

## **8.4 Results – Inorganics**

### **8.4.1 Metals**

A suite of toxic metals comprising arsenic, cadmium, total chromium, copper, lead, mercury, nickel, selenium and zinc was tested in all nine samples. All recorded metal concentrations were below their respective criteria.

### **8.4.2 pH**

All samples were analysed for pH. Results ranged from a slightly acidic pH of 5.34 in the organic rich topsoil of TP2, to a neutral pH of 7.33 in the sample collected from TP6 where topsoil was absent.

### **8.4.3 Asbestos Screen**

The samples from TP4, TP5 and TP7 were screened for fibres and asbestos identification. No fibres were detected.

## **8.5 Results- Organics**

### **8.5.1 Polyaromatic Hydrocarbons (PAHs)**

Four samples were analysed for specified 16 PAHs, and in addition a general SVOC suite (which includes PAHs) was analysed on an additional two samples. All samples reported all of the individual PAHs well below their screening criterion, with the exception of the sample collected from TP3 which showed a single result for dibenzo(ah) anthracene of 330ug/kg compared with the screening criterion of 280ug/kg. The mean and US<sub>95</sub> concentrations for the dibenzo(ah)anthracene data set are 105ug/kg and 200ug/kg respectively; well below the assessment criterion. A maximum value test undertaken at the 10% (conservative) level indicated the 330ug/kg result was not an outlier. The result is therefore not considered to indicate any particular issue at the site.

### **8.5.2 Semi-volatile organic compounds**

Two samples (TP6 and TP9) were analysed for the general suite of semi-volatile organic compounds. The results for the standard suite library substances were all reported below the limit of detection of 100ug/kg.

### **8.5.3 Petroleum Hydrocarbons**

Two samples (TP4 and TP5), from the area near the car storage, were analysed for a suite of banded petroleum hydrocarbons and BTEX (benzene, toluene, ethylbenzene and xylenes). There were no exceedences of the screening criteria and all values were low.

## **9 Revised Conceptual Site Model and Risk Assessment**

The preliminary conceptual model and risk assessment has been revised to take into account the information obtained from the site investigation and is presented below. No significant contamination was identified at the site, and so the likelihood of source-pathway-receptor linkages from contaminants in the soil has been able to be reduced to very unlikely (0-5%).

The highest identified risk is the risk from naturally occurring radon gas which was assessed as low to moderate as a consequence of the HPA classification of the site within a radon affected area.

**Table 8: Summary of Potential Feasible Pollutant Linkages and Risk Estimation following Site Investigation**

Contaminant (Source)	Pathway(s)	Receptor	Potential Consequence of Hazard	Likelihood of Source-Pathway-Receptor Linkage&	Risk Estimation	Comments
Near-surface soils on site containing potentially elevated concentrations of metals	inhalation/ingestion of dust, dermal contact, ingestion of contaminants through fruit and vegetable consumption grown in contaminated soil	Humans (Future site users)	Moderate	Very Unlikely	<b>Negligible to Low</b>	No elevated metal concentrations found on site during investigation
Near-surface soils on site containing potentially elevated concentrations of metals	inhalation/ingestion of dust, dermal contact	Humans (Construction Workers)	Moderate	Very Unlikely	<b>Negligible to Low</b>	No elevated metal concentrations found on site during investigation
Near-surface soils on site containing potentially elevated concentrations of metals, PAHs/Oils/Fuels	inhalation/ingestion of dust	Off-site residents	Mild	Very Unlikely	<b>Negligible</b>	No indication of PAH or Oil or Fuel contamination found on site during investigation
Soils on site containing potentially elevated concentrations of PAHs/Oils/Fuels	inhalation/ingestion of dust, inhalation of indoor vapours, inhalation of outdoor vapours, dermal contact, ingestion of contaminants through fruit and	Humans (Future site users)	Severe	Very Unlikely	<b>Low</b>	No indication of PAH or Oil or Fuel contamination found on site during investigation

Contaminant (Source)	Pathway(s)	Receptor	Potential Consequence of Hazard	Likelihood of Source-Pathway-Receptor Linkage&	Risk Estimation	Comments
	vegetable consumption grown in contaminated soil					
Soils on site containing potentially elevated concentrations of PAHs/Oils/Fuels	Inhalation/ingestion of dust, inhalation of indoor vapours, inhalation of outdoor vapours, dermal contact	Humans (Construction Workers)	Moderate	Very Unlikely	<b>Negligible to Low</b>	No indication of PAH or Oil or Fuel contamination found on site during investigation
Soils on site containing potentially elevated concentrations of PAHs/Oils/Fuels	Direct Contact	Building Materials Plastic Pipes	Mild	Very Unlikely	<b>Negligible</b>	No indication of PAH or Oil or Fuel contamination found on site during investigation
Soils on site potentially containing asbestos	Inhalation of fibres	Humans (Future Residents, Construction Workers, Off-site residents)	Severe	Very Unlikely	<b>Low</b>	No indication of asbestos contamination found on site during investigation, no fibres found in screened soil samples
Naturally occurring Radon gas	Migration through ground and build up of gas in enclosed spaces	Humans (Future Residents)	Severe	Unlikely	<b>Low to Moderate</b>	Risk can be managed through installation of appropriate radon gas protection measures during build

## 10 Summary

- Nine trial holes were dug at the site to a maximum depth of 0.75m bgl using a mechanical excavator
- No Made Ground was encountered on site – the soils were logged as topsoil or weathered bedrock (Shale).
- Nine soil samples were collected and variously analysed for contaminants including metals, pH, PAHs, TPH, SVOCs. The results compared to DEFRA C4SL values and CIEH/LQM suitable for use screening criteria. There was a single exceedance of a residential with home-grown produce criteria. The sample collected from TP3 in the north of the site recorded a dibenzo(ah)anthracene concentration of 330ug/kg compared to the screening criterion of 280ug/kg. The result was not considered an outlier per the maximum value test, and the US<sub>95</sub> value for the dibenzo(ah)anthracene data set as a whole was only 200ug/kg.
- Statistical analysis of the data indicates that the true mean concentrations of potential contaminants are less than the screening criteria used, suggesting the level of risk posed to human health under the proposed residential scenario is acceptably low.
- A revised risk assessment was produced incorporating the additional information gathered. The risks have been revised downwards, based on the lack of significant concentrations of potential contaminants recorded.
- The site falls within an area where full radon protection measures are required in new build dwellings under Building Regulations as between 10 and 30% of properties exceed the Health Protection Agency action level.

## 11 Conclusions & Recommendations

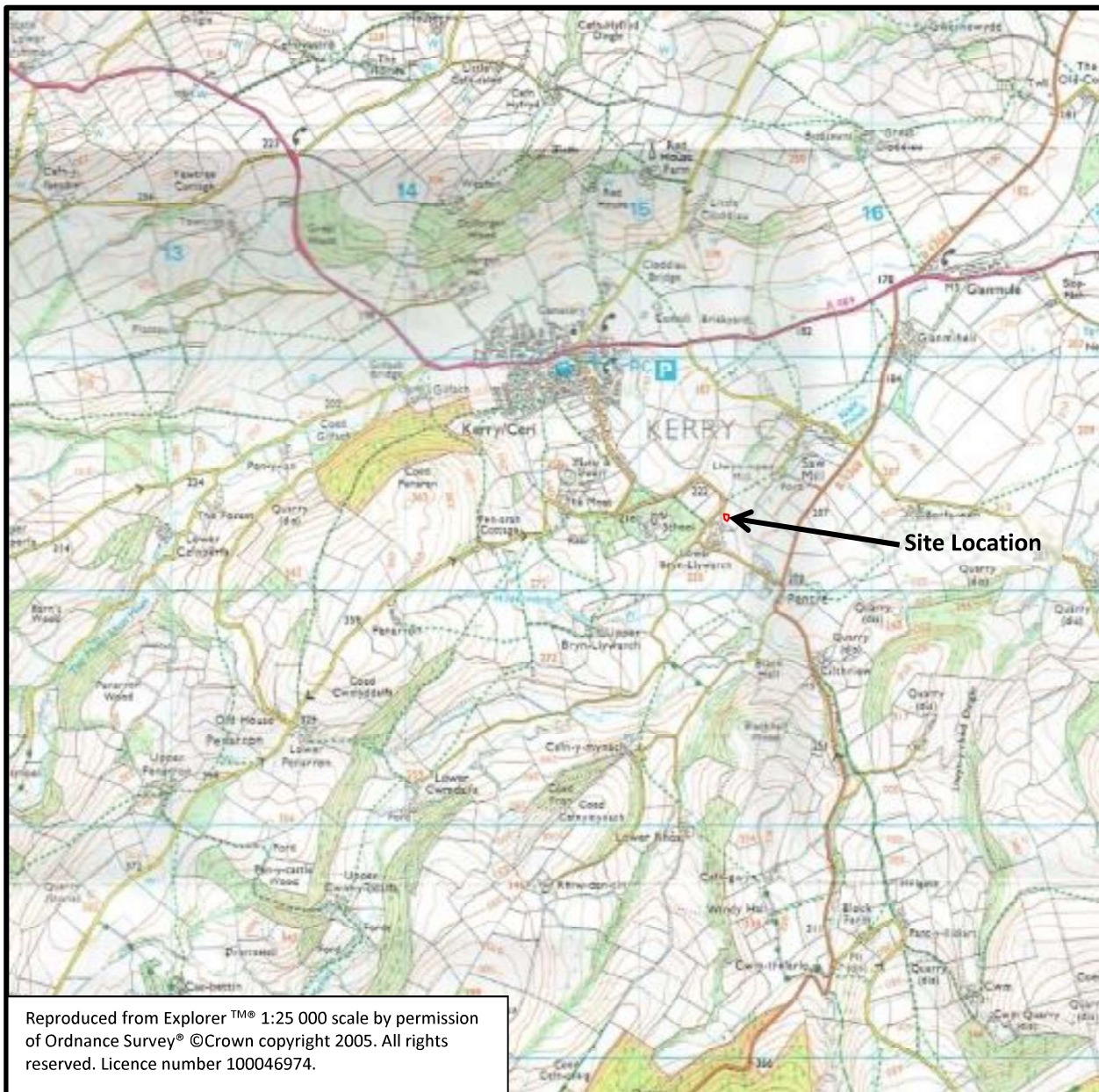
It is the conclusion of this report that provided appropriate radon protection measures are installed in the new dwellings to the satisfaction of the Building Inspector, then no specific remedial actions are required in respect of developing the site for residential use.

