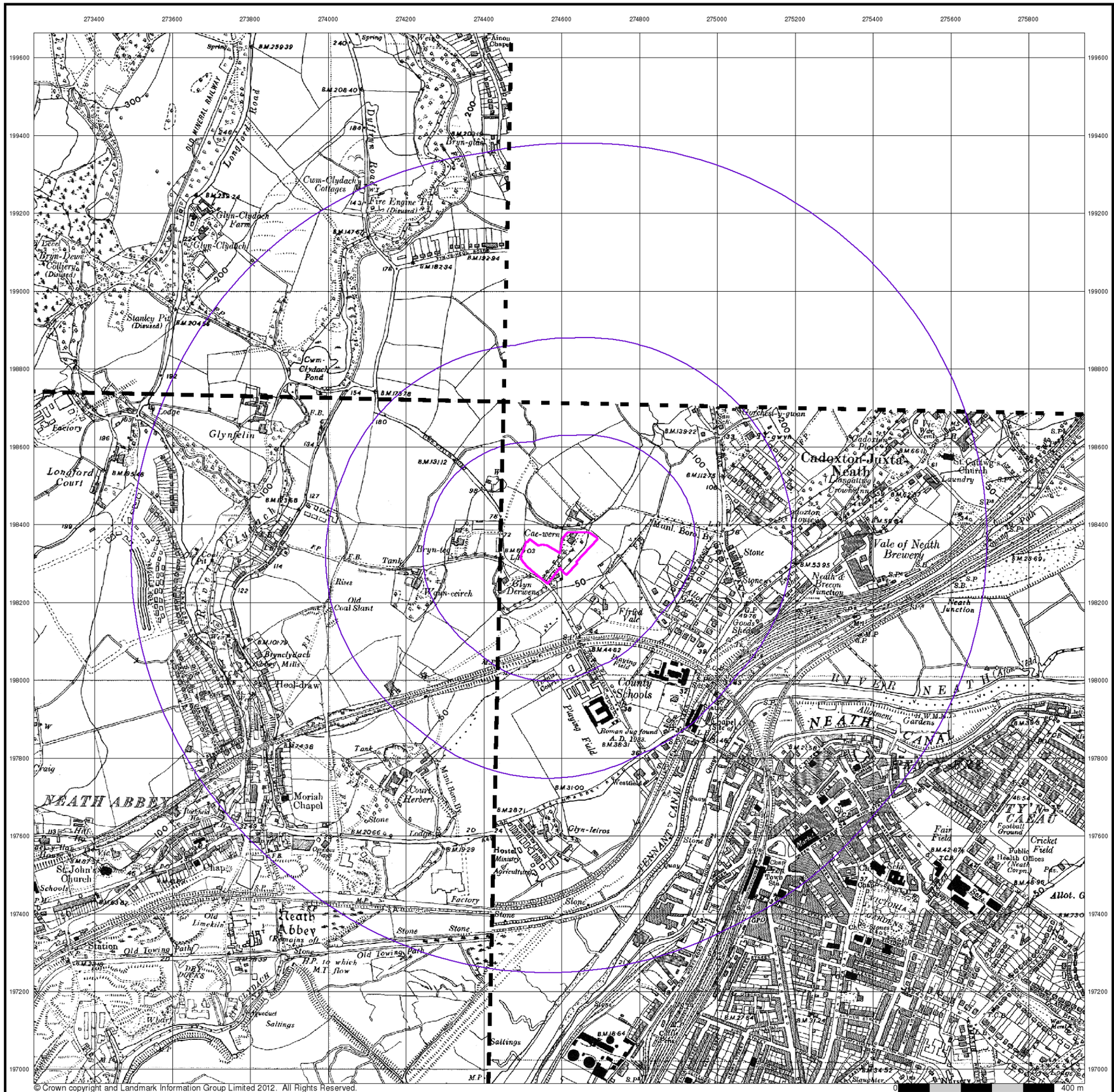


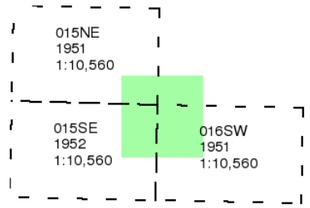
Glamorganshire

Published 1951 - 1952

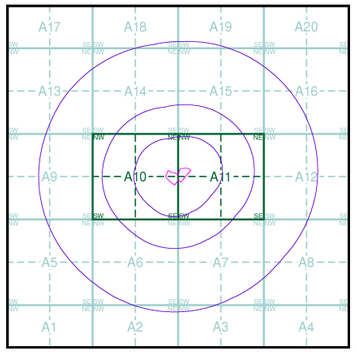
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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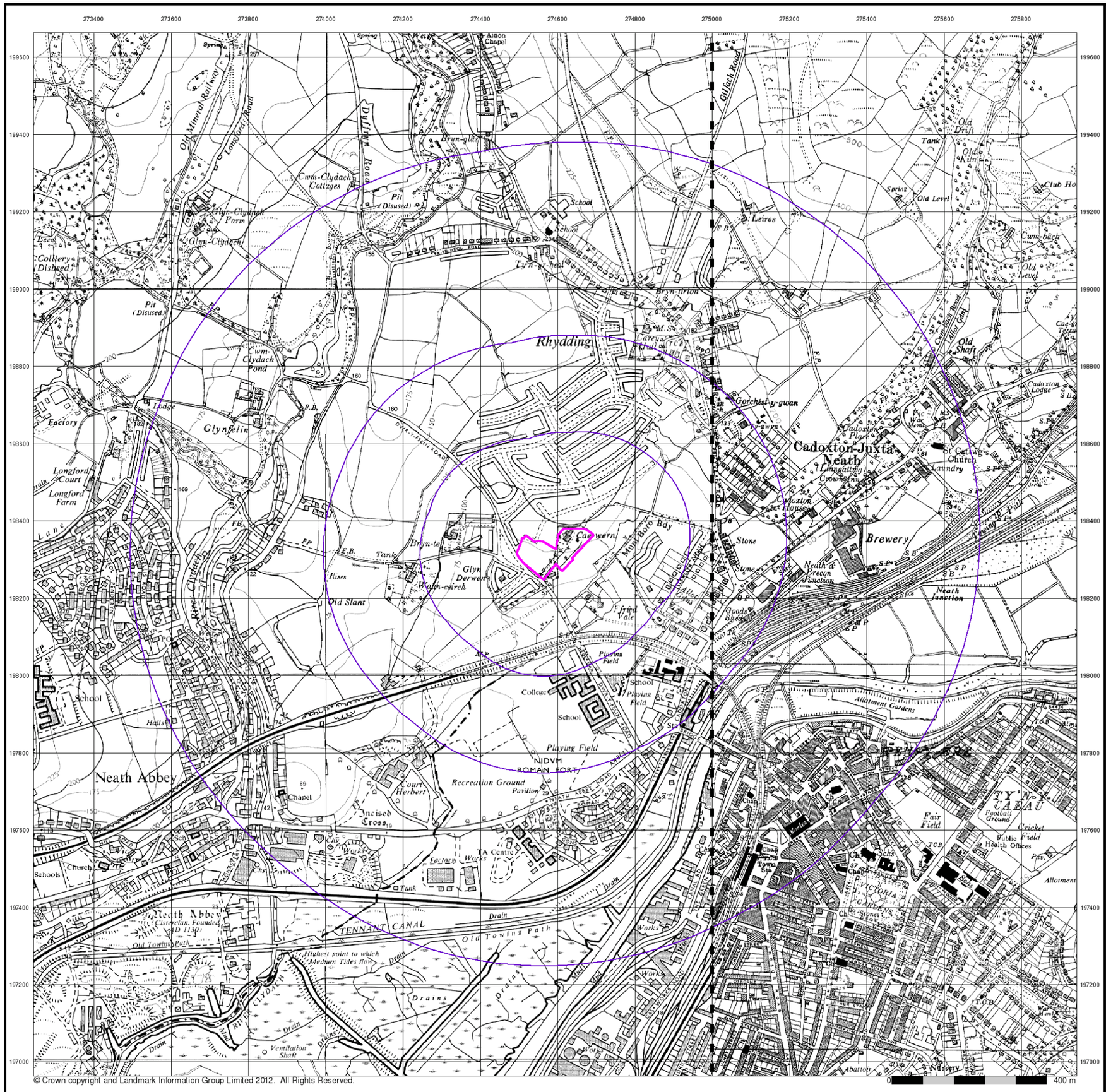

Ordnance Survey Plan

Published 1964 - 1965

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
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Slice:	A
Site Area (Ha):	1.33
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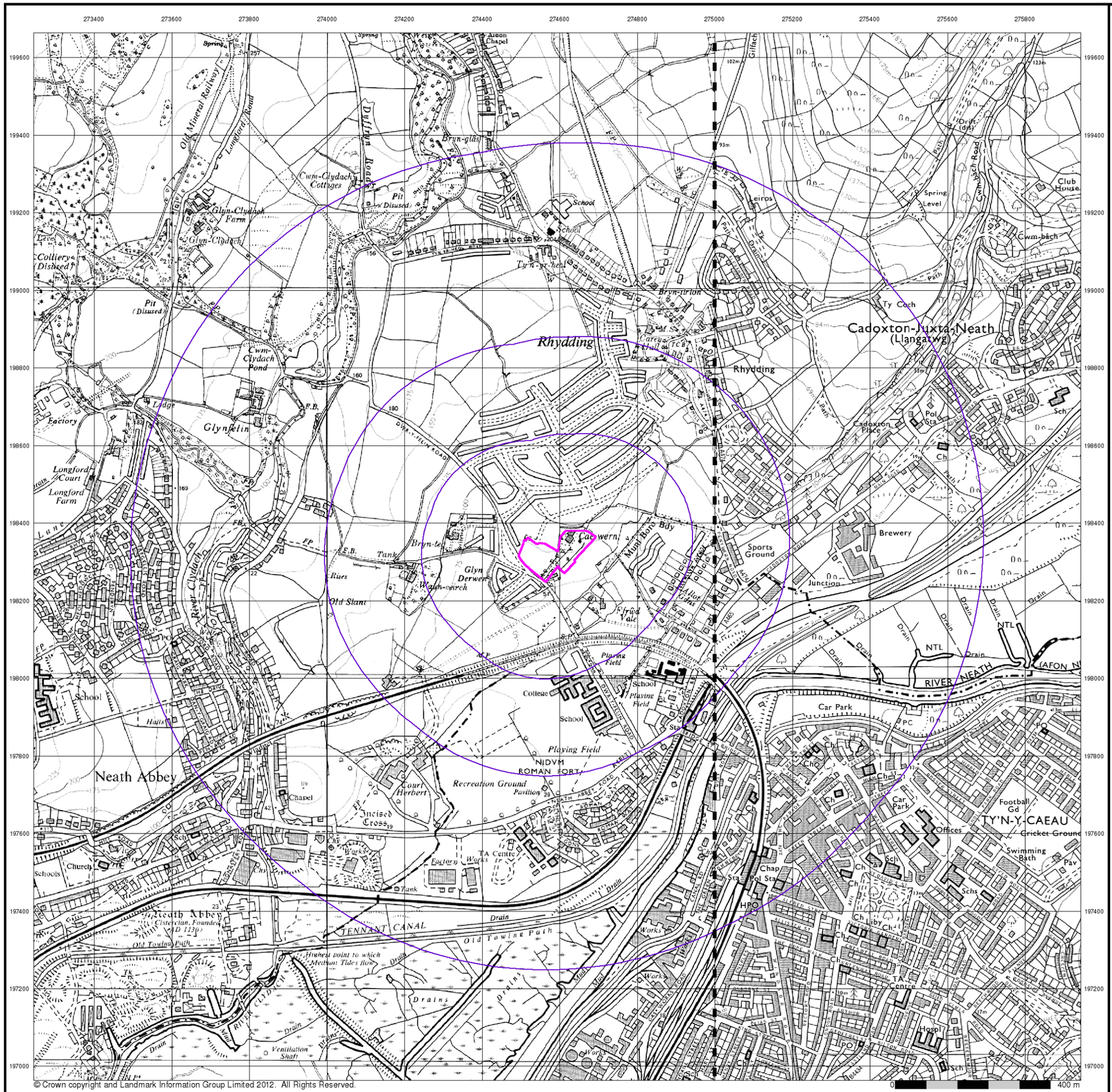


EARTH SCIENCE PARTNERSHIP

ESP

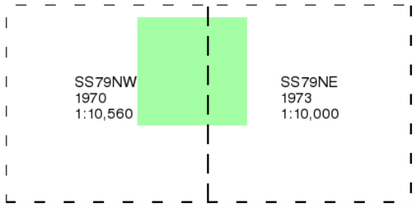
Ordnance Survey Plan

Published 1970 - 1973

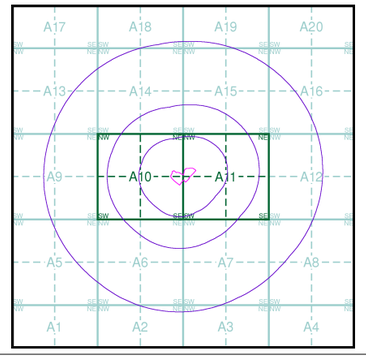
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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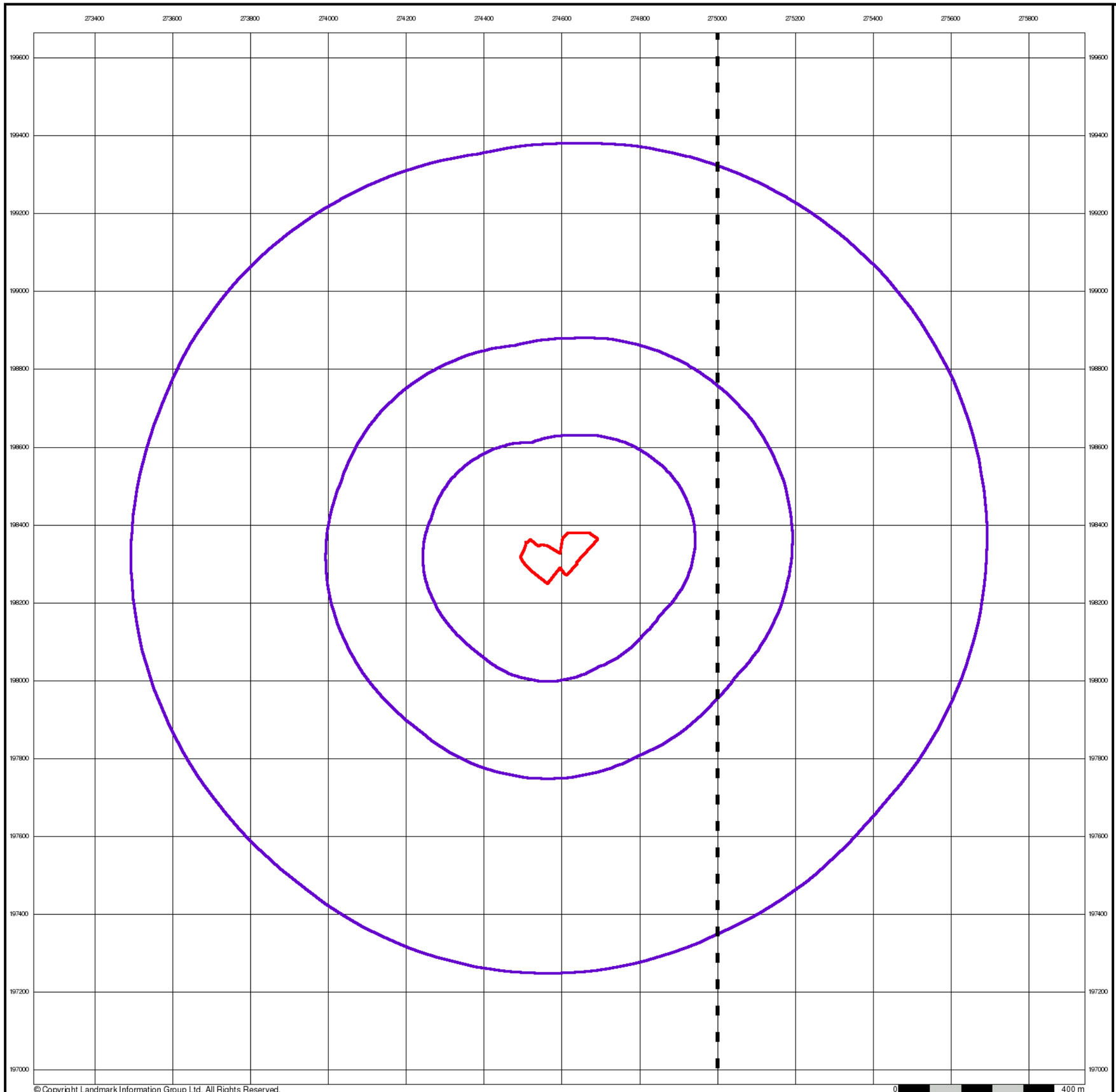


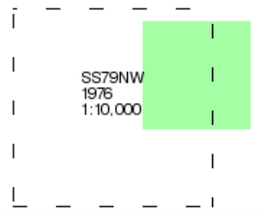
Swansea

Published 1976

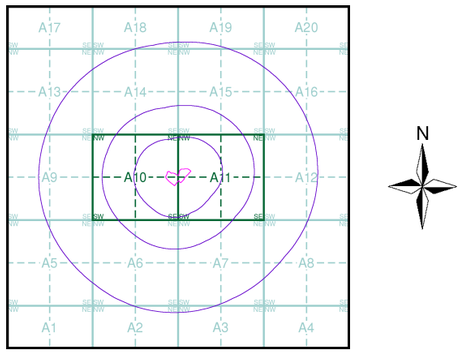
Source map scale - 1:10,000

These maps were produced by the Russian military during the Cold War between 1950 and 1997, and cover 103 towns and cities throughout the U.K. The maps are produced at 1:25,000, 1:10,000 and 1:5,000 scale, and show detailed land use, with colour-coded areas for development, green areas, and non-developed areas. Buildings are coloured black and important building uses (such as hospitals, post offices, factories etc.) are numbered, with a numbered key describing their use.
They were produced by the Russians for the benefit of navigation, as well as strategic military sites and transport hubs, for use if they were to have invaded the U.K. The detailed information provided indicates that the areas were surveyed using land-based personnel, on the ground, in the cities that are mapped.

Map Name(s) and Date(s)



Russian Map - Slice A



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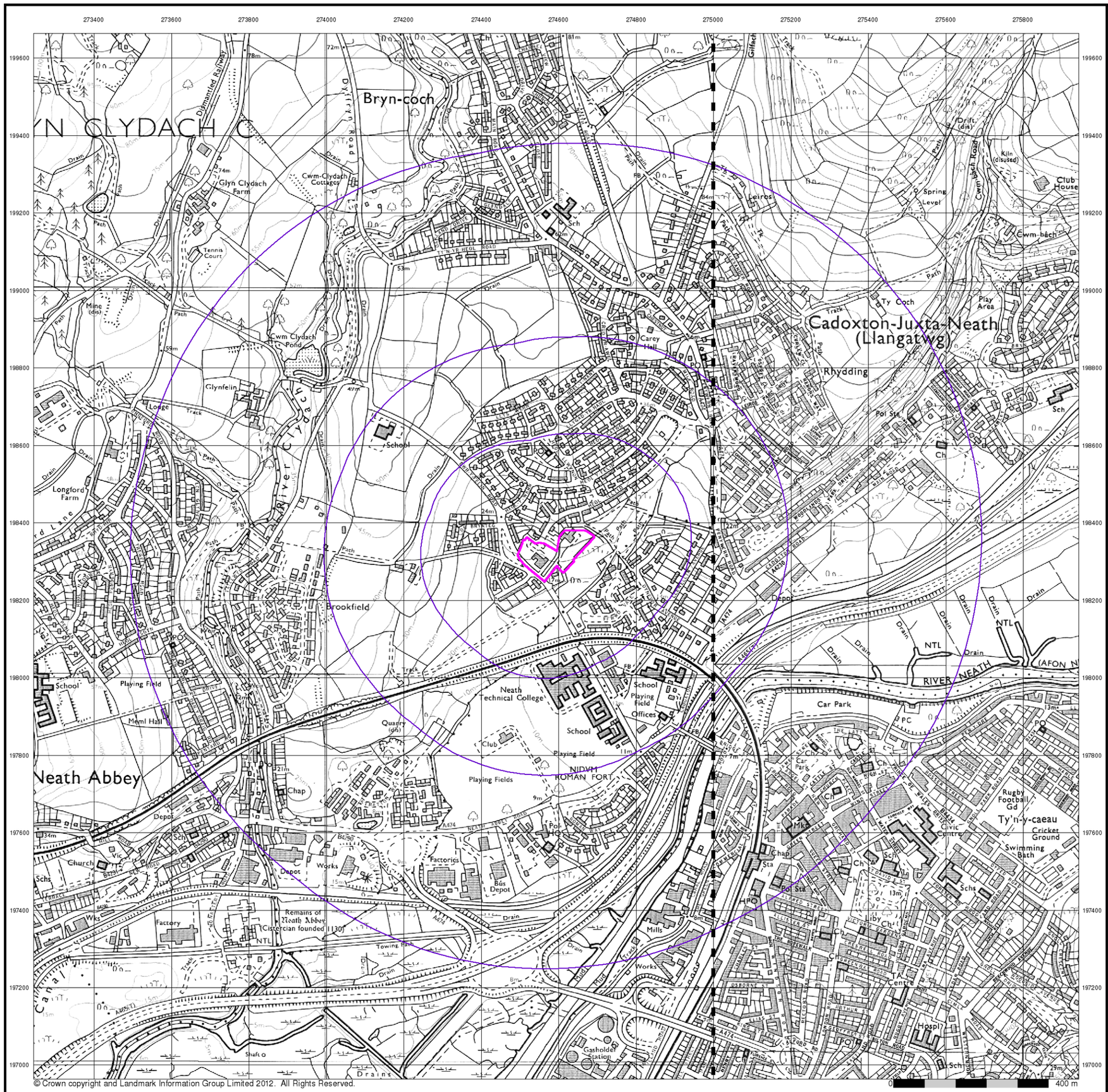

EARTH SCIENCE PARTNERSHIP ESP

Ordnance Survey Plan

Published 1980 - 1983

Source map scale - 1:10,000

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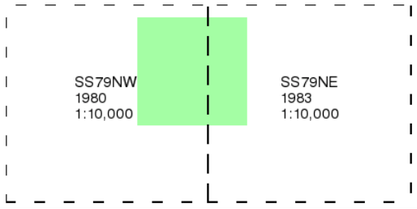
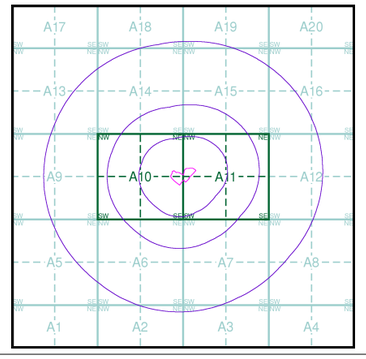
Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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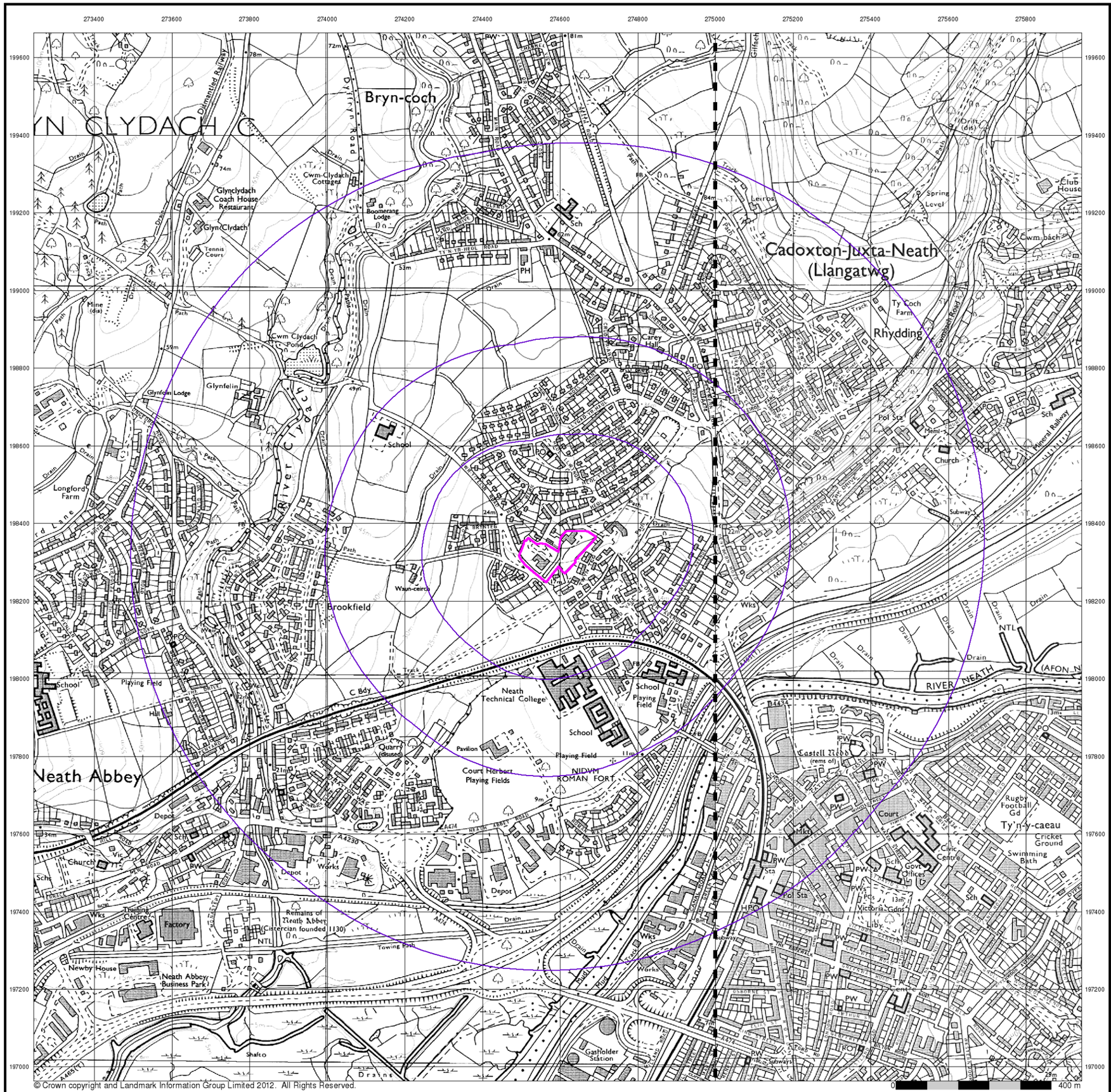

Ordnance Survey Plan

Published 1992

Source map scale - 1:10,000

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Map Name(s) and Date(s)

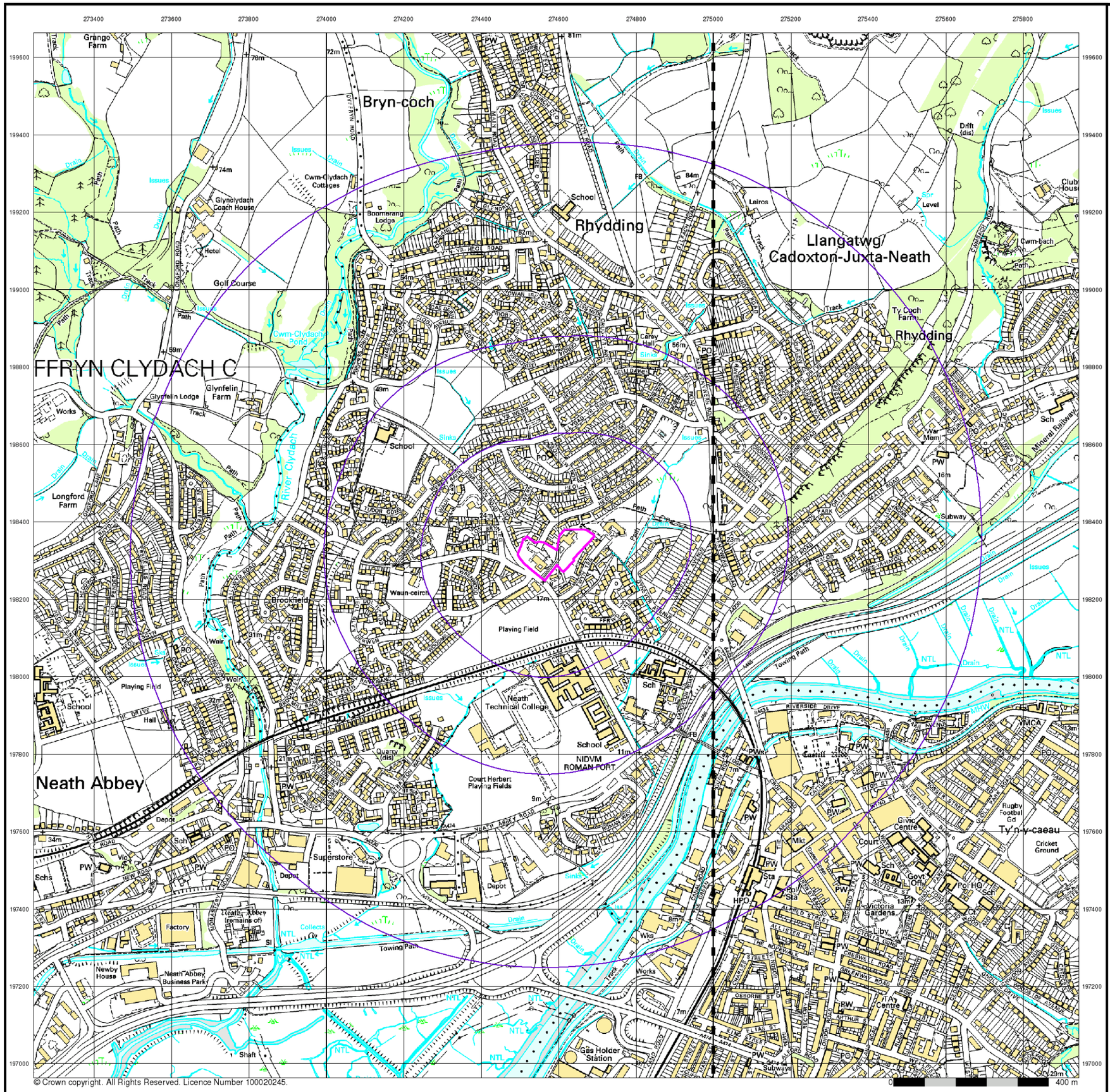
Historical Map - Slice A

Order Details

Order Number: 44003267_2_1
Customer Ref: 5186e
National Grid Reference: 274590, 198330
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE



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10k Raster Mapping

Published 2006

Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. The data is derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

Order Number:	44003267_2_1
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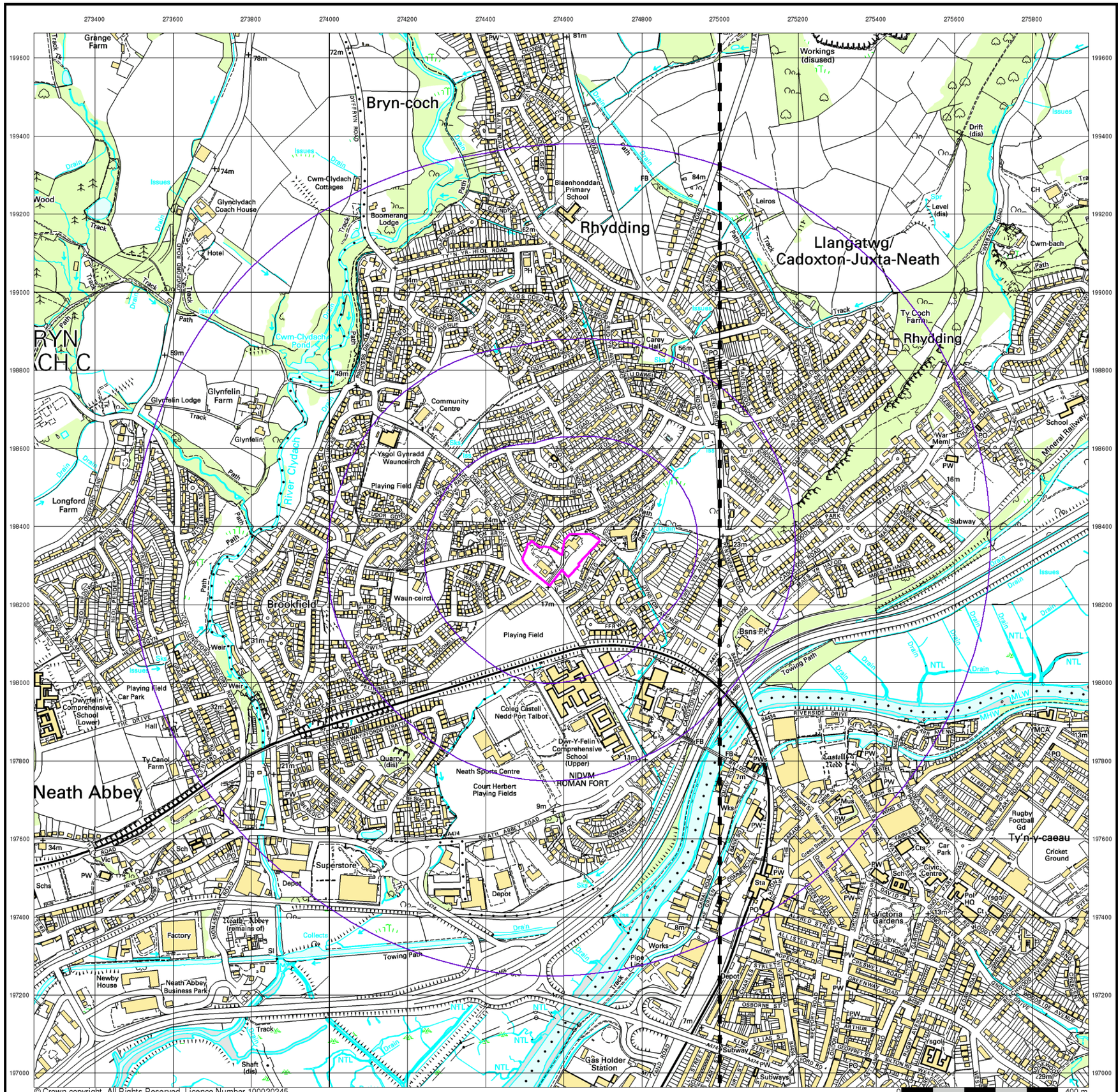


EARTH SCIENCE ESP PARTNERSHIP

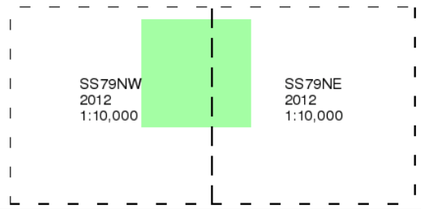
10k Raster Mapping

Published 2012

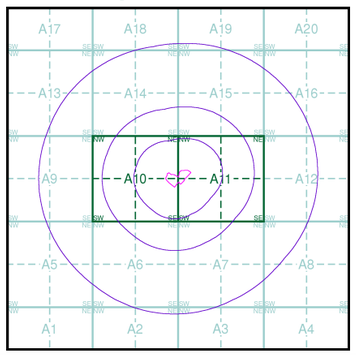
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A



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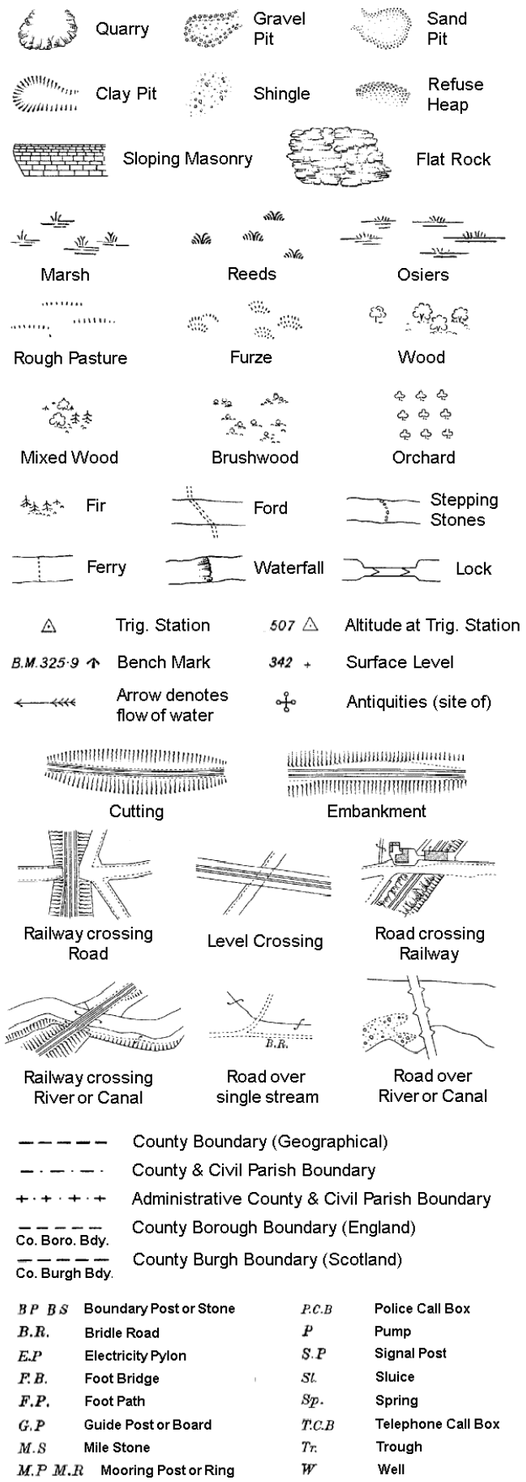
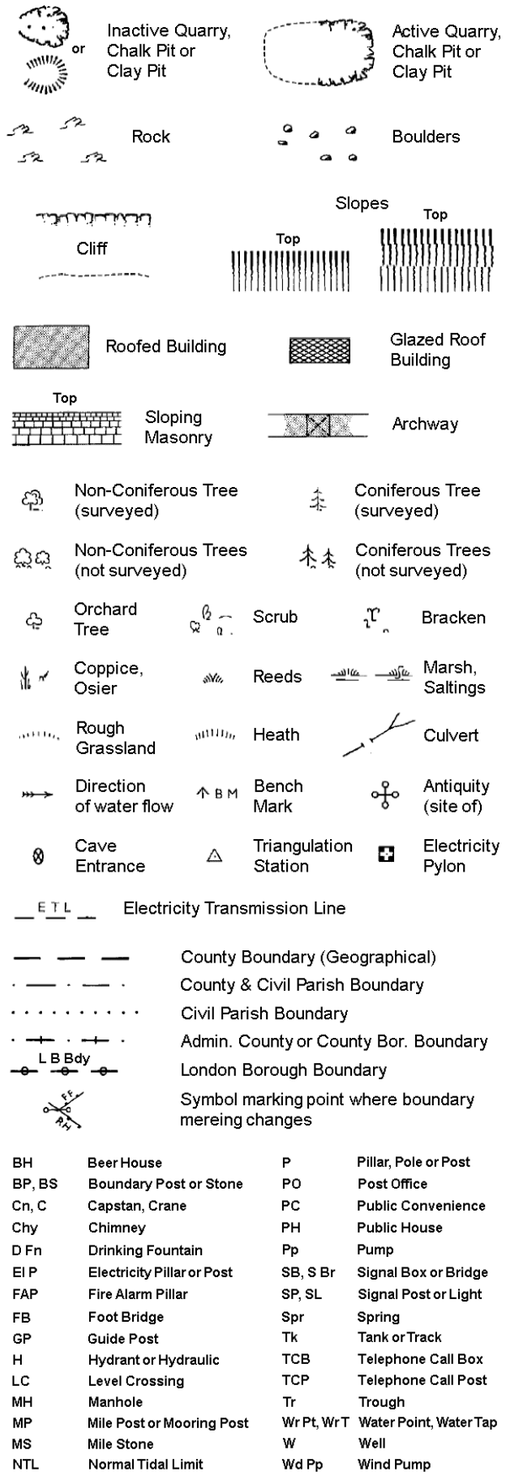
Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



