

BLAEN BOWI SOLAR PARK, EXTENSION AREAS, CARMARTHENSHIRE: GEOPHYSICAL SURVEY 2015 (NGR SN 32790 35510)



Prepared by DAT Archaeological Services
For: Corylus Planning



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RHIF YR ADRODDIAD / REPORT NO. 2015/22
RHIF Y DIGWYLLIAD / EVENT RECORD NO. 108469

Mai 2015
May 2015



**BLAEN BOWI SOLAR FARM, PROPOSED
EXTENSION AREAS, CARMARTHENSHIRE:
GEOPHYSICAL 2015**

Gan / By

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**BLAEN BOWI SOLAR FARM, PROPOSED EXTENSION AREAS,
CARMARTHENSHERE:
GEOPHYSICAL SURVEY**

SUMMARY

DAT Archaeological Services were commissioned by Corylus Planning to undertake a geophysical survey of land near Blaen Bowi, Carmarthenshire. The geophysical survey was commissioned prior to the submission of a planning application by Corylus Planning for the extension of a proposed solar farm which has already been given planning consent.

The proposed solar farm site is located on the gradual slopes between two prominent hills with known Prehistoric activity recorded on Moelfre which rises to the north of the site, this includes a Bronze Age barrow cemetery (CM107). Overall the site potential could be highest for Prehistoric activity, specifically Bronze Age remains associated with the barrow cemetery atop of Moelfre Hill.

The geophysical survey was conducted in April 2015 and included an area approximately 13.4ha in size. The survey was conducted using a fluxgate gradiometer which detects variations in the earth's magnetic field.

The survey results demonstrate that gradiometer survey does work successfully on the geology of the site area. Overall the survey has shown up few anomalies which could be interpreted as being of archaeological origin. Old field boundaries and former track ways do show up clearly, as well as a few service trenches (possibly water pipes) and geological anomalies. Features representative of moorland clearance when the area was turned to improved pasture have also been identified.

Further archaeological mitigation may be required at the site, and specifically in areas where the few identified anomalies of potential archaeological origin were identified across the development site. Due to the limited nature of disturbance anticipated by the development, an archaeological watching brief may be considered suitable as the extent of groundworks proposed would probably be limited to those associated with cable trenching and the footprints of the substation and metering cabinets. Existing track ways will be used to access the site and no further excavation of tracks is to be carried out across the development site.

The geophysical survey has indicated no archaeological remains that could preclude the proposed development.

1. INTRODUCTION

1.1 Project Commission

- 1.1.1 DAT Archaeological Services were commissioned by Corylus Planning to undertake a geophysical survey at the site of a proposed extension to a solar park which has already been granted planning consent near Blaen Bowi, Carmarthenshire (NGR SN 32480 35530 and SN 32670 34830; Figure 1).
- 1.1.2 This work was undertaken as a supplementary survey to one that was being undertaken for an area for which planning permission had already been consented. The consented area comprised two fields (Fields B & C) lying to the west of the B4333 road between Hermon and Newcastle Emlyn.
- 1.1.3 An archaeological condition was placed upon planning permission for the two fields (Planning Application No. W/28837), which required as a minimum a geophysical survey of the area. The geophysical survey was undertaken in March and April 2015. In advance of submission of the planning application for an extension to the consented solar farm, Corylus Planning appointed DAT Archaeological Services to continue the geophysical survey into three additional fields and along a proposed cable run between the areas.
- 1.1.4 The results of the geophysical survey should provide a better indication of the archaeological potential of the site and enable targeting of any further archaeological mitigation requirements before or during the development programme. Such mitigation could range from a watching brief to a full excavation, depending on what is or is not revealed.
- 1.1.5 As part of the planning application for the consented solar park, an Environmental Statement was prepared in support of the application by Dulas Ltd, which included a chapter on 'Archaeology and Cultural Heritage'¹. The scope of this report covered the area of the proposed solar park extension as well. The report on the consented areas (DAT Report No. 2015/21) should be read in conjunction with this report.

1.2 Scope of the project

- 1.2.1 A Written Scheme of Investigation (WSI) for a geophysical survey was prepared by DAT Archaeological Services prior to the commencement of the survey within the original two consented fields and this was also used to detail the methodology of the survey for the extension areas. The WSI was drawn up following initial consultation with the archaeological advisors to Carmarthenshire County Council:
 - Provision of a written scheme of investigation to outline the methodology for the geophysical survey which DAT Archaeological Services will undertake.
 - To identify the presence/absence of any potential archaeological deposits through gradiometer survey.
 - To establish the character, extent and date range (where possible) for any archaeological deposits to be affected by the proposed works; and

¹ Dulas Ltd, July 2013, *Blaen Bowi Solar Park Environmental Report, Archaeology and Cultural Heritage* chapter pp60 - 70

- To use the information to determine the scope of any further archaeological mitigation which might be required at the proposed site of the solar park.