In the event that any suspect material or contamination is found at any time when carrying out the approved development that was not previously identified, it should be reported in writing immediately to the Local Planning Authority, and an appropriate re-assessment undertaken.




## **Figures**

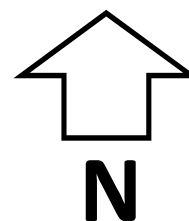
Figure 1	Site Location Plan
Figure 2	Current & Proposed Layout Plan
Figure 3	Trial Hole Location Plan

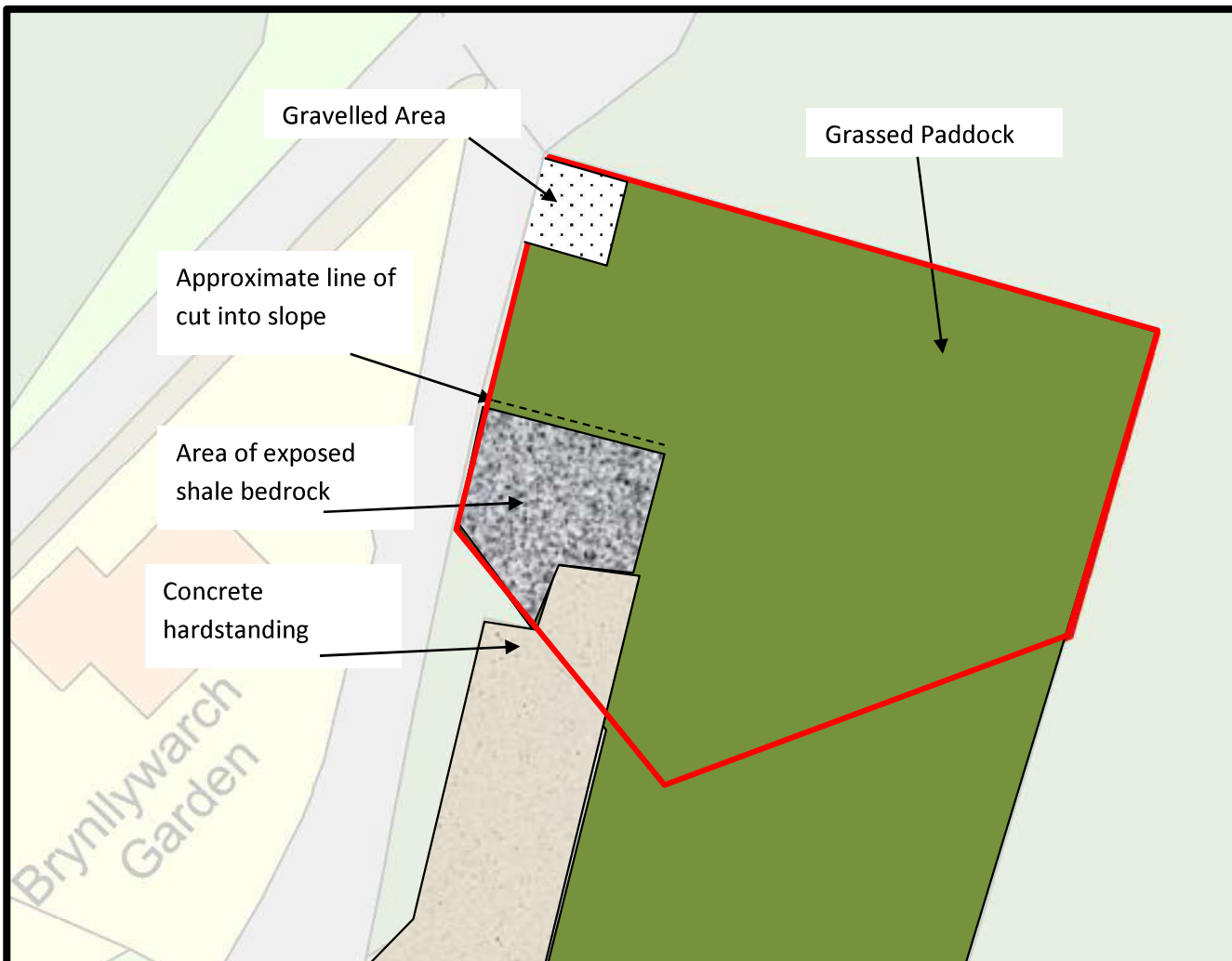


**MENV07112 – Land at Brynlllywarch Garden, Kerry, Powys**

**Figure 1: Site Location Map**

**Scale (Approx) :** 0  1km

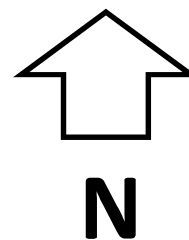




**MENV07114 Land at Brynllwarch Garden, Kerry, Powys**

**Figure 2: Current Site Layout**

Scale (approx): 0 25m




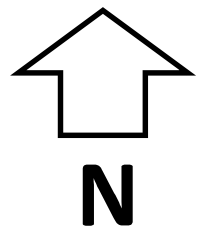
Approx Site Boundary: —

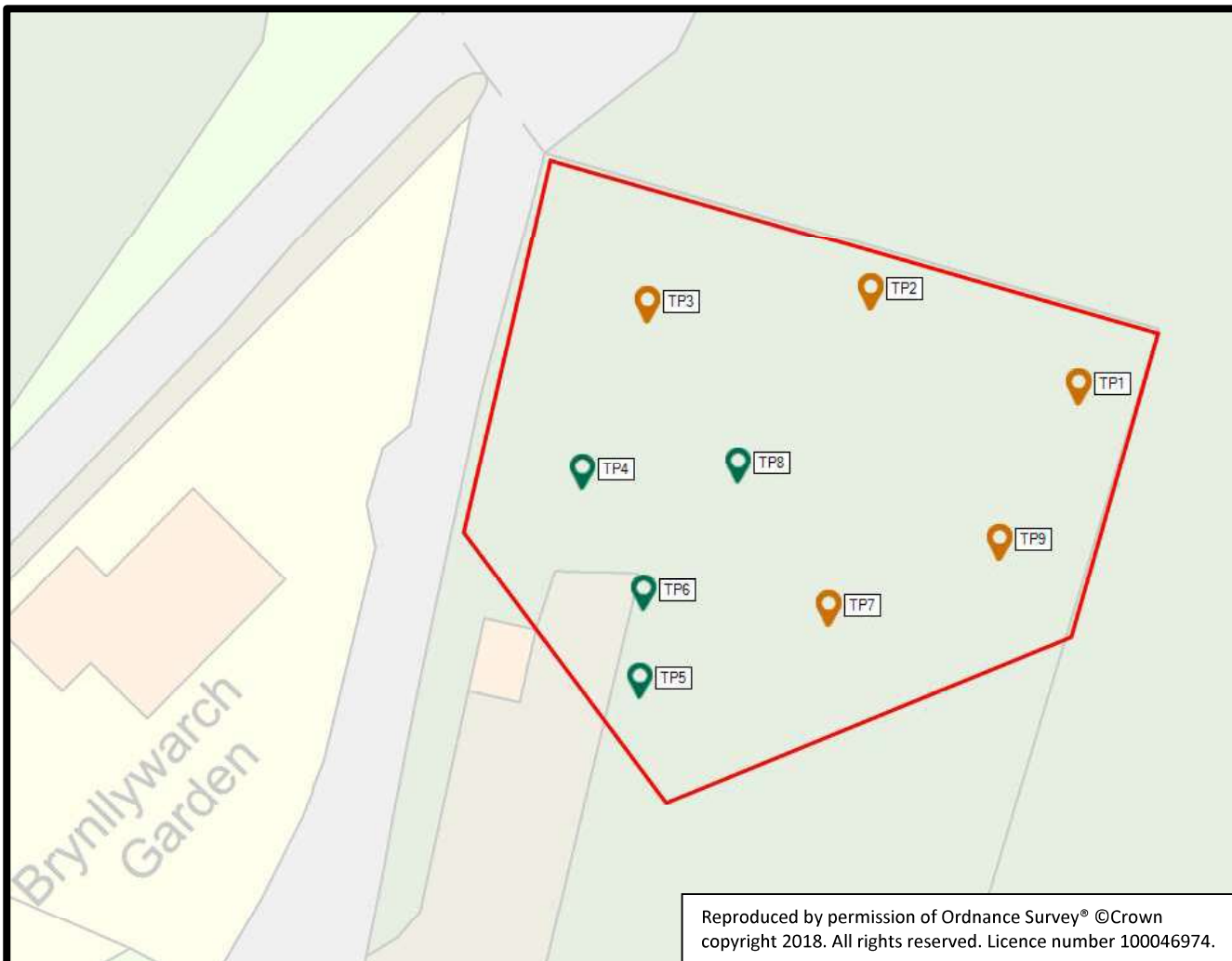


**MENV07114 Land at Brynllwarch Garden, Kerry, Powys**

**Figure 3: Proposed Site Layout**

Scale (approx): 0  25m



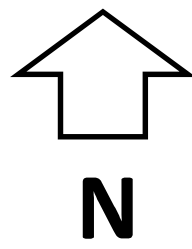


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**MENV07114 Land at Brynllwarch Garden, Kerry, Powys**

**Figure 4: Trial Hole Locations**

**Scale (approx):** 0  25m



## **Appendix A**

Photographs





Photo 1: NW Corner of site



Photo 5: temporary roofed area in front of cutting



Photo 2: At S of site, looking offsite towards wider plot area and access.