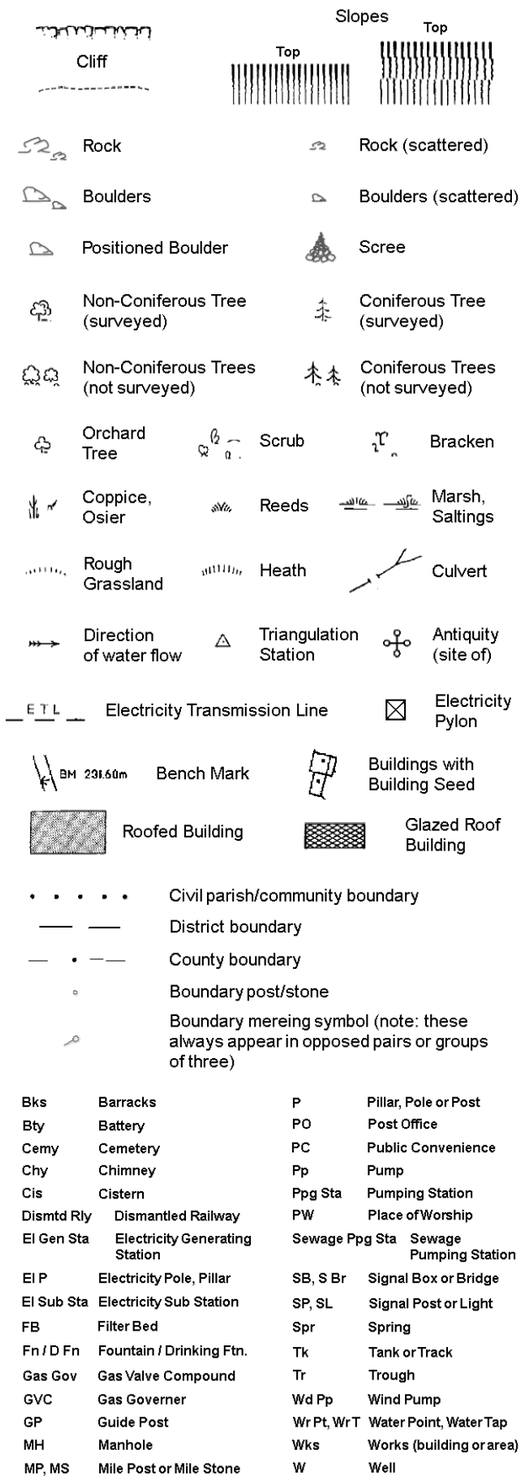
B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



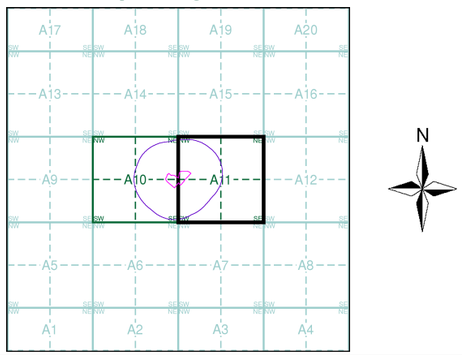
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

EARTH SCIENCE ESP PARTNERSHIP

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Glamorganshire	1:2,500	1877	2
Glamorganshire	1:2,500	1899	3
Glamorganshire	1:2,500	1919	4
Glamorganshire	1:2,500	1935	5
Ordnance Survey Plan	1:1,250	1951 - 1967	6
Ordnance Survey Plan	1:2,500	1952 - 1968	7
Ordnance Survey Plan	1:1,250	1952 - 1989	8
Ordnance Survey Plan	1:2,500	1965	9
Ordnance Survey Plan	1:1,250	1965 - 1967	10
Additional SIMs	1:1,250	1967 - 1989	11
Ordnance Survey Plan	1:2,500	1970	12
Ordnance Survey Plan	1:1,250	1978	13
Additional SIMs	1:1,250	1982 - 1989	14
Additional SIMs	1:1,250	1989	15
Additional SIMs	1:1,250	1990	16
Large-Scale National Grid Data	1:1,250	1993	17
Large-Scale National Grid Data	1:1,250	1994 - 1996	18

Historical Map - Segment A11



Order Details

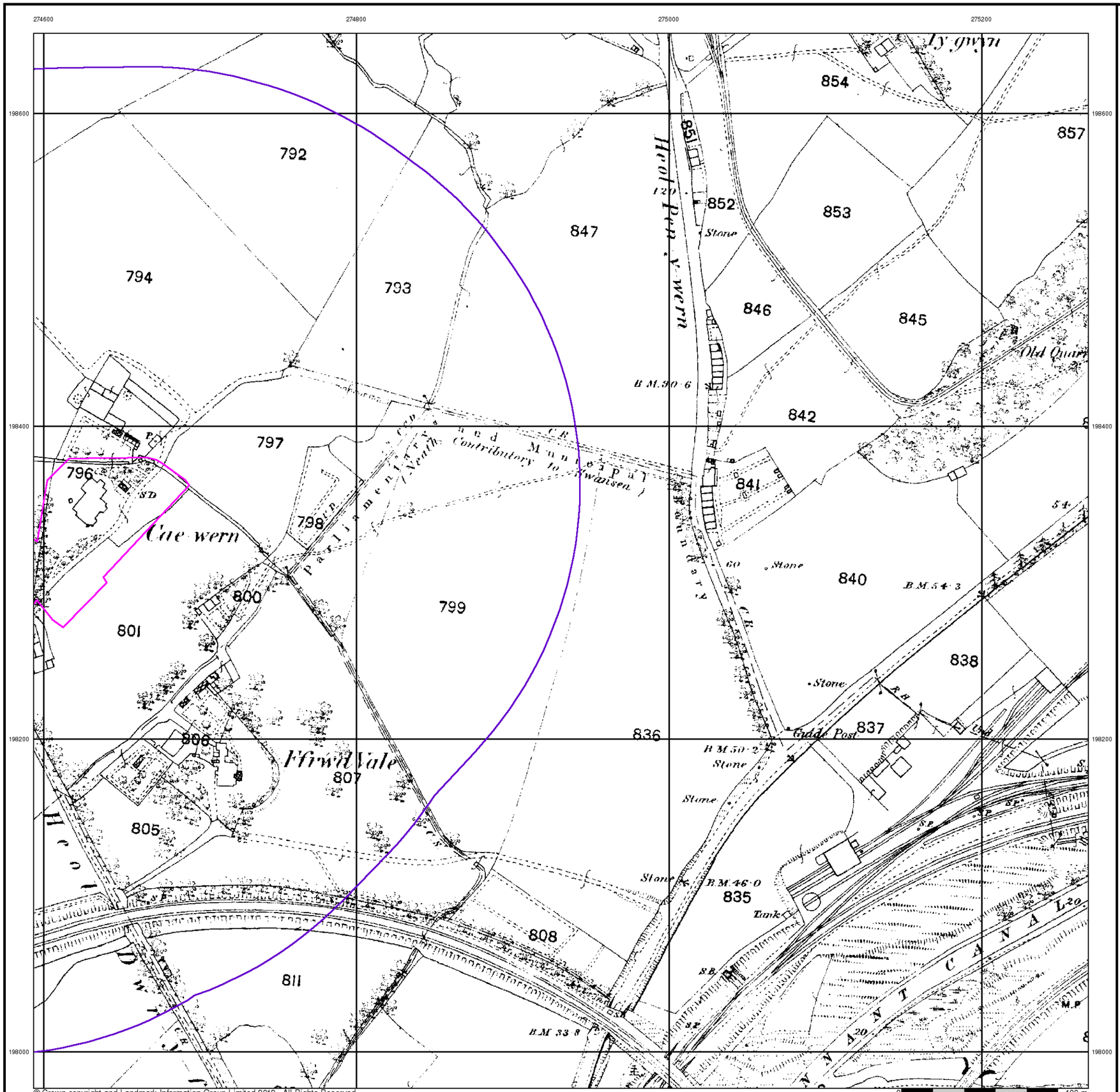
Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark® Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



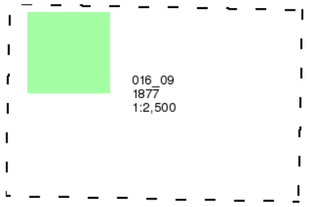
Glamorganshire

Published 1877

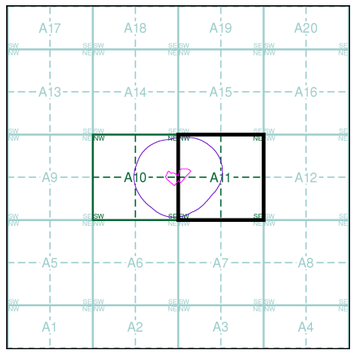
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
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Site Details

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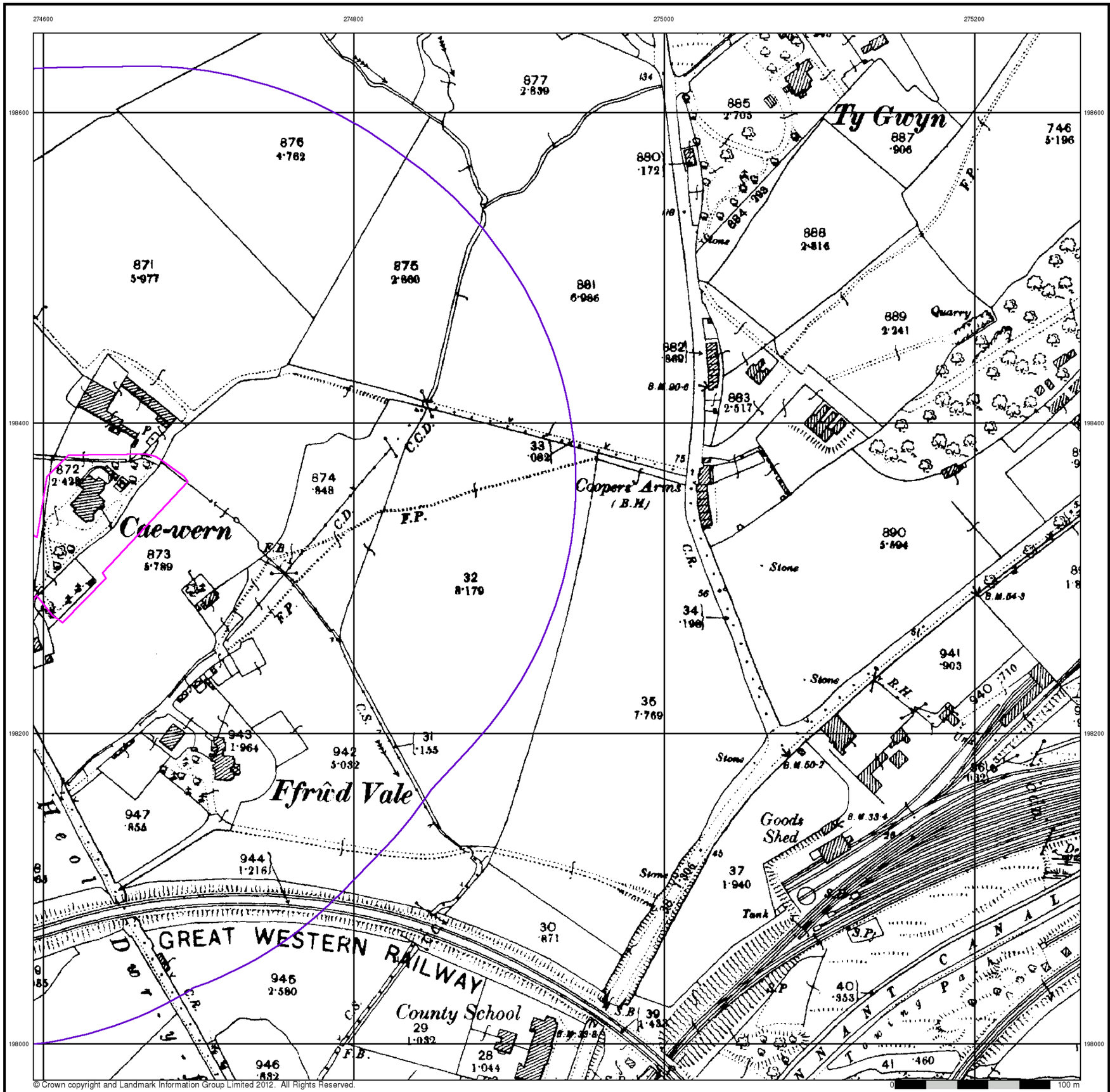


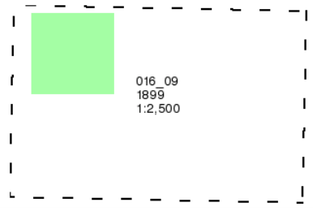
Glamorganshire

Published 1899

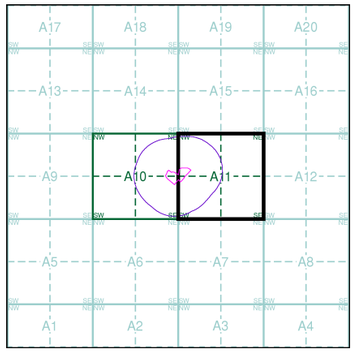
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
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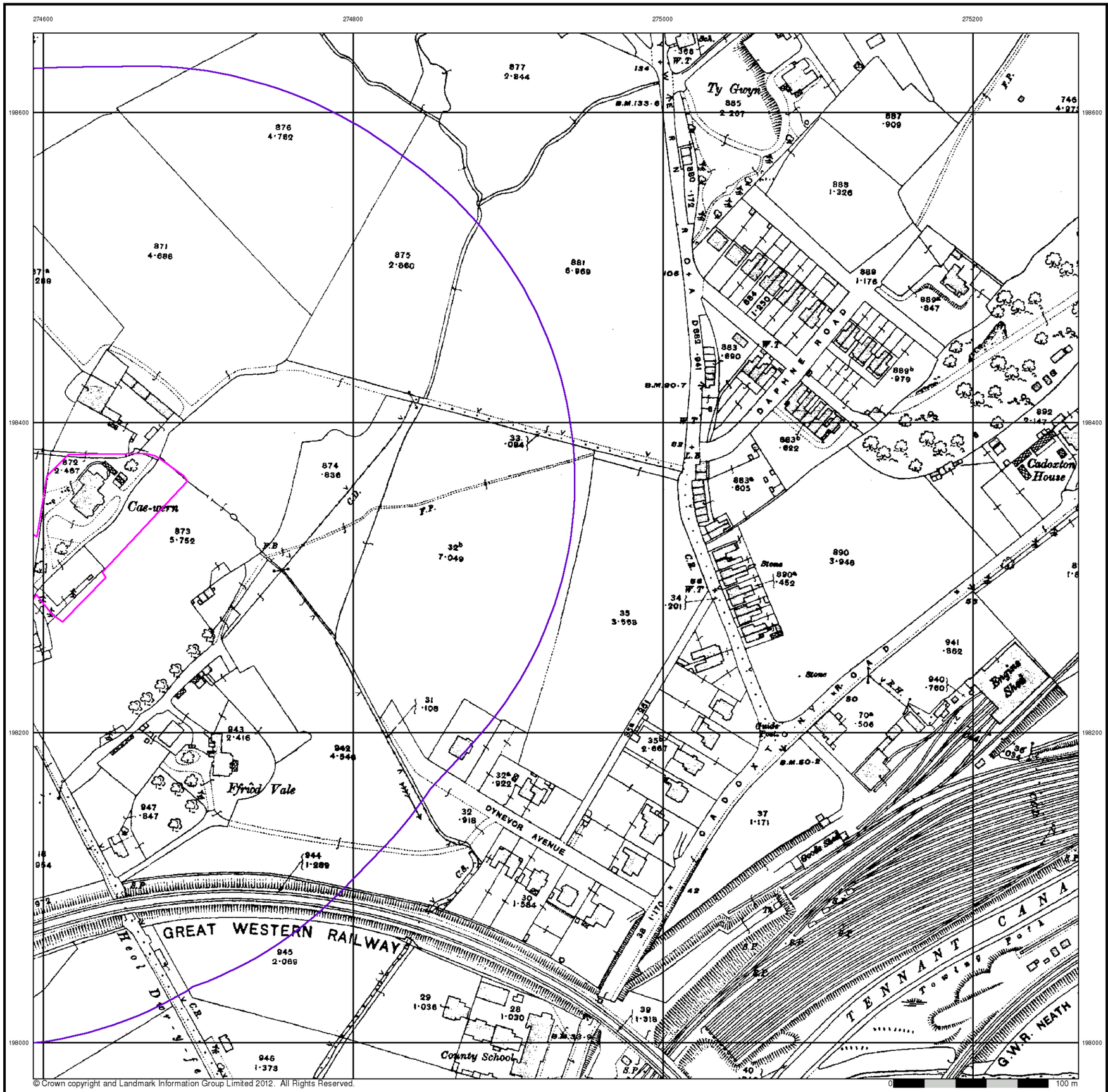


EARTH SCIENCE ESP PARTNERSHIP

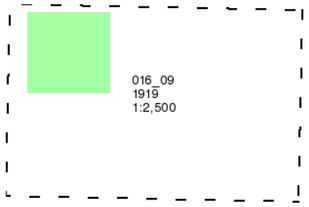
Glamorganshire

Published 1919

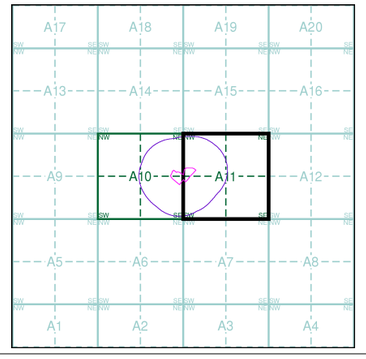
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
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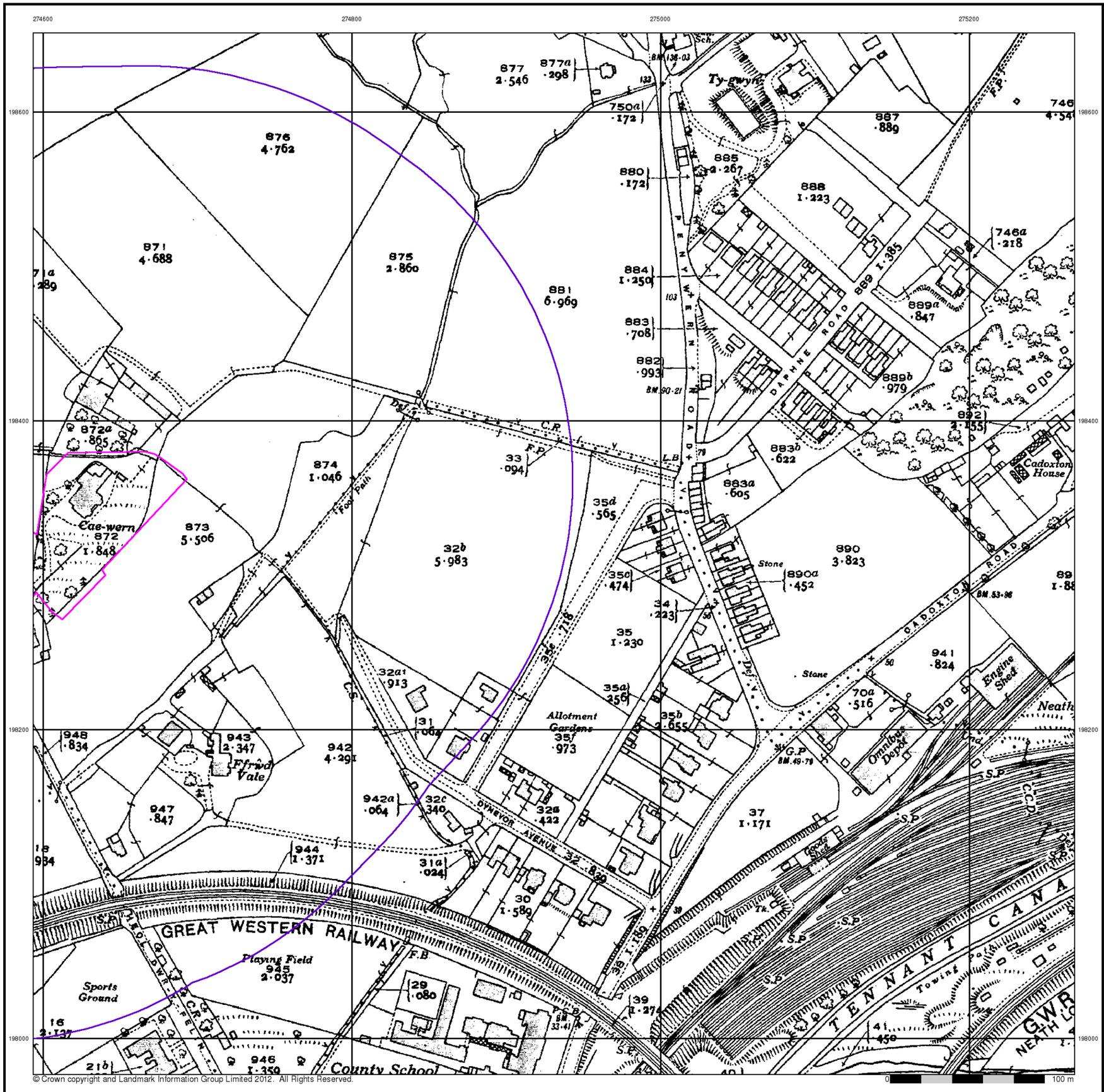


0 100 m

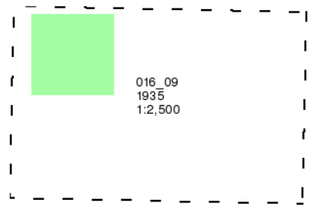
Glamorganshire

Published 1935

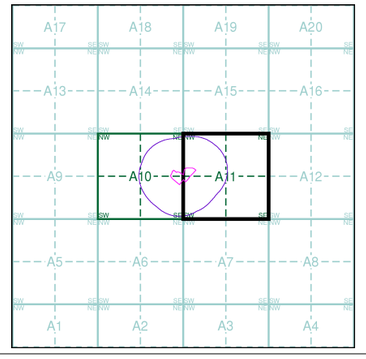
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



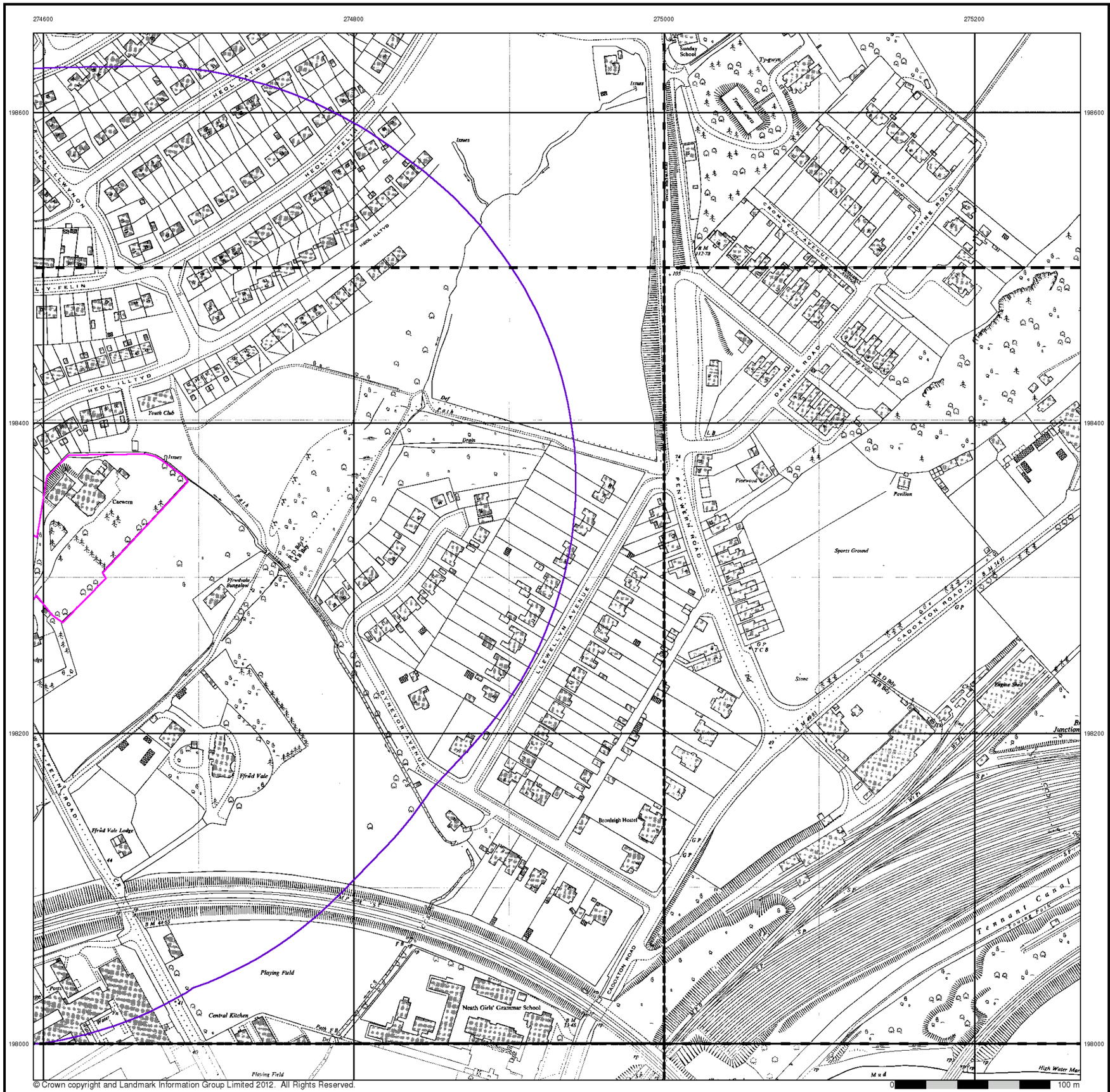
Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



EARTH SCIENCE ESP PARTNERSHIP

Ordnance Survey Plan

Published 1951 - 1967

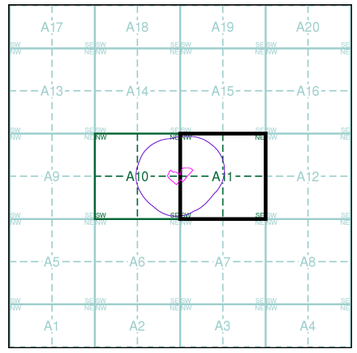
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SS7498NE 1967 1:1,250
SS7598NW 1967 1:1,250
SS7498SE 1967 1:1,250
SS7598SW 1967 1:1,250
SS7497NE 1951 1:1,250
SS7597NW 1951 1:1,250

Historical Map - Segment A11

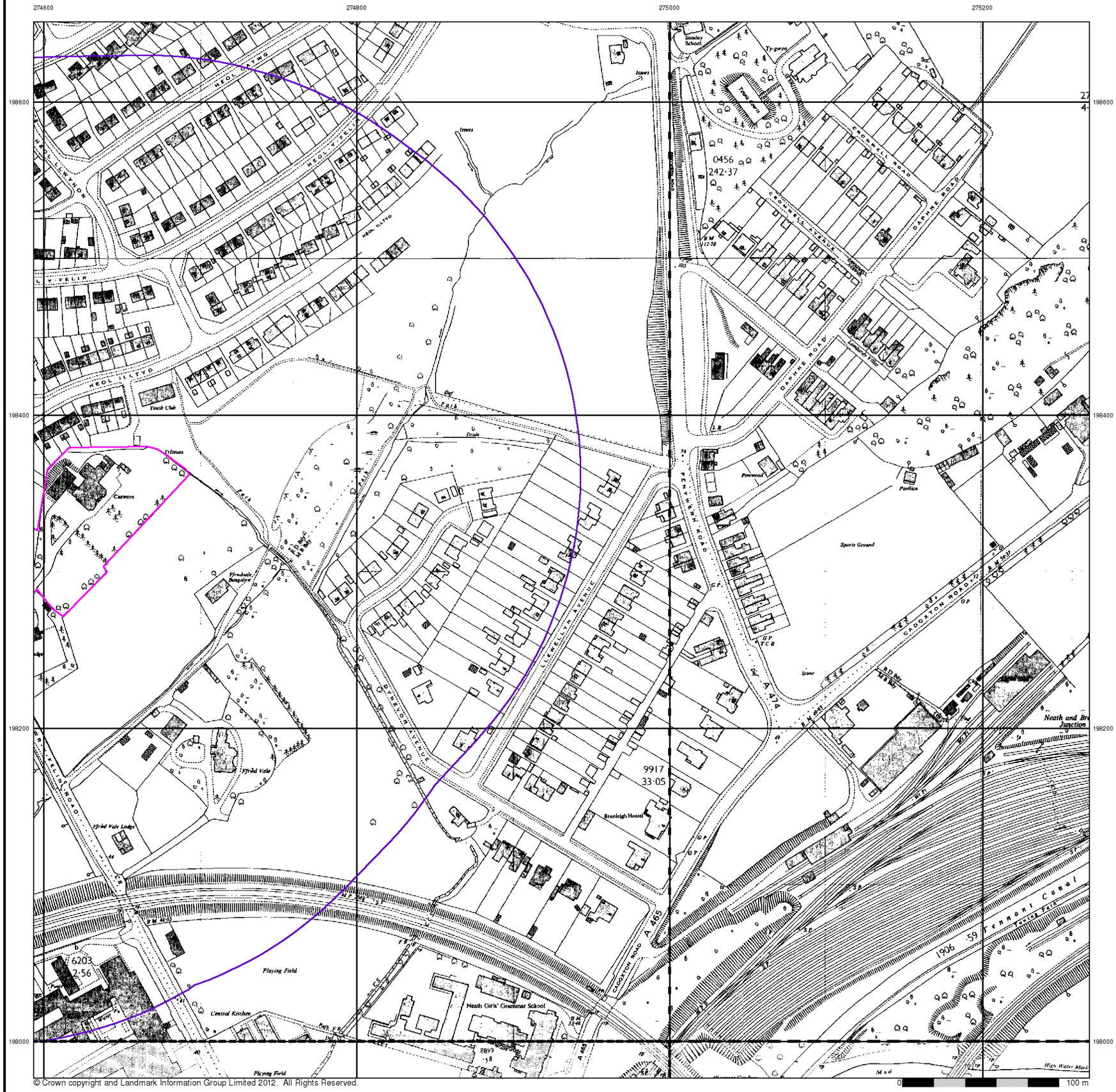


Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE



EARTH SCIENCE ESP PARTNERSHIP

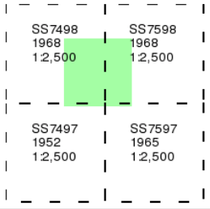
Ordnance Survey Plan

Published 1952 - 1968

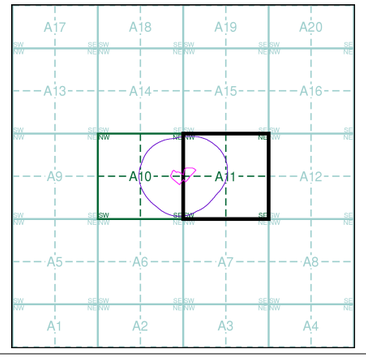
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11

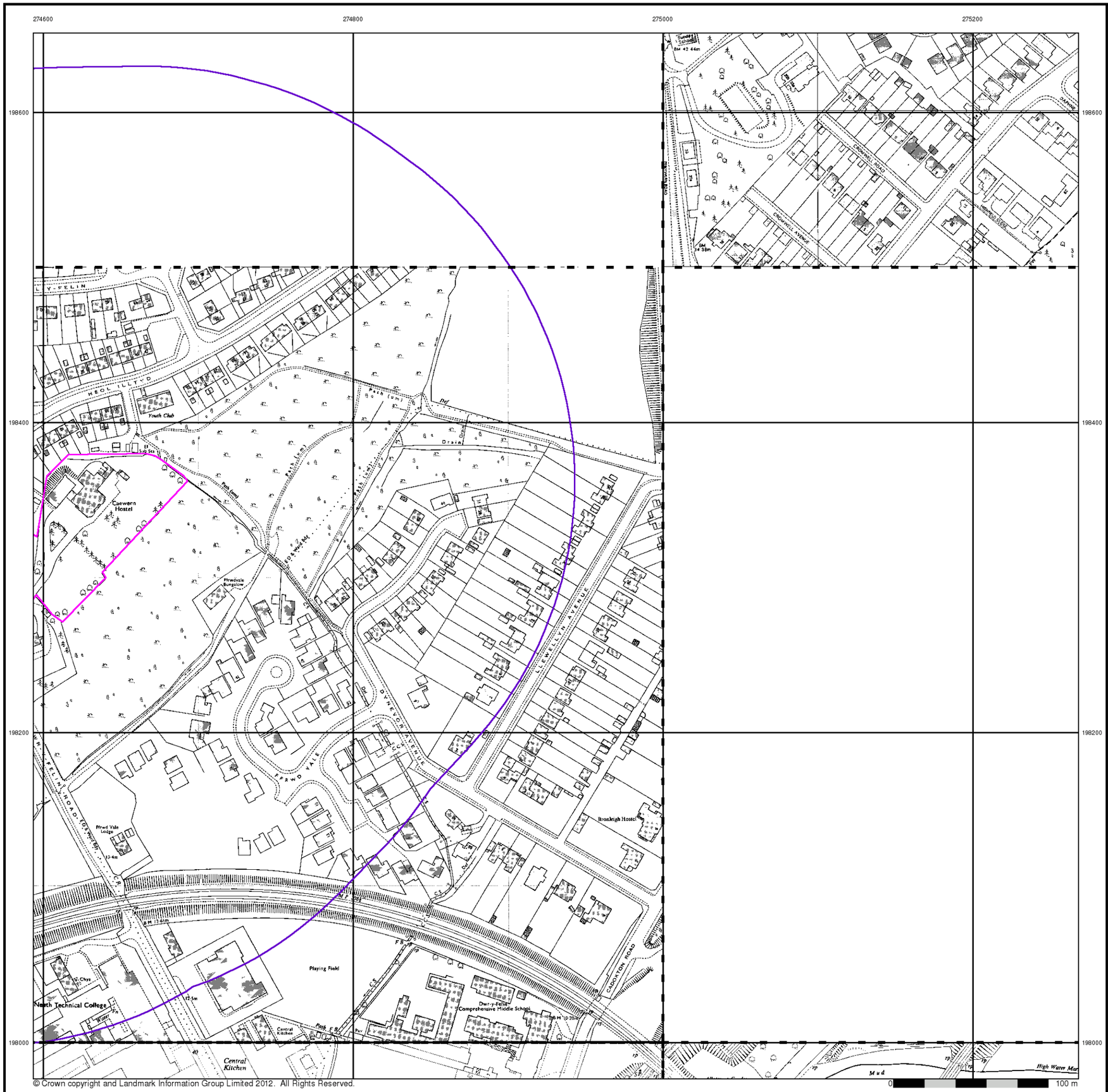


Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE



EARTH SCIENCE PARTNERSHIP ESP

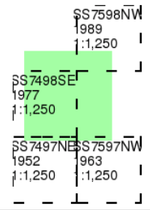
Ordnance Survey Plan

Published 1952 - 1989

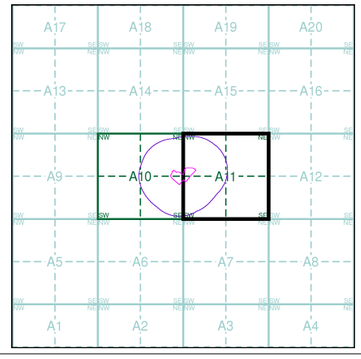
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



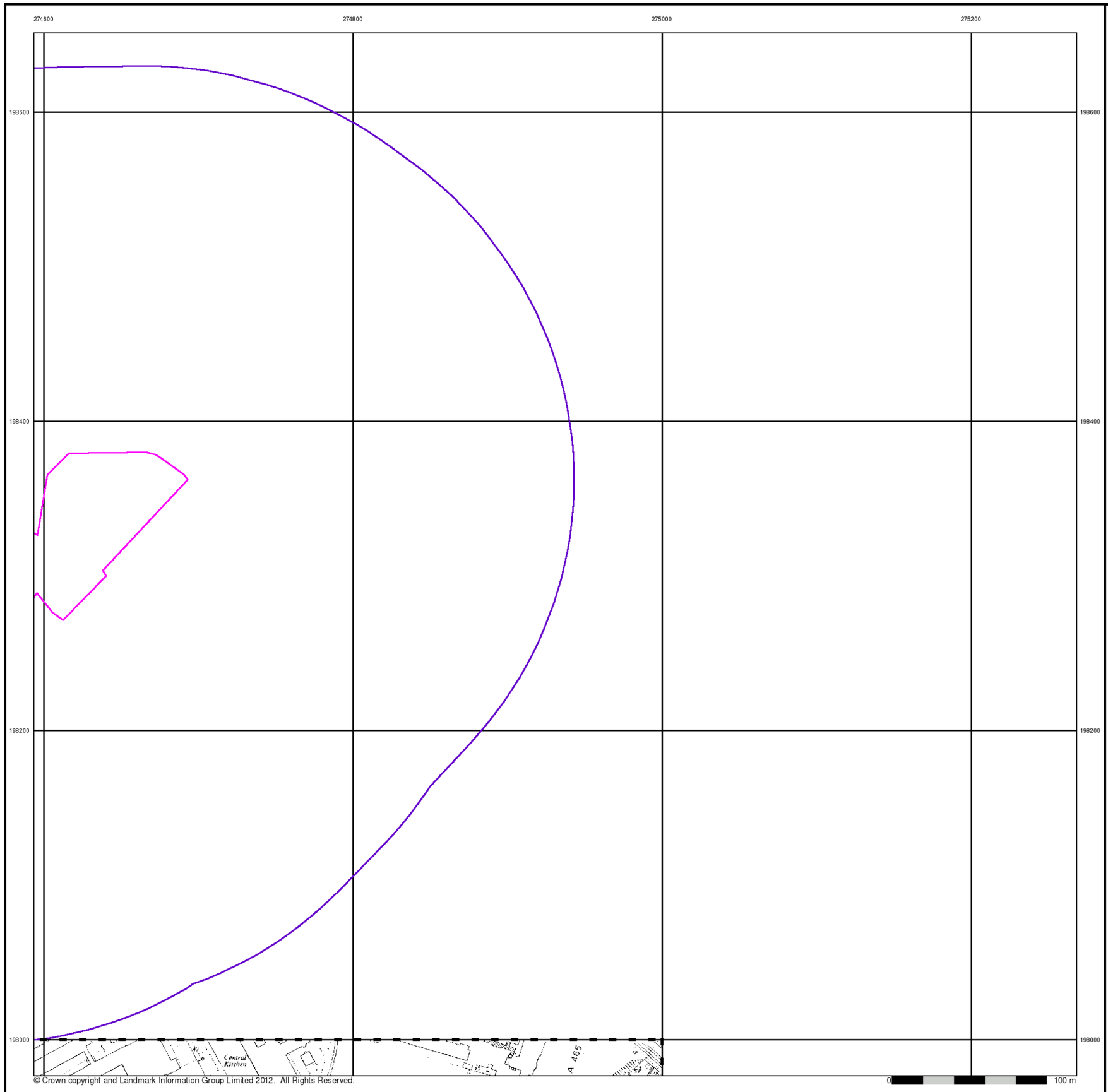
Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



0 100 m

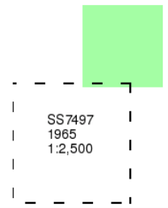
Ordnance Survey Plan

Published 1965

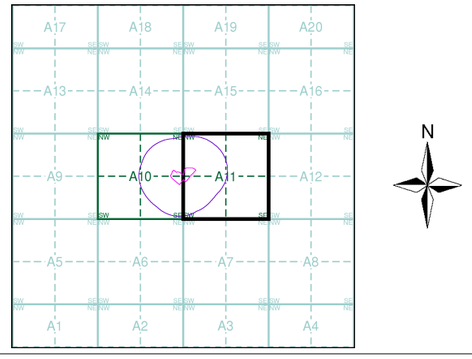
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

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Tel: 0844 844 9952
Fax: 0844 844 9951
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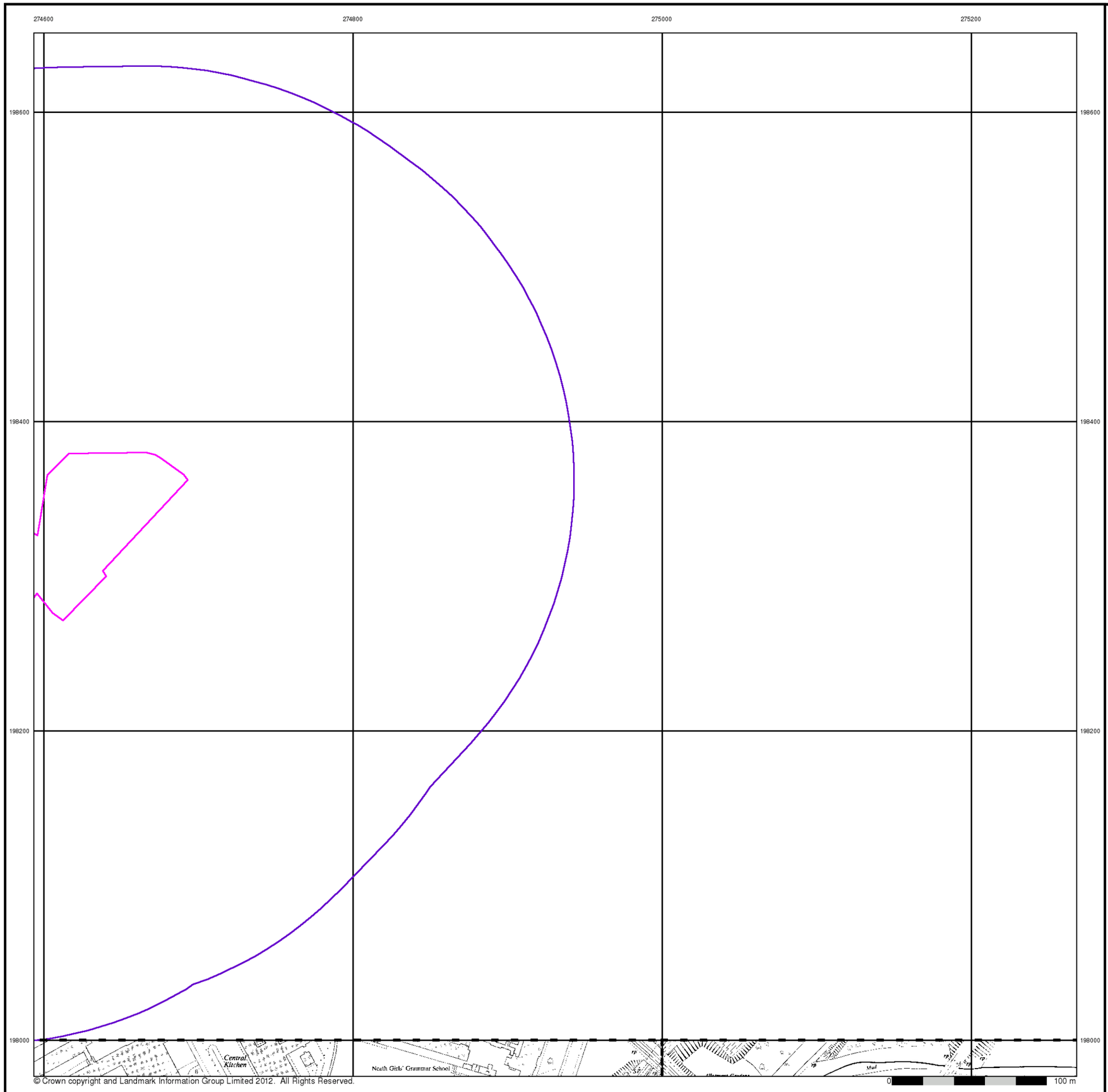