1.3 Report outline

- 1.3.1 This report provides a summary and discussion of the geophysical survey and its results.

1.4 Abbreviations

- 1.4.1 Sites recorded on the Regional Historic Environment Record (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). Gradiometer readings are measured in nanoTesla (nT).

1.5 Illustrations

- 1.5.1 Printed map extracts are not necessarily produced to their original scale.

1.6 Timeline

- 1.6.1 The following timeline (**Table 1**) is used within this report to give date ranges for the various archaeological periods that may be mentioned within the text.

Period	Approximate date	
Palaeolithic –	c.450,000 – 10,000 BC	Prehistoric
Mesolithic –	c. 10,000 – 4400 BC	
Neolithic –	c.4400 – 2300 BC	
Bronze Age –	c.2300 – 700 BC	
Iron Age –	c.700 BC – AD 43	
Roman (Romano-British) Period –	AD 43 – c. AD 410	Historic
Post-Roman / Early Medieval Period –	c. AD 410 – AD 1086	
Medieval Period –	1086 – 1536	
Post-Medieval Period ² –	1536 – 1750	
Industrial Period –	1750 – 1899	
Modern –	20 th century onwards	

Table 1: Archaeological and Historical Timeline for Wales.

² The post-medieval and industrial periods are combined as the post-medieval period on the Regional Historic Environment Record as held by Dyfed Archaeological Trust



Figure 1: Location map based on the Ordnance Survey. Proposed development location outlined in red
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2. THE SITE

2.1 Location

- 2.1.1 The proposed development site covers an area of approximately 13.4ha and is divided into two main areas separated by a country road that connects the B4333 between Hermon and Newcastle Emlyn in Carmarthenshire.
- 2.1.2 The three fields and cable run between form part of an extension to a solar farm which has already been granted planning permission by Carmarthenshire County Council. The fields are labelled A to E (Figure 2), Fields B & C are the consented solar farm and reported on separately (DAT Report No. 2015/21). The extension fields comprise Field A (separated into A and A(1)) which lies directly west of the consented site; Fields D and E which lie to the south and which will be connected by a cable run.
- 2.1.3 Fields A and A(1) cover an area of c.7.9ha. Fields D and E cover an area of c.5.5ha. A survey corridor of between 60m and 30m was also surveyed, which ran along the potential line of the proposed cable run linking the north and south areas of the solar farm, an additional area of c.1.5ha of geophysical survey.