Photo 6: Grassed pastureland/paddock



Photo 3: Area of cutting into shale



Photo 7: Site looking SW towards Brynllwarch Gardens



Photo 4: area adjacent cutting

## **Appendix B**

Landmark Envirocheck Data



## Groundwater Vulnerability

**General**

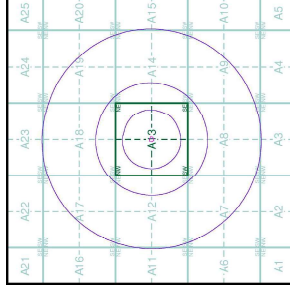
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Site
- Map ID

**Agency and Hydrological**

**Geological Classes**

- Major Aquifer (Highly Permeable)
  - High (H) 1, 2, 3, U
  - Intermediate (I) 1, 2
  - Low
- Minor Aquifer (Variably Permeable)
  - High (H) 1, 2, 3, U
  - Intermediate (I) 1, 2
  - Low
- Non Aquifer (Negligibly Permeable)
- Water or Sea
- Drift Deposit

### Site Sensitivity Context Map - Slice A

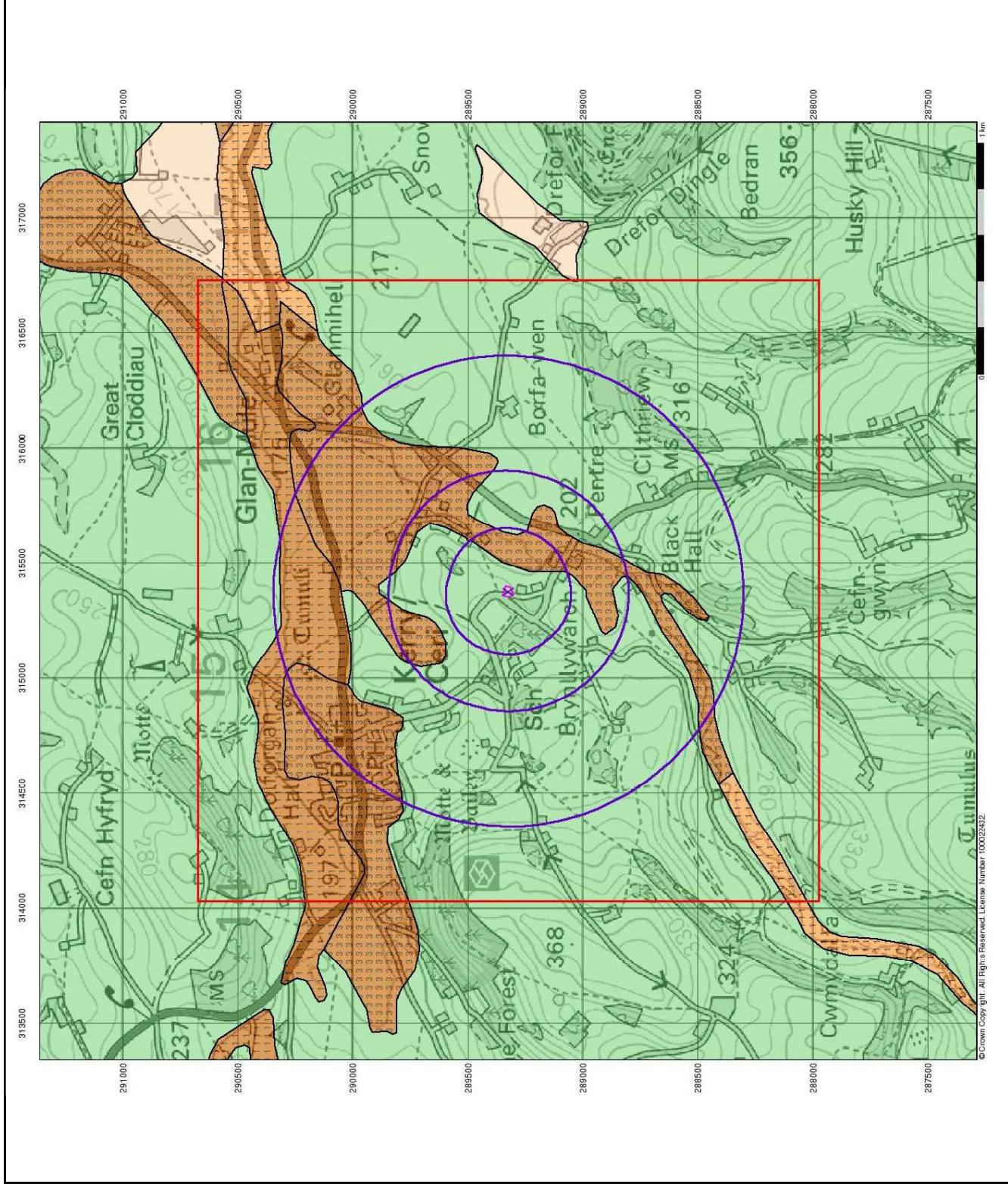


### Order Details

Order Number: 162311708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315380, 289330  
 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

Land at Brynlywarch Garden, Kerry/Cerri, Powys





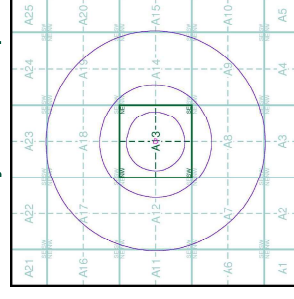
## Bedrock Aquifer Designation

- General**
- Specified Site
  - Specified Buffer(s)
  - Bearing Reference Point
  - Site
  - Map ID

### Agency and Hydrological

- Geological Classes**
- Principal Aquifer
  - Secondary A Aquifer
  - Secondary B Aquifer
  - Secondary Undifferentiated
  - Unproductive Strata
  - Unknown
  - Unknown (Lakes and Landlip)