EARTH SCIENCE PARTNERSHIP ESP

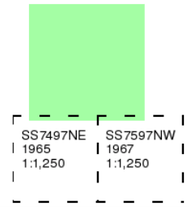
Ordnance Survey Plan

Published 1965 - 1967

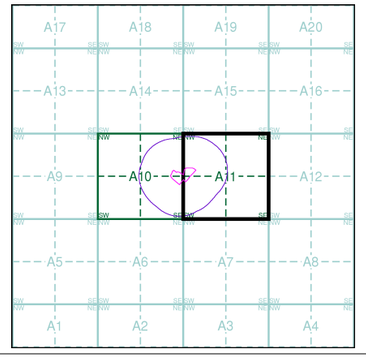
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



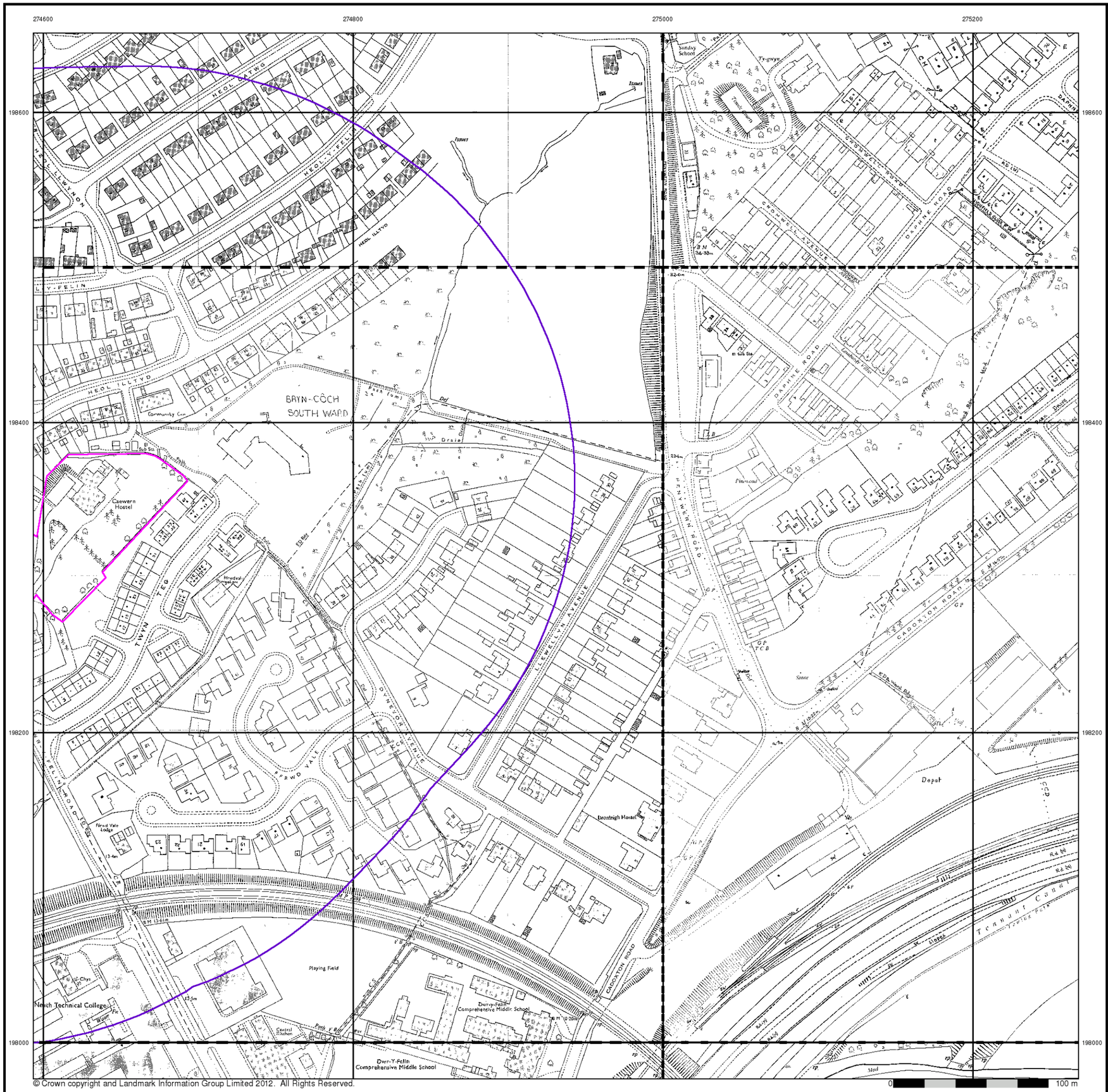
Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Additional SIMs

Published 1967 - 1989

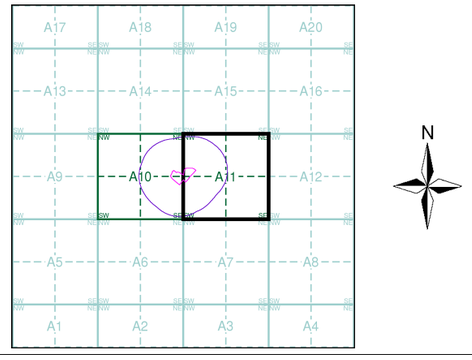
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS7498NE	SS7598NW
1967	1978
1:1,250	1:1,250
SS7498SE	SS7598SW
1986	1977
1:1,250	1:1,250
SS7497NE	SS7597NW
1989	1967
1:1,250	1:1,250

Historical Map - Segment A11



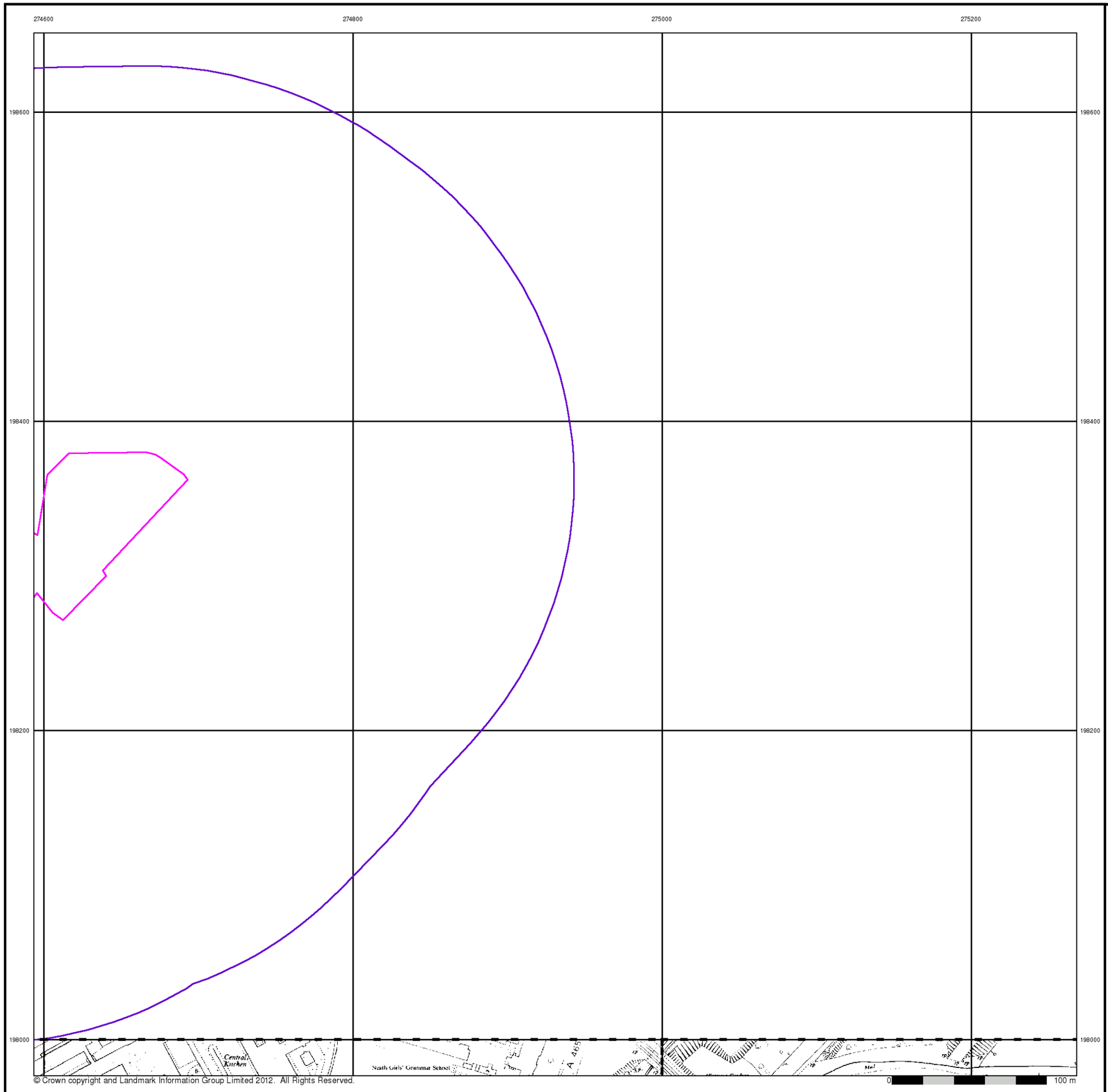
Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



EARTH SCIENCE PARTNERSHIP ESP

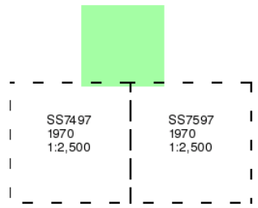
Ordnance Survey Plan

Published 1970

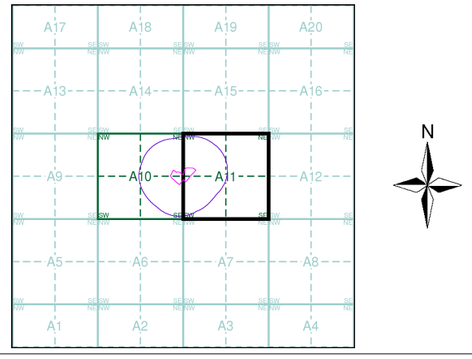
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

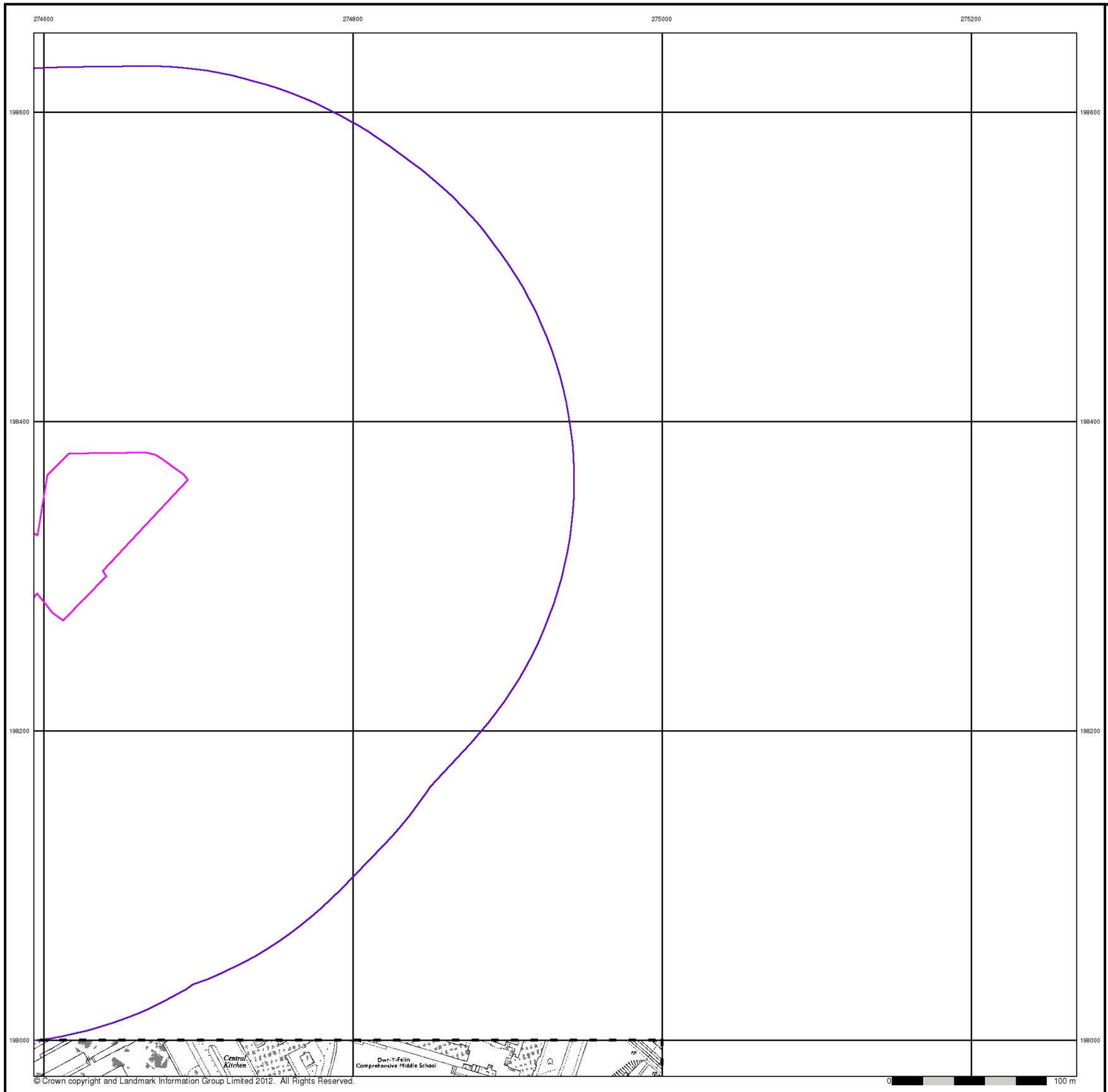
Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



EARTH SCIENCE PARTNERSHIP ESP

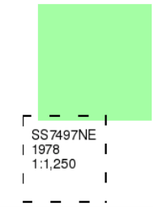
Ordnance Survey Plan

Published 1978

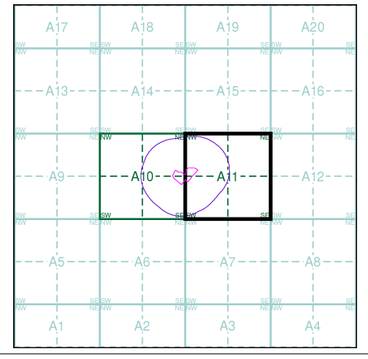
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark® Information Group
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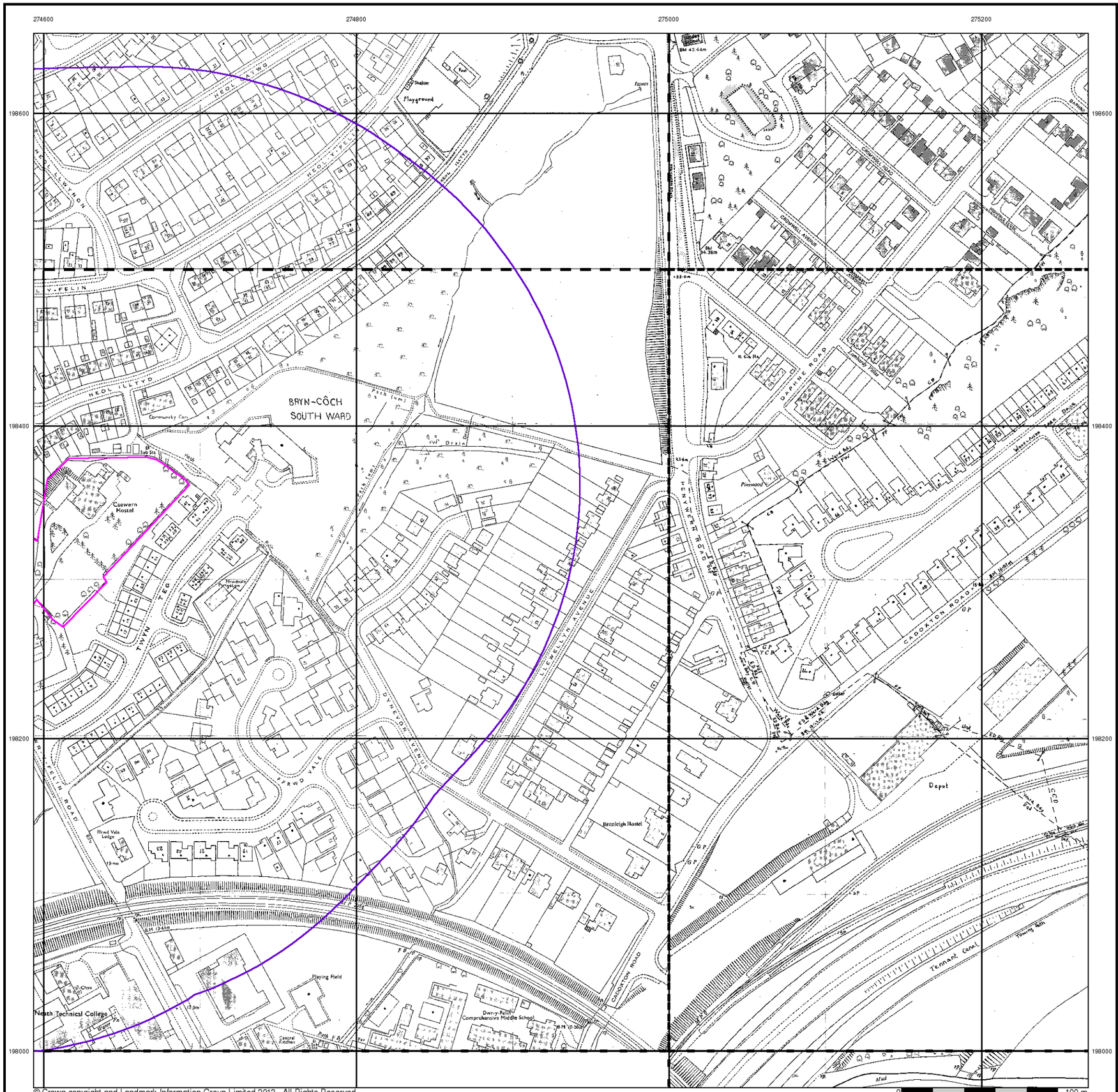


Additional SIMs

Published 1982 - 1989

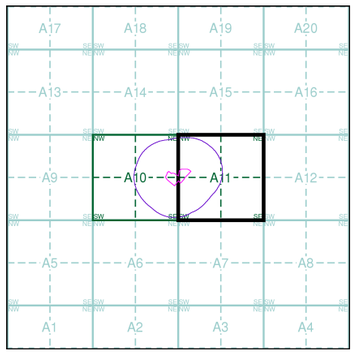
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS7498NE 1989 1:1,250
SS7598NW 1989 1:1,250
SS7498SE 1989 1:1,250
SS7598SW 1985 1:1,250
SS7597NW 1982 1:1,250

Historical Map - Segment A11



Order Details

Order Number:	44003267_2_1
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National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

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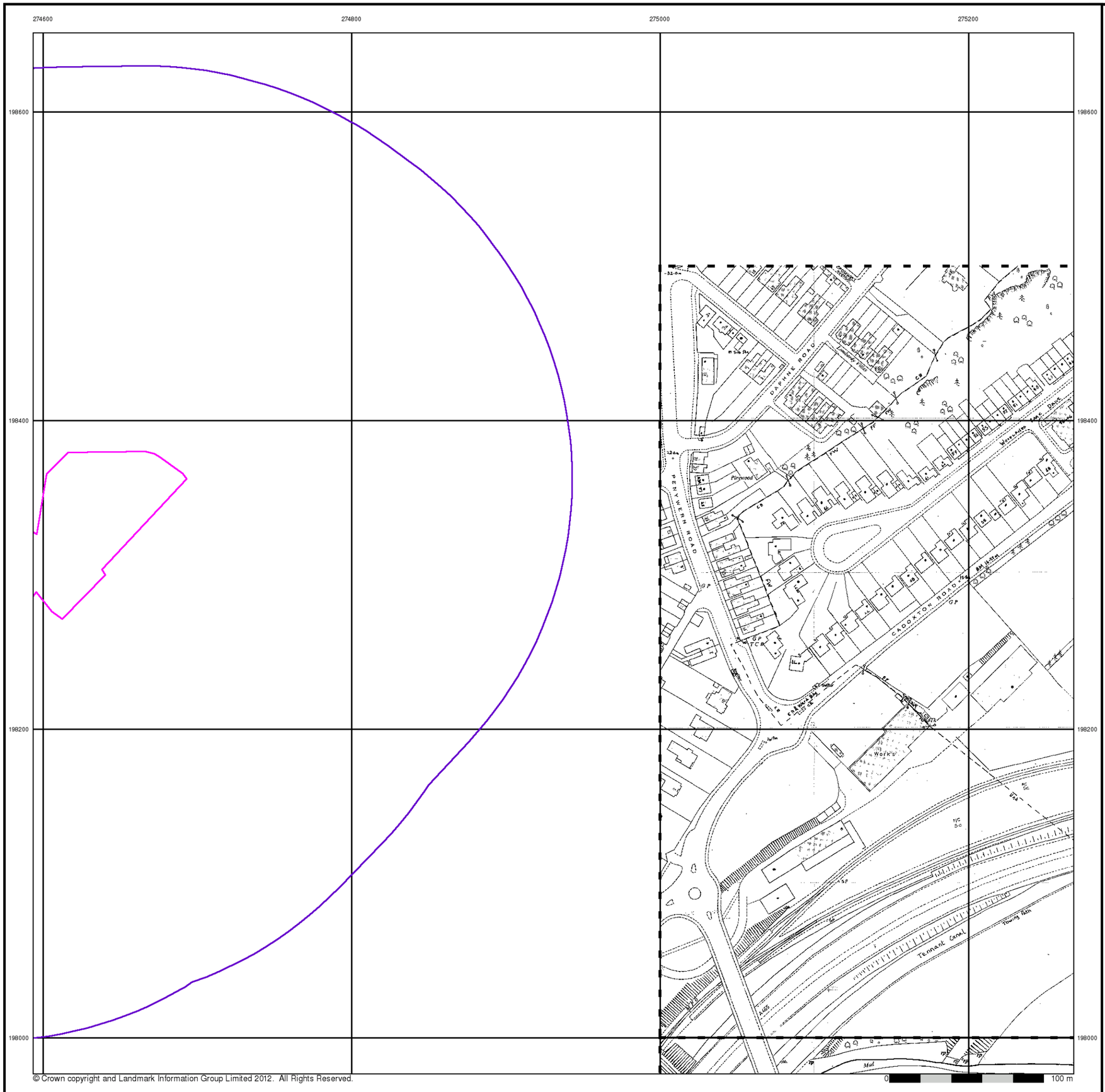


Additional SIMs

Published 1989

Source map scale - 1:1,250

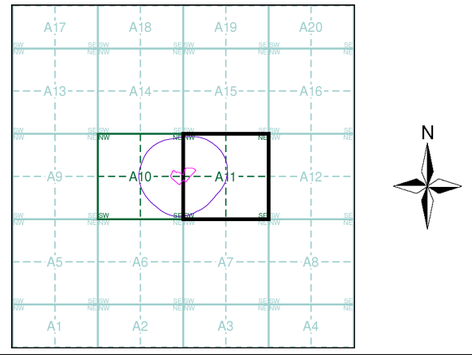
The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS7598SW
1989
1:1,250

SS7597NW
1989
1:1,250

Historical Map - Segment A11



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National Grid Reference:	274590, 198330
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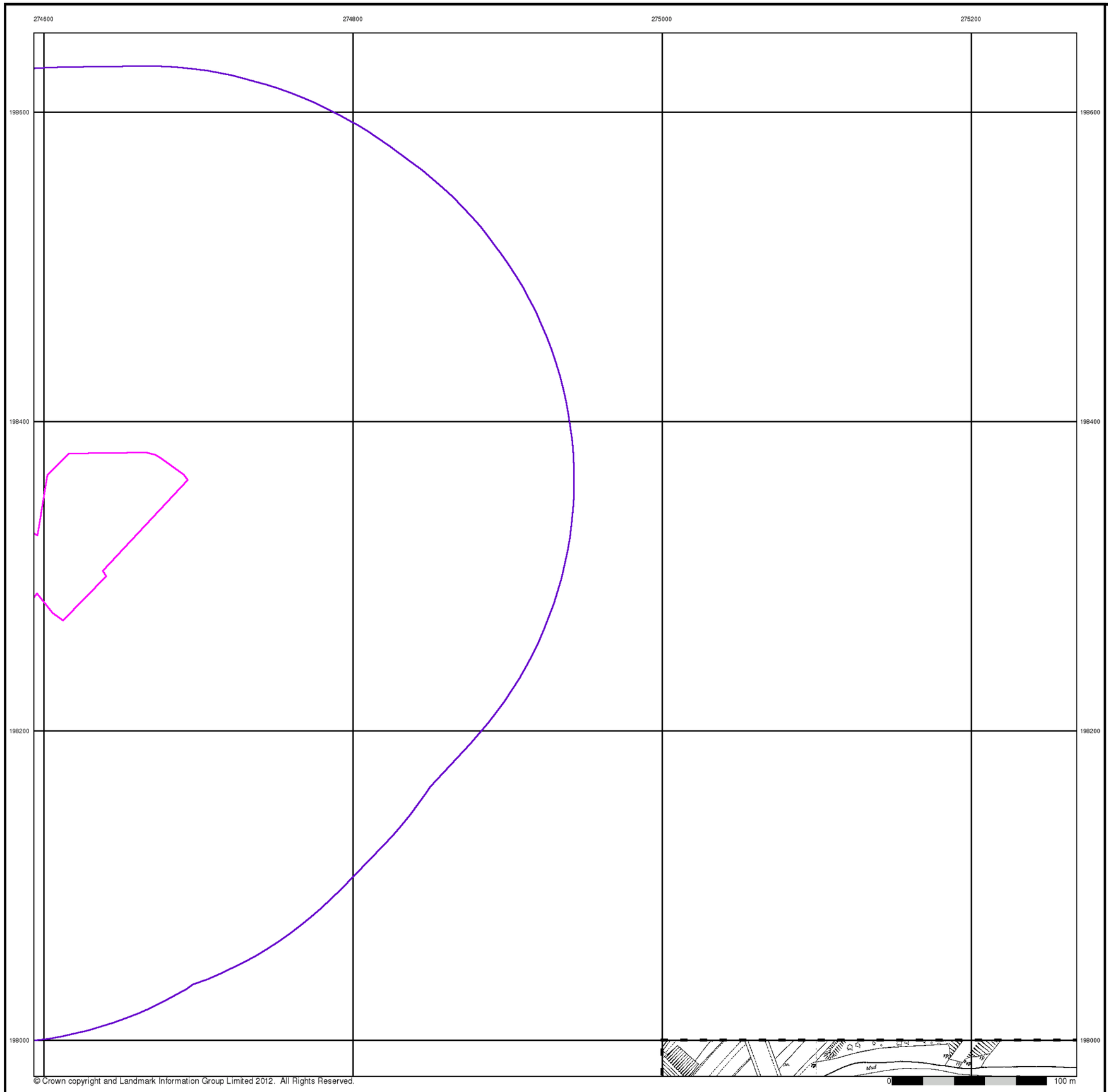


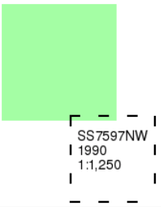
Additional SIMs

Published 1990

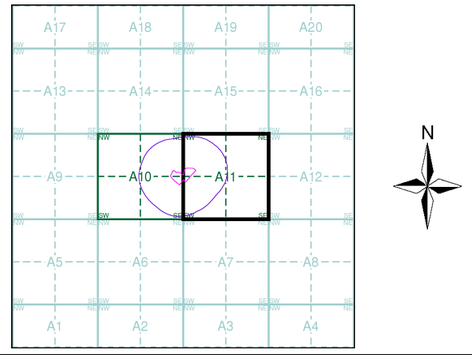
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A11



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Order Number:	44003267_2_1
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Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

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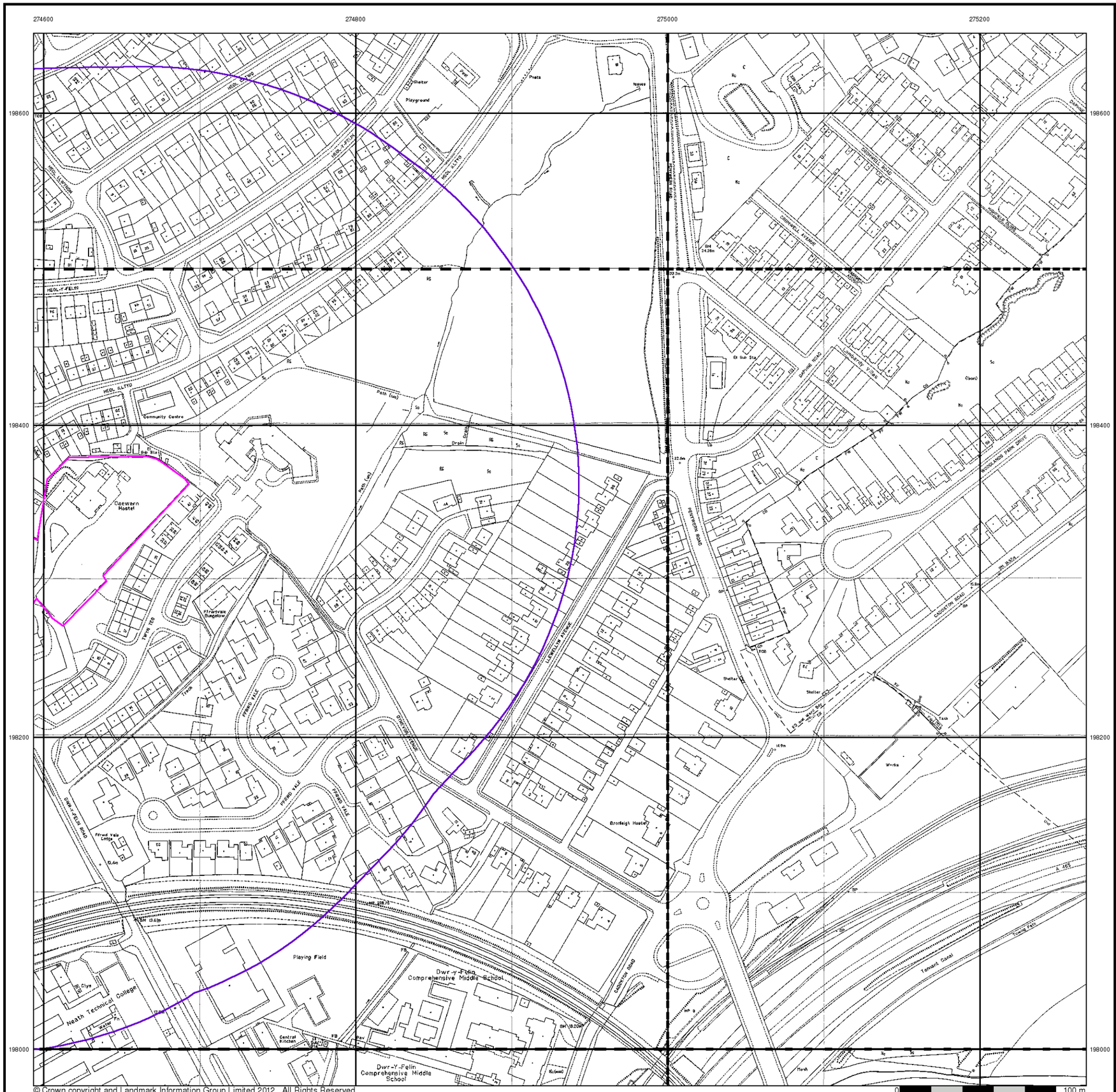

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EARTH SCIENCE PARTNERSHIP
ESP

Large-Scale National Grid Data

Published 1993

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS7498NE 1993 1:1,250	SS7598NW 1993 1:1,250
SS7498SE 1993 1:1,250	SS7598SW 1993 1:1,250
SS7497NE 1993 1:1,250	SS7597NW 1993 1:1,250

Historical Map - Segment A11

Order Details

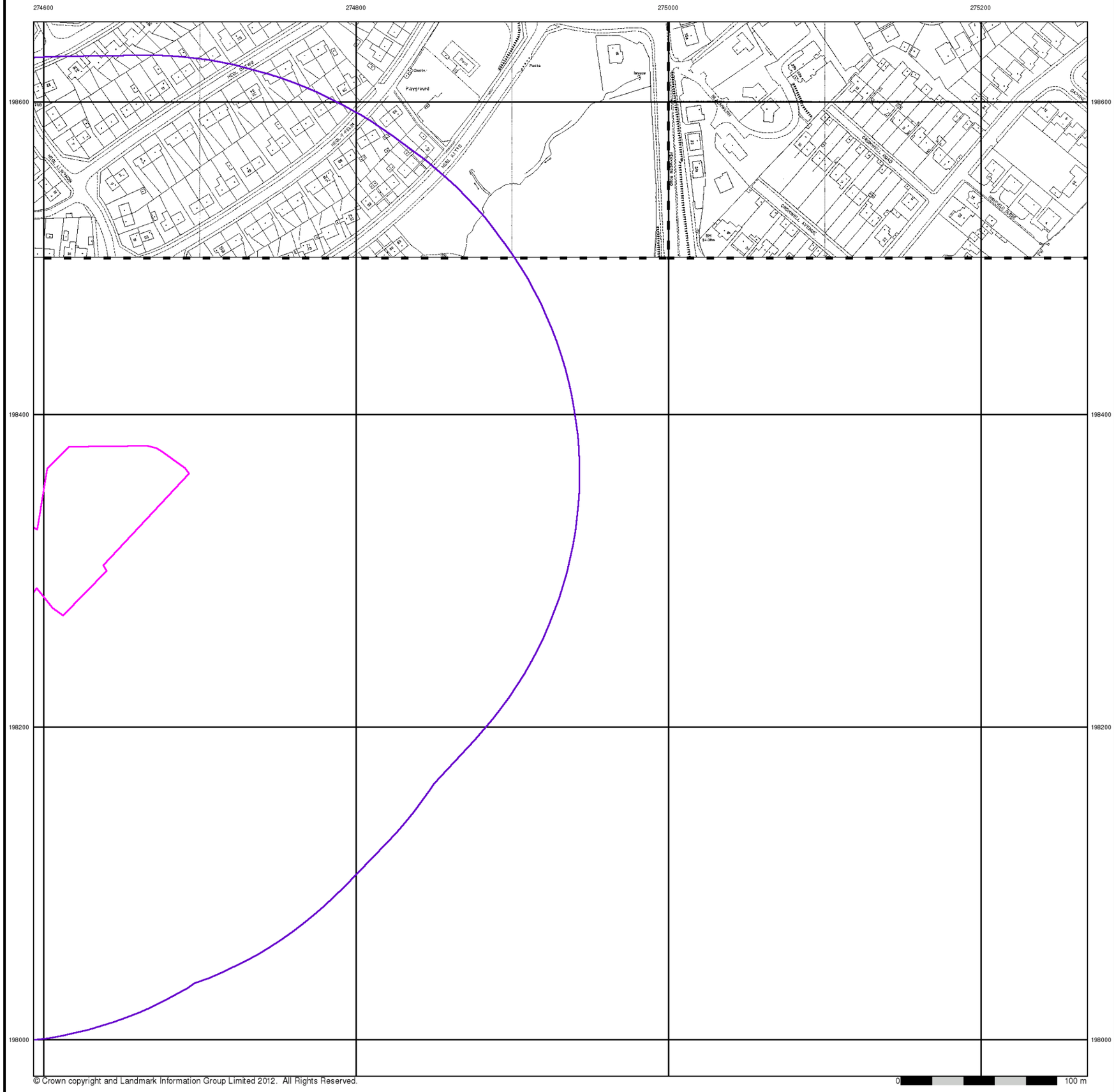
Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark
Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



EARTH SCIENCE PARTNERSHIP
ESP

Large-Scale National Grid Data

Published 1994 - 1996

Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

Historical Map - Segment A11

Order Details

Order Number:	44003267_2_1
Customer Ref:	5186e
National Grid Reference:	274590, 198330
Slice:	A
Site Area (Ha):	1.33
Search Buffer (m):	250

Site Details

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Landmark®
Information Group

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Fax:	0844 844 9951
Web:	www.envirocheck.co.uk

Appendix C- Environmental Data Report

Caewern Site, Heol Illtyd, Neath, SA10 7SE

Prepared for:
E Ltd
Earth Science Partnership Ltd
33 Cardiff Road
Taff's Well
Cardiff
CF15 7RB

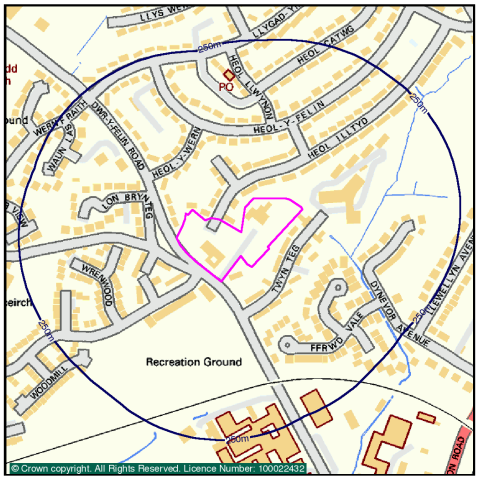
Report Reference: SCD_44003267_3_1

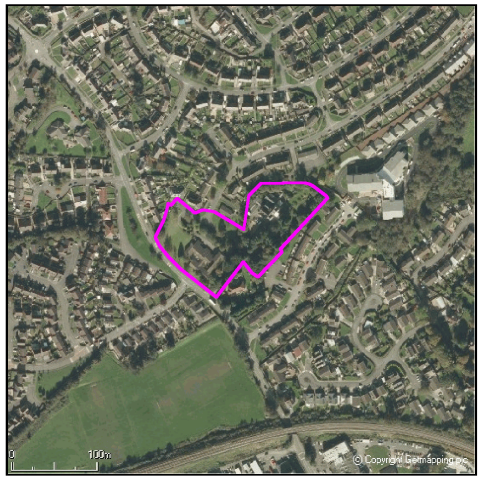
Report Date: 05-FEB-2013

Customer Reference: 5186e

National Grid Reference: 274590 198320

Site Area: 13265 m²





If you have any questions on the contents of this Report please contact Landmark Customer Helpdesk which is open from 9:00am - 5:30pm, Monday - Friday, via one of the following channels:

Telephone: 0844 844 9966
Fax: 0844 844 9980
Email: info@landmarkinfo.co.uk
Website: www.sitecheck.co.uk

Sitecheck® Data

Contents

Historical Land Use Potentially Infilled Land	Page No.	Reference Number (Map ID)
Potentially Infilled Land (Water)		
Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Date of Mapping: 1935	10	1

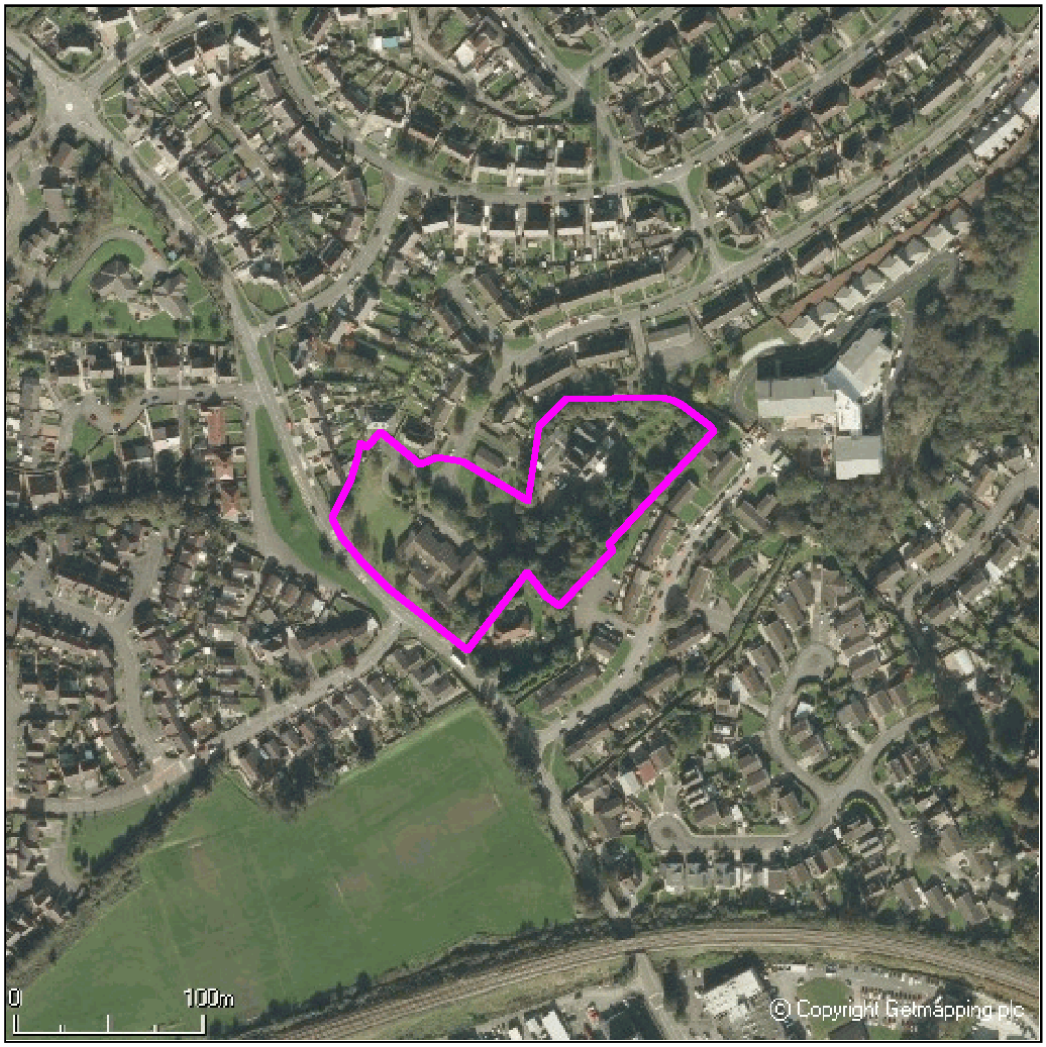
Sensitivity Pathways	Page No.	Reference Number (Map ID)
Groundwater Vulnerability		
Geological Classification: Minor Aquifer (Variably permeable) - These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers, Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise, Map Scale: 1:100,000, Map Name: Sheet 35 West Glamorgan, Contact Ref: 2	14	-

Other Factors Geological	Page No.	Reference Number (Map ID)
Coal Mining Affected Areas		
In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report., Contact Ref: 3	15	-
Mining Instability		
Risk: Inconclusive Coal Mining,	15	-
Radon Potential - Radon Affected Areas		
Affected Areas: The property is in a radon affected area, as between 3 and 5% of homes are above the action level, Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 1	15	-
Radon Potential - Radon Protection Measures		
Radon Protection Measures: Basic, Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 1	15	-
Potential for Landslide Ground Stability Hazards		
Hazard Potential: Low, Contact Ref: 1	15	-

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Other Factors Geological	Page No.	Reference Number (Map ID)
Potential for Shrinking or Swelling Clay Ground Stability Hazards		
Hazard Potential: Very Low, Contact Ref: 1	16	-
Potential for Collapsible Ground Stability Hazards		
Hazard Potential: Very Low, Contact Ref: 1	15	-

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk



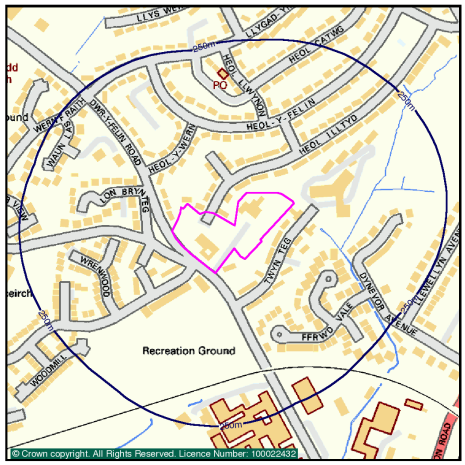
Site
Caewern Site,Heol Illtyd,Neath,SA10 7SE

Grid Reference
274590, 198320

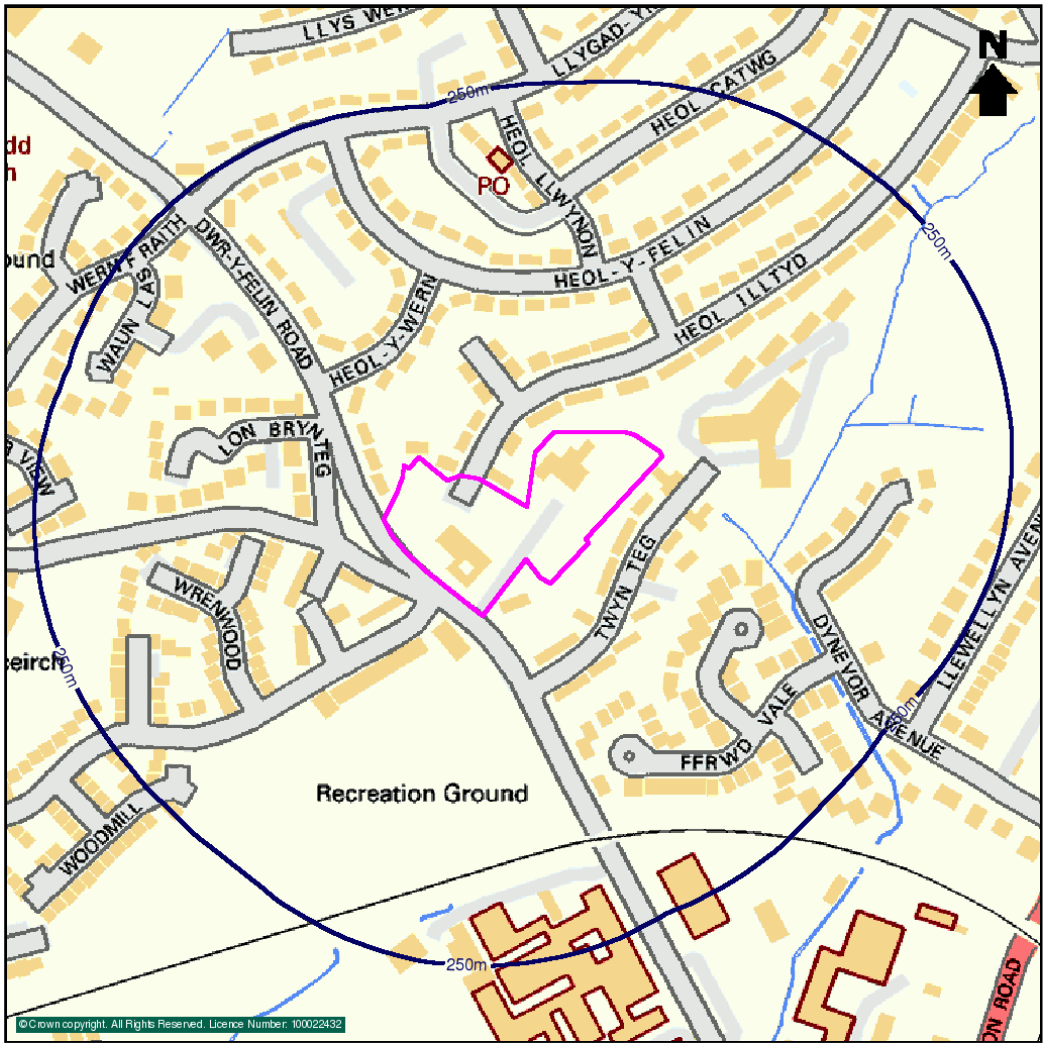
Report Reference
SCD_44003267_3_1

Customer Reference
5186e

Size of Site
13265 m²



If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk



Site
Caewern Site,Heol Illtyd,Neath,SA10 7SE

Grid Reference
274590, 198320

Report Reference
SCD_44003267_3_1

Customer Reference
5186e

Size of Site
13265 m²

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Current Land Use Contaminants	On Site 0	0-250m 2
Waste / Landfill Sites		
BGS Recorded Landfill Sites	0	0
Licensed Waste Management Facilities (Landfill Boundaries)	0	0
Licensed Waste Management Facilities (Locations)	0	0
Local Authority Recorded Landfill Sites	0	0
Registered Landfill Sites	0	0
Registered Waste Transfer Sites	0	0
Registered Waste Treatment or Disposal Sites	0	0
Statutory Authorisations		
Local Authority Pollution Prevention and Controls	0	0
Contaminated Land Register Entries and Notices	0	0
Registered Radioactive Substances	0	0
Discharge Consents		
Discharge Consents	0	0
Water Industry Act Referrals	0	0
Industrial Processes		
Integrated Pollution Controls	0	0
Integrated Pollution Control Registered Waste Sites	0	0
Integrated Pollution Prevention And Control	0	0
Local Authority Integrated Pollution Prevention And Control	0	0
Storage of Hazardous Substances		
Control of Major Accident Hazards Sites (COMAH)	0	0
Explosive Sites	0	0
Notification of Installations Handling Hazardous Substances (NIHHS)	0	0
Planning Hazardous Substance Consents	0	0
Contraventions		
Local Authority Pollution Prevention and Control Enforcements	0	0
Enforcement and Prohibition Notices	0	0
Planning Hazardous Substance Enforcements	0	0
Prosecutions Relating to Authorised Processes	0	0
Prosecutions Relating to Controlled Waters	0	0
Substantiated Pollution Incident Register	0	0

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Current Land Use Contaminants	On Site 0	0-250m 2
Potentially Contaminative Uses		
Contemporary Trade Directory Entries	0	1
Fuel Station Entries	0	0
Miscellaneous		
BGS Recorded Mineral Sites	0	1

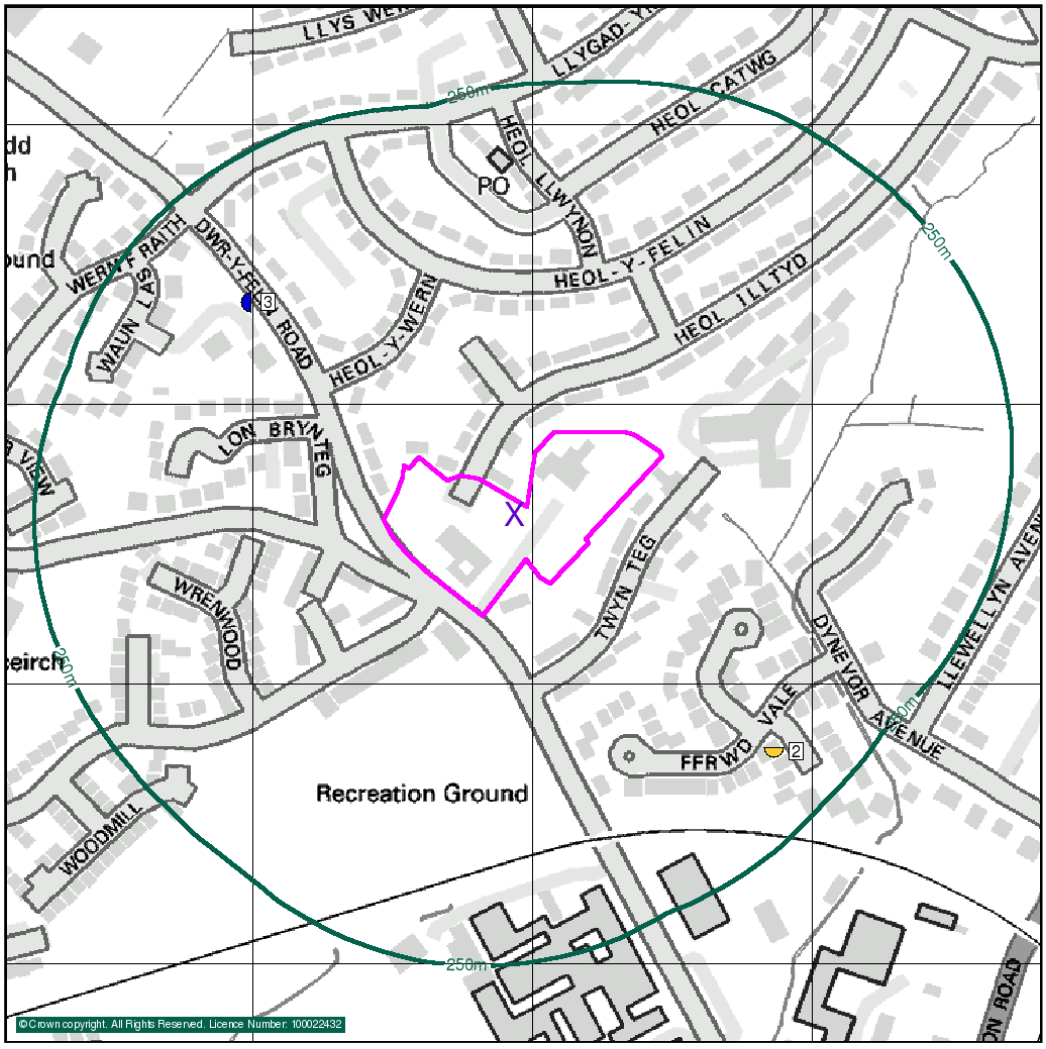
Historical Land Use Contaminants	On Site 1	0-250m 7
Potentially Contaminative Uses		
Historical Tanks And Energy Facilities	0	1
Potentially Contaminative Industrial Uses (Past Land Use)	0	2
Potentially Infilled Land		
Former Marshes	0	0
Potentially Infilled Land (Non-Water)	0	1
Potentially Infilled Land (Water)	1	3

Sensitivity Pathways and Receptors	On Site 1	0-250m 1
Pathways		
Groundwater Vulnerability	1	n/a
Drift Deposits	0	n/a
Historical Flood Liabilities	0	0
Extreme Flooding from Rivers or Sea without Defences	0	0
Flooding from Rivers or Sea without Defences	0	0
Areas Benefiting from Flood Defences	0	0
Flood Water Storage Areas	0	0
Flood Defences	0	0

Sensitivity Pathways and Receptors	On Site 1	0-250m 1
Environmentally Sensitive Receptors		
Areas of Outstanding Natural Beauty	0	0
Environmentally Sensitive Areas	0	0
Local Nature Reserves	0	0
Marine Nature Reserves	0	0
National Nature Reserves	0	0
Nearest Surface Water Feature	0	1
Ramsar Sites	0	0
Sites of Special Scientific Interest	0	0
Source Protection Zones	0	0
Special Areas of Conservation	0	0
Special Protection Areas	0	0
Water Abstractions	0	0
Protected Countryside Areas		
Forest Parks	0	0
National Parks	0	0
National Scenic Areas	0	0

Other Factors Geological	On Site 9	0-250m 3
Brine Compensation Area	0	n/a
Coal Mining Affected Areas	1	n/a
Mining Instability	1	0
Man-Made Mining Cavities	0	0
Natural Cavities	0	0
Potential for Collapsible Ground Stability Hazards	1	0
Radon Potential - Radon Affected Areas	1	n/a
Radon Potential - Radon Protection Measures	1	n/a
Potential for Compressible Ground Stability Hazards	1	0
Potential for Ground Dissolution Stability Hazards	0	0
Potential for Landslide Ground Stability Hazards	1	1
Potential for Running Sand Ground Stability Hazards	1	1
Potential for Shrinking or Swelling Clay Ground Stability Hazards	1	1
Non Coal Mining Areas of Great Britain	0	0

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk



General

- Site Boundary
- Search Buffer
- Bearing Reference Point
- Reference Number

Miscellaneous

- BGS Recorded Mineral Site

Potentially Contaminative Use

- Potentially Contaminative Use

Waste/Landfill Sites

- BGS Recorded Landfill Site
- Licensed Waste Management Facilities (Landfill)
- Local Authority Recorded Landfill Site
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site
- Registered Landfill Site
- Point Location of Registered Landfill Site
- BGS Recorded Landfill Site (Point)
- Licensed Waste Management Facilities (Location)
- Local Authority Recorded Landfill Site (Point)
- Registered Waste Transfer Site (Point)
- Registered Waste Treatment or Disposal Site (Point)
- Registered Landfill Site Potential Landfill Buffer

Contraventions

- Local Authority Pollution Prevention and Control Enforcement
- Planning Hazardous Substance Enforcement
- Prosecution Relating to Authorised Processes
- Enforcement and Prohibition Notice
- Substantiated Pollution Incident Register
- Prosecution Relating to Controlled Waters

Storage Of Hazardous Substances

- COMAH
- Planning Hazardous Substance Consent
- Explosive Site
- NHHS

Industrial Processes

- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Integrated Pollution Control Registered Waste Site
- Local Authority Integrated Pollution Prevention and Control

Statutory Authorisations

- Local Authority Pollution Prevention and Control
- Contaminated Land Register Entry or Notice (Point)
- Contaminated Land Register Entry or Notice
- Registered Radioactive Substance

Discharge Consents

- Discharge Consent
- Water Industry Act Referral

If you would like any further assistance regarding this report then please contact
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Contaminants Waste / Landfill Sites	Ref No.	Search Buffer	Direction
Local Authority Landfill Coverage			
Name: Neath Port Talbot County Borough Council, - Has supplied landfill data, Contact Ref: 4	-	On Site	E

Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Contemporary Trade Directory Entries			
Tynygarn Meat Supplies, 15, Ffrwd Vale, Neath, West Glamorgan, SA10 7BA, Meat - Wholesale, Status: Inactive, Positional Accuracy: Automatically positioned to the address	2	0-250m	SE

Miscellaneous	Ref No.	Search Buffer	Direction
BGS Recorded Mineral Sites			
Bryn-Teg, , Rhydding, Neath, West Glamorgan, Status: Ceased, Reference: 154088, Positional Accuracy: Located by supplier to within 10m, Contact Ref: 1	3	0-250m	NW

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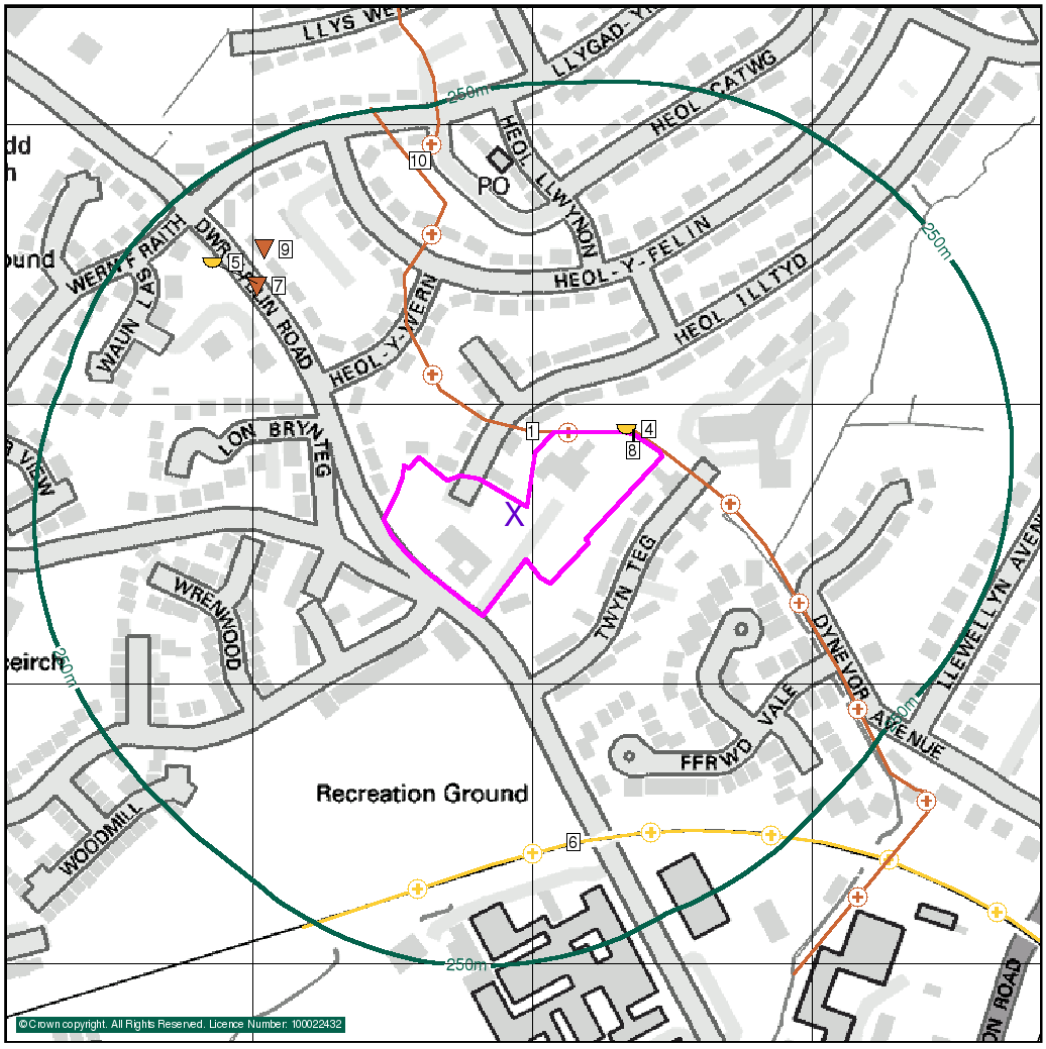

General	Potentially Contaminative Use	Potentially Infilled Land
Site Boundary	Point Feature	Point Feature
Search Buffer	Area Feature	Area Feature
Bearing Reference Point	Line Feature	Line Feature
Reference Number		

If you would like any further assistance regarding this report then please contact
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Contaminants Potentially Contaminative Uses	Ref No.	Search Buffer	Direction
Historical Tanks And Energy Facilities			
Electrical Sub Station Facilities, Scale of Mapping: 1:1,250, Date of Mapping: 1977	4	0-250m	NE
Potentially Contaminative Industrial Uses (Past Land Use)			
Mining & quarrying general, Date of Mapping: 1900	5	0-250m	NW
Railways, Date of Mapping: 1884 - 1992	6	0-250m	S

Potentially Infilled Land	Ref No.	Search Buffer	Direction
Potentially Infilled Land (Non-Water)			
Unknown Filled Ground (Pit, quarry etc), Date of Mapping: 1992	7	0-250m	NW
Potentially Infilled Land (Water)			
Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Date of Mapping: 1935	1	On Site	N
Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Date of Mapping: 1965	8	0-250m	NE
Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Date of Mapping: 1940	9	0-250m	NW
Unknown Filled Ground (Pond, marsh, river, stream, dock etc), Date of Mapping: 1935	10	0-250m	N

If you would like any further assistance regarding this report then please contact
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Map Details

The following maps have been analysed for Historical Tanks and Energy Facilities

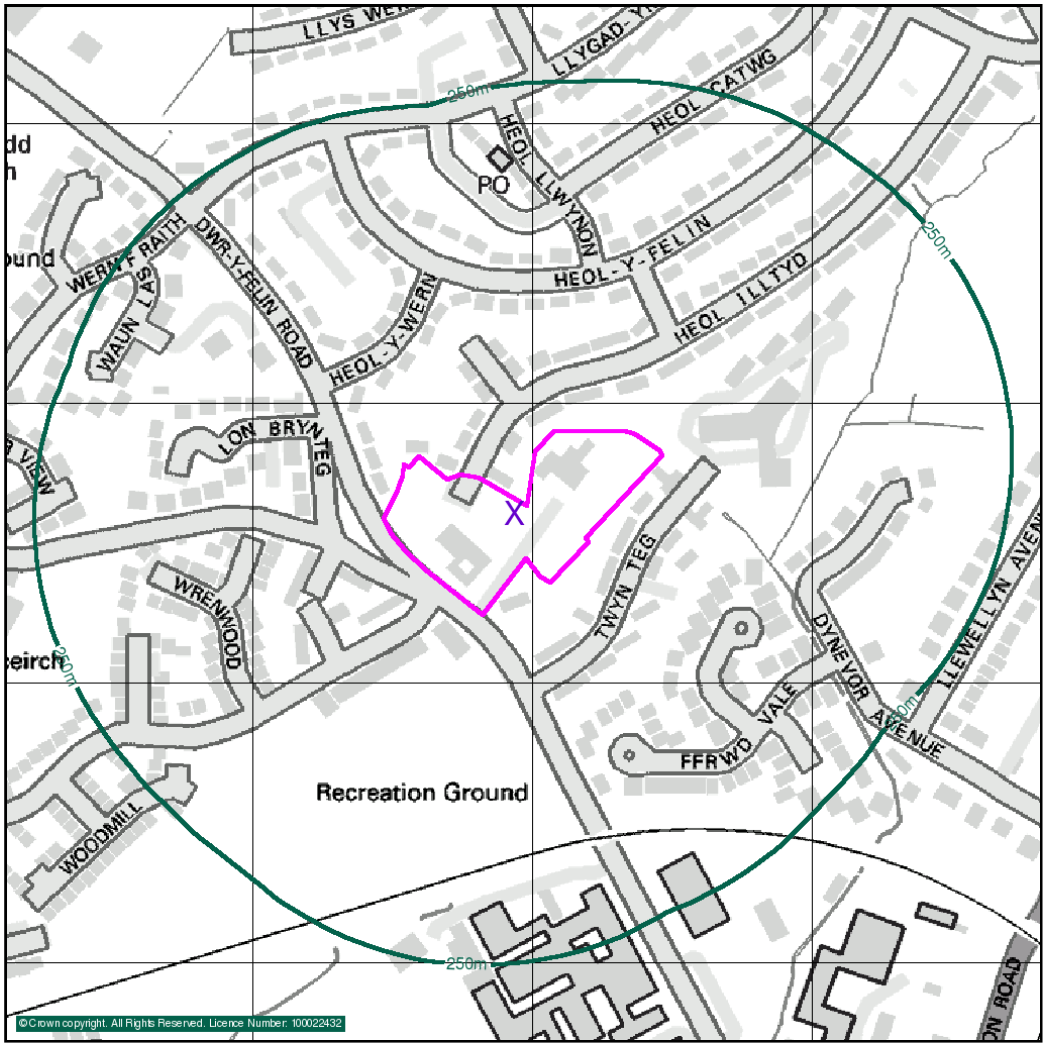
1:1,250	Mapsheet	Published
Ordnance Survey Plan	SS7498SE	1967
Ordnance Survey Plan	SS7498SW	1967
Ordnance Survey Plan	SS7498SE	1977
1:2,500	**Mapsheet**	**Published**
Ordnance Survey Plan	SS7498	1968

The following maps have been analysed for Potentially Contaminative Uses and Potentially Infilled Land information

1:10,000	Mapsheet	Published
Ordnance Survey Plan	SS79NW	1992
1:10,560	**Mapsheet**	**Published**
Glamorganshire	016_00	1884
Glamorganshire	016_SW	1900
Glamorganshire	016_SW	1921
Glamorganshire	016_SW	1935
Ordnance Survey Plan	SS79NW	1965

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Flood Map



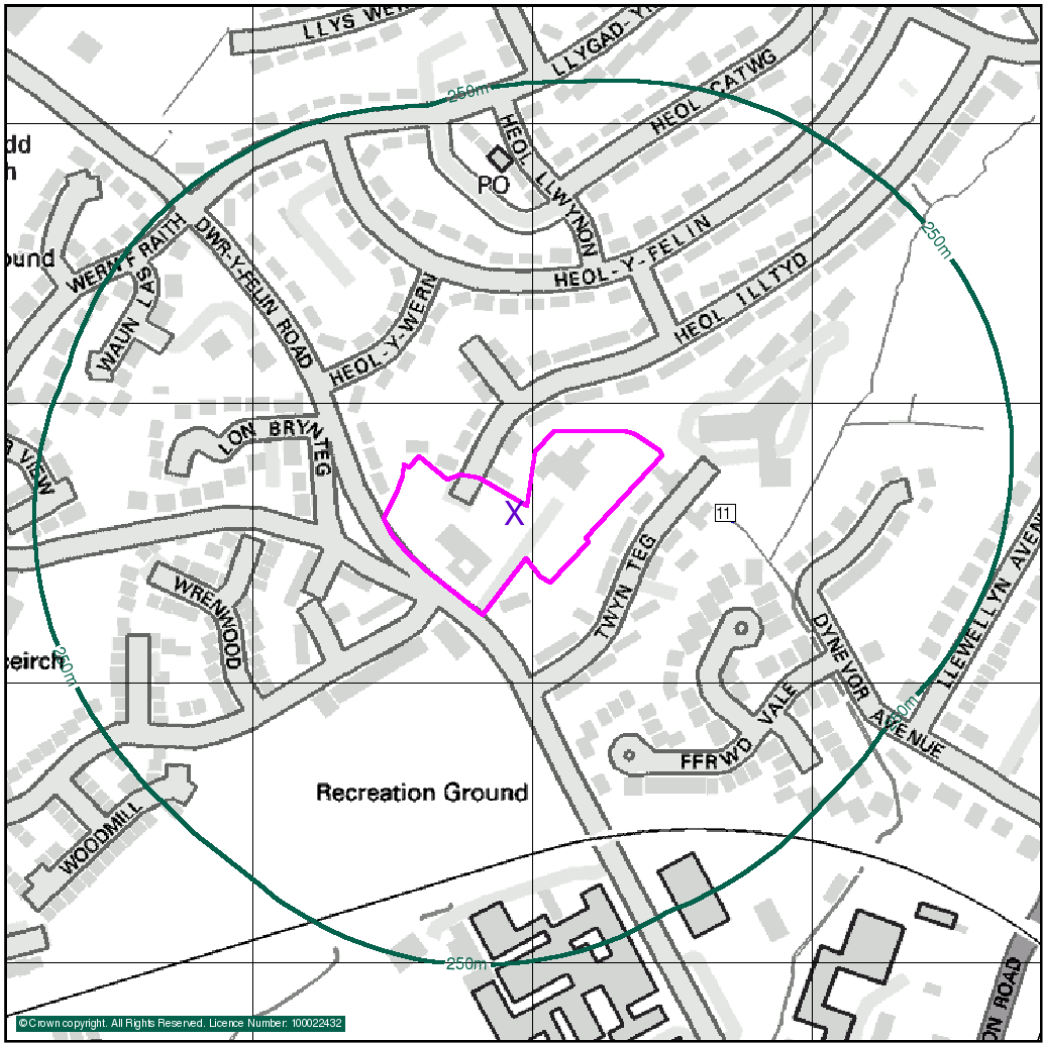
General

- Site Boundary
- Search Buffer
- Bearing Reference Point
- Reference Number

Area of Floodplain

- Areas Benefiting from Flood Defences
- Flood Water Storage Areas
- Flood Defences
- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)

Sensitivity Map



General

- Site Boundary
- Search Buffer
- Bearing Reference Point
- Reference Number

Environmentally Sensitive Land Use

- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- Nearest Surface Water Feature
- Water Abstractions

Protected Coutryside Areas

- Forest Park
- National Park
- National Scenic Area

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Pathways and Receptors Pathways	Ref No.	Search Buffer	Direction
Groundwater Vulnerability			
Geological Classification: Minor Aquifer (Variably permeable) - These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers, Soil Classification: Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise, Map Scale: 1:100,000, Map Name: Sheet 35 West Glamorgan, Contact Ref: 2	-	On Site	E
Drift Deposits			
None	-		-
Extreme Flooding from Rivers or Sea without Defences			
None	-		-
Flooding from Rivers or Sea without Defences			
None	-		-
Areas Benefiting from Flood Defences			
None	-		-
Flood Water Storage Areas			
None	-		-
Flood Defences			
None	-		-

Environmentally Sensitive Receptors	Ref No.	Search Buffer	Direction
Nearest Surface Water Feature			
Distance: 61m	11	0-250m	E

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Other Factors Geological	Search Buffer	Direction
Brine Compensation Area		
No		-
Coal Mining Affected Areas		
In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report., Contact Ref: 3	On Site	E
Mining Instability		
Risk: Inconclusive Coal Mining,	On Site	E
Non Coal Mining Areas of Great Britain		
No Hazard		-
Radon Potential - Radon Affected Areas		
Affected Areas: The property is in a radon affected area, as between 3 and 5% of homes are above the action level, Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 1	On Site	E
Radon Potential - Radon Protection Measures		
Radon Protection Measures: Basic, Source: British Geological Survey, National Geoscience Information Service, Contact Ref: 1	On Site	E
Potential for Collapsible Ground Stability Hazards		
Hazard Potential: Very Low Contact Ref: 1	On Site	E
Potential for Compressible Ground Stability Hazards		
Hazard Potential: No Hazard, Contact Ref: 1	On Site	E
Potential for Ground Dissolution Stability Hazards		
No Hazard		-
Potential for Landslide Ground Stability Hazards		
Hazard Potential: Low, Contact Ref: 1	On Site	E
Hazard Potential: Very Low, Contact Ref: 1	0-250m	N
Potential for Running Sand Ground Stability Hazards		
Hazard Potential: No Hazard Contact Ref: 1	On Site	E
Hazard Potential: Very Low Contact Ref: 1	0-250m	N

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Other Factors Geological	Search Buffer	Direction
Potential for Shrinking or Swelling Clay Ground Stability Hazards		
Hazard Potential: Very Low Contact Ref: 1	On Site	E
Hazard Potential: No Hazard Contact Ref: 1	0-250m	S

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Registered Landfill Sites

At present no complete national data set exists for landfill site boundaries, therefore a point grid reference, provided by the data supplier, is used for some landfill sites. In certain cases the point grid references supplied provide only an approximate position and can vary from the site entrance to the centre of the site. Where the exact position of the site is unclear, Landmark construct either a 100 metre or 250 metre "buffer" around the point to warn of the possible presence of landfill. The size of this "buffer" relates to the positional accuracy that can be attributed to the site. The "buffer" is shown on the map as an orange cross-hatched circle and is referred to in the map legend as Potential Landfill Buffer. Where actual boundaries are available, the landfill site area is shown on the map as a red diagonal hatched polygon and referred to in the map legend as Registered Landfill Site.

Local Authority Recorded Landfill Sites

Local Authority landfill data are sourced from individual local authorities that were able to provide information on sites operating prior to the introduction of the Control of Pollution Act (COPA) in 1974. Appropriate authorities are listed under Local Authority Landfill Coverage with an indication of whether or not they were able to make landfill data available. Details of any records identified are disclosed. You should be aware that if the local authority 'Had landfill data but passed it to the relevant environment agency' it does not necessarily mean that local authority landfill data is included in our other Landfill datasets. In addition if no data has been made available, for all or part of the search area, you should be aware that a negative response under 'Local Authority Recorded Landfill Sites' does not necessarily confirm that no local authority landfills exist.

Flooding

The Sitecheck report flood map plots all flood related features revealed within the search area as supplied by the relevant agency. However, to avoid confusion, the text entry in the body of the report only reveals the detail of the nearest feature in each flood data set. This is also reflected in the summary table where only a single entry is included to indicate the search buffer of the nearest occurrence.

Mining Instability Data

The Mining Instability data was obtained on Licence from Ove Arup + Partners Limited (for further information, contact mining.review@arup.com). No reproduction or further use of such data is to be made without the prior written consent of Ove Arup + Partners Limited. The information and data supplied in the Product are derived from publicly available records and other third party sources and neither Ove Arup + Partners nor Landmark warrant the accuracy or completeness of such information or data.

The information in this Sitecheck Data Report is derived from a number of statutory and non-statutory sources. While every effort is made to ensure accuracy, Landmark cannot guarantee the accuracy or completeness of such information or data, nor to identify all the factors that may be relevant. If you are a private individual using this report Landmark recommend that you discuss its contents in full with your professional advisor. It is essential to read this report in conjunction with the Product User Guide and your attention is drawn to the scope of the report section within this guide.

The Sitecheck Data User guide is available free of charge from our website www.sitecheck.co.uk

Ordnance Survey® Licensed Partner
Environment Agency
SEPA Scottish Environment Protection Agency
Landmark® Information Group
THE COAL AUTHORITY
BGS 1835 British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
SearchCode™
COPSO

If you would like any further assistance regarding this report then please contact
Landmark on (Tel) 0844 844 9966, (Fax) 0844 844 9980, Email: helpdesk@landmark.co.uk

Contact Names and Addresses

1 British Geological Survey Enquiry Service

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
Nottinghamshire
NG12 5GG

Telephone 0115 936 3143
Fax 0115 936 3276

enquiries@bgs.ac.uk
www.bgs.ac.uk

2 Environment Agency National Customer Contact Centre (NCCC)

PO Box 544
Templeborough
Rotherham
S60 1BY

Telephone 08708 506 506

enquiries@environment-agency.gov.uk

Please note that the Environment Agency/SEPA have a charging policy in place for enquiries.

3 The Coal Authority Mining Report Service

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

Telephone 0845 7626848

thecoalauthority@coal.gov.uk

4 Neath Port Talbot County Borough Council Environmental Health Department

Room 322
Neath Civic Centre
Neath
West Glamorgan
SA11 3QZ

Telephone 01639 763333
Fax 01693 763444

www.neath-porttalbot.gov.uk

Other Contacts

Landmark Information Group Limited

Legal and Financial
Imperium
Imperial Way
Reading
Berkshire
RG2 0TD

Telephone 0844 844 9966
Fax 0844 844 9980

info@landmarkinfo.co.uk
www.landmarkinfo.co.uk

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Landmark Information Group Ltd, Imperium, Imperial Way, Reading, Berkshire, RG2 0TD. Telephone: 0844 844 9966, Fax No: 0844 844 9980, email: helpdesk@landmark.co.uk which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered firms maintain compliance with the Code.

The Search Code:

- Provides protection for homebuyers, sellers, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- Sets out minimum standards which firms compiling and selling search reports have to meet.
- Promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- Enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Code will:

- Display the Code logo prominently on their search reports.
- Act with integrity and carry out work with due skill, care and diligence.
- At all times maintain adequate and appropriate insurance to protect consumers.
- Conduct business in an honest, fair and professional manner.
- Handle complaints speedily and fairly.
- Ensure that all search services comply with the law, registration rules and standards.
- Monitor their compliance with the Code.

COMPLAINTS

If you have a query or complaint about your search, you should raise it directly with the firm, and if appropriate ask for your complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if it finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details:
The Property Ombudsman Scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Search Code

COMPLAINTS PROCEDURE

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of its receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

Complaints should be sent to:

Head of Customer Relations
Landmark Information Group Ltd
Landmark UK Property
Imperium
Imperial Way
Reading
RG2 0TD

Telephone: 0844 844 9966

E-mail: helpdesk@landmark.co.uk

Fax: 0844 844 9980

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman Scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

LANDMARK CONVEYANCING TERMS & CONDITIONS

Full Terms and Conditions can be found on the following link:

http://www.landmarkinfo.co.uk/Terms/Show/432

Appendix D- Coal Mining Report

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: 0845 762 6848 DX 716176 MANSFIELD 5

LANDMARK INFORMATION GROUP LIMITED
SOWTON INDUSTRIAL ESTATE
ABBEY COURT
UNIT 5/7 EAGLE WAY
EXETER
DEVON
EX2 7HY

Our reference:	**51000223168003**
Your reference:	**44003267**
Date of your enquiry:	**06 February 2013**
Date we received your enquiry:	**06 February 2013**
Date of issue:	**06 February 2013**

This report is for the property described in the address below and the attached plan.

Non-Residential Coal Authority Mining Report

SITE AT CAEWERN SITE, HEOL ILLTYD, NEATH PORT TALBOT,

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

The property is in the likely zone of influence from workings in 4 seams of coal at shallow to 290m depth, and last worked in 1928.

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

Within, or within 20 metres of, the boundary of the property there is 1 mine entry, the approximate position of which is shown on the attached plan.

There is no record of what steps, if any, have been taken to treat the mine entry.

Records may be incomplete. Consequently, there may exist in the local area mine entries of which the Coal Authority has no knowledge.

For an additional fee, the Coal Authority will provide a supplementary Mine Entry Interpretive Report. The report will provide a separate assessment for the mine entry (entries) referred to in this report. It will give details based on information in the Coal Authority's possession, together with an opinion on the likelihood of mining subsidence damage arising from ground movement as a consequence of the existence of the mine entry/entries. It will also give details of the remedies available for subsidence damage where the mine entry was sunk in connection with coal mining.

Please note that it may not be possible to produce a report if the main building to the property cannot be identified from Coal Authority plans (ie. for development sites and new build).

For further advice on how to order this additional information visit www.groundstability.com or telephone 0845 7626 848.

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.

Withdrawal of support

The property is not in an area for which a notice of entitlement to withdraw support has been published.

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

Working facilities orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to owners of former copyhold land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Comments on Coal Authority information

The attached plan shows the approximate location of the disused mine entry/entries referred to in this report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence act 1991*). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A leaflet setting out the rights and the obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by telephoning 0845 762 6848 or online at www.coal.decc.gov.uk/en/coal/cms/services/claims.