### Site Sensitivity Context Map - Slice A

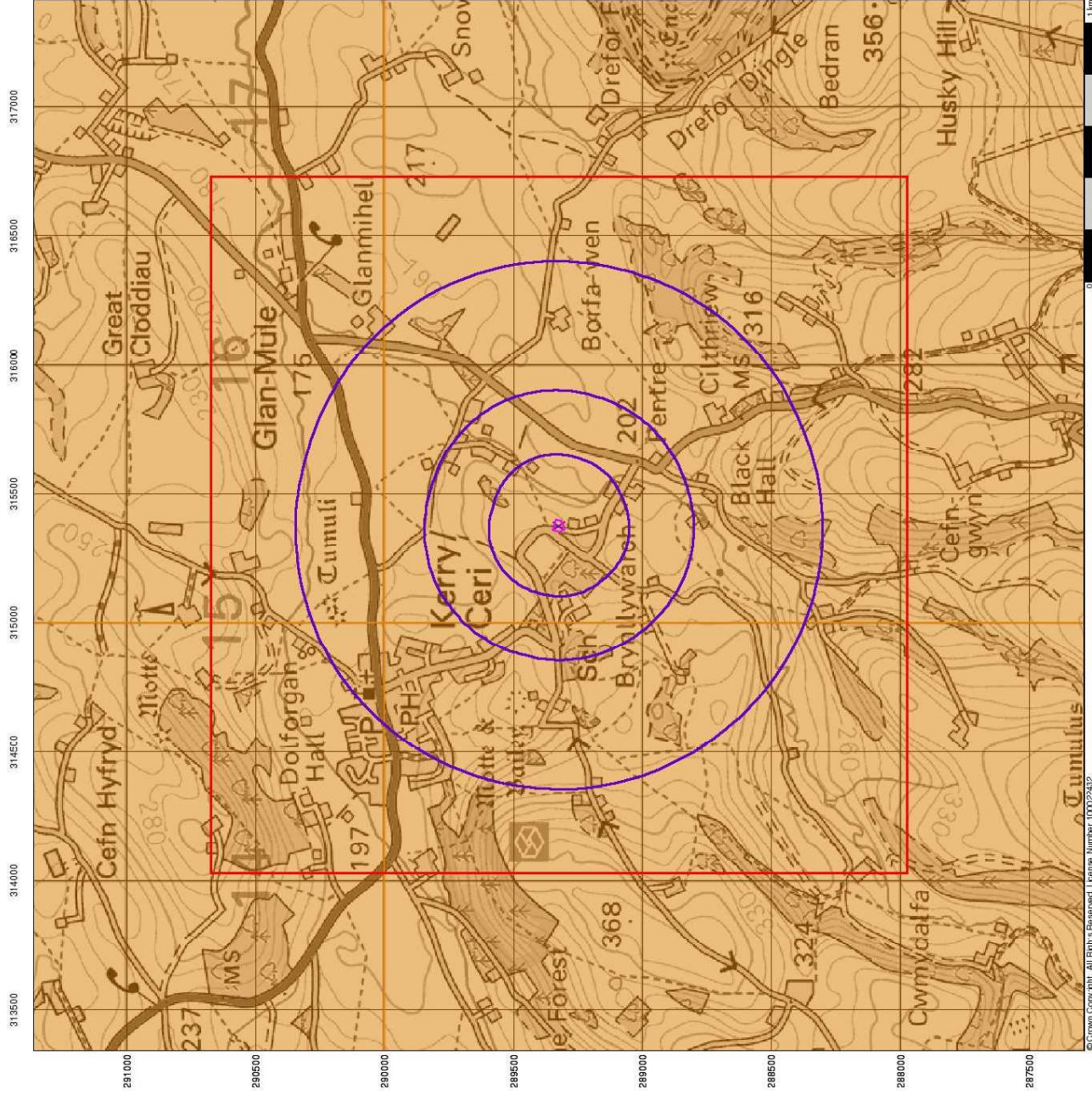


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### Site Details

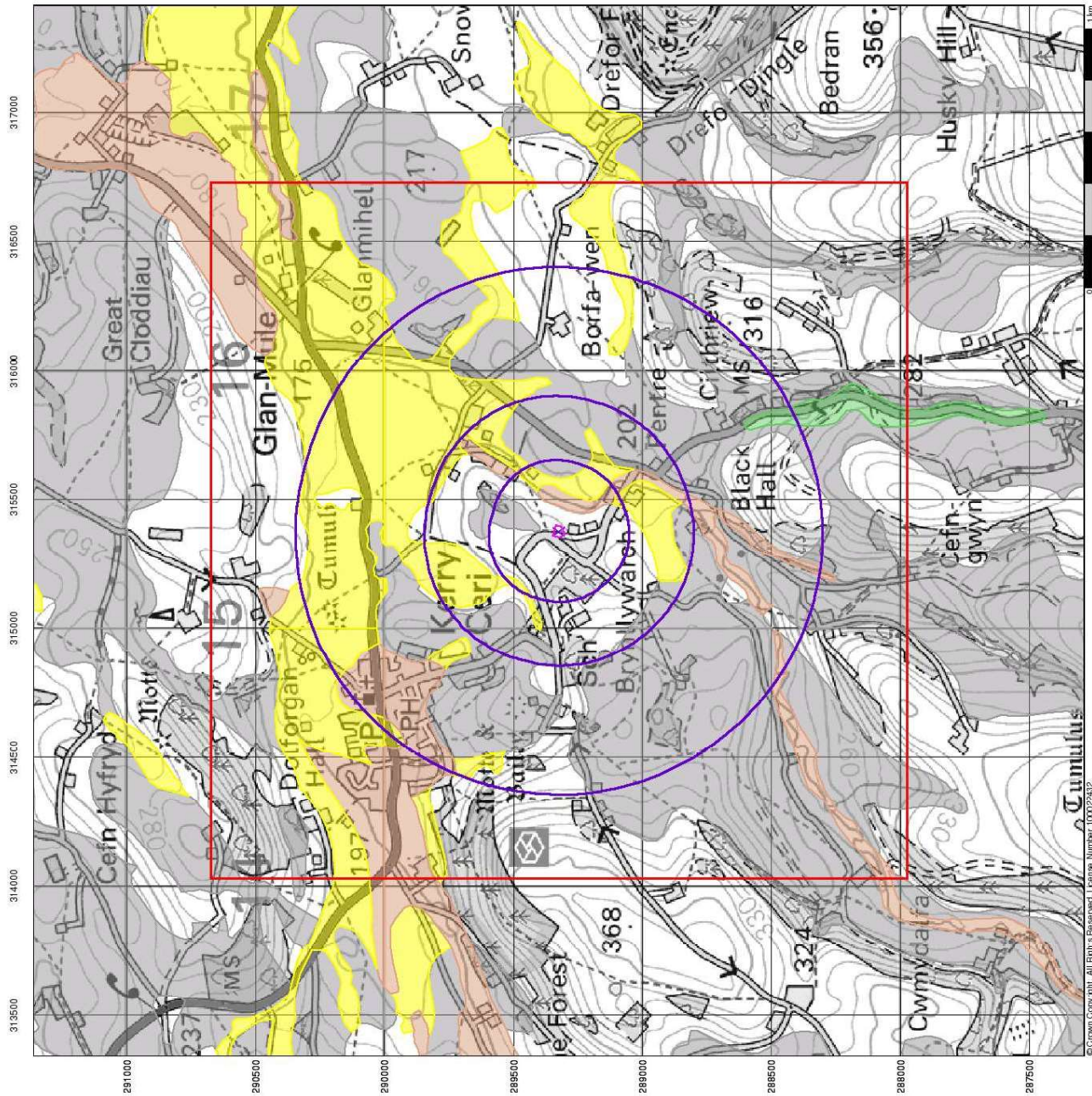
Land at Brynlywarch Garden, Kerry/Ceri, Powys



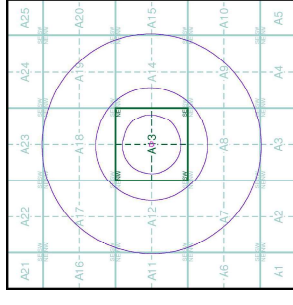


## Superficial Aquifer Designation

- General**
- Specified Site
  - Site
  - Specified Buffer(s)
  - Map ID
  - Bearing Reference Point
- Agency and Hydrological**
- Principal Aquifer
  - Secondary A Aquifer
  - Secondary B Aquifer
  - Secondary Undifferentiated
  - Unproductive Strata
  - Unknown
  - Unknown (Lakes and Landlip)



### Site Sensitivity Context Map - Slice A



### Order Details

Order Number: 16231708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315360, 289330  
 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

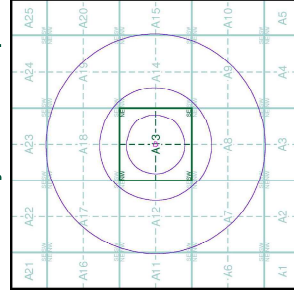
Land at Brynlywarch Garden, Kerry/Ceri, Powys



## Source Protection Zones

- General**
- Specified Site
  - Site
  - Specified Buffer(s)
  - Map ID
  - Bearing Reference Point
- Agency and Hydrological**
- limer zone (Zone 1)
  - limer zone - subsurface activity only (Zone 1c)
  - Outer zone (Zone 2)
  - Outer zone - subsurface activity only (Zone 2c)
  - Total catchment (Zone 3)
  - Total catchment - subsurface activity only (Zone 3c)
  - Special Interest (Zone 4)