If you wish to discuss the relevance of any of the information contained in this report you should seek the advice of a qualified mining engineer or surveyor. If you or your adviser wish to examine the source plans from which the information has been taken these are normally available at our Mansfield office, free of charge, by prior appointment, telephone 01623 637235. Should you or your adviser wish to carry out any physical investigations that may enter, disturb or interfere with any disused mine entry the prior permission of the owner must be sought. For coal mine entries the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries). Our emergency telephone number at all times is 01623 646333.

*Note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals. The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed. This is necessary due to the public safety implications of any development in these circumstances.

Information from the Cheshire Brine Subsidence Compensation Board

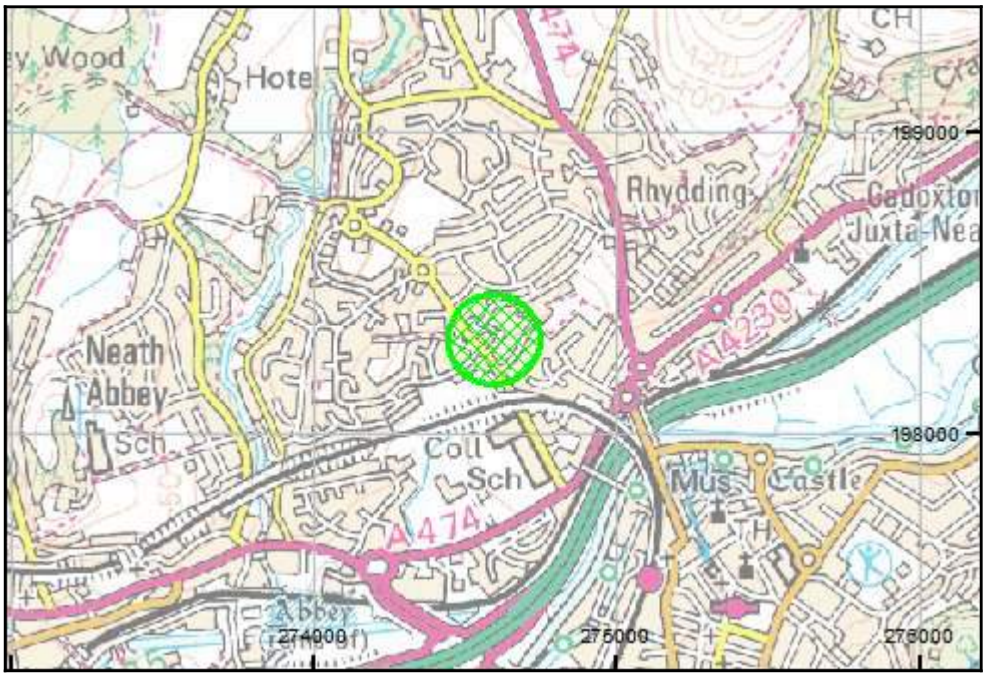
The property lies outside the Cheshire Brine Compensation District.

Additional Remarks

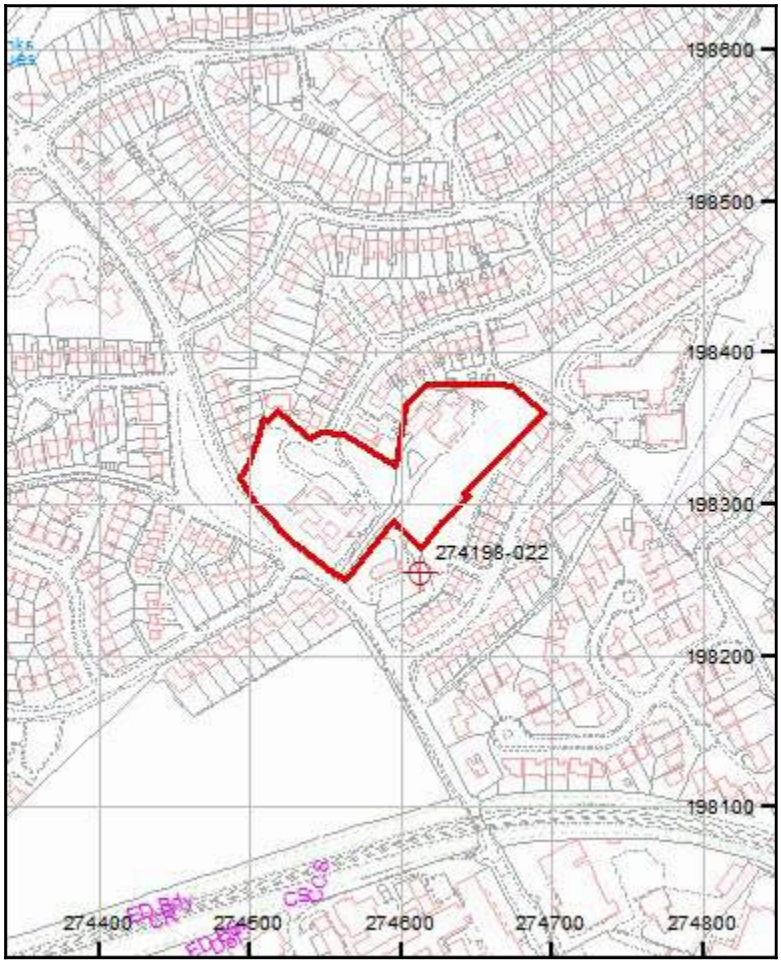
This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006.

Location map

Approximate position of property



Enquiry boundary



Key

Approximate position of enquiry boundary shown

Disused Adit or Mineshaft

Mapping sourced from Ordnance Survey

Appendix E- UXO Report

Pre-Desk Study Assessment

Site:	Caewern, Neath
Client:	Earth Science Partnership
Contact:	
Date:	
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway, junctions and sidings. ■ Industry, including steel works and chemical works.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	Anecdotal evidence indicates that the Site was requisitioned by the military and used as a civil defence control centre. This is not considered to provide a source of Unexploded Ordnance (UXO) hazard.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway, junctions and sidings. ■ Industry, including steel and engineering works. ■ Military camps. ■ Anti-Aircraft (AA) guns and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	3No. The nearest was located approximately 3km from the Site.
WWII Bombing	During WWII the Site was located in the Rural District (RD) of Neath, which officially recorded 205No. High Explosive (HE) bombs with a very low regional bombing density of 3.9 bombs per 405 hectares (ha). No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	No readily available records of bombing or other significant military activity on the Site have been found. It is considered that the Site is likely to have a low Unexploded Ordnance (UXO) hazard level. A detailed desk study, whilst always prudent, is likely to do no more than confirm a low UXO hazard level for the Site.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It is possible that further research may change the level of identified hazard.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

Appendix F1- Previous Investigation, Trial Pit Records

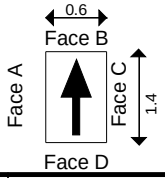
TP1A

Site Location:	Caewern House, Neath
Client:	POBL Group.
Project No:	6346H

Excavation date:	15/09/2016	**Excavation method/plant:**	**Shoring/support:**
Backfill date:	15/09/2016	Mechanical Excavator.	None.
Logged by:	ESP-DT.	1.5T Tracked Mini Digger.	

Survey details:
Ground Level: 53.500 mOD
Easting: 274653 m
Northing: 198354 m
Bearing: -

Plan details:



Face stability:
Minor spalling throughout.

Groundwater observations:
No groundwater observed.

Sampling & Testing / Stratum Details

Depth	Type	PID (ppm)	S_u (kPa)	(Thk) & Depth	Description	Legend
0.10	D			(0.20) 0.20	Soft brown slightly sandy grvelly CLAY. Rare fragment of porcelain. Common rootelets within upper 100mm. (MADE GROUND).	
				(0.50) 0.70	Soft to firm brown sandy gravelly CLAY. Rare fragments of brick and clay tile. (MADE GROUND).	
0.60	D			(0.40) 1.10	Soft to firm dark brown sandy gravelly CLAY with rare fragments of brick. Land drain identified at base of pit. Trial pit terminated. (MADE GROUND).	
					End of trial pit at 1.10 m depth.	

General notes:

1. All linear dimensions are in metres unless stated otherwise.
2. All relative density and shear strength descriptions are based only on field observations and available in-situ shear vane data.
3. Trial pit logged from the ground surface.

Weather and environmental conditions:

Dry, warm and sunny.

Other comments:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Trial pit excavated on lower level to undertake soakaway test.
3. Trial pit terminated at 1.1m due to land drain at base. Repositioned to TP1b.
4. Trial pit backfilled with arisings on completion.

TP1B

Site Location: Caewern House, Neath
Client: POBL Group.
Project No: 6346H

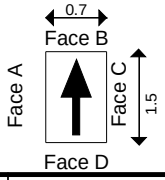
Excavation date: 15/09/2016
Backfill date: 15/09/2016
Logged by: ESP-DT.

Excavation method/plant: Mechanical Excavator. 1.5T Tracked Mini Digger.

Shoring/support: None.

Survey details:
Ground Level: 53.500 mOD
Easting: 274655 m
Northing: 198353 m
Bearing: -

Plan details:



Face stability:
Minor spalling throughout.

Groundwater observations:
No groundwater observed.

Sampling & Testing / Stratum Details

Depth	Type	PID (ppm)	S_u (kPa)	(Thk) & Depth	Description	Legend
				(0.15) 0.15	Soft brown slightly sandy grvelly CLAY. Rare fragments of brick. Common rootelets within upper 100mm. (MADE GROUND).	
				(0.45)	Soft to firm brown sandy gravelly CLAY. Rare fragments of clay tile. (MADE GROUND).	
0.65	D			0.60		
				(0.80)	Probably loose to medium dense dark blackish brown slightly clayey sandy fine to coarse angular GRAVEL. Possible rare ash and clinker. (MADE GROUND).	
				1.40		
1.60	B			(0.70)	Probably medium dense brown with patches of grey sandy clayey coarse angular to subangular sandstone GRAVEL with a low to medium angular sandstone cobble content. (Possible GRADE E GROVESEND FORMATION).	
2.00	B			2.10	*End of trial pit at 2.10 m depth.*	

General notes:

1. All linear dimensions are in metres unless stated otherwise.
2. All relative density and shear strength descriptions are based only on field observations and available in-situ shear vane data.
3. Trial pit logged from the ground surface.

Weather and environmental conditions:

Dry, warm and sunny.

Other comments:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Trial pit excavated on lower level to undertake soakaway test. Repositioned from TP1a.
3. Trial pit backfilled with arisings on completion.

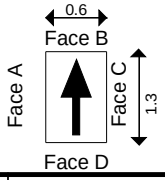
TP2

Site Location:	Caewern House, Neath
Client:	POBL Group.
Project No:	6346H

Excavation date:	15/09/2016	**Excavation method/plant:**	**Shoring/support:**
Backfill date:	15/09/2016	Mechanical Excavator.	None.
Logged by:	ESP-DT.	1.5T Tracked Mini Digger.	

Survey details:
Ground Level: 57.200 mOD
Easting: 274644 m
Northing: 198373 m
Bearing: -

Plan details:



Face stability:
Minor spalling throughout.

Groundwater observations:
No groundwater observed.

Sampling & Testing / Stratum Details

Depth	Type	PID (ppm)	S_u (kPa)	(Thk) & Depth	Description	Legend
0.10	D			(0.15) 0.15	Soft dark brown sandy CLAY. Common rootlets within upper 100mm. Re-worked soils. (MADE GROUND).	
				(0.75)	Firm light brown slightly gravelly sandy CLAY with a low subrounded sandstone cobble content. Rare fragments of glass and fragments of glass bottles. (MADE GROUND).	
0.60	D			0.90		
1.10	D			(1.70)	Stiff light brown gravelly sandy CLAY with a low subrounded sandstone cobble content. (Possible GRADE E GROVESEND FORMATION).	
2.00	D			2.60	*End of trial pit at 2.60 m depth.*	

General notes:

1. All linear dimensions are in metres unless stated otherwise.
2. All relative density and shear strength descriptions are based only on field observations and available in-situ shear vane data.
3. Trial pit logged from the ground surface.

Weather and environmental conditions:

Dry, warm and sunny.

Other comments:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Trial pit excavated adjacent to proposed Block
3. Trial pit terminated at maximum reach of excavator reached.
4. Trial pit backfilled with arisings on completion.

TP3

Site Location: Caewern House, Neath
Client: POBL Group.
Project No: 6346H

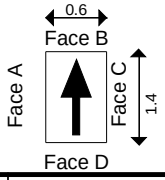
Excavation date: 15/09/2016
Backfill date: 15/09/2016
Logged by: ESP-DT.

Excavation method/plant: Mechanical Excavator. 1.5T Tracked Mini Digger.

Shoring/support: None.

Survey details:
Ground Level: 56.700 mOD
Easting: 274650 m
Northing: 198369 m
Bearing: -

Plan details:



Face stability:
Minor spalling throughout.

Groundwater observations:
No groundwater observed.

Sampling & Testing / Stratum Details

Depth	Type	PID (ppm)	S_u (kPa)	(Thk) & Depth	Description	Legend
0.20	D			(0.25) 0.25	Soft dark brown sandy CLAY. Common rootlets within upper 100mm. Rare fragments of brick and clay tile. Re-worked soils. (MADE GROUND).	
0.50	D			(0.55)	Soft brown slightly sandy slightly gravelly clay. Rare fragment of brick. (MADE GROUND).	
0.70	D			0.80		
1.00	D			(0.25) 1.05	Firm light brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to subangular. Possible re-worked soils. (MADE GROUND).	
1.20	B			(0.55)	Probably medium dense to dense dark brown clayey sandy fine to coarse angular sandstone GRAVEL with a medium angular sandstone cobble content. (Possible GRADE E GROVESEND FORMATION).	
				1.60	*End of trial pit at 1.60 m depth.*	

General notes:

1. All linear dimensions are in metres unless stated otherwise.
2. All relative density and shear strength descriptions are based only on field observations and available in-situ shear vane data.
3. Trial pit logged from the ground surface.

Weather and environmental conditions:

Dry, warm and sunny.

Other comments:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Trial pit excavated in area of proposed Block
3. Trial pit terminated in dense strata.
4. Trial pit backfilled with arisings on completion.

TP4

Site Location: Caewern House, Neath
Client: POBL Group.
Project No: 6346H

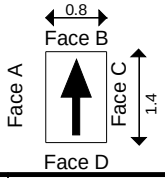
Excavation date: 15/09/2016
Backfill date: 15/09/2016
Logged by: ESP-DT.

Excavation method/plant: Mechanical Excavator. 1.5T Tracked Mini Digger.

Shoring/support: None.

Survey details:
Ground Level: 55.000 mOD
Easting: 274639 m
Northing: 198360 m
Bearing: -

Plan details:



Face stability:
Minor spalling throughout.

Groundwater observations:
No groundwater observed.

Sampling & Testing / Stratum Details

Depth	Type	PID (ppm)	S_u (kPa)	(Thk) & Depth	Description	Legend
				(0.10) 0.05	TARMACADAM. (MADE GROUND).	
0.20	D			(0.15) 0.15	CONCRETE. (MADE GROUND).	
				0.30	Probably dense brown sandy fine to coarse sandy angular GRAVEL. (MADE GROUND).	
0.50	D			(0.50)	Probably very dense brown very clayey sandy fine to coarse angular GRAVEL with a medium to high angular cobble and low to medium angular boulder content. Occasional bricks and brick fragmets. (MADE GROUND).	
				0.80		
				(0.50)	Probably dense to very dense brown sandy angular GRAVEL and COBBLES. Occasional bricks and brick fragments. (MADE GROUND).	
1.10	B					
				1.30	*End of trial pit at 1.30 m depth.*	

General notes:

1. All linear dimensions are in metres unless stated otherwise.
2. All relative density and shear strength descriptions are based only on field observations and available in-situ shear vane data.
3. Trial pit logged from the ground surface.

Weather and environmental conditions:

Dry, warm and sunny.

Other comments:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Trial pit excavated adjacent to Caewern House.
3. Surface tarmacadam broken out prior to excavation.
4. Trial pit backfilled with arisings on completion.

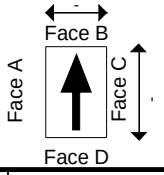
TP7

Site Location:	Caewern, Neath
Client:	Grwp Gwalia
Project No:	5186E

Excavation date:	14/05/2013	**Excavation method/plant:**	Mechanical Excavator JCB 3CX	**Shoring/support:**	None
Backfill date:	14/05/2013				
Logged by:	DB				

Survey details:
Ground Level: 49.900 mOD
Easting: 274590 m
Northing: 198330 m
Bearing: -

Plan details:



Face stability:
Minor spalling throughout.

Groundwater observations:
Minor inflow at 2.4m.

Sampling & Testing / Stratum Details

Depth	Type	PID (ppm)	S_u (kPa)	(Thk) & Depth	Description	Legend
				(0.20)	Rough vegetated surface followed by: soft dark brown sandy CLAY. (TOPSOIL).	
				0.20		
0.30	D				Probably dense grey brown silty sandy angular tabular coarse GRAVEL with a medium angular tabular cobble content. Predominantly sandstone and mudstone. (COAL MEASURES BEDROCK, GRADE IV - HIGHLY WEATHERED).	
0.80	D					
				(3.30)		
				3.50	*End of trial pit at 2.50 m depth.*	

General notes:

1. All linear dimensions are in metres unless stated otherwise.
2. All relative density and shear strength descriptions are based only on field observations and available in-situ shear vane data.
3. Trial pit logged from the ground surface.

Weather and environmental conditions:

Wet & Cold

Other comments:

1. Grid reference of site only.
2. Elevation interpolated from site survey, based on site datum.
3. Pit backfilled with arisings on completion.

Appendix F2- Previous Investigation, Windowless Sample Borehole Records

Project Name: Caewern House, Neath.	Drilling method: Windowless Sampling.	**WS1**
Site Location: Neath.	Equipment: Terrier.	
Client: POBL Group.		
Project No: 6346H		
Start date: 15/09/2016	Driller:	Ground Level: 56.000 mOD
End date: 15/09/2016	Logged by: ESP-DT.	Easting: 274666 m
Backfill date: 15/09/2016	Date logged: 15/09/2016	Northing: 198370 m

Sample Details and SPT Data / Strata Details / Water

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth	Depth (Thickness)	Description	Legend	Strikes / Standing	Depth	Backfill / Installations
						(0.30)	Grass surface followed by: probably loose to medium dense brown slightly sandy fine to coarse angular GRAVEL. Occasional fragments of brick. (MADE GROUND).				
0.30	D					0.30	Probably medium dense becoming dense to very dense at base brown clayey sandy fine to coasre angular to subangular GRAVEL with a low to medium angular cobble content. (Possible GRADE E GROVESEND FORMATION).				
0.60	D										
0.90	D					(1.20)				1	
1.20 - 1.65	SPT-C		N=26								
1.50 - 1.60	SPT-C		(90mm) N > 50			1.50	*End of Borehole at 1.50 m*			2	
										3	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth

General Remarks:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Windowless sample position in area of proposed Block
3. Service inspection pit excavated by hand to 1.2m depth.
4. Drillhole terminated due to lack of penetration in dense ground conditions.
5. No groundwater observed to 1.5m depth

Project Name: Caewern House, Neath.	Drilling method: Windowless Sampling.	**WS2**
Site Location: Neath.	Equipment: Terrier.	
Client: POBL Group.		
Project No: 6346H		
Start date: 15/09/2016	Driller:	Ground Level: 55.200 mOD
End date: 15/09/2016	Logged by: ESP-DT.	Easting: 274653 m
Backfill date: 15/09/2016	Date logged: 15/09/2016	Northing: 198361 m

Sample Details and SPT Data / Strata Details / Water

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth	Depth (Thickness)	Description	Legend	Strikes / Standing	Depth	Backfill / Installations
0.10	D					(0.15) 0.15	Grass surface followed by: probably loose to medium dense brown slightly sandy fine to coarse angular GRAVEL. Occasional fragments of brick. (MADE GROUND).				
0.45	D					(0.75)	Probably medium dense brownish red slightly clayey sandy fine-medium angular GRAVEL. Occasional fragments of brick and whole bricks. (MADE GROUND).				
1.00	D					0.90 (0.20)	Soft to firm light brown sandy gravelly CLAY with low angular sandstone cobble content. (Possible GRADE E GROVESEND FORMATION).			1	
1.10	D					1.10					
1.20 - 1.65	SPT-C		N=38			(0.30)	Very dense brown slightly clayey sandy fine to coarse angular GRAVEL with low to medium angular cobble content. (Possible GRADE E GROVESEND FORMATION).			2	
1.40 - 1.79	SPT-C		N > 50 (235mm)			1.40	*End of Borehole at 1.40 m*			3	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth

General Remarks:

1. Grid reference interpolated from available mapping. Ground level interpolated from topographical survey.
2. Windowless sample position in area of proposed Block
3. Service inspection pit excavated by hand to 1.2m depth.
4. Drillhole terminated due to lack of penetration in dense ground conditions.
5. No groundwater observed to 1.4m depth

Appendix F3- Previous Investigation, Rotary Drillhole Records

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E	Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH1**
Start date: 20/05/2013 End date: 20/05/2013 Backfill date: 20/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 50.000 mOD Easting: 274590 m Northing: 198330 m	

Sample Details and SPT Data

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

Strata Details

Depth (Thickness)	Description	Legend
	CLAY with gravel	
(4.60)		
4.60	Weathered broken MUDSTONE	
(0.70)		
5.30	SANDSTONE with bands of mudstone	
	Continued next sheet	

Water

Strikes / Standing	Depth	Backfill / Installations

1 2 3 4 5 6 7 8 9

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
23.50 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 20.5 and 23.5m depth.

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E		Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH1**
Start date: 20/05/2013 End date: 20/05/2013 Backfill date: 20/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 50.000 mOD Easting: 274590 m Northing: 198330 m	

Sample Details and SPT Data / Strata Details / Water

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth	Depth (Thickness)	Description	Legend	Strikes / Standing	Depth	Backfill / Installations
						(16.70)	SANDSTONE with bands of mudstone *Continued next sheet*			11 12 13 14 15 16 17 18 19	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
23.50 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 20.5 and 23.5m depth.

DH1

Project Name: Caerwern
Site Location: Caewern, Neath
Client: Grwp Gwalia
Project No: 5186E

Drilling method: Rotary open hole, water flush
Equipment: Klemm

Start date:	20/05/2013	Driller:	SG	Ground Level:	50.000 mOD
End date:	20/05/2013	Logged by:	SG	Easting:	274590 m
Backfill date:	20/05/2013	Date logged:	-	Northing:	198330 m

Sample Details and SPT Data

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

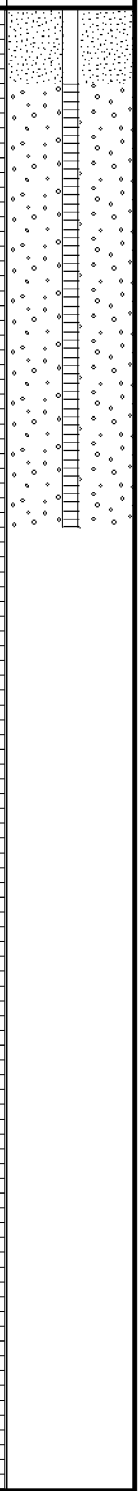
Strata Details

Depth (Thickness)	Description	Legend
	SANDSTONE with bands of mudstone	
22.00	VOID and BACKFILLED WORKINGS (1.5m)	
(1.50)		
23.50	*End of Borehole at 23.50 m*	

Water

Strikes / Standing

Backfill / Installations



Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
23.50 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 20.5 and 23.5m depth.

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E	Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH6**
Start date: 20/05/2013 End date: 21/05/2013 Backfill date: 21/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 50.200 mOD Easting: 274590 m Northing: 198330 m	

Sample Details and SPT Data

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

Strata Details

Depth (Thickness)	Description	Legend
	CLAY with gravel	
(5.40)		
5.40		
(0.20)	Fractured MUDSTONE	
5.60		
(0.20)	COAL (200mm)	
5.80		
(0.20)	MUDSTONE	
6.00		
	SANDSTONE with bands of mudstone and siltstone	
	Continued next sheet	

Water

Strikes / Standing	Depth	Backfill / Installations
▽	1 2 3 4 5 6 7 8 9	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed
-	-	8.50	-	-	-	-

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
30.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. Drillhole backfilled with arisings and cement on completion.

DH6

Project Name: Caerwern
Site Location: Caewern, Neath
Client: Grwp Gwalia
Project No: 5186E

Drilling method: Rotary open hole, water flush
Equipment: Klemm

Start date: 20/05/2013
End date: 21/05/2013
Backfill date: 21/05/2013

Driller: SG
Logged by: SG
Date logged: -

Ground Level: 50.200 mOD
Easting: 274590 m
Northing: 198330 m

Sample Details and SPT Data / Strata Details / Water

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth	Depth (Thickness)	Description	Legend	Strikes / Standing	Depth	Backfill / Installations
						(18.50)	SANDSTONE with bands of mudstone and siltstone			11 12 13 14 15 16 17 18 19	

Continued next sheet

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
30.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. Drillhole backfilled with arisings and cement on completion.

DH6

Project Name: Caerwern
Site Location: Caewern, Neath
Client: Grwp Gwalia
Project No: 5186E

Drilling method: Rotary open hole, water flush
Equipment: Klemm

Start date: 20/05/2013
End date: 21/05/2013
Backfill date: 21/05/2013

Driller: SG
Logged by: SG
Date logged: -

Ground Level: 50.200 mOD
Easting: 274590 m
Northing: 198330 m

Sample Details and SPT Data

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

Strata Details

Depth (Thickness)	Description	Legend
	SANDSTONE with bands of mudstone and siltstone	
24.50		
	COAL (2.5m) Probable Swansea Four Feet seam.	
(2.50)		
27.00		
	MUDSTONE	
(3.00)		

Water

Strikes / Standing	Depth	Backfill / Installations

21 22 23 24 25 26 27 28 29

End of Borehole at 30.00 m

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
30.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. Drillhole backfilled with arisings and cement on completion.

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E	Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH7**
Start date: 21/05/2013 End date: 22/05/2013 Backfill date: 22/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 54.700 mOD Easting: 274590 m Northing: 198330 m	

Sample Details and SPT Data

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

Strata Details

Depth (Thickness)	Description	Legend
(2.00)	CLAY with gravel	
2.00	GRAVEL, COBBLES and BOULDERS	
(9.00)	*Continued next sheet*	

Water

Strikes / Standing	Depth	Backfill / Installations

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed
-	-	8.50	-	-	-	-

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
33.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 29.0 and 32.0m depth.

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E	Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH7**
Start date: 21/05/2013 End date: 22/05/2013 Backfill date: 22/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 54.700 mOD Easting: 274590 m Northing: 198330 m

Sample Details and SPT Data

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

Strata Details

Depth (Thickness)	Description
	GRAVEL, COBBLES and BOULDERS
11.00	
	MUDSTONE
(2.00)	
13.00	
	COAL (0.7m)
(0.70)	
13.70	
	SANDSTONE with bands of siltstone and mudstone
	Continued next sheet

Legend

Water

Strikes / Standing

Depth: 11, 12, 13, 14, 15, 16, 17, 18, 19

Backfill / Installations

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
33.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 29.0 and 32.0m depth.

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E		Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH7**
Start date: 21/05/2013 End date: 22/05/2013 Backfill date: 22/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 54.700 mOD Easting: 274590 m Northing: 198330 m	

Sample Details and SPT Data / Strata Details / Water

Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth	Depth (Thickness)	Description	Legend	Strikes / Standing	Depth	Backfill / Installations
						(17.30)	SANDSTONE with bands of siltstone and mudstone *Continued next sheet*			21 22 23 24 25 26 27 28 29	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
33.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 29.0 and 32.0m depth.

Project Name: Caerwern **Site Location:** Caewern, Neath **Client:** Grwp Gwalia **Project No:** 5186E		Drilling method: Rotary open hole, water flush Equipment: Klemm	**DH7**
Start date: 21/05/2013 End date: 22/05/2013 Backfill date: 22/05/2013	Driller: SG Logged by: SG Date logged: -	Ground Level: 54.700 mOD Easting: 274590 m Northing: 198330 m	

Sample Details and SPT Data

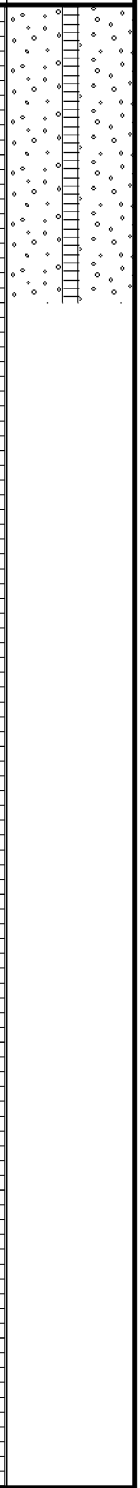
Depth	Type	PID (ppm)	SPT-N (penetration / sampler blows)	Water Depth	Casing Depth

Strata Details

Depth (Thickness)	Description	Legend
	SANDSTONE with bands of siltstone and mudstone	
31.00		
(0.50)	VOID (0.5m)	
31.50		
(1.00)	Soft Drill (1.0m) - Probable backfilled workings.	
32.50		
(0.50)	Normal Drill	
33.00	*End of Borehole at 33.00 m*	

Water

Strikes / Standing	Depth	Backfill / Installations



Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed minutes	Depth to Water	Depth Sealed

Chiselling

From Depth	To Depth	Minutes Taken

Hole and Casing Diameters

Hole Depth	Hole Diameter	Casing Diameter	Casing Depth
33.00 m	-		

General Remarks:

1. Grid reference of site only. Elevation interpolated from site survey, based on site datum.
2. No hazardous gas recorded during drilling.
3. Strata descriptions based on drillers records.
4. 50mm dia gas well installed on completion with response zone between 29.0 and 32.0m depth.

Appendix G1- Previous Investigation, Soakaway Infiltration Test Results

SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

Project Name:	PROPOSED RESIDENTIAL DEVELOPMENT - CAEWERN HOUSE, NEATH
Project Ref:	6346h
Date of Testing:	15-09-16
Test Location:	SA1 (TP1b)
Fill Number:	1
Soil Infiltration Rate	test failed m/sec

Test results:

Time (mins)	Water Level (m bgl)
0	0.53
2	0.54
6	0.57
10	0.59
15	0.61
20	0.62
23	0.65
30	0.68
40	0.73
60	0.78
90	0.83
110	0.86
121	0.91
158	0.96
223	1.02
250	1.04
274	1.09
303	1.13
322	1.16
348	1.18

Pit Dimensions (m)

Length	1.50
Width	0.70
Depth	2.10

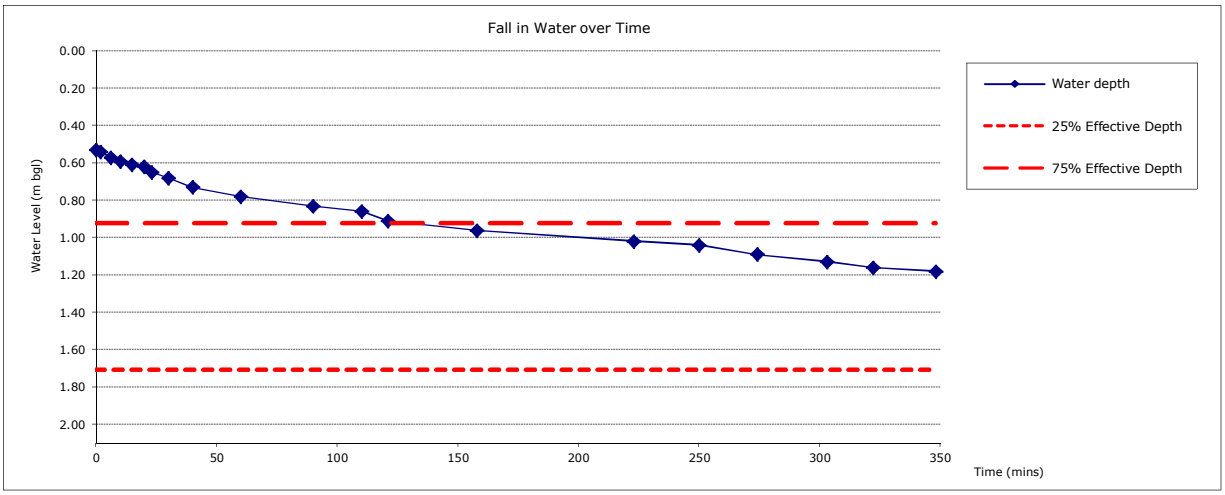
Assumed Invert Level (m bgl)	0.53

Ground Conditions:

0 - 0.15m	Brown slightly sandy grvelly CLAY. (MADE GROUND).
0.15 - 0.6m	Brown sandy gravelly CLAY. (MADE GROUND).
0.6 - 1.4m	Dark blackish brown slightly clayey sandy fine to coarse angular GRAVEL. (MADE GROUND).
1.4 - 2.1m	Brown with patches of grey sandy clayey GRAVEL with a low to medium angular sandstone cobble content. (Probable weathered bedrock)

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Stability of pit sides was good.
4. Test failed to empty from 75% to 25% effective depth.



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	0.82
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	4.504
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{0.824}{\text{no value}}$

f **test failed**

APPENDIX C - SOAKAWAY INFILTRATION TEST RESULTS

Project Name:	Caewern, Neath
Project Ref:	5186e
Test Location:	SA-1 (TP1a)
Soil Infiltration Rate (m/sec)	**test failed**

Test results:

Time (mins)	Water Level (m bgl)
0	1.01
1	1.01
2	1.00
3	1.00
4	1.00
5	1.00
8	1.01
10	1.01
15	1.01
30	1.01
40	1.01
62	1.01
87	1.01
112	1.01
162	1.00
222	0.98
251	0.91

Pit Dimensions (m)

Length	2.00
Width	0.70
Depth	2.00

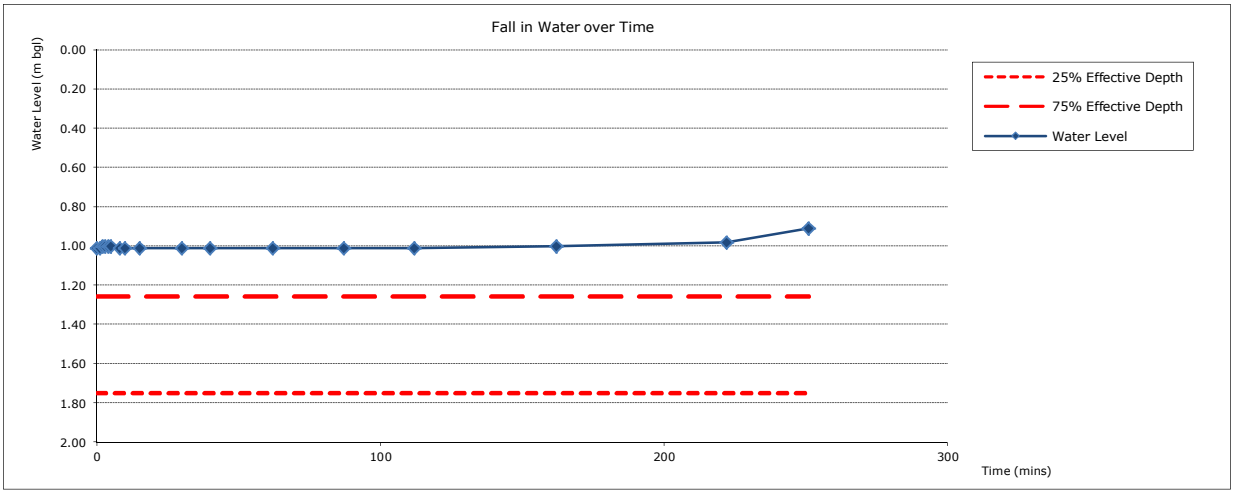
Assumed Invert Level (m bgl)	1.01

Ground Conditions:

0.0-0.4m	Tarmacadam on concrete and brick rubble. (MADE GROUND)
0.4-0.65m	Grey brown gravelly CLAY (POSSIBLE OLD SUBSOIL)
0.65-1.1m	Brown silty sandy GRAVEL (GLACIAL DEPOSITS)
1.1-2.0m	Brown, mottled orange brown, clayey very sandy GRAVEL with cobbles and boulders (GLACIAL DEPOSITS)

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Stability of pit sides was good during excavation. Some slumping below water level evident from test results



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	0.69
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	4.073
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{0.693}{\text{no value}}$

f **test failed**

APPENDIX C - SOAKAWAY INFILTRATION TEST RESULTS

Project Name:	Caewern, Neath
Project Ref:	5186e
Test Location:	SA-2 (TP3a)
Soil Infiltration Rate (m/sec)	**test failed**

Test results:

Time (mins)	Water Level (m bgl)
0	0.75
1	0.81
2	0.85
3	0.92
4	0.94
6	1.00
8	1.03
10	1.05
15	1.07
20	1.10
25	1.11
30	1.12
35	1.12
41	1.12
53	1.12
63	1.13
73	1.14
100	1.14
139	1.14
169	1.15
195	1.16

Pit Dimensions (m)

Length	2.20
Width	0.70
Depth	2.00

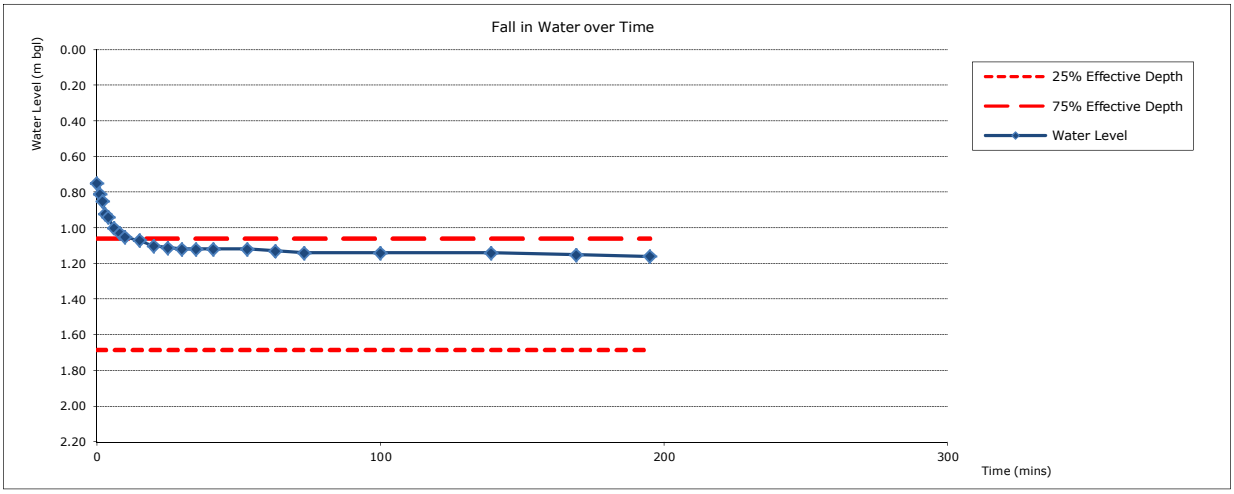
Assumed Invert Level (m bgl)	0.75

Ground Conditions:

0.0-0.1m	Grass and clayey TOPSOIL
0.1-2.0m	Light grey/brown silty fine to coarse GRAVEL with cobbles and boulders (GLACIAL DEPOSITS)

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Stability of pit sides was good during excavation and testing.
4. Apparent pipe bedding at around 1.1m, leading to unrepresentative initial testing results (to around 20 mins).



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	0.96
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	5.165
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{0.963}{\text{no value}}$

f **test failed**

APPENDIX C - SOAKAWAY INFILTRATION TEST RESULTS

Project Name:	Caewern, Neath
Project Ref:	5186e
Test Location:	SA-3 (TP7a)
Soil Infiltration Rate (m/sec)	test failed

Test results:

Time (mins)	Water Level (m bgl)
0	0.50
1	0.52
2	0.52
3	0.53
4	0.54
5	0.56
7	0.57
10	0.60
13	0.62
16	0.64
20	0.67
24	0.69
29	0.72
33	0.74
44	0.80
50	0.82
60	0.86
73	0.90
90	0.94
110	0.97
134	1.01
172	1.05
202	1.07
234	1.09
264	1.10

Pit Dimensions (m)

Length	1.70
Width	0.70
Depth	1.70

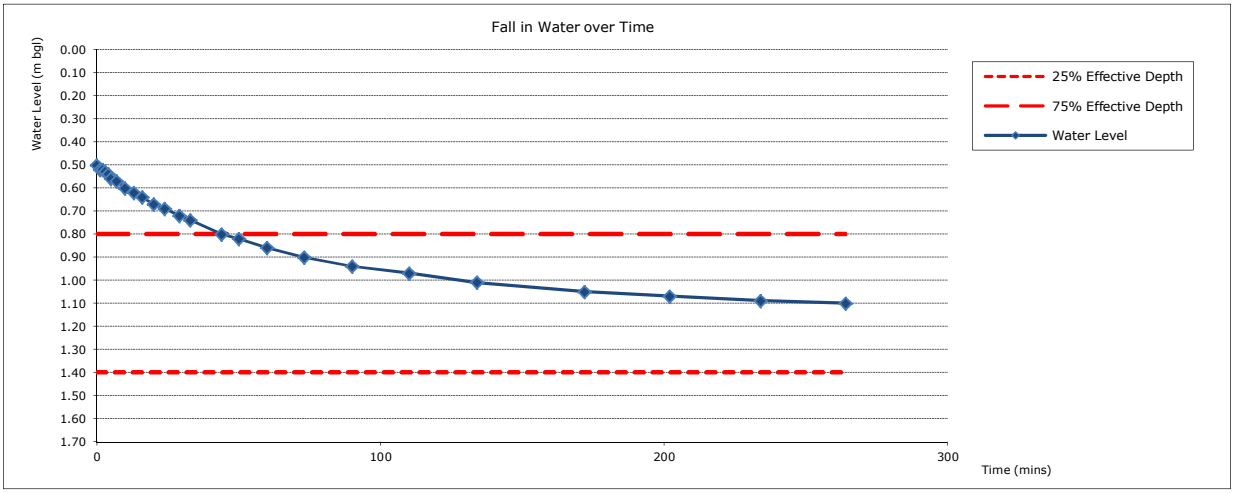
Assumed Invert Level (m bgl)	0.50

Ground Conditions:

0-0.2m	Grass on clayey TOPSOIL
0.2-0.4m	Brown/grey sandy gravelly CLAY
0.4-0.9m	Brown/orange brown angular tabular COBBLES in a matrix of sandy clayey fine to coarse gravel (matrix around 10 to 20%) (WEATHERED COAL MEASURES)
0.9-1.7m	Grey angular tabular COBBLES in a matrix of sandy silty fine to coarse gravel (matrix around 10 to 20%) (WEATHERED COAL MEASURES)

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Stability of pit sides was good during excavation and testing.
4. Moderate groundwater inflow at 1.6m, rose to 1.3m after 20 minutes.