## Site Sensitivity Context Map - Slice A

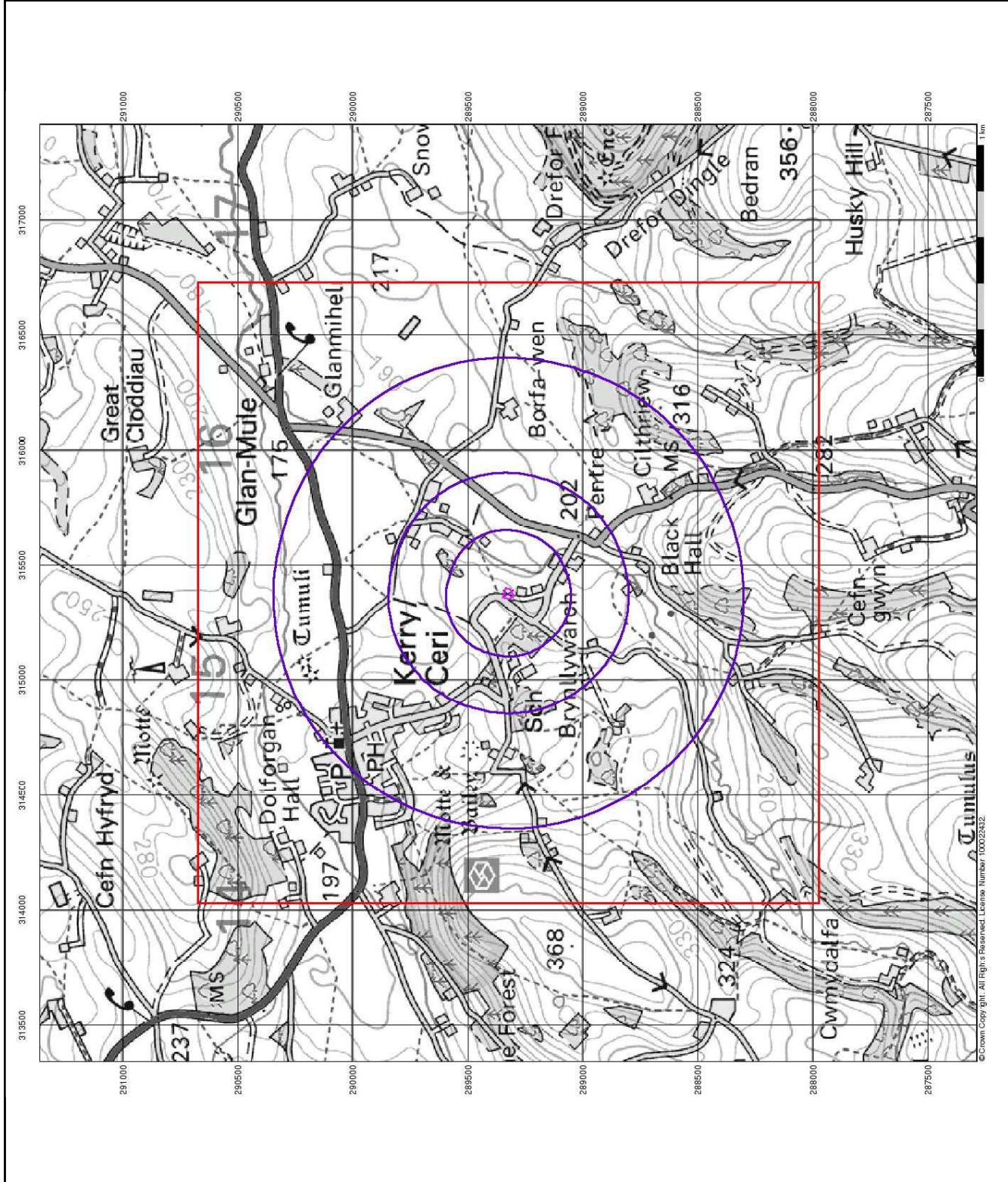


## Order Details

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 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 1000

## Site Details

Land at Brynllwarch Garden, Kerry/Ceri, Powys

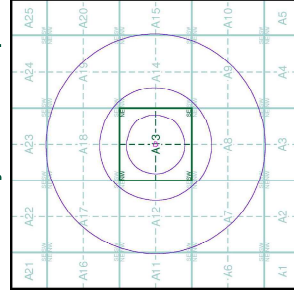




## Sensitive Land Uses

- General**
- Specified Site
  - Site
  - Map ID
  - Bearing Reference Point
- Sensitive Land Uses**
- Ancient Woodland
  - Area of Adopted Green Belt
  - Area of Unadopted Green Belt
  - Area of Outstanding Natural Beauty
  - Environmentally Sensitive Area
  - Forest Park
  - Local Nature Reserve
  - Marine Nature Reserve
  - National Nature Reserve
  - National Park
  - Nitrate Sensitive Area
  - Nitrate Vulnerable Zone
  - Ramsar Site
  - Site of Special Scientific Interest
  - Special Area of Conservation
  - Special Protection Area
  - World Heritage Sites

## Site Sensitivity Context Map - Slice A

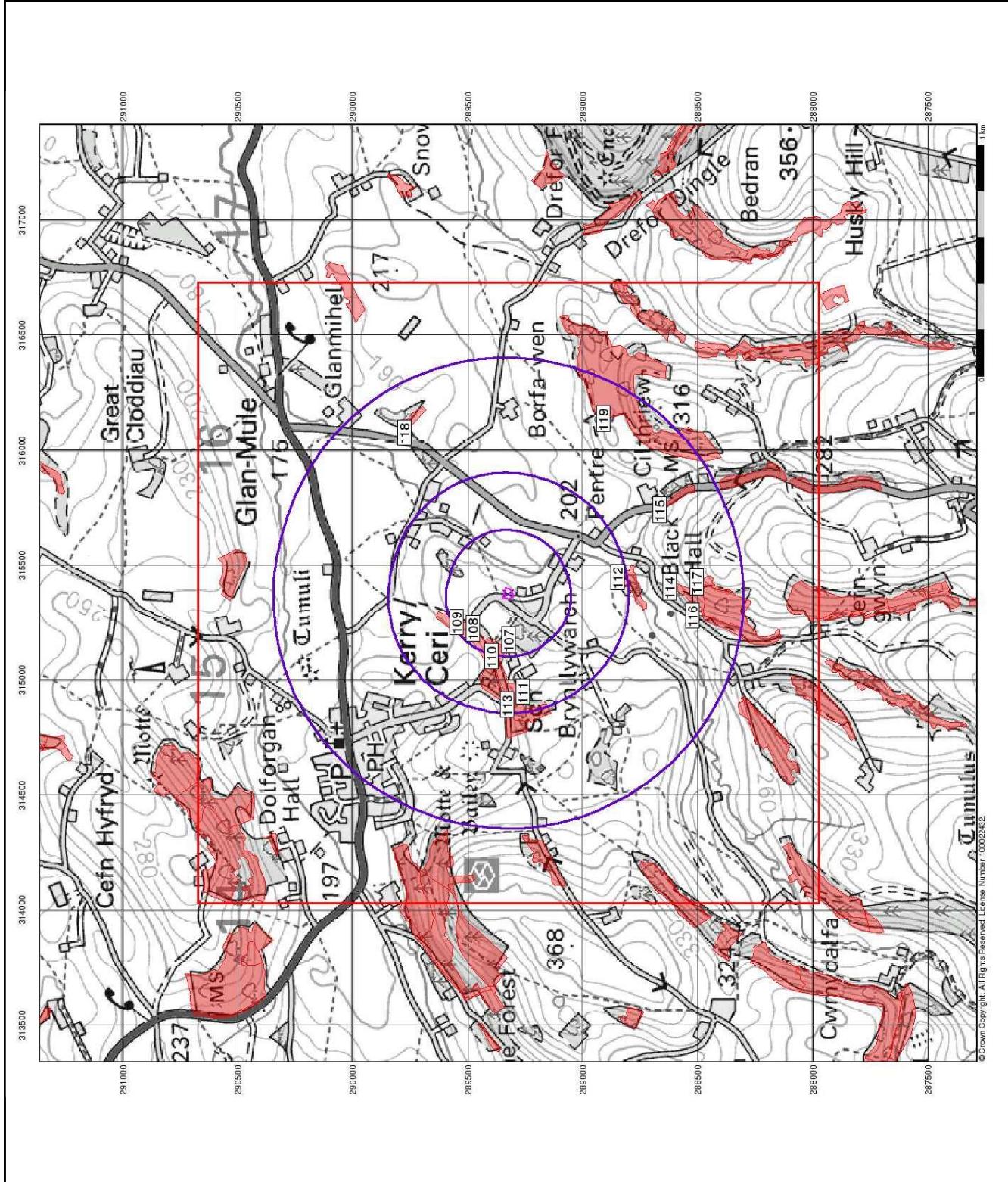


## Order Details

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## Site Details

Land at Brynlywarch Garden, Kerry/Ceri, Powys








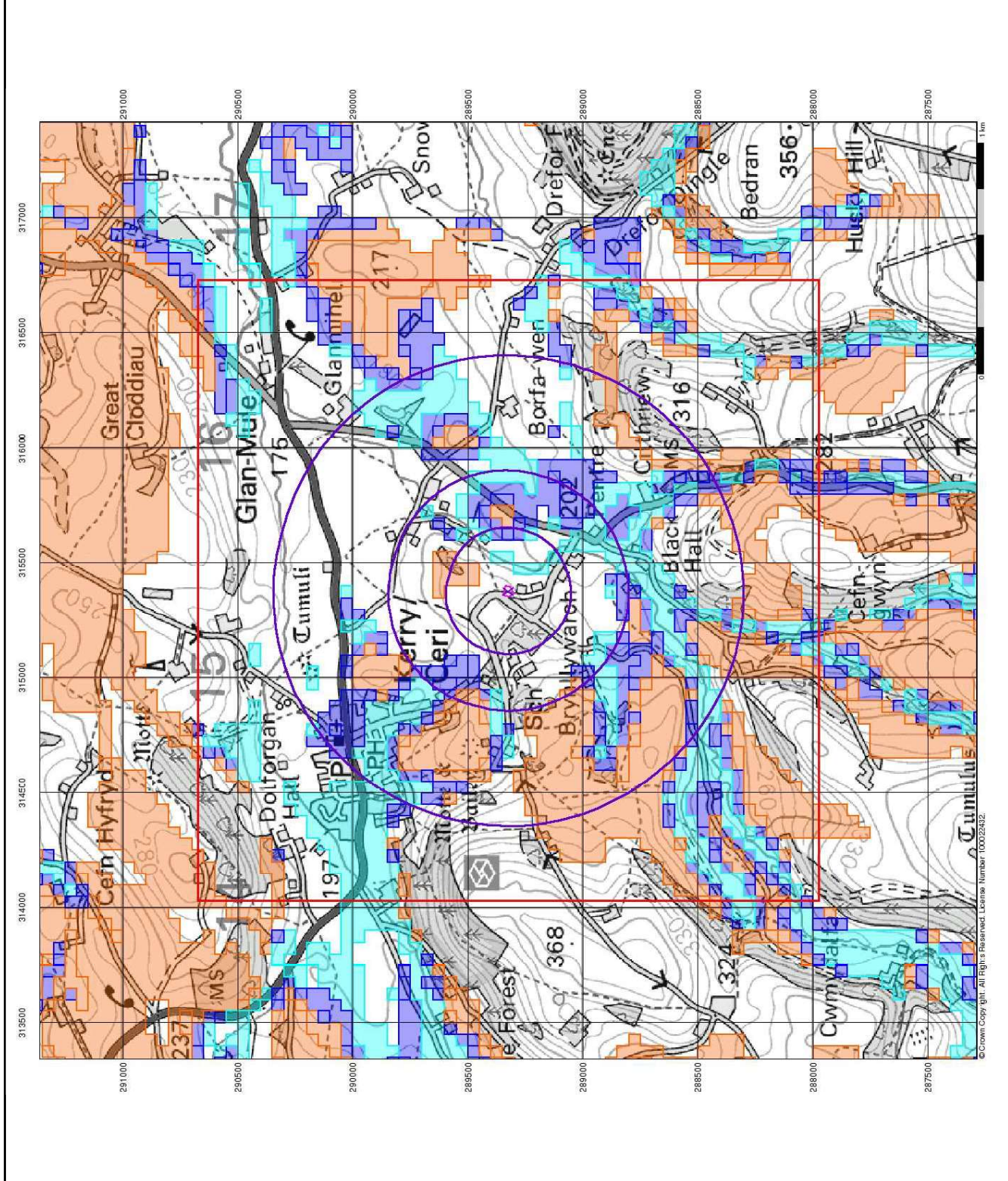
## BGS Flood GFS Data

### General

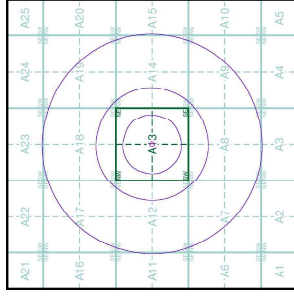
-  Specified Site
-  Specified Buffer(s)
-  Bearing Reference Point
-  Slice

### Agency and Hydrological (Flood)

-  Limited Potential for Groundwater Flooding to Occur
-  Potential for Groundwater Flooding of Property Situated Below Ground Level
-  Potential for Groundwater Flooding to Occur at Surface



### Site Sensitivity Context Map - Slice A



### Order Details

Order Number: 16231708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315360, 289330  
 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

Land at Brynlywarch Garden, Kerry/Ceri, Powys



## Historical Mapping & Photography included:

Mapping Type	Scale	Date	Eq.
Montgomeryshire	1:2,500	1886	2
Montgomeryshire	1:2,500	1903	3
Ordnance Survey Plan	1:2,500	1983	4
Large-Scale National Grid Data	1:2,500	1994	5
Historical Aerial Photography	1:2,500	2000	6

## Historical Mapping Legends

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

	Slopes Top		Rock		Boulders (scattered)		Positioned Boulder		Non-Coniferous Tree (surveyed)		Non-Coniferous Trees (not surveyed)		Orchard Tree		Coppice, Osier		Rough Grassland		Direction of water flow		Triangulation Station		Electricity Transmission Line		Pyon		Buildings with Building Seed		Roofed Building		Civil parish/community boundary		District boundary		County boundary		Boundary post/stone		Always appear in opposed pairs or groups of three		Barracks		Battery		Cemety		Chimney		Cistern		Disamtd Rly		EI Gen Sta		EI P		EI Sub Sta		EI Sub Sta		Filter Bed		Fountain/Drinking Ftn		Gas Gov		Gas Governor		GVC		GP		Mamhole		MP, MS		Mile Post or Mile Stone		Well
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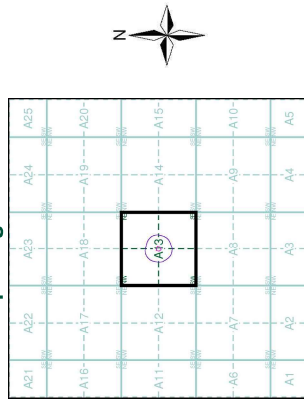
### Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250

	Inactive Quarry, Chalk Pit or Clay Pit		Active Quarry, Chalk Pit or Clay Pit		Rock		Boulders		Roofed Building		Sloping Masonry		Glazed Roof Building		Archway		Non-Coniferous Tree (surveyed)		Non-Coniferous Trees (not surveyed)		Orchard Tree		Coppice, Osier		Rough Grassland		Bench Mark		Heath		Culvert		Antiquity (site of)		Electricity Pylon		County Boundary (Geographical)		County & Civil Parish Boundary		Civil Parish Boundary		Admin. County or County Bor. Boundary		London Borough Boundary		Symbol marking point where boundary mereing changes		Beer-House		BP, BS		Boundary Post or Stone		Capstan, Crane		Ch, C		Chimney		D Fm		EI P		Electricity Pillar or Post		Fire Alarm Pillar		Foot Bridge		GP		Guide Post		Hydrant or Hydraulic		Level Crossing		LC		Mamhole		MP		Mile Post or Mooring Post		MS		Normal Tidal Limit		NLT		Well		Wind Pump
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### Ordnance Survey County Series and Ordnance Survey Plan 1:2,500

	Quarry		Gravel Pit		Shingle		Refuse Heap		Sand Pit		Flat Rock		Marsh		Reeds		Osiers		Wood		Furze		Brushwood		Orchard		Stepping Stones		Lock		Trig. Station		507		Surface Level		Antiquities (site of)		Embankment		Cutting		Railway crossing Road		Level Crossing		Road crossing Railway		Road over single stream		Road over River or Canal		County Boundary (Geographical)		County & Civil Parish Boundary		Administrative County & Civil Parish Boundary		County Borough Boundary (England)		County Burgh Boundary (Scotland)		B.P. B.S. Boundary Post or Stone		B.R.		Bridle Road		F.C.B.		Police Call Box		Pump		Signal Post		S.P.		Foot Bridge		S.L.		Sluice		S.P.		Spring		Telephone Call Box		T.C.B.		Trough		T.T.		Well		M.P. M.L. Mooring Post or Ring
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## Historical Map - Segment A13



## Order Details

Order Number: 162311708\_1\_1  
 Customer Ref: MIENV07115  
 National Grid Reference: 315380, 289330  
 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

## Site Details

Land at Brynlywarch Garden, Keny/Ceri, Powys

## Montgomeryshire

Published 1886

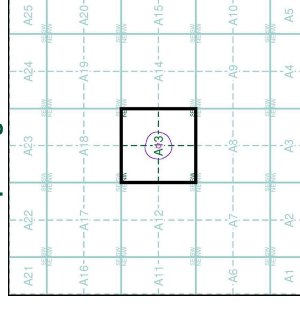
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the National Library of Scotland in the 1940s. The maps were scanned at a scale of 1:2,500 and are shown here at a scale of 1:2,500. 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)