Soil Infiltration Rate (m/sec)

$$f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	0.71
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	4.07
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec)

$$f = \frac{0.714}{\text{no value}}$$

f **test failed**

Appendix G2- Previous Investigation, Groundwater and Gas Monitoring Results

Appendix D - Results of Gas and Groundwater Monitoring

Visit 1

Date:	26.06.13	**Barometric Pressure (mb):**	1001	steady
Time:	12:35	**Site Status:**	Care home in active use	
Engineer:	DT/GE	**Ground Condition:**	dry and open.	
Weather:	Sunny, Light wind.			
Instrument:	Gas Data LMSxi G3,18e meter	**Calibration date:**	14/01/2014	
Instrument:	Phocheck 2000+ PID	**Calibration date:**	21/11/2013	

Well ID: DH1	**Well dia.(mm):**	50	**Date installed:**	20.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.28			**Groundwater depth (m):**		6.46		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading									
After 30 Seconds									
After 1 Minute									
After 3 Minutes									
Comments:	No padlock or gas tap fitted. Apex informed.								

Well ID: DH2	**Well dia.(mm):**	50	**Date installed:**	17.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	25.25			**Groundwater depth (m):**		8.35		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading									
After 30 Seconds									
After 1 Minute									
After 3 Minutes									
Comments:	No padlock or gas tap fitted. Apex informed.								

Well ID: DH4	**Well dia.(mm):**	50	**Date installed:**	15.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.71			**Groundwater depth (m):**		7.39		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0.0	82.3	0.0	0.0	17.6	0	0.0	0.0	18.7
After 30 Seconds	1	0.0	85.4	1.4	0.0	13.1	0	0.5	0.5	
After 1 Minute	1	0.0	89.0	4.3	0.0	6.6	0	0.5	0.5	
After 3 Minutes	-1	0.0	88.7	5.3	0.0	5.9	0	0.2	0.2	
Comments:									

Well ID: DH7	**Well dia.(mm):**	50	**Date installed:**	21.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	31.54			**Groundwater depth (m):**		11.15		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading									
After 30 Seconds									
After 1 Minute									
After 3 Minutes									
Comments:	No gas tap present. Pipe left too high under cap. Apex informed.								

Appendix D - Results of Gas and Groundwater Monitoring

Visit 2

Date:	15.07.13	**Barometric Pressure (mb):**	1020	steady	
Time:	15:40	**Site Status:**	Care home in active use		
Engineer:	GE	**Ground Condition:**	dry and open.		
Weather:	Clear, 20C, light wind				
Instrument:	Gas Data LMSxi G3,18e meter	**Calibration date:**	14/01/2014		
Instrument:	Phocheck 2000+ PID	**Calibration date:**	21/11/2013		

Well ID: DH1	**Well dia.(mm):**	50	**Date installed:**	20.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.33			**Groundwater depth (m):**		6.5		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-3	0.0	85.8	0.0	0.0	14.1	0	0.00	0.0
After 30 Seconds	0	0.0	85.7	0.0	0.0	14.2	0	0.00	
After 1 Minute	0	0.0	85.7	0.0	0.0	14.2	0	-0.10	
After 3 Minutes	0	0.0	85.6	0.0	0.0	14.3	0	0.10	
Comments:	Lock & gas tap have been fitted.								

Well ID: DH2	**Well dia.(mm):**	50	**Date installed:**	17.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	25.16			**Groundwater depth (m):**		8.4		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0.0	85.8	0.0	0.0	14.1	0	-0.10	4.1
After 30 Seconds	0	0.0	85.6	0.0	0.0	14.3	0	0.00	
After 1 Minute	0	0.0	85.6	0.0	0.0	14.3	0	0.00	
After 3 Minutes	0	0.0	85.6	0.0	0.0	14.3	0	0.10	
Comments:	Lock & gas tap have been fitted.								

Well ID: DH4	**Well dia.(mm):**	50	**Date installed:**	15.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.42			**Groundwater depth (m):**		7.11		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-2	0.0	83.7	0.0	0.0	16.2	0	-0.60	6.0
After 30 Seconds	0	0.0	91.7	4.8	0.0	3.4	0	-0.20	
After 1 Minute	0	0.0	90.9	5.8	0.0	3.2	0	0.00	
After 3 Minutes	0	0.0	90.7	5.9	0.0	3.3	0	0.00	
Comments:									

Well ID: DH7	**Well dia.(mm):**	50	**Date installed:**	21.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	32.18			**Groundwater depth (m):**		11.22		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0.0	86.4	0.0	0.0	13.5	0	0.00	2.5
After 30 Seconds	0	0.0	84.9	0.0	0.0	15.0	0	0.00	
After 1 Minute	0	0.0	84.9	0.0	0.0	15.0	0	-0.10	
After 3 Minutes	0	0.0	85.2	0.0	0.0	14.7	0	0.00	
Comments:	Pipe length fixed.								

Appendix D - Results of Gas and Groundwater Monitoring

Visit 3

Date:	02.08.13	**Barometric Pressure (mb):**	1005	steady
Time:	15:00	**Site Status:**	Care home in active use	
Engineer:	GE	**Ground Condition:**	dry and open.	
Weather:	Sunny, clear, light wind, ~18C			
Instrument:	Gas Data LMSxi G3,18e meter	**Calibration date:**	14/01/2014	
Instrument:	Phocheck 2000+ PID	**Calibration date:**	21/11/2013	

Well ID: DH1	**Well dia.(mm):**	50	**Date installed:**	20.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.31			**Groundwater depth (m):**		6.63		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-1	0	81.6	3.9	0	14.4	0	-1.20	0.0
After 30 Seconds	-3	0	79.2	0.3	0	20.4	0	-1.50	
After 1 Minute	5	0	79.2	0.3	0	20.4	0	-1.60	
After 3 Minutes	-4	0	79.2	0.3	0	20.4	0	-0.80	
Comments:									

Well ID: DH2	**Well dia.(mm):**	50	**Date installed:**	17.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	25.33			**Groundwater depth (m):**		8.51		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-1	0	82.3	3.6	0	14	0.2	-0.20	1.5
After 30 Seconds	0	0	81.8	3.8	0	14.3	0.3	0.00	
After 1 Minute	-2	0	81.8	3.8	0	14.3	0.1	-0.10	
After 3 Minutes	1	0	82.1	4.2	0	13.6	0	0.00	
Comments:									

Well ID: DH4	**Well dia.(mm):**	50	**Date installed:**	15.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.52			**Groundwater depth (m):**		7.23		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-1	0.0	82.6	4.8	0.0	12.5	0	-0.90	3.3
After 30 Seconds	-5	0.0	83.2	5.5	0.0	11.2	0.1	0.50	
After 1 Minute	2	0.0	83.2	5.5	0.0	11.2	0.2	0.00	
After 3 Minutes	-8	0.0	85.1	3.0	0.0	11.8	0.3	-0.20	
Comments:									

Well ID: DH7	**Well dia.(mm):**	50	**Date installed:**	21.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	32.2			**Groundwater depth (m):**		11.3		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0	82	0.3	0	17.6	0.2	0.10	16.2
After 30 Seconds	0	0	80.3	0	0	19.6	0.3	0.00	
After 1 Minute	1	0	79.7	0	0	20.2	0.1	0.40	
After 3 Minutes	0	0	79.5	0	0	20.4	0.2	0.20	
Comments:									

Appendix D - Results of Gas and Groundwater Monitoring

Visit 4

Date:	13.08.13	**Barometric Pressure (mb):**	1022	steady
Time:	10:30	**Site Status:**	Care home in active use	
Engineer:	GE	**Ground Condition:**	dry and open.	
Weather:	Sunny, dry, ~18C			
Instrument:	Gas Data LMSxi G3,18e meter	**Calibration date:**	14/01/2014	
Instrument:	Phocheck 2000+ PID	**Calibration date:**	21/11/2013	

Well ID: DH1	**Well dia.(mm):**	50	**Date installed:**	20.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	17.41			**Groundwater depth (m):**		6.47		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0	82	1.7	0	16.2	0	0.00	0.0
After 30 Seconds	1	0	80.9	1.7	0	17.3	0	0.20	
After 1 Minute	-1	0	80.9	1.5	0	17.5	0	-0.30	
After 3 Minutes	0	0	80.7	1.2	0	18	0	0.00	
Comments:									

Well ID: DH2	**Well dia.(mm):**	50	**Date installed:**	17.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	25.38			**Groundwater depth (m):**		8.42		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-2	0	84.2	2.4	0	13.3	0	-0.10	0.0
After 30 Seconds	0	0	82.5	1	0	16.4	0	0.00	
After 1 Minute	1	0	80.6	0.3	0	19	0	0.40	
After 3 Minutes	0	0	78.4	0.1	0	20.4	0	0.60	
Comments:									

Well ID: DH4	**Well dia.(mm):**	50	**Date installed:**	15.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.53			**Groundwater depth (m):**		6.98		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading									
After 30 Seconds									
After 1 Minute									
After 3 Minutes									
Comments:	Bung not seated correctly upon opening cover.								

Well ID: DH7	**Well dia.(mm):**	50	**Date installed:**	21.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):				**Groundwater depth (m):**				
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading									
After 30 Seconds									
After 1 Minute									
After 3 Minutes									
Comments:	Bus parked over well.								

Appendix D - Results of Gas and Groundwater Monitoring

Visit 5

Date:	19.08.13	**Barometric Pressure (mb):**	1018	steady
Time:	08:30	**Site Status:**	Care home in active use	
Engineer:	GE	**Ground Condition:**	dry and open.	
Weather:	Dry, clear, ~13C			
Instrument:	Gas Data LMSxi G3,18e meter	**Calibration date:**	14/01/2014	
Instrument:	Phocheck 2000+ PID	**Calibration date:**	21/11/2013	

Well ID: DH1	**Well dia.(mm):**	50	**Date installed:**	20.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.34			**Groundwater depth (m):**		6.34		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-2	0.1	81.3	1.3	0	17.3	0	-2.10	0.2
After 30 Seconds	-5	0	80.6	1.4	0	17.9	0	-0.60	
After 1 Minute	0	0	80.5	1.3	0	18.1	0	0.00	
After 3 Minutes	0	0	81	1	0	17.9	0	0.00	
Comments:									

Well ID: DH2	**Well dia.(mm):**	50	**Date installed:**	17.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	25.4			**Groundwater depth (m):**		8.12		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0	85.1	2.1	0	12.7	0	0.00	0.9
After 30 Seconds	0	0	83.1	1.4	0	15.4	0	0.00	
After 1 Minute	0	0	81.9	0.7	0	17.3	0	0.00	
After 3 Minutes	1	0	81.1	0.3	0	18.5	0	0.10	
Comments:									

Well ID: DH4	**Well dia.(mm):**	50	**Date installed:**	15.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.50			**Groundwater depth (m):**		6.91		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-17	0.0	80.9	1.7	0.0	17.3	0	-4.00	0.2
After 30 Seconds	-14	0.0	80.4	1.7	0.0	17.8	0	-1.60	
After 1 Minute	-8	0.0	80.4	1.7	0.0	17.8	0	-0.80	
After 3 Minutes	-6	0.0	81.2	1.7	0.0	17.0	0	-0.70	
Comments:									

Well ID: DH7	**Well dia.(mm):**	50	**Date installed:**	21.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	32.19			**Groundwater depth (m):**		10.97		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0	82.6	0.4	0	16.9	0	0.00	3.9
After 30 Seconds	0	0	81.1	0.2	0	18.6	0	0.00	
After 1 Minute	0	0	80.3	0.1	0	19.5	0	0.00	
After 3 Minutes	0	0	80.3	0	0	19.6	0	0.00	
Comments:									

Appendix D - Results of Gas and Groundwater Monitoring

Visit 6

Date:	11.09.13	**Barometric Pressure (mb):**	1024	steady
Time:	08:00	**Site Status:**	Care home in active use	
Engineer:	GE	**Ground Condition:**	dry and open.	
Weather:	Overcast, dry			
Instrument:	Gas Data LMSxi G3,18e meter	**Calibration date:**	14/01/2014	
Instrument:	Phocheck 2000+ PID	**Calibration date:**	21/11/2013	

Well ID: DH1	**Well dia.(mm):**	50	**Date installed:**	20.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.36			**Groundwater depth (m):**		6.66		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-3000	0	80.8	1.9	0	17.2	0	-<<<<	1040.0
After 30 Seconds	-3	0	80.1	2.8	0	17	0	-0.40	
After 1 Minute	-1	0	80	1.8	0	18.1	0	-0.10	
After 3 Minutes	0	0	79.8	1.4	0	18.7	0	0.00	
Comments:	Suspect calibration issue with PID								

Well ID: DH2	**Well dia.(mm):**	50	**Date installed:**	17.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	25.42			**Groundwater depth (m):**		8.5		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0	84.1	3	0	12.8	0	0.00	0.9
After 30 Seconds	0	0	81.8	1.4	0	16.7	0	0.00	
After 1 Minute	0	0	81	0.7	0	18.2	0	0.00	
After 3 Minutes	0	0	79.9	0.3	0	19.7	0	0.00	
Comments:									

Well ID: DH4	**Well dia.(mm):**	50	**Date installed:**	15.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	23.44			**Groundwater depth (m):**		7.18		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	-16	0.0	85.4	4.5	0.0	10.0	0	-3.80	47.0
After 30 Seconds	-4	0.0	84.9	4.6	0.0	10.4	0	-0.50	
After 1 Minute	0	0.0	85.0	4.5	0.0	10.4	0	0.00	
After 3 Minutes	0	0.0	85.1	4.5	0.0	10.3	0	0.00	
Comments:									

Well ID: DH7	**Well dia.(mm):**	50	**Date installed:**	21.05.13	**Response stratum:**		Sandstone / Backfilled workings		
	Well depth (m):	32.29			**Groundwater depth (m):**		11.25		
Monitored Variables	**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (l/hr)**	**PID (ppm)**
Immediate Reading	0	0	84.3	0.5	0	15.1	0	0.00	4.1
After 30 Seconds	0	0	81.8	0.1	0	18	0	0.00	
After 1 Minute	0	0	80.3	0	0	19.6	0	0.00	
After 3 Minutes	0	0	80.7	0	0	19.2	0	0.00	
Comments:									

Appendix H1- Previous Investigation, Geotechnical Laboratory Test Results

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 32507

Client's Reference: **6346h PO 5423**

Report Date: **10-10-2016**

Client **Earth Science Partnership**
33 Cardiff Road
Taff's Well
Cardiff
CF15 7RB

Contract Title: **Caewern House, Neath**

For the attention of: **Daniel Thomas**

Date Received: **24-09-2016**

Date Commenced: **24-09-2016**

Date Completed: **10-10-2016**

Test Description	Qty
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	3
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	3
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	1
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Vaughan Edwards (Managing Director)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Client ref: 6346H

Location: Caewern House, Neath

Contract Number: 32507-

Hole Number	Sample Number	Type	Depth (m)	Description of Sample*
WS2			1.00	Brown fine to medium sandy gravelly silty CLAY.
TP2			0.60	Brown fine to medium sandy gravelly silty CLAY.
TP3			1.00	Brown fine to medium sandy gravelly silty CLAY.

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory

GSTL
GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Sharp (Office Manager)
Date: 10.10.16

UKAS TESTING
2788

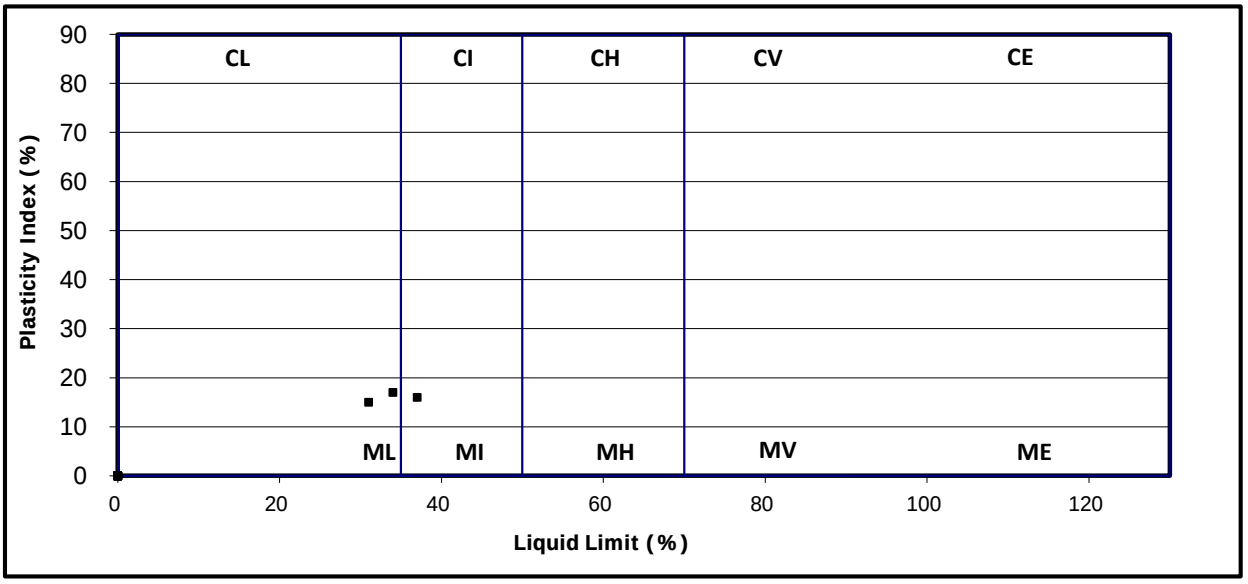
Test Report: **Method of the Determination of the plastic limit and plasticity index**
BS 1377 : Part 2 : 1990 Method 5

Client ref: **6346H**
Location: **Caewern House, Neath**
Contract Number: **32507-**

Hole / Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
WS2		1.00	20	31	16	15	90	CL Low Plasticity
TP2		0.60	24	37	21	16	95	CI Intermediate Plasticity
TP3		1.00	17	34	17	17	90	CL Low Plasticity

Symbols: **NP : Non Plastic** **# : Liquid Limit and Plastic Limit Wet Sieved**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Sharp (Office Manager)
Date: 10.10.16

UKAS TESTING 2788

Test Report:

Particle Size Distribution Test

BS 1377 Part 2:1990.

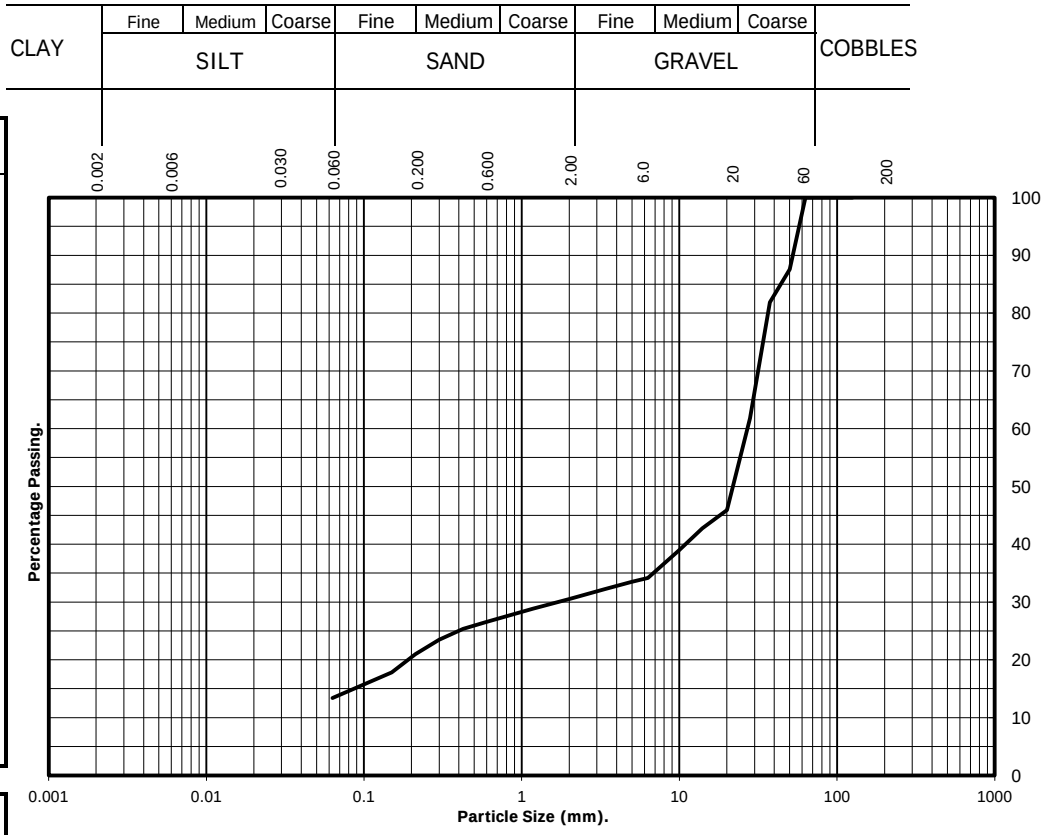
Wet Sieve, Clause 9.2

Client ref:	**6346H**	**Sample Number:**	**N/A**
Contract Number:	**32507-**	**Depth from (m):**	**1.60**
Hole Number:	**TP1B**	**Depth to (m):**	**N/A**
		Sample Type:	**B**

Location: **Caewern House, Neath**

Description: **Brown fine to medium silty clayey sandy GRAVEL.**

BS Test Sieve	% Passing
125	100
90	100
75	100
63	100
50	88
37.5	82
28	62
20	46
14	43
10	39
6.3	34
5.0	33
3.35	32
2.00	31
1.18	29
0.60	27
0.425	25
0.300	23
0.212	21
0.150	18
0.063	13



Particle Diameter	% Passing
0.02	#
0.006	#
0.002	#

	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	13	18	69	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Emma Sharp (Office Manager)

Date: 10.10.16

GSTL
GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Appendix H2- Previous Investigation, Geo-environmental Laboratory Test Results

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-79504

30-Sep-16

Client Earth Science Partnership
33 Cardiff Road
Taffs Well
Cardiff
CF15 7RB

Our Reference	16-79504
Client Reference	6346H
Order No	5422
Contract Title	Caewern House
Description	6 Soil samples.
Date Received	26-Sep-16
Date Started	26-Sep-16
Date Completed	30-Sep-16
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 16-79504
Client Ref 6346H
Contract Title Caewern House

				Lab No	1057540	1057541	1057542	1057543	1057544	1057545
				Sample ID	WS1	WS2	TP2	TP4	WS2	TP2
				Depth	0.60	0.45	0.60	0.50	1.20	1.10
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	15/09/16	15/09/16	15/09/16	15/09/16	15/09/16	15/09/16
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Metals										
Arsenic	DETSC 2301#	0.2	mg/kg	22	160	42	98		
Barium	DETSC 2301#	1.5	mg/kg	55	420	72	140		
Beryllium	DETSC 2301#	0.2	mg/kg	0.3	1.0	0.4	0.7		
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.5	0.6	0.5	0.6		
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	1.3	0.3	0.5		
Chromium	DETSC 2301#	0.15	mg/kg	13	19	16	13		
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0		
Copper	DETSC 2301#	0.2	mg/kg	150	680	67	250		
Lead	DETSC 2301#	0.3	mg/kg	26	290	45	99		
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.05	< 0.05	0.12		
Nickel	DETSC 2301#	1	mg/kg	18	43	22	21		
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.8		
Vanadium	DETSC 2301	0.8	mg/kg	17	39	23	24		
Zinc	DETSC 2301#	1	mg/kg	55	400	110	290		
Inorganics										
pH	DETSC 2008#			6.8	6.7	6.8	8.6	7.1	6.8
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	0.2	< 0.1		
Organic matter	DETSC 2002#	0.1	%	1.6	2.4	3.9	4.8		
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10				< 10	14
Sulphur as S, Total	DETSC 2320	0.01	%	0.01				0.02	0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.03				0.03	0.03
PAHs										
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.06	< 0.03	< 0.03		
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03		
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	< 0.03	< 0.03		
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	0.10	< 0.10	< 0.10		
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	0.4	< 0.3		

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-79504
Client Ref 6346H
Contract Title Caewern House

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1057540	WS1 0.60	SOIL	NAD	none	J Woodmansey
1057541	WS2 0.45	SOIL	NAD	none	J Woodmansey
1057542	TP2 0.60	SOIL	NAD	none	J Woodmansey
1057543	TP4 0.50	SOIL	NAD	none	J Woodmansey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-79504
Client Ref 6346H
Contract Caewern House

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1057540	WS1 0.60 SOIL	15/09/16	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
1057541	WS2 0.45 SOIL	15/09/16	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
1057542	TP2 0.60 SOIL	15/09/16	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
1057543	TP4 0.50 SOIL	15/09/16	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
1057544	WS2 1.20 SOIL	15/09/16	PT 1L	pH + Conductivity (7 days)	
1057545	TP2 1.10 SOIL	15/09/16	PT 1L	pH + Conductivity (7 days)	

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix I- Trial Pit Records (ESP, 2021)

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: Shovel and Split shovel

Shoring/support: None

HP01

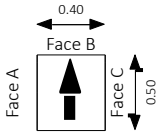
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 25/06/2021
Backfill date: 25/06/2021
Logged by: AB

Survey details:

Ground Level: 53.6 mOD
Easting: 274654 mOD
Northing: 198356 mOD
Bearing:

Plan details:



Face Stability:

Stable

Groundwater observations:

Groundwater not encountered

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
					Soft, brown mottled dark brown, sandy clayey SILT. Sand is fine to coarse. Abundant rootlets. (TOPSOIL).	(*0.20*)		
						0.20	53.43	
0.40	ES				Firm, brown mottled dark brown, sandy gravelly SILT with moderate cobble content and rare boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone. Mudstone cobbles are subangular to subrounded measuring 60-80mm. Mudstone boulders are subangular measuring 220mm in size. Brick fragments and slag-like material present. (MADE GROUND).	(*0.40*)		
						0.60	53.03	
					End of Trialpit at 0.600m			
						1.0		
						2.0		
						3.0		

Weather and environmental conditions:

1. Dry

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated by hand as area largely overgrown and bound by stone walls meaning inaccessible for excavtor.
3. Exacavated to a depth of 0.6m to establish ground conditions on site and take environmental samples.
4. Service plans inspected and trial pit position scanned with a cable avoidance tool and before breaking ground for all positions.
5. Trial pit concluded due to the presence of dense rock at base of pit. 6.Trial pit backfilled with arisings upon completion of logging.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: 2 ft toothed bucket

Shoring/support: None

TP201

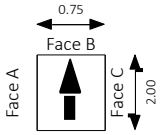
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 13/05/2021
Backfill date: 14/05/2021
Logged by: AB

Survey details:

Ground Level: 49.9 mOD
Easting: 274625 mOD
Northing: 198312 mOD
Bearing:

Plan details:



Face Stability:

Minor Sidewall Collapse

Groundwater observations:

Groundwater inflow at 1.7m rising to 1.1m on completion of excavation.

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
0.10	ES				Soft, brown mottled dark grey, sandy clayey SILT. Sand is fine to coarse. Wood fragments present, abundant rootlets. (TOPSOIL).	(0.15) 0.15	49.75	
0.30	ES				Firm, dark brown mottled light brown gravelly sandy CLAY with low cobble content. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone and sandstone. Mudstone and sandstone cobbles are angular to subangular measuring 60-110mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).	(0.25) 0.40	49.50	
0.80	ES				Dense, brown mottled orange, sandy clayey GRAVEL with high cobble content and occasional boulders. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone and sandstone. Mudstone and sandstone cobbles are angular to subangular measuring 60-120mm. Mudstone boulders are angular measuring 120-220mm. (Possible Grade E GROVESEND FORMATION).	(0.60) 1.00	48.90	
1.40	ES				Very Dense, light grey mottled dark grey, very sandy clayey GRAVEL with high cobble content and common boulders. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone and sandstone. Mudstone and sandstone cobbles are angular measuring 60-120mm. Mudstone boulders are angular measuring 120-380mm. (Possible Grade D GROVESEND FORMATION).			
1.50	D					(1.00)		
1.80	B							
					End of Trialpit at 2.000m	2.00	47.90	
						3.0		

Weather and environmental conditions:

1. Intermitent light rain

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated to a depth of 2.0m to establish ground conditions on site and undertake soakaway testing.
3. Service plans inspected and trial pit position scanned with a cable avoidence tool and before breaking ground for all positions.
4. Trial pit concluded due to the presence of dense material and desired testing depth was achieved.
5. Trial pit backfilled with arisings upon completion of testing.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: 2 ft toothed bucket

Shoring/support: None

TP202

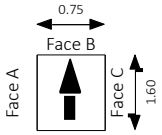
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 13/05/2021
Backfill date: 14/05/2021
Logged by: AB

Survey details:

Ground Level: 51.5 mOD
Easting: 274655 mOD
Northing: 198332 mOD
Bearing:

Plan details:



Face Stability:

Minor Sidewall Collapse

Groundwater observations:

Groundwater not encountered

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
					Soft, brown mottled dark grey, sandy gravelly clayey SILT. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone. Wood fragments present, abundant rootlets. Grass overlain. (TOPSOIL).	(*0.20*)		
0.20	B					0.20	51.30	
	ES				Soft, brown mottled orange, gravelly very clayey SILT with low cobble content. Gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subangular measuring 60-120mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).	(*0.65*)		
0.60	ES							
0.70	B							
	D					0.85	50.65	
					Firm to stiff, grey, gravelly CLAY with moderate cobble content and occasional boulders. Gravel is fine to coarse angular to subangular consisting of mudstone. Mudstone cobbles are angular to subanguar measuring 60-120mm. Mudstone boulders are angular measuring 150-550mm. (Possible Grade D GROVESEND FORMATION).	1.0		
1.00	ES							
1.10	D							
1.40	B					(*1.15*)		
					End of Trialpit at 2.000m	2.00 2.0	49.50	
						3.0		

Weather and environmental conditions:

1. Intermitent light rain

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated to a depth of 2.0m to establish ground conditions on site and undertake soakaway testing.
3. Service plans inspected and trial pit position scanned with a cable avoidence tool and before breaking ground for all positions.
4. Trial pit concluded as desired testing depth was achieved.
5. Trial pit backfilled with arisings upon completion of testing.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: 2 ft toothed bucket

Shoring/support: None

TP203

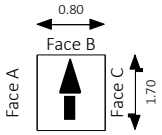
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 13/05/2021
Backfill date: 14/05/2021
Logged by: AB

Survey details:

Ground Level: 52.5 mOD
Easting: 274656 mOD
Northing: 198345 mOD
Bearing:

Plan details:



Face Stability:

Minor Sidewall Collapse

Groundwater observations:

Groundwater inflow at 1.6m rising to 1.25 m on completion of excavation.

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
0.20	ES				Soft, brown mottled dark grey, sandy gravelly clayey SILT. Sand is fine to coarse, gravel is fine to coarse angular to subangular consisting of mudstone. Wood fragments present, abundant rootlets. Grass overlain. (TOPSOIL).	(0.20) 0.20	52.30	
0.40	ES				Firm, light brown mottled orange, gravelly sandy clayey SILT. Sand is fine to coarse, gravel is fine to coarse angular to subangular consisting of mudstone. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).	(0.40) 0.60	51.90	
0.70	ES				Firm, light grey mottled brown, gravelly sandy silty CLAY with moderate cobble content and occasional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subangular consisting of mudstone. Mudstone cobbles are angular to subanguar measuring 60-120mm. Mudstone boulders are angular to subangular measuring 150-350mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).	(0.65) 1.0		
0.80	D					1.25	51.25	
1.60	ES				Dense, dark grey, very sandy clayey GRAVEL with abundant cobbles and common boulders. Sand is fine to coarse, gravel is fine to coarse angular to subangular consisting of mudstone. Mudstone cobbles are angular to subanguar measuring 60-120mm. Mudstone boulders are angular to subangular measuring 150-500mm. (Possible Grade E GROVESEND FORMATION).	(0.55)		
					End of Trialpit at 1.800m	1.80	50.70	
						2.0		
						3.0		

Weather and environmental conditions:

1. Intermitent light rain

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated to a depth of 1.8m to establish ground conditions on site and undertake soakaway testing.
3. Service plans inspected and trial pit position scanned with a cable avoidence tool and before breaking ground for all positions.
4. Trial pit concluded due to the presence of dense material and desired testing depth was achieved.
5. Trial pit backfilled with arisings upon completion of testing.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: 2 ft toothed bucket

Shoring/support: None

TP204

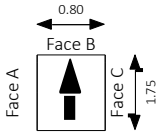
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 13/05/2021
Backfill date: 13/05/2021
Logged by: AB

Survey details:

Ground Level: 54.5 mOD
Easting: 274613 mOD
Northing: 198343 mOD
Bearing:

Plan details:



Face Stability:

Stable

Groundwater observations:

Groundwater not encountered

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
					Tarmacadam surfacing (MADE GROUND).	(0.10)		
0.10	B					0.10	54.40	
	ES				Loose, black mottled grey, sandy slightly clayey GRAVEL. Sand is fine to coarse, gravel is fine to coarse subangular to subrounded consisting of mudstone. Rare brick fragments and glass present. (MADE GROUND).	(0.20)		
0.35	ES					0.30	54.20	
						(0.10)	54.10	
0.50 -	ES				Loose, Red mottled pink, very sandy GRAVEL. Sand is fine to coarse, gravel is fine to medium subangular to subrounded consisting of sandstone. (MADE GROUND).	0.40		
0.60						(0.20)		
0.70	ES				Firm, light brown, slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse, gravel is fine to coarse subangular to subrounded consisting of mudstone. (MADE GROUND).	0.60	53.90	
						(0.35)		
1.00	ES				Firm, light grey mottled brown, sandy gravelly CLAY. Sand is fine to coarse, gravel is fine to coarse subangular to subrounded consisting of mudstone. Rare brick fragments present. (MADE GROUND).	0.95	53.55	
						1.0		
1.20	B				Firm, light brown, sandy very gravelly very clayey SILT with moderate cobble content and occasional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subrounded measuring 60-120mm. Mudstone boulders are angular measuring 120-1000mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).			
1.40	D					(0.95)		
						1.90	52.60	
					Medium dense, Dark brown to light grey, gravelly clayey very silty SAND with moderate cobble content and occansional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subrounded measuring 60-120mm. Mudstone boulders are angular measuring 120-300mm. (Possible Grade E GROVESEND FORMATION).	2.0		
2.20	B							
2.50	D					(1.40)		
3.00	B					3.0		
3.10	D							
					End of Trialpit at 3.300m	3.30	51.20	

Weather and environmental conditions:

1. Intermitent light rain

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated to a depth of 3.3m to establish ground conditions on site and take envronmental samples.
3. Service plans inspected and trial pit position scanned with a cable avoidence tool and before breaking ground for all positions.
4. Trial pit concluded as maximum working depth of the excavator was achieved. 5.Trial pit backfilled with arisings upon completion of logging.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: 2 ft toothed bucket

Shoring/support: None

TP205

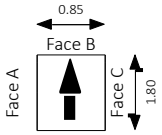
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 13/05/2021
Backfill date: 13/05/2021
Logged by: AB

Survey details:

Ground Level: 54.8 mOD
Easting: 274638 mOD
Northing: 198343 mOD
Bearing:

Plan details:



Face Stability:

Minor Sidewall Collapse

Groundwater observations:

Groundwater not encountered

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
					Tarmacadam surfacing (MADE GROUND).	(0.10)		
						0.10	54.70	
					Dense, grey, sandy gravelly COBBLES. Sand is fine to coarse, gravel is medium to coarse subangular to subrounded consisting of limestone. Limestone cobbles are subangular to subrounded measuring 60-100mm. (Gravel fill- MADE GROUND).	(1.00)		
0.70	B							
						1.0		
					Firm, reddish brown, sandy very gravelly clayey SILT with moderate cobble content and occasional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subrounded measuring 60-120mm. Mudstone boulders are angular measuring 120-200mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).	1.10	53.70	
						(0.70)		
1.60	D							
1.80	B				Dense, Dark brown to light grey, sandy clayey very silty GRAVEL with moderate cobble content and occansional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subrounded measuring 60-120mm. Mudstone boulders are angular measuring 120-400mm. (Possible Grade E GROVESEND FORMATION).	1.80	53.00	
2.00	D					2.0		
						(0.70)		
2.40	B							
					End of Trialpit at 2.500m	2.50	52.30	
						3.0		

Weather and environmental conditions:

1. Intermittent light rain

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated to a depth of 2.5m to establish ground conditions on site and take environmental samples.
3. Service plans inspected and trial pit position scanned with a cable avoidance tool and before breaking ground for all positions.
4. Trial pit concluded due to the presence of dense rock at base of pit. 5.Trial pit backfilled with arisings upon completion of logging.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Excavation method/plant: 2 ft toothed bucket

Shoring/support: None

TP206

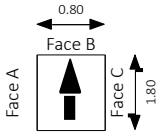
Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Excavation date: 13/05/2021
Backfill date: 13/05/2021
Logged by: AB

Survey details:

Ground Level: 54.9 mOD
Easting: 274640 mOD
Northing: 198359 mOD
Bearing:

Plan details:



Face Stability:

Stable

Groundwater observations:

Groundwater not encountered

Depth	Sample		Test Details		Strata Details			
m	Type	Class	Type	Result	Description	Depth (thickness)	mOD	Legend
					Tarmac Surface Layer (MADE GROUND).	(0.10)		
						0.10	54.80	
0.30	ES				Dense, dark brown mottled dark grey, sandy silty clayey GRAVEL with abundant cobbles and occasional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subangular consisting of mudstone, sandstone. Mudstone cobbles are angular to subangular measuring 60-110mm. Mudstone boulders are angular measuring 150-300mm. Building debris such as brick and glass common. Rare plastic present. (MADE GROUND).	(0.70)		
0.60	ES							
						0.80	54.10	
					Firm, reddish brown, sandy very gravelly clayey SILT with moderate cobble content and occasional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subrounded measuring 60-120mm. Mudstone boulders are angular measuring 120-200mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).	1.0		
1.10	ES					(0.80)		
						1.60	53.30	
					Dense, Dark brown to light grey, sandy clayey very silty GRAVEL with moderate cobble content and occansional boulders. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone and sandstone. Mudstone cobbles are angular to subrounded measuring 60-120mm. Mudstone boulders are angular measuring 120-450mm. (Possible Grade E GROVESEND FORMATION).	2.0		
						(1.00)		
2.30	ES							
					End of Trialpit at 2.600m	2.60	52.30	
						3.0		

Weather and environmental conditions:

1. Intermittent light rain

Other comments:

1. Coordinates and ground level obtained using client supplied information and online sources.
2. Trial pit excavated to a depth of 2.6m to establish ground conditions on site and take environmental samples.
3. Service plans inspected and trial pit position scanned with a cable avoidance tool and before breaking ground for all positions.
4. Trial pit concluded due to the presence of dense rock at base of pit. 5.Trial pit backfilled with arisings upon completion of logging.