043_04	1886	12.500
044_01	1886	12.500
044_05	1886	12.500

### Historical Map - Segment A13

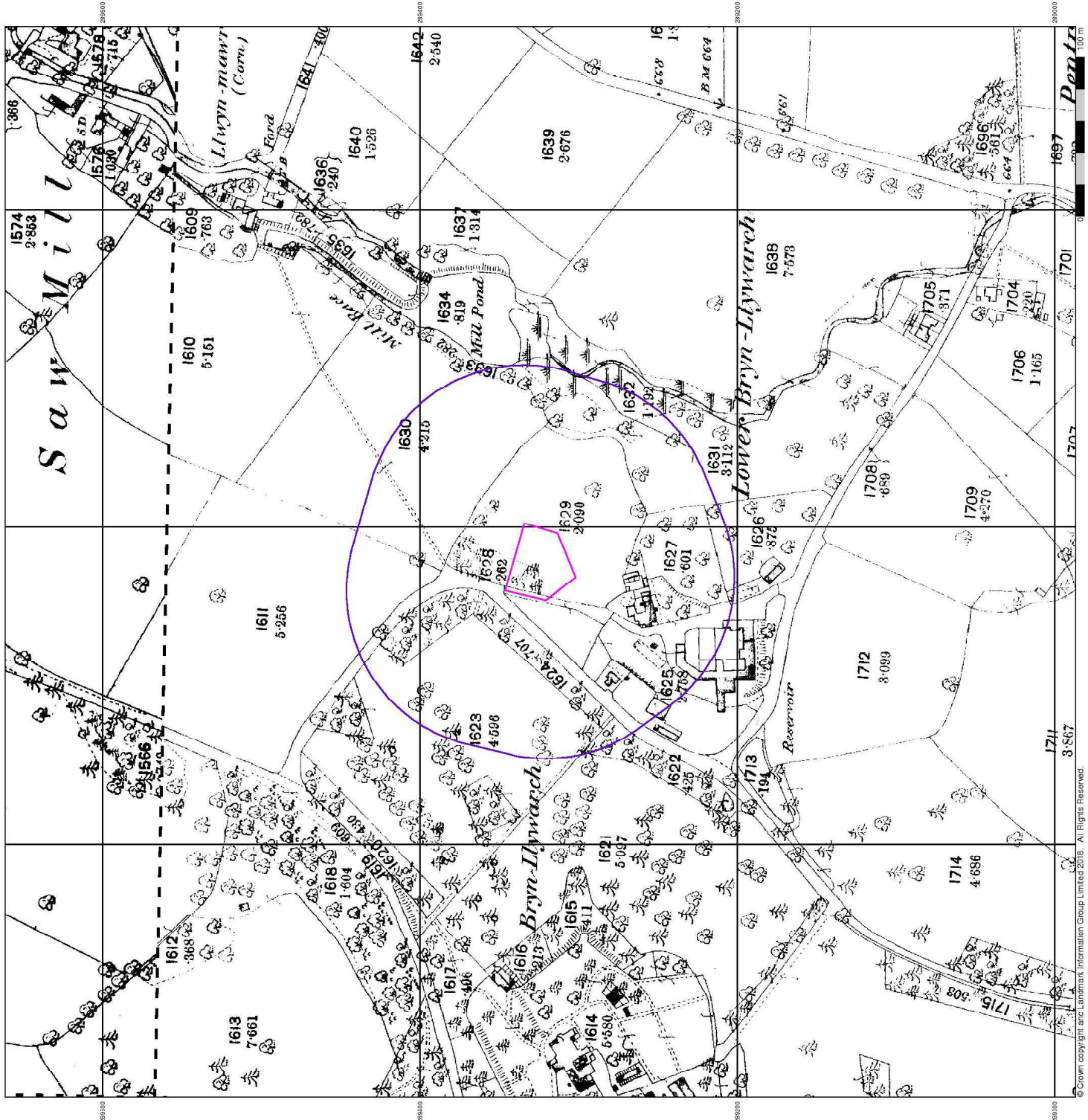


### Order Details

Order Number: 162311708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315380, 289330  
 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

Land at Brynlywarch Garden, Keny/Ceri, Powys





## Montgomeryshire

Published 1903

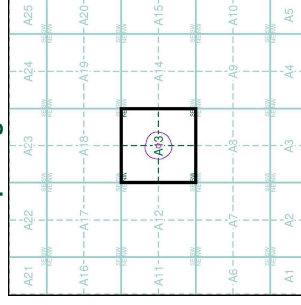
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the National Library of Scotland in the 1940s. In 1964, the National Library of Scotland was merged with the Ordnance Survey to form the Ordnance Survey. 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.

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044_05	1903	12,500

### Historical Map - Segment A13



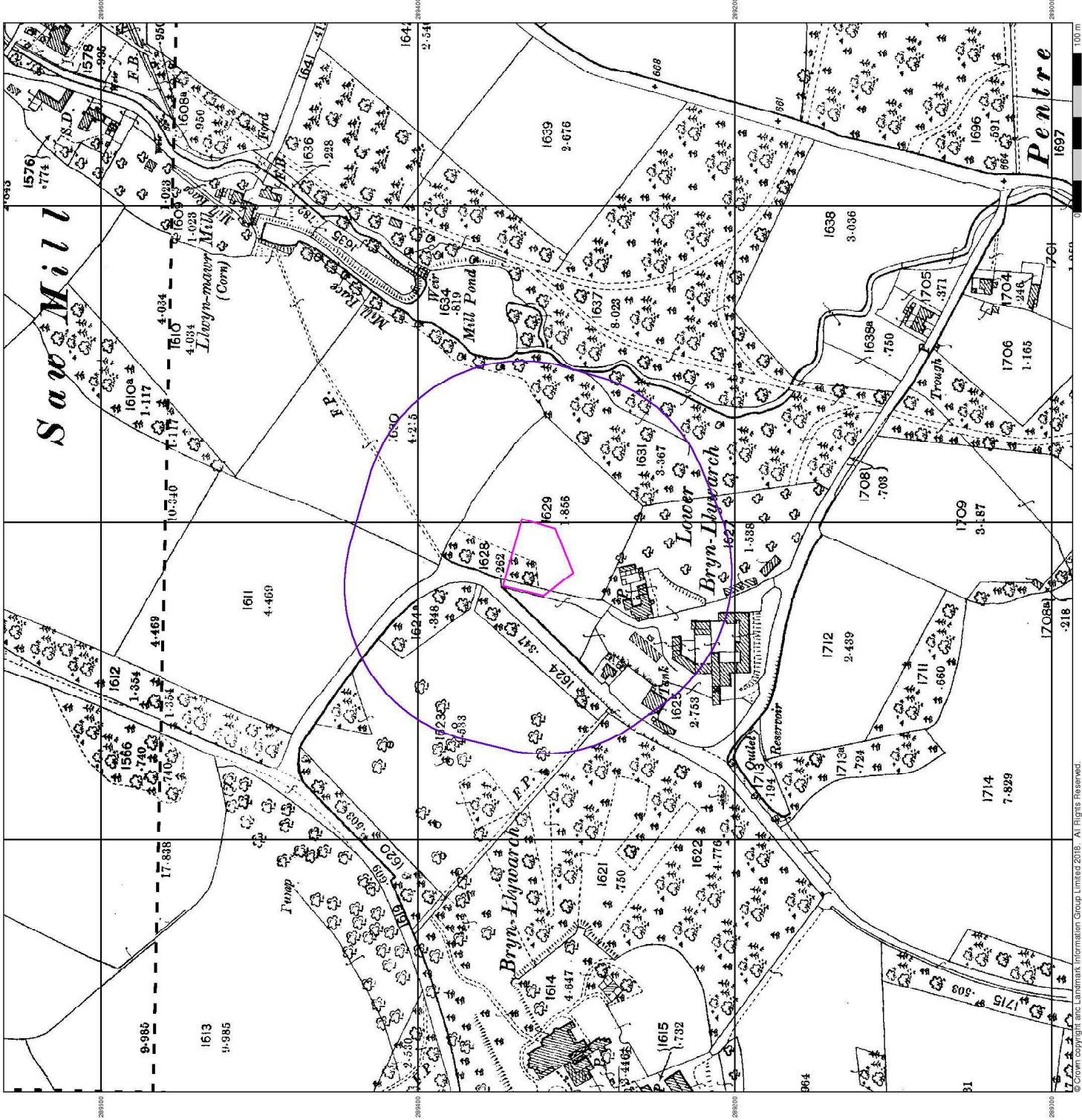
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Order Number: 162311708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315380, 289330

Site: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

Land at Brynlywarch Garden, Keny/Ceri, Powys



## Ordnance Survey Plan

Published 1983

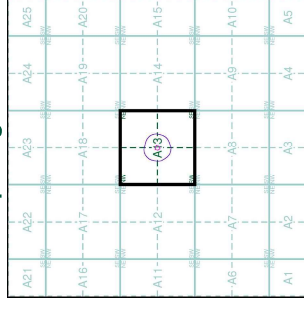
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the Ordnance Survey, London, and Scotland in the 1940s. In 1964 the 2,500 scale maps were reissued and renumbered to be the illustrated 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)