Appendix J- Rotary Drillhole Records and SPT Plots (ESP, 2021)

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				**BH01**
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					

Start date:	25/06/2021	Driller:	C.Jones	Ground Level:	49.93 mOD		
End date:	28/06/2021	Logged by:	C.Jones	Easting:	274618 m		
Backfill date:	28/06/2021	Date logged:	28/06/2021	Northing:	198306 m		

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N
					40 (1,2/2,3,15, 20)
					30 (2,3/4,6,10, 10)
					50 (15 for 115mm/50 for 97mm)

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD	Backfill/ Install-ations
0.0	Tarmacadam surface layer			(0.10)	49.83	
0.1	Loose, black mottled grey, gravelly slightly clayey SAND Sand is fine to coarse, gravel is fine to coarse subangular to subrounded consisting of mudstone. Rare brick fragments and glass present. (MADE GROUND).			0.10		
0.5				(0.40)	49.43	
1.0				0.50		
1.5	Firm, dark brown mottled light brown gravelly sandy CLAY. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone and sandstone. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).			(0.70)		
2.0				1.20	48.73	
2.5	Medium dense, clayey GRAVEL. (Possible WEATHERED GROVESEND FORMATION).			(2.80)		
3.0						
3.5						
4.0	MUDSTONE. (Probable GROVESEND FORMATION).			4.00	45.93	
4.2	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			(0.20)	45.73	
4.5				4.20		
5.0						
5.5						
6.0						
6.5						
7.0						
7.5						
8.0						
8.5						
9.0						
9.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
25-06-2021	12:00		4.50	8.5

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
25/06/2021	12:00	12.30	4.50	0.00	0.00	
25/06/2021	12:00	8.50	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 21.6 and 20.4m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name:	Caewern House
Site Location:	Neath
Client:	LINC Cymru Housing Association
Project No:	7828b
Drilling method	Rotary open hole
Equipment	KLEMM

BH01

Start date:	25/06/2021	Driller:	C.Jones
End date:	28/06/2021	Logged by:	C.Jones
Backfill date:	28/06/2021	Date logged:	28/06/2021
Ground Level:	49.93 mOD		
Easting:	274618 m		
Northing:	198306 m		

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
10.5	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			(12.80)		
17.0	SILTSTONE. (Probable GROVESEND FORMATION).			17.00 (3.10)	32.93	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
25-06-2021	12:00		4.50	8.5

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
25/06/2021	12:00	12.30	4.50	0.00	0.00	
25/06/2021	12:00	8.50	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 21.6 and 20.4m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				**BH01**
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					
Start date: 25/06/2021	Driller: C.Jones	Ground Level: 49.93 mOD			
End date: 28/06/2021	Logged by: C.Jones	Easting: 274618 m			
Backfill date: 28/06/2021	Date logged: 28/06/2021	Northing: 198306 m			

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD	Backfill/ Installations
	SILTSTONE. (Probable GROVESEND FORMATION).			20.10	29.83	
	BROKEN GROUND, possible indicator of backfilled or collapsed workings at this depth. (Probable GROVESEND FORMATION).			(0.20)	29.63	
20.5	SILTSTONE. (Probable GROVESEND FORMATION).			20.30		
				(0.70)		
21.0	CAVITY, loss of flush recorded, probable working encountered. (WORKED SWANSEA FOUR FEET SEAM).			21.00	28.93	
				(0.40)		
21.5	BROKEN GROUND with intermittent cavities, no recovery. Possible indicator of backfilled or collapsed workings at this depth. (Probable BACKFILLED WORKINGS/ COLLAPSED ROOF).			21.40	28.53	
22.0						
				(1.60)		
22.5						
23.0	Normal drilling possibly indicating a return to competent bedrock. (Probable GROVESEND FORMATION).			23.00	26.93	
23.5						
24.0				(2.00)		
24.5						
25.0	Normal drilling possibly indicating a continuation of competent bedrock, loss of flush recorded possible cavities present, no recovery. (Probable GROVESEND FORMATION).			25.00	24.93	
25.5						
26.0				(2.50)		
26.5						
27.0						
27.5	Normal drilling possibly indicating a continuation of competent bedrock, no recovery. (Probable GROVESEND FORMATION).			27.50	22.43	
28.0						
28.5				(2.50)		
29.0						
29.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
25-06-2021	12:00		4.50	8.5

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
25/06/2021	12:00	12.30	4.50	0.00	0.00	
25/06/2021	12:00	8.50	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 21.6 and 20.4m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name:	Caewern House	Drilling method	Rotary open hole	BH01	
Site Location:	Neath	Equipment	KLEMM		
Client:	LINC Cymru Housing Association	Ground Level:	49.93 mOD		
Project No:	7828b	Easting:	274618 m		
Start date:	25/06/2021	Driller:	C.Jones	Northing:	198306 m
End date:	28/06/2021	Logged by:	C.Jones		
Backfill date:	28/06/2021	Date logged:	28/06/2021		

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD	Backfill/ Install-ations
	End of Borehole at 30.000m			30.00	19.93	

30.5 31.0 31.5 32.0 32.5 33.0 33.5 34.0 34.5 35.0 35.5 36.0 36.5 37.0 37.5 38.0 38.5 39.0 39.5

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
25-06-2021	12:00		4.50	8.5

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
25/06/2021	12:00	12.30	4.50	0.00	0.00	
25/06/2021	12:00	8.50	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 21.6 and 20.4m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Start date:	28/06/2021	Driller:	C.Jones	Ground Level:	52.20 mOD
End date:	29/06/2021	Logged by:	C.Jones	Easting:	274632 m
Backfill date:	29/06/2021	Date logged:	29/06/2021	Northing:	198321 m

Project Name: Caewern House
Site Location: Neath
Client: LINC Cymru Housing Association
Project No: 7828b

Drilling method: Rotary open hole
Equipment: KLEMM

BH02

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N
					12 (1,1/2,2,3,5)
					26 (3,3/5,5,7,9)
					27 (2,5/6,5,8,8)
					28 (3,3/4,7,9,8)
					50 (25 for 96mm/50 for 83mm)

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD	Backfill/ Install-ations
0.0	Soft, brown, sandy gravelly clayey SILT. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone. Wood fragments present, abundant rootlets. Grass overlain. (TOPSOIL).			(0.15)	52.05	
0.15				0.15		
0.5				(1.05)		
1.0	Firm to stiff, brown, gravelly silty CLAY. Gravel is fine to coarse angular to subrounded consisting of mudstone and siltstone. Mudstone cobbles are angular to subangular measuring 60-80mm. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).			1.20	51.00	
1.2				(0.30)		
1.5				1.50	50.70	
2.0	Stiff, CLAY. (Possible WEATHERED GROVESEND FORMATION).					
2.5	Medium dense, clayey GRAVEL. (Possible WEATHERED GROVESEND FORMATION).			(2.70)		
3.0						
3.5						
4.0						
4.2	Medium dense, clayey sandy GRAVEL. (Possible WEATHERED GROVESEND FORMATION).			4.20	48.00	
4.5						
5.0						
5.5				(2.30)		
6.0						
6.5	SANDSTONE, noted as wet. (Probable GROVESEND FORMATION).			6.50	45.70	
6.7				(0.70)		
7.0						
7.2	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			7.20	45.00	
7.5						
8.0						
8.5						
9.0				(3.40)		
9.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
28-06-2021	12:00		4.50	6.7

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
28/06/2021	12:00	6.70	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
31.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.0m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH02
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	28/06/2021	Driller:	C.Jones	Ground Level:	52.20 mOD
End date:	29/06/2021	Logged by:	C.Jones	Easting:	274632 m
Backfill date:	29/06/2021	Date logged:	29/06/2021	Northing:	198321 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
10.5	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			10.60	41.60	
	Unworked COAL seam (Probable INTERMITTENT UNWORKED COAL SEAM).			(0.40)		
11.0	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			11.00	41.20	
11.5						
12.0						
12.5						
13.0						
13.5						
14.0						
14.5						
15.0						
15.5				(9.00)		
16.0						
16.5						
17.0						
17.5						
18.0						
18.5						
19.0						
19.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
28-06-2021	12:00		4.50	6.7

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
28/06/2021	12:00	6.70	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
31.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.0m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH02
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	28/06/2021	Driller:	C.Jones	Ground Level:	52.20 mOD
End date:	29/06/2021	Logged by:	C.Jones	Easting:	274632 m
Backfill date:	29/06/2021	Date logged:	29/06/2021	Northing:	198321 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
20.5	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			20.00	32.20	
21.0						
21.5						
22.0						
22.5						
23.0						
23.5						
24.0				(8.30)		
24.5						
25.0						
25.5						
26.0						
26.5						
27.0						
27.5						
28.0						
28.5	Back filled workings, loss of flush recorded, no recovery. (Possible WORKED SWANSEA FOUR FEET SEAM).			28.30	23.90	
29.0				(1.20)		
29.5	Normal drilling possibly indicating a return to competent bedrock. (Probable GROVESEND			29.50	22.70	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
28-06-2021	12:00		4.50	6.7

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
28/06/2021	12:00	6.70	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
31.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.0m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					

BH02

Start date:	28/06/2021	Driller:	C.Jones	Ground Level:	52.20 mOD
End date:	29/06/2021	Logged by:	C.Jones	Easting:	274632 m
Backfill date:	29/06/2021	Date logged:	29/06/2021	Northing:	198321 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
30.5	Normal drilling possibly indicating a return to competent bedrock. (Probable GROVESEND FORMATION).			(1.50)		
31.0	End of Borehole at 31.000m			31.00	21.20	
31.5						
32.0						
32.5						
33.0						
33.5						
34.0						
34.5						
35.0						
35.5						
36.0						
36.5						
37.0						
37.5						
38.0						
38.5						
39.0						
39.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
28-06-2021	12:00		4.50	6.7

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed
28/06/2021	12:00	6.70	4.50	0.00	0.00	

Hole Diameter

Hole Depth	Hole Diameter
31.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.0m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership
Consulting Engineers | Geologists | Environmental Scientists

Start date:	29/06/2021	Driller:	C.Jones	Project Name: Caewern House	Drilling method: Rotary open hole	BH03
End date:	29/06/2021	Logged by:	C.Jones	Site Location: Neath	Equipment: KLEMM	
Backfill date:	29/06/2021	Date logged:	29/06/2021	Client: LINC Cymru Housing Association	Ground Level: 52.48 mOD	
				Project No: 7828b	Easting: 274657 m	
					Northing: 198344 m	

Core Details and SPT Data / Strata Details / Water / Depth / Backfill/Installations

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N	Description	Water Strikes/Standing	Depth (Thickness)	mOD
						Soft, brown, sandy gravelly clayey SILT. Sand is fine to coarse, gravel is fine to coarse angular to suangular consisting of mudstone. Wood fragments present, abundant rootlets. Grass overlain. (TOPSOIL).		(0.20) 0.20	52.28
					50 (3,3/50 for 168mm)	Firm, light brown mottled orange, gravelly sandy silty CLAY. Sand is fine to coarse, gravel is fine to coarse angular to subrounded consisting of mudstone. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).		(1.00) 1.20	51.28
						Stiff, CLAY. (Possible WEATHERED GROVESEND FORMATION).		(0.30) 1.50	50.98
						SANDSTONE. (Probable BOULDER).		(1.20) 2.70	49.78
					50 (25 for 11mm/50 for 9mm)	SANDSTONE. (Probable BOULDER).		(0.30) 3.00	49.48
					50 (5,6/50 for 260mm)	Very dense, clayey GRAVEL. (Possible WEATHERED GROVESEND FORMATION).		(2.00) 5.00	47.48
						SANDSTONE. (Probable GROVESEND FORMATION).		(1.00) 6.00	46.48
					50 (25 for 10mm/50 for 18mm)	SILTSTONE. (Probable GROVESEND FORMATION).		(1.00) 7.00	45.48
						Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).		(3.50)	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
31.50	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.5m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					
Start date: 29/06/2021	Driller: C.Jones	Ground Level: 52.48 mOD			
End date: 29/06/2021	Logged by: C.Jones	Easting: 274657 m			
Backfill date: 29/06/2021	Date logged: 29/06/2021	Northing: 198344 m			

BH03

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).					
10.5				10.50	41.98	
	Unworked COAL seam (Probable INTERMITTENT UNWORKED COAL SEAM).			(0.10)	41.88	
				10.60		
11.0	MUDSTONE. (Probable GROVESEND FORMATION).			(1.00)		
11.5				11.60	40.88	
	Unworked COAL seam (Probable INTERMITTENT UNWORKED COAL SEAM).			(0.40)		
12.0				12.00	40.48	
	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).					
12.5						
13.0						
13.5						
14.0						
14.5						
15.0						
15.5						
16.0						
16.5						
17.0						
17.5						
18.0						
18.5						
19.0						
19.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
31.50	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.5m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH03
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	29/06/2021	Driller:	C.Jones	Ground Level:	52.48 mOD
End date:	29/06/2021	Logged by:	C.Jones	Easting:	274657 m
Backfill date:	29/06/2021	Date logged:	29/06/2021	Northing:	198344 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
20.5	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			(17.00)		
21.0						
21.5						
22.0						
22.5						
23.0						
23.5						
24.0						
24.5						
25.0						
25.5						
26.0						
26.5						
27.0						
27.5						
28.0						
28.5						
29.0	CAVITY, loss of flush recorded, probable working encountered. (Possible WORKED SWANSEA FOUR FEET SEAM).			29.00 (0.40)	23.48	
29.5	Normal Drilling, probable collapsed roof boulder. (Probable BACKFILLED WORKINGS OR COLLAPSED			29.40 (0.60)	23.08	

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
31.50	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.5m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH03
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	29/06/2021	Driller:	C.Jones	Ground Level:	52.48 mOD
End date:	29/06/2021	Logged by:	C.Jones	Easting:	274657 m
Backfill date:	29/06/2021	Date logged:	29/06/2021	Northing:	198344 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD	Backfill/ Install-ations
				30.00	22.48	
				(0.60)		
30.5	Normal Drilling, probable collapsed roof boulder. (Probable BACKFILLED WORKINGS OR COLLAPSED ROOF).			30.60	21.88	
	Soft Drilling. (Probable BACKFILLED/COLLAPSED WORKINGS).					
31.0	Normal drilling possibly indicating a return to competent bedrock. (Probable GROVESEND FORMATION).			(0.90)		
31.5	End of Borehole at 31.500m			31.50	20.98	
32.0						
32.5						
33.0						
33.5						
34.0						
34.5						
35.0						
35.5						
36.0						
36.5						
37.0						
37.5						
38.0						
38.5						
39.0						
39.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
31.50	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 31.5m depth. Borehole back filled with arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Site Location: Neath	Client: LINC Cymru Housing Association	Project No: 7828b	Drilling method: Rotary open hole	Equipment: KLEMM

BH04

Start date:	29/06/2021	Driller:	C.Jones	Ground Level:	54.92 mOD
End date:	30/06/2021	Logged by:	C.Jones	Easting:	274644 m
Backfill date:	30/06/2021	Date logged:	30/06/2021	Northing:	198358 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N
					36 (6,4/11,7,9,9)
					50 (25 for 105mm/50 for 86mm)
					23 (3,8/6,5,6,6)
					50 (25 for 101mm/50 for 106mm)

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD
0.0	Black, clayey sandy GRAVEL. (MADE GROUND)			(1.20)	
1.20	Very dense, silty sandy GRAVEL. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).			(1.10)	53.72
2.30	Very dense, angular GRAVEL with sand. (Probable GROVESEND FORMATION).			(1.30)	52.62
3.60	Medium dense, angular GRAVEL with clay. (Probable GROVESEND FORMATION).			(1.50)	51.32
5.10	MUDSTONE. (Probable GROVESEND FORMATION).			(3.40)	49.82
8.50	SANDSTONE. (Probable GROVESEND FORMATION).				46.42

Backfill/ Install-ations

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					
Start date: 29/06/2021	Driller: C.Jones	Ground Level: 54.92 mOD			
End date: 30/06/2021	Logged by: C.Jones	Easting: 274644 m			
Backfill date: 30/06/2021	Date logged: 30/06/2021	Northing: 198358 m			

BH04

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
10.5	SANDSTONE. (Probable GROVESEND FORMATION).			(3.70)		
11.0						
11.5						
12.0				12.20	42.72	
12.5	MUDSTONE. (Probable GROVESEND FORMATION).					
13.0						
13.5				(2.60)		
14.0						
14.5				14.80	40.12	
15.0	Unworked COAL seam. (Probable INTERMITTENT UNWORKED COAL SEAM).			(0.30)		
	MUDSTONE. (Probable GROVESEND FORMATION).			15.10	39.82	
15.5						
16.0				(1.90)		
16.5						
17.0	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			17.00	37.92	
17.5						
18.0						
18.5						
19.0						
19.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH04
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	29/06/2021	Driller:	C.Jones	Ground Level:	54.92 mOD
End date:	30/06/2021	Logged by:	C.Jones	Easting:	274644 m
Backfill date:	30/06/2021	Date logged:	30/06/2021	Northing:	198358 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			(13.00)		

20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name:	Caewern House
Site Location:	Neath
Client:	LINC Cymru Housing Association
Project No:	7828b
Drilling method	Rotary open hole
Equipment	KLEMM

BH04

Start date:	29/06/2021	Driller:	C.Jones
End date:	30/06/2021	Logged by:	C.Jones
Backfill date:	30/06/2021	Date logged:	30/06/2021
Ground Level:	54.92 mOD		
Easting:	274644 m		
Northing:	198358 m		

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
	End of Borehole at 30.000m			30.00	24.92	

30.5 31.0 31.5 32.0 32.5 33.0 33.5 34.0 34.5 35.0 35.5 36.0 36.5 37.0 37.5 38.0 38.5 39.0 39.5

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
29-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					

BH05

Start date:	30/06/2021	Driller:	C.Jones	Ground Level:	54.50 mOD
End date:	01/07/2021	Logged by:	C.Jones	Easting:	274616 m
Backfill date:	01/07/2021	Date logged:	01/07/2021	Northing:	198339 m

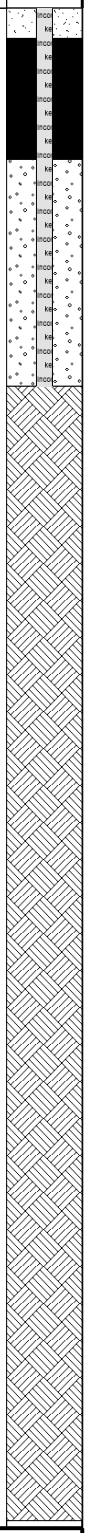
Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N
					20 (2,3/3,5,5,7)
					36 (4,4/7,10,9, 10)
					24 (3,6/4,6,7,7)

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	mOD
0.0	Black clayey sandy GRAVEL. (MADE GROUND)			(0.30)	
0.3	Stiff, CLAY. (Possible GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).			0.30	54.20
1.2	Dense to medium dense, clayey sandy GRAVEL. (Possible WEATHERED GROVESEND FORMATION).			(0.90) 1.20	53.30
5.5	SANDSTONE. (Probable GROVESEND FORMATION).			(4.30) 5.50	49.00
5.7	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			(0.20) 5.70	48.80
30.0				(6.30)	

Backfill/ Install-ations



Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
30-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole				
Site Location: Neath	Equipment: KLEMM				
Client: LINC Cymru Housing Association					
Project No: 7828b					

BH05

Start date:	30/06/2021	Driller:	C.Jones	Ground Level:	54.50 mOD
End date:	01/07/2021	Logged by:	C.Jones	Easting:	274616 m
Backfill date:	01/07/2021	Date logged:	01/07/2021	Northing:	198339 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water Strikes/ Standing	Depth (Thickness)	Depth mOD	Backfill/ Install-ations
10.5	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).					
11.0						
11.5						
12.0				12.00	42.50	
	Unworked COAL seam (Probable INTERMITTENT UNWORKED COAL SEAM).			(0.60)		
12.5				12.60	41.90	
	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).					
13.0						
13.5						
14.0						
14.5						
15.0						
15.5						
16.0						
16.5						
17.0						
17.5						
18.0						
18.5						
19.0						
19.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
30-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH05
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	30/06/2021	Driller:	C.Jones	Ground Level:	54.50 mOD
End date:	01/07/2021	Logged by:	C.Jones	Easting:	274616 m
Backfill date:	01/07/2021	Date logged:	01/07/2021	Northing:	198339 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water: Strikes/ Standing	Depth: Depth (Thickness)	Depth: mOD	Backfill/ Install-ations
20.5	Interbedded MUDSTONE and SILTSTONE BANDS. (Probable GROVESEND FORMATION).			(17.40)		
21.0						
21.5						
22.0						
22.5						
23.0						
23.5						
24.0						
24.5						
25.0						
25.5						
26.0						
26.5						
27.0						
27.5						
28.0						
28.5						
29.0						
29.5						

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
30-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

Earth Science Partnership

Consulting Engineers | Geologists | Environmental Scientists

Project Name: Caewern House	Drilling method: Rotary open hole	BH05
Site Location: Neath	Equipment: KLEMM	
Client: LINC Cymru Housing Association		
Project No: 7828b		

Start date:	30/06/2021	Driller:	C.Jones	Ground Level:	54.50 mOD
End date:	01/07/2021	Logged by:	C.Jones	Easting:	274616 m
Backfill date:	01/07/2021	Date logged:	01/07/2021	Northing:	198339 m

Core Details and SPT Data

Depth (Length)	TCR (%)	SCR (%)	RQD (%)	FI	SPT-N

Strata Details

Depth	Description	Legend	Water: Strikes/ Standing	Depth: Depth (Thickness)	Depth: mOD	Backfill/ Install-ations
	End of Borehole at 30.000m			30.00	24.50	

30.5 31.0 31.5 32.0 32.5 33.0 33.5 34.0 34.5 35.0 35.5 36.0 36.5 37.0 37.5 38.0 38.5 39.0 39.5

Progress & Standing Water Levels

Date	Time	Hole Depth	Casing Depth	Water Depth
30-06-2021	12:00		4.50	Dry

Water Strikes

Date	Time	Strike Depth	Casing Depth	Elapsed Minutes	Depth to Water	Depth Sealed

Hole Diameter

Hole Depth	Hole Diameter
30.00	

Casing Diameter

Casing Diameter	Casing Depth
	4.50

General Remarks

1. Coordinates and ground level obtained using client supplied information and online sources. Service plans inspected and borehole position scanned with CAT and genny before breaking ground for all positions. Hand excavated service pit to 1.2m depth.
2. Borehole concluded at 30.0m depth. 50mm gas monitoring well installed with response zone between 1.0 and 2.5m. remainder of borehole back filled with gravel, bentonite and arisings.
3. Strata descriptions based off drillers descriptions.
4. No evidence of hazardous ground gas identified during drilling.

PROPOSED RESIDENTIAL DEVELOPMENT
FORMER CAEWERN HOUSE, NEATH

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APPENDIX J - RESULTS OF STANDARD PENETRATION TESTING (SPT)

BH	depth (m)	S/C	Driller	casing depth (m)	water depth (m)	Seating blows		Test drive				SPT N-value	Extrapolated N-value*	Design N-value*	Soils
						75mm	75mm	75mm	75mm	75mm	75mm				
BH01	1.20	C	CJ	-	dry	1	2	2	3	15	20	40		21	clayey GRAVEL
	2.70	C	CJ	-	dry	2	3	4	6	10	10	30		16	clayey GRAVEL
	4.20	C	CJ	-	dry	17	8/40mm	30	20/22mm			> 50	155	27	MUDSTONE
BH02	1.20	C	CJ	-	dry	1	1	2	2	3	5	12		6	clayey GRAVEL
	2.70	C	CJ	-	dry	3	3	5	5	7	9	26		14	clayey GRAVEL
	4.20	C	CJ	-	dry	2	5	6	5	8	8	27		14	clayey GRAVEL
	5.70	C	CJ	-	dry	3	3	4	7	9	8	28		15	clayey GRAVEL
	7.20	C	CJ	-	6.70	19	6/21mm	41	9/8mm			> 50	181	27	weathered SANDSTONE
BH03	1.20	C	CJ	-	dry	3	3	4	19	27/18mm		> 50	89	27	clayey GRAVEL
	2.70	C	CJ	-	dry	25/11mm		50/9mm				> 50	1667	27	clayey GRAVEL
	4.20	C	CJ	-	dry	5	6	6	10	20	14/35mm	> 50	58	27	GRAVEL
	5.70	C	CJ	-	dry	25/10mm		50/18mm				> 50	833	27	GRAVEL
BH04	1.20	C	CJ	-	dry	6	4	11	7	9	9	36		19	clayey GRAVEL
	2.70	C	CJ	-	dry	18	7/30mm	36	14/11mm			> 50	174	27	GRAVEL
	4.20	C	CJ	-	dry	3	8	6	5	6	6	23		12	clayey GRAVEL
	5.70	C	CJ	-	dry	15	10/26mm	19	31-NP			> 50	200	27	MUDSTONE
BH05	1.20	C	CJ	-	dry	2	3	3	5	5	7	20		11	clayey GRAVEL
	2.70	C	CJ	-	dry	4	4	7	10	9	10	36		19	clayey GRAVEL
	4.20	C	CJ	-	dry	3	6	4	6	7	7	24		13	clayey GRAVEL

Design N-value allows for corrections as applicable.

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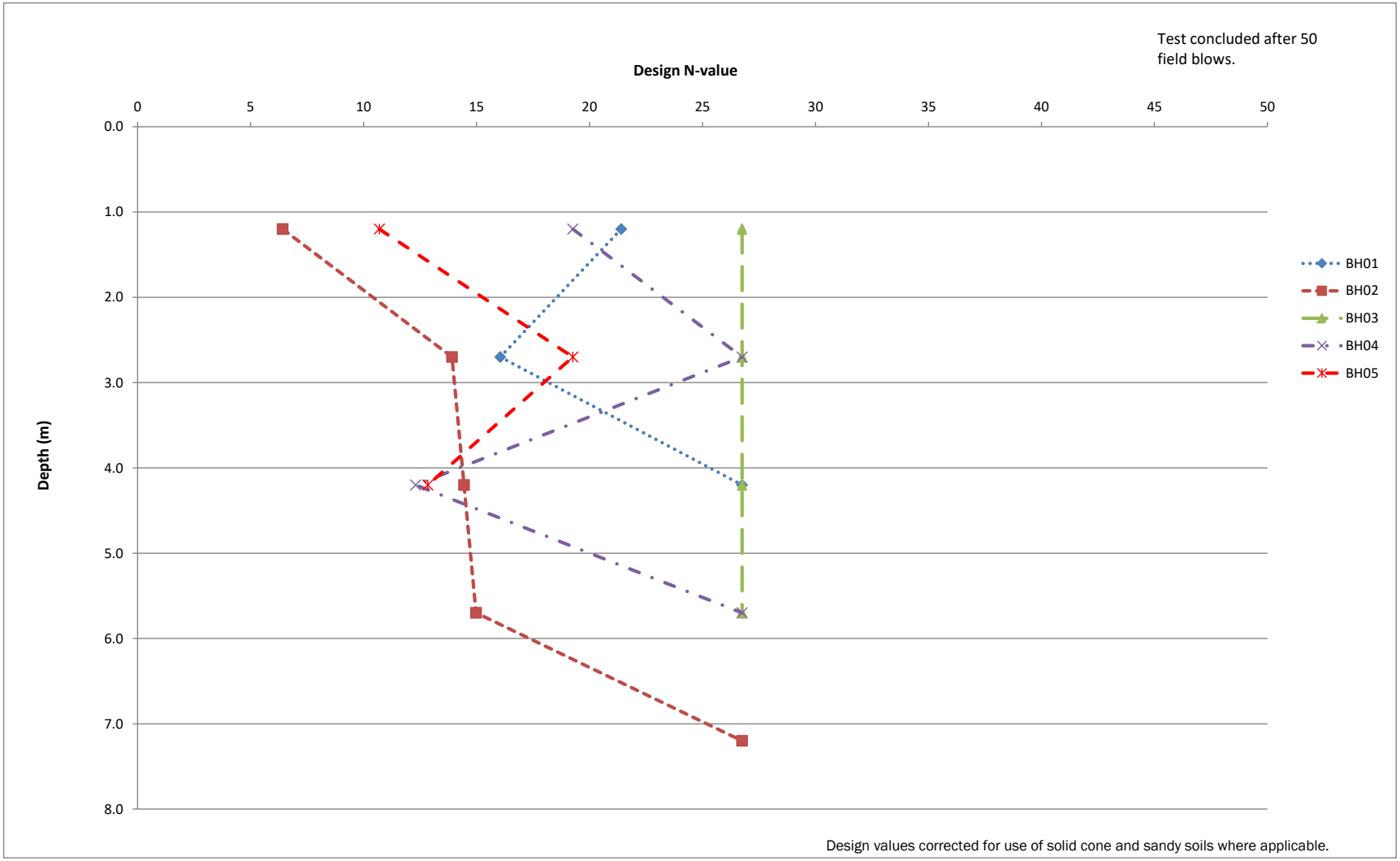
APPENDIX J - RESULTS OF STANDARD PENETRATION TESTING (SPT)



Appendix K- Results of Soakaway Infiltration Testing (ESP, 2021)

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	13/05/2021
Test Location:	SA201
Fill Number:	1
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.10
1	0.12
2	0.13
3	0.14
4	0.15
5	0.18
6	0.20
7	0.22
8	0.23
9	0.25
10	0.27
11	0.30
12	0.32
13	0.35
14	0.37
15	0.41
60	0.63
120	0.71
248	0.9
1178	1.04

Pit Dimensions (m)

Length	2.00
Width	0.75
Depth	2.00

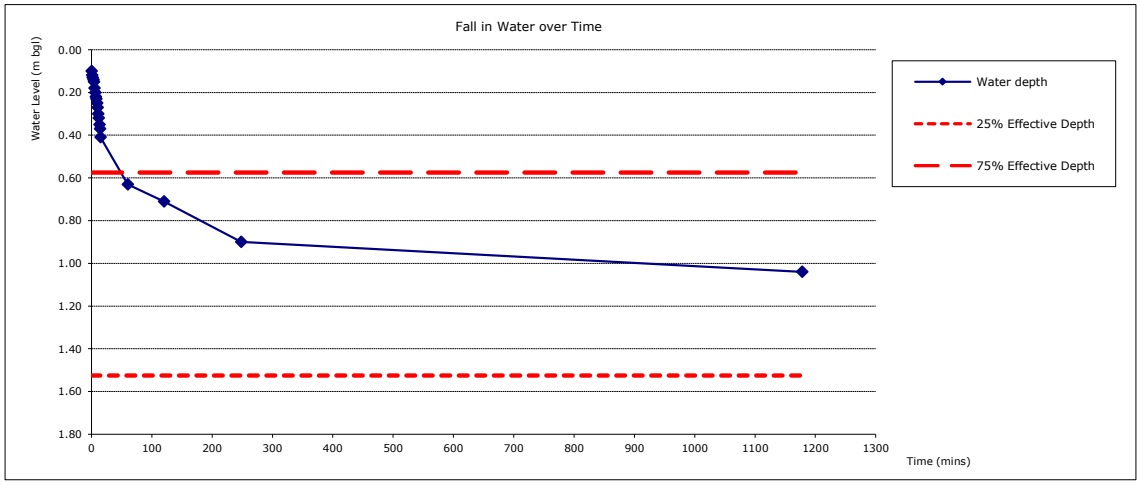
Assumed Invert Level (m bgl)	0.10

Ground Conditions:

GL - 0.15m	Brown, sandy gravelly SILT. (TOPSOIL).
0.15 - 0.4m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).
0.4 - 1.0m	Light grey, gravelly sandy silty CLAY, moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION
1.0 - 2.0m	Light Grey mottled dark grey, very sandy clayey GRAVEL with high cobble content and occasional boulders. (Weathered GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.
4. During excavation of the trial pit, perched groundwater was encountered at 1.7m rising to 1.1m after 1 hour.



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	1.43
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	6.725
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{1.425}{\text{no value}}$

f **test failed**

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	14/05/2021
Test Location:	SA201
Fill Number:	2
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.01
1	0.02
2	0.04
3	0.05
4	0.06
5	0.07
6	0.08
7	0.09
8	0.10
9	0.11
10	0.12
11	0.13
12	0.14
13	0.16
15	0.20
16	0.22
25	0.33
65	0.51
114	0.78
150	0.85
185	0.9
240	0.98

Pit Dimensions (m)

Length	2.00
Width	0.75
Depth	2.00

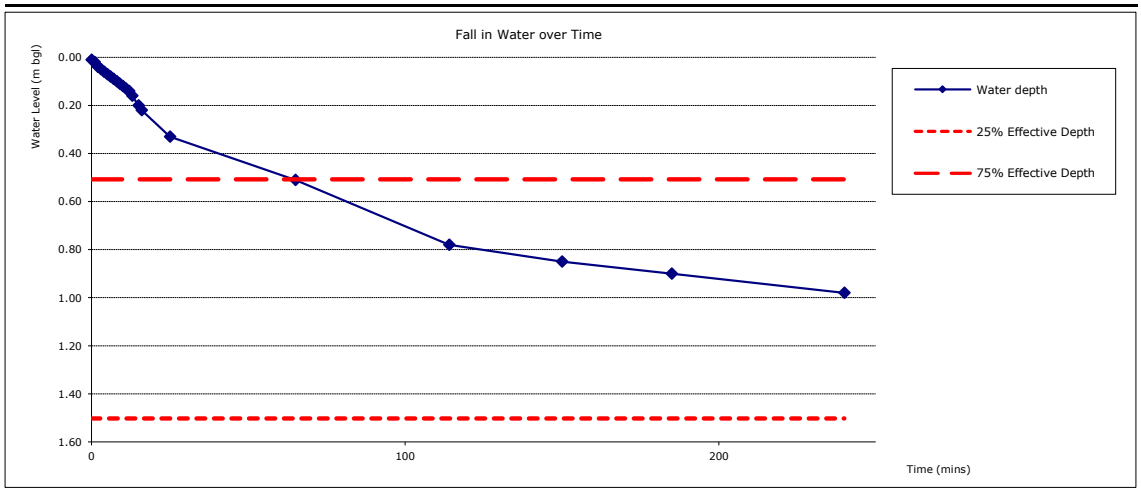
Assumed Invert Level (m bgl)	0.01

Ground Conditions:

GL - 0.15m	Brown, sandy gravelly SILT. (TOPSOIL).
0.15 - 0.4m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).
0.4 - 1.0m	Light grey, gravelly sandy silty CLAY, moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION
1.0 - 2.0m	Light Grey mottled dark grey, very sandy clayey GRAVEL with high cobble content and occasional boulders. (Weathered GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.
4. During excavation of the trial pit, perched groundwater was encountered at 1.7m rising to 1.1m after 1 hour.



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	1.49
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	6.9725
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{1.493}{\text{no value}}$

f **test failed**

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	14/05/2021
Test Location:	SA201
Fill Number:	3
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.03
1	0.05
2	0.08
3	0.11
4	0.14
5	0.17
6	0.19
7	0.21
8	0.22
9	0.23
10	0.24
11	0.25
12	0.26
13	0.28
14	0.29
15	0.30
16	0.31
50	0.60
90	0.75
122	0.82
152	0.86
210	0.93

Pit Dimensions (m)

Length	2.00
Width	0.75
Depth	2.00

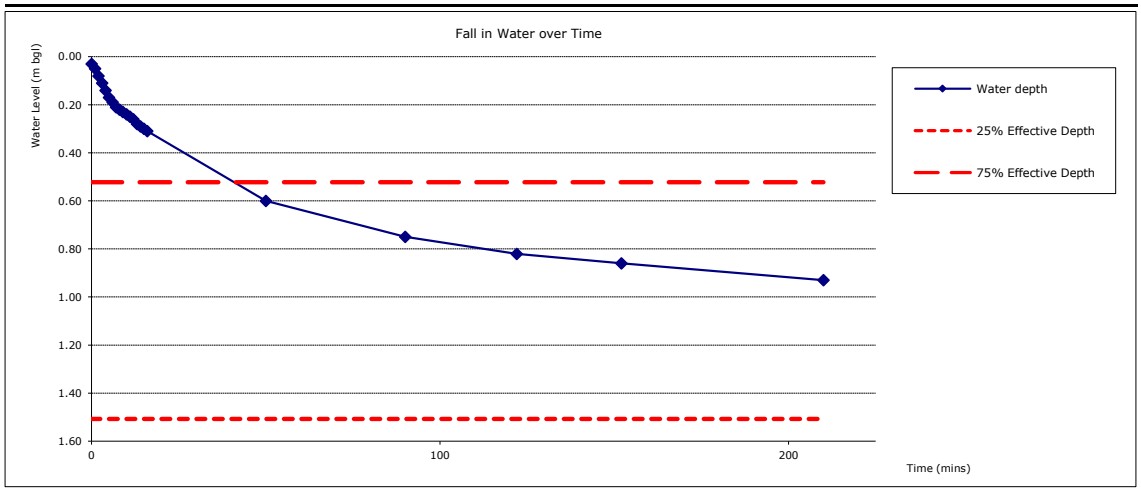
Assumed Invert Level (m bgl)	0.03

Ground Conditions:

GL - 0.15m	Brown, sandy gravelly SILT. (TOPSOIL).
0.15 - 0.4m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).
0.4 - 1.0m	Light grey, gravelly sandy silty CLAY, moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION
1.0 - 2.0m	Light Grey mottled dark grey, very sandy clayey GRAVEL with high cobble content and occasional boulders. (Weathered GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.
4. During excavation of the trial pit, perched groundwater was encountered at 1.7m rising to 1.1m after 1 hour.
5. Trial pit backfilled on completion of third fill



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	1.48
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	6.9175
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{1.478}{\text{no value}}$

f **test failed**

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	13/05/2021
Test Location:	SA202
Fill Number:	1
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.92
1	0.92
2	0.92
3	0.92
4	0.92
5	0.92
6	0.92
7	0.92
8	0.92
9	0.92
10	0.92
15	0.92
80	0.92
120	0.93
185	0.93
240	0.93
1205	0.93
1265	0.93
1355	0.93
1390	0.93
1550	0.93
1590	0.93

Pit Dimensions (m)

Length	1.60
Width	0.75
Depth	2.00

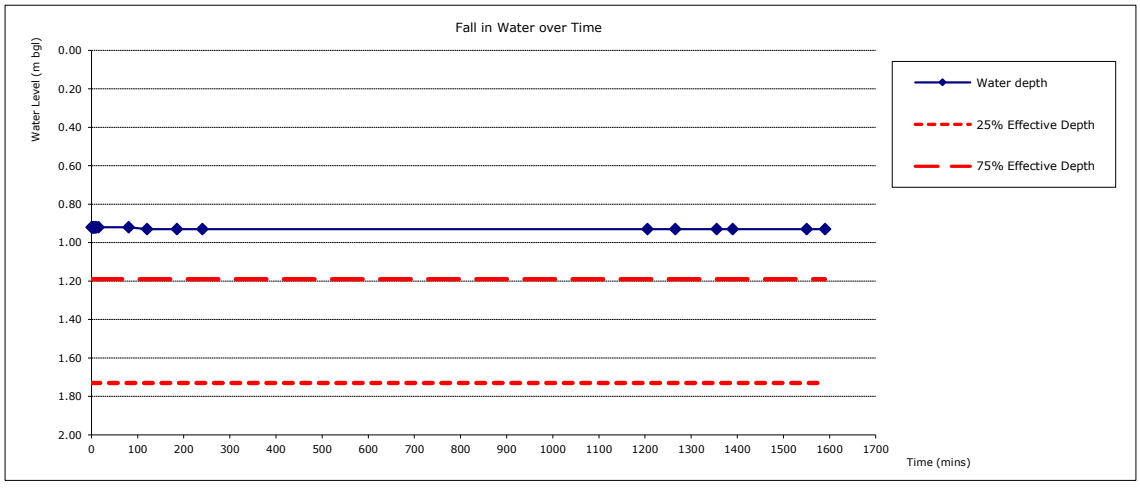
Assumed Invert Level (m bgl)	0.92

Ground Conditions:

GL - 0.2m	Brown, sandy gravelly SILT. (TOPSOIL).
0.2 - 0.85m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).
0.85 - 2.0m	Light grey mottled brown, gravelly sandy silty CLAY with moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/ WEATHERED GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	0.65
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	3.738
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{0.648}{\text{no value}}$

f **test failed**

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	13/05/2021
Test Location:	SA203
Fill Number:	1
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.29
1	0.35
2	0.40
3	0.49
4	0.56
5	0.65
6	0.71
7	0.76
8	0.79
9	0.82
10	0.83
11	0.85
12	0.89
13	0.90
14	0.92
15	0.94
68	1.10
120	1.19
188	1.23
227	1.25
1157	1.25

Pit Dimensions (m)

Length	1.70
Width	0.80
Depth	1.80

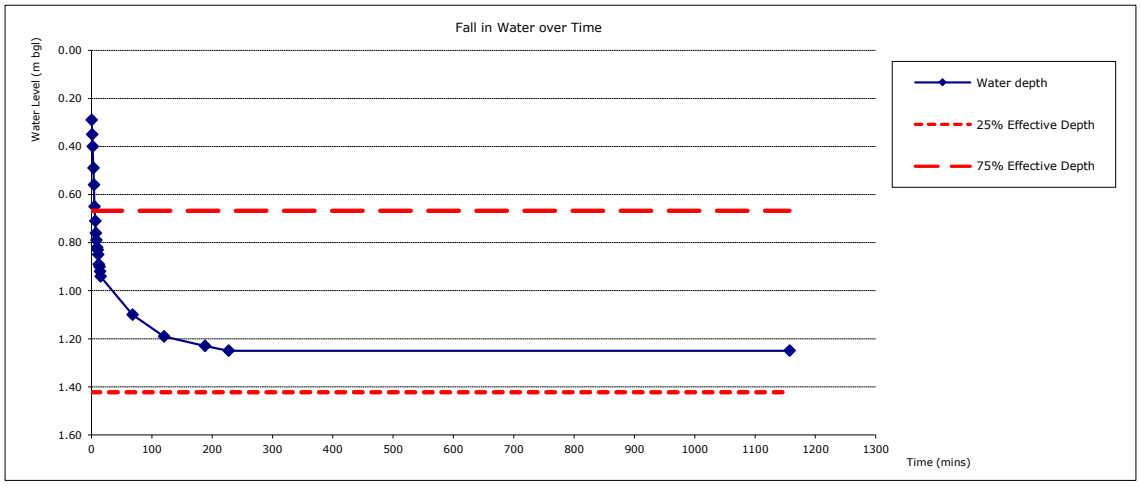
Assumed Invert Level (m bgl)	0.29

Ground Conditions:

GL - 0.2m	Brown, sandy gravelly SILT. (TOPSOIL).
0.2 - 0.6m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/WEATHERED GROVESEND FORMATION BEDROCK).
0.6 - 1.25m	Light grey, gravelly sandy silty CLAY, moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/WEATHERED GROVESEND FORMATION
1.25 - 1.8m	Dark grey, very sandy clayey GRAVEL with abundant cobbles and common boulders. (Weathered GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.
4. During excavation of the trial pit, perched groundwater was encountered at 1.6m rising to 1.25m after 1 hour.



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	1.03
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	5.135
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{1.027}{\text{no value}}$

f **test failed**

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	14/05/2021
Test Location:	SA203
Fill Number:	2
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.18
1	0.21
2	0.26
3	0.31
4	0.34
5	0.40
6	0.44
7	0.47
8	0.49
9	0.52
10	0.56
11	0.59
12	0.62
13	0.65
14	0.69
15	0.72
20	1.00
70	1.09
105	1.14
135	1.19
175	1.22
195	1.25

Pit Dimensions (m)

Length	1.70
Width	0.80
Depth	1.80

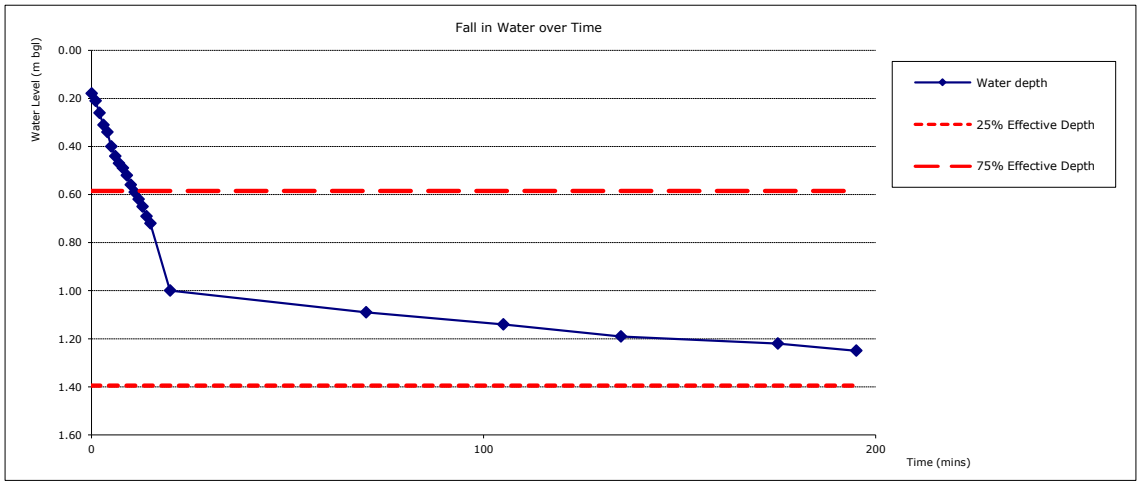
Assumed Invert Level (m bgl)	0.18

Ground Conditions:

GL - 0.2m	Brown, sandy gravelly SILT. (TOPSOIL).
0.2 - 0.6m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/WEATHERED GROVESEND FORMATION BEDROCK).
0.6 - 1.25m	Light grey, gravelly sandy silty CLAY, moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/WEATHERED GROVESEND FORMATION
1.25 - 1.8m	Dark grey, very sandy clayey GRAVEL with abundant cobbles and common boulders. (Weathered GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.
4. During excavation of the trial pit, perched groundwater was encountered at 1.6m rising to 1.25m after 1 hour.



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	1.10
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	5.41
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{1.102}{\text{no value}}$

f **test failed**

APPENDIX K - SOAKAWAY INFILTRATION TEST RESULTS

BRE 365 method

esp ENGINEERS GEOLOGISTS SCIENTISTS

Project Name:	Caewern House, Neath
Project Ref:	7828b
Date of Testing:	14/05/2021
Test Location:	SA203
Fill Number:	3
Soil Infiltration Rate	**test failed m/sec**

Test results:

Time (mins)	Water Level (m bgl)
0	0.22
1	0.34
2	0.49
3	0.54
4	0.62
5	0.67
6	0.72
7	0.76
8	0.80
9	0.83
10	0.85
11	0.87
12	0.89
13	0.91
14	0.94
15	0.96
16	0.99
55	1.11
94	1.16
122	1.21
162	1.23
191	1.25

Pit Dimensions (m)

Length	1.70
Width	0.80
Depth	1.80

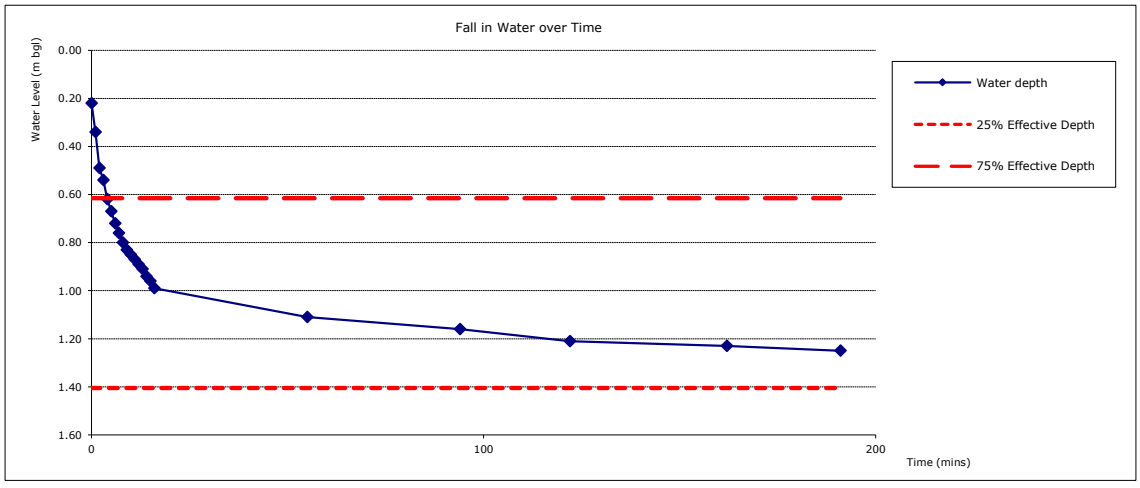
Assumed Invert Level (m bgl)	0.22

Ground Conditions:

GL - 0.2m	Brown, sandy gravelly SILT. (TOPSOIL).
0.2 - 0.6m	Light brown mottled orange, gravelly sandy clayey SILT. (Probable GLACIAL DIAMICTON/WEATHERED GROVESEND FORMATION BEDROCK).
0.6 - 1.25m	Light grey, gravelly sandy silty CLAY, moderate cobble content and occasional boulders. (Probable GLACIAL DIAMICTON/WEATHERED GROVESEND FORMATION
1.25 - 1.8m	Dark grey, very sandy clayey GRAVEL with abundant cobbles and common boulders. (Weathered GROVESEND FORMATION BEDROCK).

Remarks:

1. Testing undertaken in general accordance with BRE Digest 365:2007
2. Trial pit was not filled with aggregate for test.
3. Minor spalling sidewall.
4. During excavation of the trial pit, perched groundwater was encountered at 1.6m rising to 1.25m after 1 hour.
5. Trial pit backfilled on completion of third fill



Soil Infiltration Rate (m/sec) $f = \frac{V_{p75-25}}{\alpha_{p50} \times t_{p75-25}}$

V_{p75-25}	Effective depth storage volume of water in the trial pit between 75% and 25% effective depth	1.07
α_{p50}	The internal surface area of the trial pit up to 50% effective depth and including the base area	5.31
t_{p75-25}	The time for the water level to fall from 75% to 25% effective depth	n/a

Soil Infiltration Rate (m/sec) $f = \frac{1.074}{\text{no value}}$

f **test failed**

Appendix L- Groundwater and Gas Monitoring Results (ESP, 2021)

APPENDIX L - PROPOSED RESIDENTIAL DEVELOPMENT
CAEWERN HOUSE, NEATH
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)
Project Ref. 7828b

Monitoring Event 1

Date:	19/07/2021	**Atmospheric Pressure (start):**	990 mb	**Trend:**	Rising
Time:	1345	**Atmospheric Pressure (end):**	1,009 mb		
Engineer:	DC	**Site Status:**	Undeveloped (deralict)		
Weather:	Hot (≥28°C), dry, clear skies	**Ground Conditions:**	Hard-surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	04/06/2021		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	21/06/2022		

Well ID:	**BH01**	**Well dia.(mm):**	50	**Date installed:**	28/06/2021	**Response stratum:**		Backfilled coal workings	
		Well depth (m):	21.98			**Groundwater depth (m):**		6.32	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		-1.0	7.0	78.7	0.5	1.1	19.7	0.0	-0.3	0.1
After 30 Seconds		-1.0	1.4	79.5	0.7	0.0	19.8	0.0	-0.3	0.0
After 1 Minute		0.0	1.4	79.5	0.5	0.0	20.0	0.0	0.0	0.0
After 2 Minutes		-1.0	0.7	79.8	0.8	0.0	19.4	0.0	-0.3	0.0
Steady State		-1.0	0.2	81.2	1.5	0.0	17.3	0.0	-0.3	0.0
min		*-1.0*	*0.2*	*78.7*	*0.5*	*0.0*	*17.3*	*0.0*	*-0.3*	*0.0*
max		*0.0*	*7.0*	*81.2*	*1.5*	*1.1*	*20.0*	*0.0*	*0.0*	*0.1*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**-0.0045 L/hr**	
Comments:										

Well ID:	**BH04**	**Well dia.(mm):**	50	**Date installed:**	30/06/2021	**Response stratum:**		MADE GROUND	
		Well depth (m):	2.60			**Groundwater depth (m):**		2.60	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	5.9	78.4	0.6	0.2	20.8	0.0	0.0	0.0
After 30 Seconds		0.0	3.2	78.5	0.2	0.1	21.2	0.0	0.0	0.0
After 1 Minute		0.0	2.4	78.6	0.2	0.1	21.1	0.0	0.0	0.0
After 2 Minutes		0.0	1.4	78.6	0.2	0.0	21.2	0.0	0.0	0.0
Steady State		0.0	1.4	78.6	0.2	0.0	21.2	0.0	0.0	0.0
min		*0.0*	*1.4*	*78.4*	*0.2*	*0.0*	*20.8*	*0.0*	*0.0*	*0.0*
max		*0.0*	*5.9*	*78.6*	*0.6*	*0.2*	*21.2*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**BH05**	**Well dia.(mm):**	50	**Date installed:**	01/07/2021	**Response stratum:**		Sandy CLAY and GRAVEL	
		Well depth (m):	2.60			**Groundwater depth (m):**		Dry	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	6.2	79.3	1.8	0.2	18.7	0.0	0.0	0.0
After 30 Seconds		0.0	3.9	80.2	4.9	0.1	14.8	0.0	0.0	0.0
After 1 Minute		0.0	3.9	80.3	6.1	0.1	13.5	0.0	0.0	0.0
After 2 Minutes		0.0	2.4	80.4	6.7	0.1	12.8	0.0	0.0	0.0
Steady State		0.0	2.4	80.5	6.8	0.1	12.6	0.0	0.0	0.0
min		*0.0*	*2.4*	*79.3*	*1.8*	*0.1*	*12.6*	*0.0*	*0.0*	*0.0*
max		*0.0*	*6.2*	*80.5*	*6.8*	*0.2*	*18.7*	*0.0*	*0.0*	*0.0*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:		CO2 at >5% vol. after 45 seconds, remaining above 5% vol. for the duration of monitoring and reaching a maximum (at steady state) of 6.8% vol.								

Well ID:	**DH7**	**Well dia.(mm):**	50	**Date installed:**	21/05/2013	**Response stratum:**		Backfilled coal workings	
		Well depth (m):	32.48			**Groundwater depth (m):**		11.06	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		-1.0	6.9	78.6	0.3	0.2	20.9	0.0	-0.3	0.5
After 30 Seconds		0.0	5.7	78.5	0.1	0.2	21.2	0.0	0.0	0.1
After 1 Minute		-1.0	5.7	78.5	0.1	0.2	21.2	0.0	-0.3	0.1
After 2 Minutes		0.0	5.1	78.5	0.1	0.2	21.2	0.0	0.0	0.1
Steady State		0.0	5.1	78.6	0.0	0.2	21.2	0.0	0.0	0.1
min		*-1.0*	*5.1*	*78.5*	*0.0*	*0.2*	*20.9*	*0.0*	*-0.3*	*0.1*
max		*0.0*	*6.9*	*78.6*	*0.3*	*0.2*	*21.2*	*0.0*	*0.0*	*0.5*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (detection limit: <0.1%)
CH_4 - methane (detection limit: <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds
>>>.> - LEL could not be measured (CH_4 >5%)

APPENDIX L - PROPOSED RESIDENTIAL DEVELOPMENT
CAEWERN HOUSE, NEATH
Results of Hazardous Gas and Groundwater Monitoring
(Spot Monitoring)
Project Ref. 7828b

Monitoring Event 2

Date:	30/07/2021	**Atmospheric Pressure (start):**	992 mb	**Trend:**	Steadu
Time:	10:27	**Atmospheric Pressure (end):**	993 mb		
Engineer:	SO	**Site Status:**	Undeveloped (deralict)		
Weather:	Scattered showers	**Ground Conditions:**	Hard-surfaced		
Instrument:	Gas Data LMSxi G3,18e meter	**Next Calibration Due Date:**	20/07/2022		
Instrument:	Phocheck 2000+ PID	**Next Calibration Due Date:**	20/05/2022		

Well ID:	**BH01**	**Well dia.(mm):**	50	**Date installed:**	28/06/2021	**Response stratum:**		Backfilled coal workings	
		Well depth (m):				**Groundwater depth (m):**			
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		-110.0	6.5	82.2	0.4	0.2	17.2	0.0	-33.0	1.0
After 30 Seconds		-6.0	6.4	81.5	2.3	0.2	16.0	0.0	-1.8	1.2
After 1 Minute		0.0	6.4	81.5	2.3	0.2	16.0	0.0	0.0	1.2
After 2 Minutes		0.0	6.7	81.5	2.3	0.2	16.0	0.0	0.0	0.9
Steady State		0.0	6.7	81.5	2.3	0.2	16.0	0.0	0.0	0.9
min		*-110.0*	*6.4*	*81.5*	*0.4*	*0.2*	*16.0*	*0.0*	*-33.0*	*0.9*
max		*0.0*	*6.7*	*82.2*	*2.3*	*0.2*	*17.2*	*0.0*	*0.0*	*1.2*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:	Gas bung was stuck in hole so water depth could not be taken									

Well ID:	**BH04**	**Well dia.(mm):**	50	**Date installed:**	30/06/2021	**Response stratum:**		MADE GROUND	
		Well depth (m):	2.60			**Groundwater depth (m):**		2.12	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	9.2	79.0	0.1	0.4	20.5	0.0	0.0	0.2
After 30 Seconds		0.0	9.2	79.6	0.6	0.4	19.4	0.0	0.0	0.1
After 1 Minute		0.0	9.0	79.7	0.6	0.3	19.4	0.0	0.0	0.1
After 2 Minutes		0.0	8.2	79.8	0.6	0.3	19.3	0.0	0.0	0.1
Steady State		0.0	8.2	79.8	0.6	0.3	19.3	0.0	0.0	0.1
min		*0.0*	*8.2*	*79.0*	*0.1*	*0.3*	*19.3*	*0.0*	*0.0*	*0.1*
max		*0.0*	*9.2*	*79.8*	*0.6*	*0.4*	*20.5*	*0.0*	*0.0*	*0.2*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**BH05**	**Well dia.(mm):**	50	**Date installed:**	01/07/2021	**Response stratum:**		Sandy CLAY and GRAVEL	
		Well depth (m):	2.60			**Groundwater depth (m):**		Dry	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		-2.0	7.5	81.1	0.0	0.3	18.6	0.0	-0.6	0.8
After 30 Seconds		0.0	7.7	80.9	8.5	0.3	10.3	0.0	0.0	0.9
After 1 Minute		0.0	7.5	81.0	8.6	0.3	10.1	0.0	0.0	0.8
After 2 Minutes		0.0	7.4	81.1	8.6	0.3	10.0	0.0	0.0	0.7
Steady State		0.0	7.4	81.1	8.6	0.3	10.0	0.0	0.0	0.7
min		*-2.0*	*7.4*	*80.9*	*0.0*	*0.3*	*10.0*	*0.0*	*-0.6*	*0.7*
max		*0.0*	*7.7*	*81.1*	*8.6*	*0.3*	*18.6*	*0.0*	*0.0*	*0.9*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Well ID:	**DH7**	**Well dia.(mm):**	50	**Date installed:**	21/05/2013	**Response stratum:**		Backfilled coal workings	
		Well depth (m):	32.56			**Groundwater depth (m):**		11.11	
Monitored Variables		**dP (Pa)**	**LEL (%)**	**N_2 (%)**	**CO_2 (%)**	**CH_4 (%)**	**O_2 (%)**	**H_2S (ppm)**	**Flow (L/hr)**	**PID (ppm)**
Immediate Reading		0.0	6.0	79.2	0.0	0.2	20.6	0.0	0.0	0.4
After 30 Seconds		0.0	7.1	79.2	0.3	0.2	20.3	0.0	0.0	0.3
After 1 Minute		0.0	6.2	79.3	0.1	0.2	20.4	0.0	0.0	0.3
After 2 Minutes		0.0	5.9	79.3	0.1	0.2	20.4	0.0	0.0	0.3
Steady State		0.0	5.9	79.2	0.1	0.2	20.5	0.0	0.0	0.3
min		*0.0*	*5.9*	*79.2*	*0.0*	*0.2*	*20.3*	*0.0*	*0.0*	*0.3*
max		*0.0*	*7.1*	*79.3*	*0.3*	*0.2*	*20.6*	*0.0*	*0.0*	*0.4*
Borehole Hazardous Gas Flow Rates Q_{hg} (max gas conc)					**Methane:**	**0 L/hr**		**Carbon Dioxide**	**0.00 L/hr**	
Borehole Hazardous Gas Flow Rates Q_{hg} (steady state gas conc)					**Methane:**	**0.00 L/hr**		**Carbon Dioxide**	**0 L/hr**	
Comments:										

Key:

dP - differential pressure (well-atmosphere)
LEL - Lower Explosive Limit (methane)
N_2 - nitrogen
CO_2 - carbon dioxide (detection limit: <0.1%)
CH_4 - methane (detection limit: <0.2%)
O_2 - oxygen
H_2S - Hydrogen sulphide
PID - measure of volatile organic compounds
>>>.> - LEL could not be measured (CH_4 >5%)

Appendix M- Geotechnical Laboratory Test Results

Laboratory Report

UKAS TESTING
2788

GSTL
GEO Site & Testing Services Ltd

Contract Number: 54841

Client Ref: **7828b**
Client PO: **9941**

Report Date: **12-07-2021**

Client **Earth Science Partnership**
33 Cardiff Road
Taff's Well
Cardiff
CF15 7RB

Contract Title: **Caewern House, Neath**
For the attention of: **Alex Brabban**

Date Received: **07-07-2021**
Date Completed: **12-07-2021**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	3
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	3
Samples Received - @ Non Accredited Test	3
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Emma Sharp (Business Support Manager) - Paul Evans (Director) - Richard John (Quality/Technical Manager)
Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (Administrative Assistant / Health and Safety)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	54841	
Site Name	Caewern House, Neath	
Date Tested	10/07/2021	
	DESCRIPTIONS	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
TP202		D	1.40	-		Brown fine gravelly silty CLAY.
TP203		D	0.70	-		Brown silty CLAY.
TP204		D	0.70	-		Brown fine to coarse gravelly silty CLAY.
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
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				-		
				-		

Operators	Checked	12/07/2021	Richard John (Advanced Testing Manager)
Clayton Jenkins	Approved	12/07/2021	Paul Evans (Quality/Technical Manager)

UKAS TESTING
2788

GSTL	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	54841	
Project Location	Caewern House, Neath	
Date Tested	10/07/2021	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
TP202		D	1.40	-		79	83	35	48	94	CV Very High Plasticity
TP203		D	0.70	-		27	46	24	22	100	CI Intermediate Plasticity
TP204		D	0.70	-		33	56	29	27	74	CH High Plasticity
				-							
				-							
				-							
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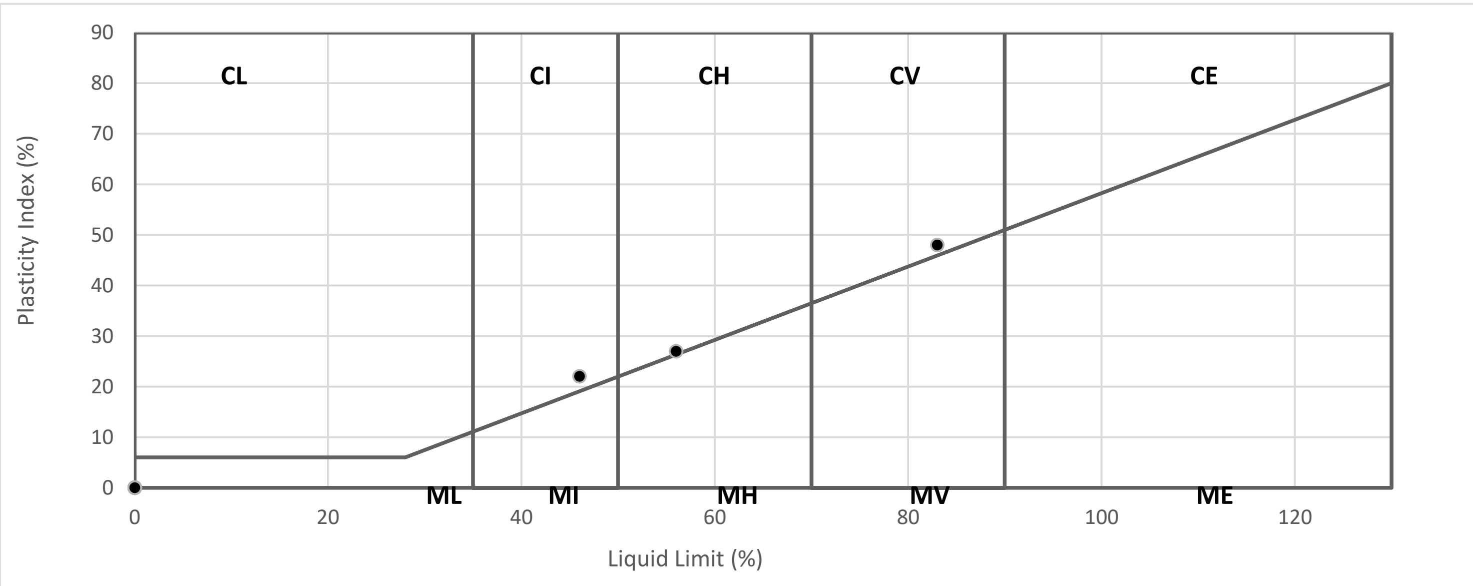
Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	12/07/2021	Richard John (Advanced Testing Manager)
Clayton Jenkins	Approved	12/07/2021	Paul Evans (Quality/Technical Manager)

UKAS TESTING
2788

Appendix N- Geo-environmental Laboratory Test Results

Certificate of Analysis

Certificate Number	21-11155	*Issued:*	03-Jun-21

Client Earth Science Partnership
33 Cardiff Road
Taffs Well
Cardiff
CF15 7RB

Our Reference	21-11155
Client Reference	7828b
Order No	db/7827b/9858
Contract Title	Caewan House, Neath
Description	8 Soil samples, 8 Leachate samples.

Date Received	26-May-21
Date Started	26-May-21
Date Completed	03-Jun-21
Test Procedures	Identified by prefix DETSn (details on request).
Notes	Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath

				Lab No	1853108	1853109	1853110	1853111	1853112	1853113
				.Sample ID	TP201	TP202	TP202	TP203	TP203	TP204
				Depth	0.30	0.60	1.00	0.40	1.60	0.35
				Other ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	13/05/2021	13/05/2021	13/05/2021	13/05/2021	13/05/2021	13/05/2021
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Metals										
Arsenic	DETSC 2301#	0.2	mg/kg	4.1	29		8.8		80
Barium	DETSC 2301#	1.5	mg/kg	90	60		28		710
Beryllium	DETSC 2301#	0.2	mg/kg	1.0	0.5		0.2		1.5
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.4	0.2		< 0.2		0.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	0.2		0.1		1.0
Chromium	DETSC 2301#	0.15	mg/kg	20	16		12		59
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0		< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg	60	47		15		380
Lead	DETSC 2301#	0.3	mg/kg	37	31		22		400
Mercury	DETSC 2325#	0.05	mg/kg	0.06	0.09		0.06		0.07
Nickel	DETSC 2301#	1	mg/kg	34	19		7.5		45
Selenium	DETSC 2301#	0.5	mg/kg	0.7	0.5		< 0.5		0.7
Vanadium	DETSC 2301#	0.8	mg/kg	22	22		18		78
Zinc	DETSC 2301#	1	mg/kg	120	68		30		970
Inorganics										
pH	DETSC 2008#		pH	7.4	6.0	6.8	6.2	7.0	8.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	0.5		0.5		< 0.1
Organic matter	DETSC 2002#	0.1	%	1.5	3.2		2.4		1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l			14		12	
Sulphur as S, Total	DETSC 2320	0.01	%			0.02		0.01	
Sulphate as SO4, Total	DETSC 2321#	0.01	%			0.02		0.02	
PAHs										
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03		< 0.03		< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.16
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.11
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.20
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.07
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.09
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.18
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.32
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03		< 0.03		< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.06
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.09
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03		< 0.03		0.26
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10		< 0.10		1.6
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	0.5		< 0.3		< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath

			Lab No	1853114	1853115
			.Sample ID	TP204	TP206
			Depth	1.00	0.60
			Other ID		
			Sample Type	SOIL	SOIL
			Sampling Date	13/05/2021	13/05/2021
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg		58
Barium	DETSC 2301#	1.5	mg/kg		100
Beryllium	DETSC 2301#	0.2	mg/kg		0.7
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg		0.3
Cadmium	DETSC 2301#	0.1	mg/kg		0.5
Chromium	DETSC 2301#	0.15	mg/kg		14
Chromium, Hexavalent	DETSC 2204*	1	mg/kg		< 1.0
Copper	DETSC 2301#	0.2	mg/kg		130
Lead	DETSC 2301#	0.3	mg/kg		68
Mercury	DETSC 2325#	0.05	mg/kg		0.08
Nickel	DETSC 2301#	1	mg/kg		24
Selenium	DETSC 2301#	0.5	mg/kg		< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg		24
Zinc	DETSC 2301#	1	mg/kg		140
Inorganics					
pH	DETSC 2008#		pH	7.8	8.5
Cyanide, Total	DETSC 2130#	0.1	mg/kg		< 0.1
Organic matter	DETSC 2002#	0.1	%		1.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	41	
Sulphur as S, Total	DETSC 2320	0.01	%	0.04	
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.05	
PAHs					
Acenaphthene	DETSC 3303#	0.03	mg/kg		< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg		< 0.03
Anthracene	DETSC 3303	0.03	mg/kg		< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg		< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg		< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg		< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03
Chrysene	DETSC 3303	0.03	mg/kg		< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg		< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03
Fluorene	DETSC 3303	0.03	mg/kg		< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg		< 0.03
Naphthalene	DETSC 3303#	0.03	mg/kg		< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg		< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg		< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg		< 0.10
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg		< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath
Sample Id TP201 0.30

Sample Numbers 1853108 1853116 1853117
Date Analysed 03/06/2021

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	1.0	3	5	6
DETSC 2003# Loss On Ignition	%	3.1	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	7.4	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	0.25	< 0.16	< 0.002	< 0.01	0.5	2	25
DETSC 2306 Barium as Ba	1.8	< 0.26	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	0.083	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.82	0.31	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	0.71	< 0.40	< 0.004	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	0.016	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	0.51	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.32	< 0.090	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.22	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.78	0.27	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	5.5	2.2	0.011	0.027	4	50	200
DETSC 2055 Chloride as Cl	1300	680	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	140	< 100	0.28	0.23	10	150	500
DETSC 2055 Sulphate as SO4	1400	690	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	10000	5700	20	64	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	< 2000	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	7.4	7.2
DETSC 2009 Conductivity uS/cm	14.6	8.1
* Temperature*	19.0	19.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.116

Stage 1

Volume of Leachant L2*	0.208
Volume of Eluate VE1*	0.188

Stage 2

Volume of Leachant L8*	0.928
Volume of Eluate VE2*	0.888

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath
Sample Id TP203 0.40

Sample Numbers 1853111 1853118 1853119
Date Analysed 03/06/2021

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	1.2	3	5	6
DETSC 2003# Loss On Ignition	%	3.9	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	6.2	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	0.75	< 0.16	< 0.002	< 0.01	0.5	2	25
DETSC 2306 Barium as Ba	1.5	< 0.26	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.42	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	0.54	< 0.40	< 0.004	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.31	< 0.090	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	< 0.17	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.28	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	1.7	3	0.003	0.028	4	50	200
DETSC 2055 Chloride as Cl	970	440	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	130	< 100	0.26	0.2	10	150	500
DETSC 2055 Sulphate as SO4	1000	500	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	8900	5000	17.8	56.1	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	< 2000	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.9	6.8
DETSC 2009 Conductivity uS/cm	12.7	7.2
* Temperature*	19.0	19.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.112

Stage 1

Volume of Leachant L2*	0.196
Volume of Eluate VE1*	0.176

Stage 2

Volume of Leachant L8*	0.897
Volume of Eluate VE2*	0.846

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath
Sample Id TP204 0.35

Sample Numbers 1853113 1853120 1853121
Date Analysed 03/06/2021

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	6.9	3	5	6
DETSC 2003# Loss On Ignition	%	4.8	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	4.1	100	n/a	n/a
DETSC 2008# pH	pH Units	8.3	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	5.4	1.4	0.011	0.021	0.5	2	25
DETSC 2306 Barium as Ba	19	4.5	0.04	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.45	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	2.8	0.77	0.006	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	4.5	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	1.1	0.56	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.66	0.18	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.85	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	3.4	< 1.3	0.007	< 0.01	4	50	200
DETSC 2055 Chloride as Cl	1800	400	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	500	110	1	1.77	10	150	500
DETSC 2055 Sulphate as SO4	10000	1700	20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	75000	26000	150	344.1	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	2100	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.8	7.1
DETSC 2009 Conductivity uS/cm	107.0	37.4
* Temperature*	19.0	19.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.117

Stage 1

Volume of Leachant L2*	0.211
Volume of Eluate VE1*	0.201

Stage 2

Volume of Leachant L8*	0.937
Volume of Eluate VE2*	0.886

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath
Sample Id TP206 0.60

Sample Numbers 1853115 1853122 1853123
Date Analysed 03/06/2021

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	4.5	3	5	6
DETSC 2003# Loss On Ignition	%	6.6	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	8.5	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
	2:1	8:1	LS2	LS10			
DETSC 2306 Arsenic as As	12	3.2	0.024	0.047	0.5	2	25
DETSC 2306 Barium as Ba	3.5	0.59	< 0.02	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	0.033	< 0.030	< 0.004	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.82	< 0.25	< 0.02	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	2.4	0.6	0.005	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	2.8	< 1.1	< 0.02	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.29	< 0.090	< 0.01	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.22	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	1.8	< 1.3	0.004	< 0.01	4	50	200
DETSC 2055 Chloride as Cl	2000	580	< 20	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	250	< 100	0.5	0.44	10	150	500
DETSC 2055 Sulphate as SO4	7200	1100	< 20	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	57000	26000	114	314.4	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	2400	< 2000	< 10	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	6.9	7.1
DETSC 2009 Conductivity uS/cm	81.9	37.6
* Temperature*	20.0	20.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.121

Stage 1

Volume of Leachant L2*	0.222
Volume of Eluate VE1*	0.212

Stage 2

Volume of Leachant L8*	0.966
Volume of Eluate VE2*	0.916

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

Summary of Asbestos Analysis
Soil Samples

Our Ref 21-11155
Client Ref 7828b
Contract Title Caewan House, Neath

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1853108	TP201 0.30	SOIL	NAD	none	Jordan Farley
1853109	TP202 0.60	SOIL	NAD	none	Jordan Farley
1853111	TP203 0.40	SOIL	NAD	none	Jordan Farley
1853113	TP204 0.35	SOIL	NAD	none	Jordan Farley
1853115	TP206 0.60	SOIL	NAD	none	Jordan Farley

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-11155
Client Ref 7828b
Contract Caewan House, Neath

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1853108	TP201 0.30 SOIL	13/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1853109	TP202 0.60 SOIL	13/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1853110	TP202 1.00 SOIL	13/05/21	GJ 250ml, GJ 60ml, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1853111	TP203 0.40 SOIL	13/05/21	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
1853112	TP203 1.60 SOIL	13/05/21	GJ 250ml, GJ 60ml, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1853113	TP204 0.35 SOIL	13/05/21	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
1853114	TP204 1.00 SOIL	13/05/21	GJ 250ml, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1853115	TP206 0.60 SOIL	13/05/21	PT 1L	pH + Conductivity (7 days)	BTEX, Naphthalene, PAH FID, PAH MS, PCB, EPH/TPH
1853116	TP201 0.30 LEACHATE	13/05/21	GJ 250ml, GJ 60ml, PT 1L		
1853117	TP201 0.30 LEACHATE	13/05/21	GJ 250ml, GJ 60ml, PT 1L		
1853118	TP203 0.40 LEACHATE	13/05/21	GJ 250ml, GJ 60ml, PT 1L		
1853119	TP203 0.40 LEACHATE	13/05/21	GJ 250ml, GJ 60ml, PT 1L		
1853120	TP204 0.35 LEACHATE	13/05/21	GJ 250ml, PT 1L		
1853121	TP204 0.35 LEACHATE	13/05/21	GJ 250ml, PT 1L		
1853122	TP206 0.60 LEACHATE	13/05/21	PT 1L		
1853123	TP206 0.60 LEACHATE	13/05/21	PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Certificate of Analysis

Certificate Number 21-13806 *Issued:* 08-Jul-21

Client Earth Science Partnership
33 Cardiff Road
Taffs Well
Cardiff
CF15 7RB

Our Reference 21-13806

Client Reference 78286

Order No 9935

Contract Title CAEWERN HOUSE

Description 3 Soil samples.

Date Received 01-Jul-21

Date Started 01-Jul-21

Date Completed 08-Jul-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 21-13806
Client Ref 78286
Contract Title CAEWERN HOUSE

			Lab No	1869552	1869553	1869554
			.Sample ID	BH01	BH02	HP01
			Depth	0.60	0.50	0.40
			Other ID			
			Sample Type	SOIL	SOIL	SOIL
			Sampling Date	25/06/2021	25/06/2021	25/06/2021
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	32	140	64
Barium	DETSC 2301#	1.5	mg/kg	98	190	240
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	0.9	0.9
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.3	0.5	0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	2.0	1.1
Chromium	DETSC 2301#	0.15	mg/kg	13	16	16
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	69	400	260
Lead	DETSC 2301#	0.3	mg/kg	36	190	170
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.07	0.14
Nickel	DETSC 2301#	1	mg/kg	26	28	32
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	16	30	32
Zinc	DETSC 2301#	1	mg/kg	100	260	170
Inorganics						
pH	DETSC 2008#		pH	6.6	6.0	5.9
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.3	0.1	0.4
Organic matter	DETSC 2002#	0.1	%	5.4	5.1	5.0
PAHs						
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.14
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.10
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03	0.23
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.09
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.07
Chrysene	DETSC 3303	0.03	mg/kg	0.04	0.05	0.24
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	0.05	0.30
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.09
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.04	0.05	0.18
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.04	0.26
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.15	0.19	1.7
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 21-13806
Client Ref 78286
Contract Title CAEWERN HOUSE

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1869552	BH01 0.60	SOIL	NAD	none	Jordan Farley
1869553	BH02 0.50	SOIL	NAD	none	Jordan Farley
1869554	HP01 0.40	SOIL	NAD	none	Jordan Farley

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-13806
Client Ref 78286
Contract CAEWERN HOUSE

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1869552	BH01 0.60 SOIL	25/06/21	GJ 250ml, PT 1L		
1869553	BH02 0.50 SOIL	25/06/21	GJ 250ml, PT 1L		
1869554	HP01 0.40 SOIL	25/06/21	GJ 250ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

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Disposal

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Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

GENERAL NOTES

1. Earth Science Partnership (ESP) believes that providing information about limitations is essential to help clients identify and therefore manage their risks. These risks can be mitigated through further investigation or research, but they cannot be eliminated. This report may not be used for any purpose other than that for which it was commissioned.

2. This report includes available factual data for the site as obtained only from the sources described in the text. The data are related to the site on the basis of the site location and boundary information provided by the client. The findings and opinions conveyed in this assessment are based on the information obtained from a variety of sources as detailed in the report, which ESP believe are reliable. Nevertheless, ESP cannot and does not guarantee the authenticity or reliability of the information it has relied on. It is possible that the assessment failed to indicate the existence of further sources of information on the site. Assuming such sources do exist, their information could not have been considered in the formulation of the opinions and findings in this report. It should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.

3. In preparing this report it has been assumed that all past and present occupants of the site have provided all relevant and other information, especially relating to known or potential hazards. This report is not required to identify insufficiencies or mistakes in the information provided by the user/owner or from any other source, but has sought to compensate for these where obvious in the light of other information.

4. Reports are normally prepared and written in the context of a stated purpose, and should not, therefore be used in a different context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission.

5. The opinions presented in this report are based on the findings derived from a site inspection, investigations and a review of historical and other records. The report details any indicators that may suggest that hazardous substances exist at the site at levels likely to warrant mitigation. Not finding such indicators does not mean that hazardous substances do not exist at the site. The most recent site inspection was undertaken as detailed within the report. Circumstances on sites are subject to change and certain indicators of the presence of hazardous substances that may have been latent at the time of this inspection may subsequently have become observable.

6. The work carried out for the assessment can only investigate a small portion of the subsurface conditions. Certain indicators or evidence of hazardous substances may have been outside the limited portion of the subsurface investigated, latent at the time of the work or only partially intercepted by the works, and thus their full significance could not be appreciated. In this regard, groundwater levels are particularly susceptible to variation and it should be noted that groundwater levels are subject to diurnal, seasonal, and climatic changes and are solely dependent on the time the ground investigation was carried out and the weather before and during the investigation.

7. Accordingly, it is possible that the assessment failed to indicate the presence or significance of hazardous substances. Assuming such substances exist, their presence could not have been considered in the formulation of the report's findings and opinions. The conclusions resulting from this study and contained in this report are not necessarily indicative of future conditions or operating practices at or adjacent to the site. Where differing ground conditions or suspect materials are encountered during future site works, additional specialist advice should be sought to assess whether the new information will materially affect the recommendations currently provided herein and whether further consideration is required. Any limiting factors should be assessed by an appropriately qualified specialist.

8. The assessment was prepared for the sole internal use and reliance of the Client. The report shall not be relied upon by or transferred to other parties without the express written authorisation of the Earth Science Partnership. If an unauthorised party comes into possession of the report, they rely on it at their peril and the authors owe them no duty of care and skill.

9. The copyright in this report and other plans and documents prepared by the ESP is owned by them and no such report, plan or document may be reproduced, published or adapted without their consent. Complete copies of this report may, however, be made and distributed by the Client as an expedient in dealing with matters related to its commission.

GENERAL GEOTECHNICAL CONSTRUCTION ADVICE

1. The locations of all buried services should be accurately determined prior to detailed design in order that zones of influence, easements, diversions etc. can be considered. Care should be undertaken that any field drains encountered are carefully and satisfactorily blocked to prevent water seeping through the drains and into any excavations.

2. A site strip should be undertaken with all surface vegetation and topsoil either stockpiled for future re-use or disposed at a suitable licensed facility. In particular, all areas of Japanese Knotweed should be excavated and disposed in accordance with published guidelines.

3. All areas of hardstandings or old foundations, basements or other substructures should be broken out and either processed for re-use on site or disposed of at a suitable licensed landfill facility.

4. For all spread foundation options, formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by lean mix concrete or suitable compacted granular material. A blinding layer of concrete should be placed after excavation and inspection in order to protect the formation against softening and disturbance.

5. Generally, all foundations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment has been undertaken.

6. The location of the exploratory holes undertaken as part of this report should be accurately surveyed in order that their precise location is known and that appropriate precautions can be taken when building over or near to these locations.

7. Appropriate precautions should be adopted to prevent the disturbance of foundations or services by roots associated with trees or hedges where shallow foundations are considered within the influence zone of such trees and hedges. Any such roots should be removed from foundation excavations and the foundations located below such disturbance strata. Where the natural soil bounded by the foundations could increase in volume greater than that outside the foundations (e.g. where a shallow foundation is sited over a previous tree or severed major roots) a compressible material / loose backfill should be placed on the faces of the footing.

8. Where the distance from foundations to existing trees/hedgerows is less than twice the foundation depth, as determined by NHBC Practice Note 3 (1985), a compressible material or loose backfill shall be placed on the outside of the foundation to absorb potential forces.