SO1588	1983	1:2,500
SO1588	1983	1:2,500

### Historical Map - Segment A13



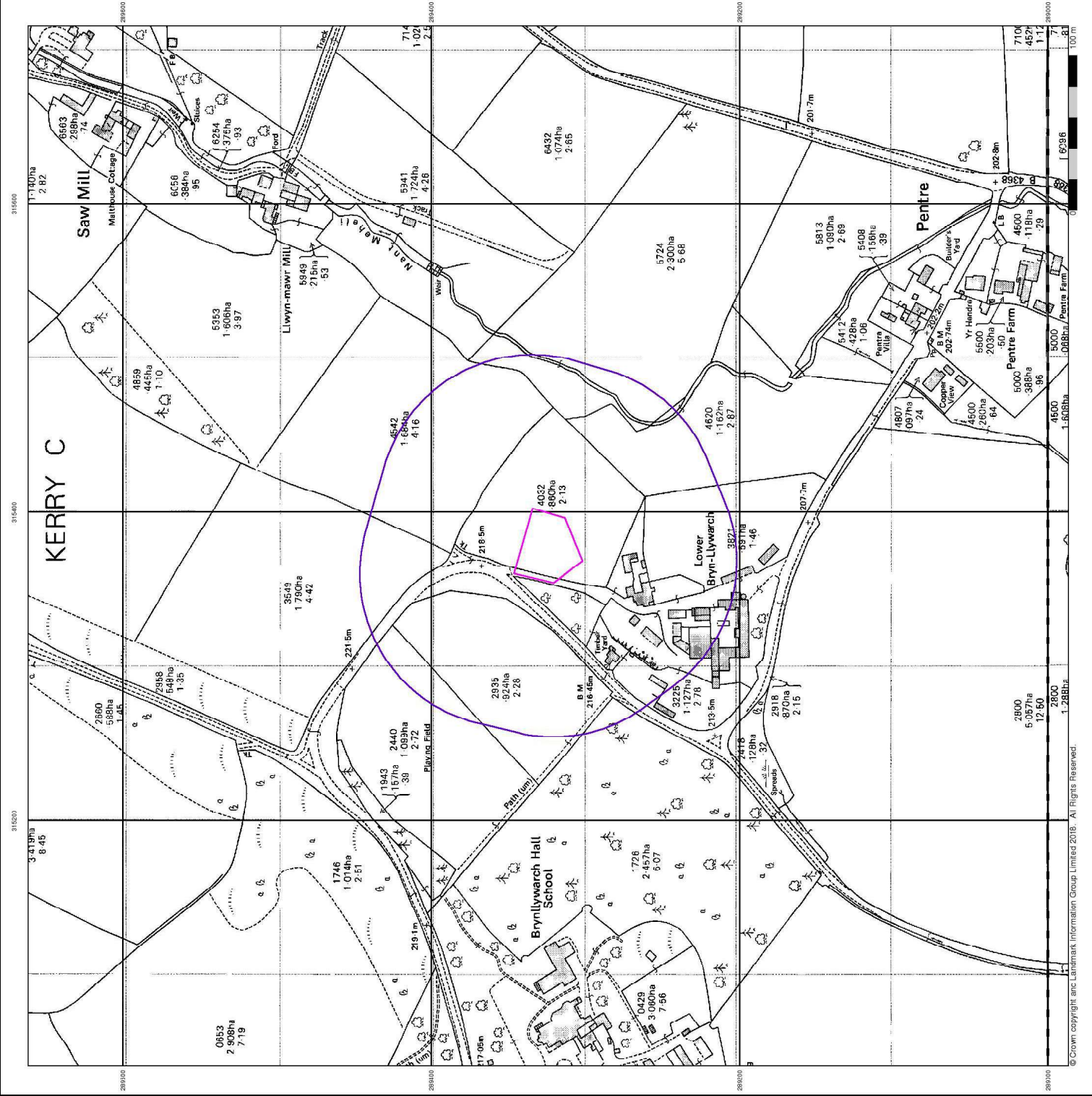
### Order Details

Order Number: 162311708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315380, 289330

Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

Land at Brynlywarch Garden, Kerry/Ceri, Powys



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## Large-Scale National Grid Data

Published 1994

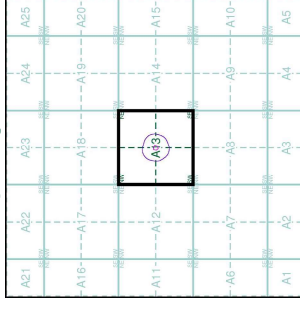
Source map scale - 1:2,500

Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's Small Scale National Grid Data) in 1992, and continued to be produced until 1999. The maps were the base on which digital mapping and provides details of contours and elevations that tend to show large 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)

SO15889	1994	1:2,500
SO15888	1994	1:2,500

### Historical Map - Segment A13



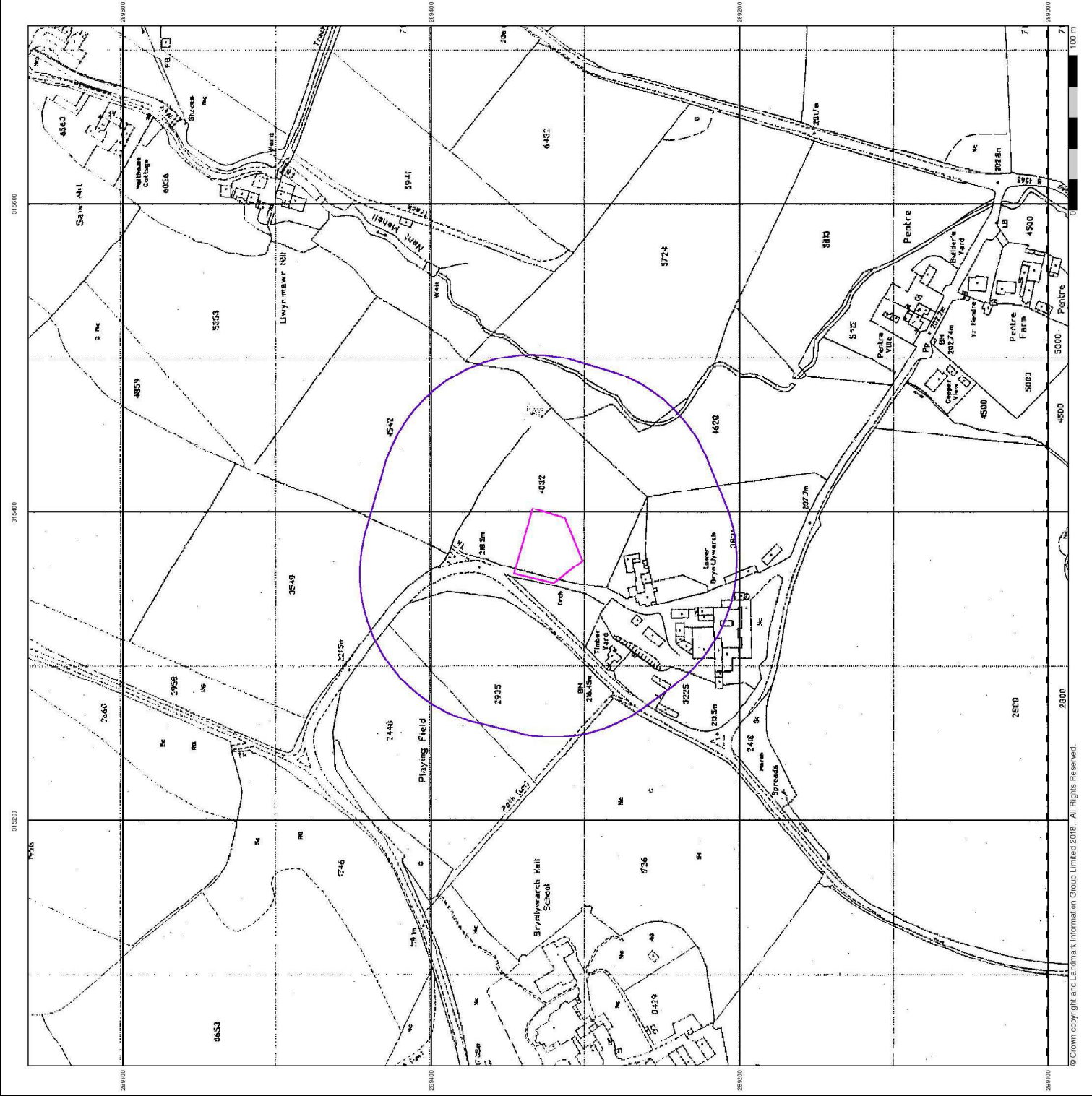
### Order Details

Order Number: 162317708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315380, 289330

Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

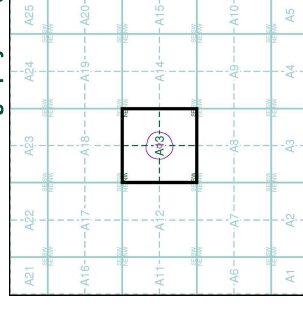
Land at Brynlywarch Garden, Keny/Ceri, Powys







### Historical Aerial Photography - Segment A13



### Order Details

Order Number: 16231708\_1\_1  
 Customer Ref: MENV07115  
 National Grid Reference: 315380, 289330  
 Slice: A  
 Site Area (Ha): 0.14  
 Search Buffer (m): 100

### Site Details

Land at Brynlywarch Garden, Kerry/Ceri, Powys

## Envirocheck<sup>®</sup> Report:

### Datasheet

#### Order Details:

**Order Number:**

162311708\_1\_1

**Customer Reference:**

MENV07115

**National Grid Reference:**

315380, 289330

**Slice:**

A

**Site Area (Ha):**

0.14

**Search Buffer (m):**

1000

#### Site Details:

Land at Brynllwarch Garden

Kerry/Ceri

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