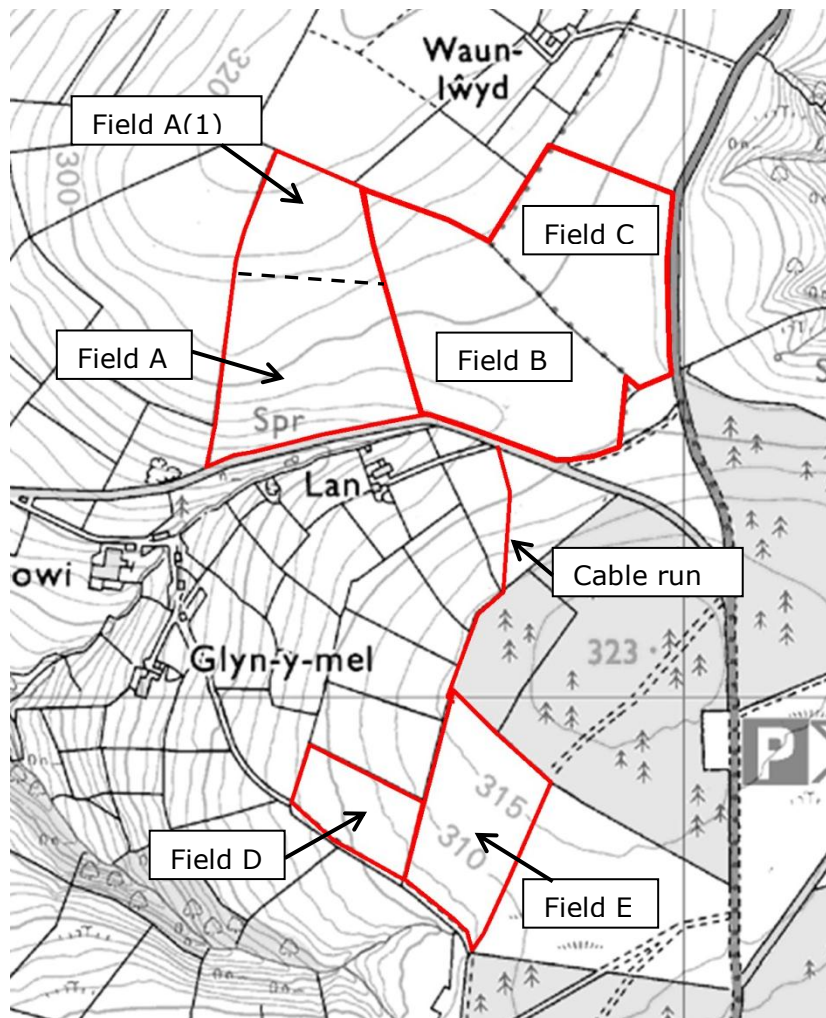


Figure 2: Field designation

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- 2.1.4 The proposed solar farm site is located on land at Blaen Bowi, its eastern most boundary lies directly adjacent to the B4333 and approximately 6km southwest of Newcastle Emlyn in Carmarthenshire. It is situated on the gradual slopes between two prominent hills. Moelfre hill lies directly to the north and has known Prehistoric activity recorded upon it in the form of Bronze Age round barrows.
- 2.1.5 The survey area consists of an enclosed field system primarily used for sheep grazing but has been ploughed in the past.

2.2 Archaeological Potential

- 2.2.1 As part of the original application for the solar park, an Archaeology and Cultural heritage chapter was prepared for the Environmental Statement by Dulas Ltd (2013). This includes a detailed archaeological and historic background and supporting plans and illustrations. As part of the preparation of this report the information included within the archaeology chapter has been reviewed, with an additional search of the regional Historic Environment Record (HER) held by the Dyfed Archaeological Trust and the RCAHMW Coflein database. A summary of all known archaeological sites within 2km of the proposed solar farm is included in Appendix 1.
- 2.2.2 There are four Scheduled Ancient Monuments located within a 2km radius of the proposed solar farm site. The nearest is the Moelfre round Barrow complex (CM107; PRNs 2274-6 and 42659) which is approximately 0.35km away on the hilltop to the north of the site. The complex comprises three Bronze Age round barrows all of which have been damaged by agricultural activities but which nonetheless are an important archaeological asset, hence their designated status.
- 2.2.3 Crug-y-Gorllwyn Round Barrow (CM108; PRN2293) lies approximately 0.76km south-southwest of the site on another hilltop. This is also of Bronze Age date.
- 2.2.4 Approximately 1.2km to the north of the site is the Tomen Seba medieval Motte (CM020; PRN2273). It was last surveyed in 1984 and the following notes were made –
"Tomen Seba Motte is in a good state of preservation. It stands 30 feet high from the bottom of the ditch to the top of the mound. There is a slight depression in the top of the mound and the mound is surrounded by a water-filled ditch about 20 feet wide. The mound stands in a field used for pasture and is itself covered with bracken and small trees."
- 2.2.5 There is no further information as to its age or origins but it would be safe to assume that it was constructed by the Normans in the latter part of the 11th century.
- 2.2.6 To the southeast of the site approximately 1.75km away is another Bronze Age barrow, the Nant Sais Round Barrow (CM106; 2295).
- 2.2.7 With the exception of the Tomen Seba Motte it can be seen that there was significant Bronze Age activity in the area. If one expanded the search radius beyond that specified for this report one would see a host of sites frequently, as with the ones mentioned above, occupying prominent positions on hilltops. The Scheduled Ancient Monuments should be viewed in this context – as components in a wider cultural complex spanning much of southwest Wales.

- 2.2.8 At its northeast corner the proposed solar farm site is immediately adjacent to the Drefach and Felindre Historic Landscape Character area. This area was important for textiles production from the medieval period until the 19th century.
- 2.2.9 There are 80 Historic Environment Records within a 2km radius of the proposed solar farm site (Appendix 1). These will be briefly outlined in chronological order and a complete list has been included in Appendix 1.
- 2.2.10 There is one Neolithic site (PRN47618) – a miniature stone axe was found some 1.2km to the west of Field A of the proposed solar farm extension. Find spots such as this are rare and are frequently indicative of long-range trade in artefacts between localities.
- 2.2.11 There is an array of Bronze Age sites nearby of which Moelfre (PRN42569) and Cefn Hiraeth (PRN10594) are barrow complexes. Five more are single barrows (e.g. Crug-y-Gorllwyn, PRN 2293; Nant Sais PRN 2295), and there is also a single standing stone, Cae Carreg Fawr (PRN7314). The barrows are part of the funerary practises of the local Bronze Age people and occupy many of the surrounding hilltops. Their abundance suggests there was a thriving population in the local area during the Bronze Age with a highly developed culture and structured society. It is distinctly possible that similar features might be encountered within the boundaries of the proposed solar farm site.
- 2.2.12 There are no known structures or features associated with the Iron Age and Roman periods within 2km of the site.
- 2.2.13 There are no known sites of early medieval date within 2km of the site. There is one definite and one possible Norman structure. The former is the scheduled motte site discussed above, Tomen Seba (PRN2273) which lies just to the north of the proposed solar farm site. The latter is a place name reference Llwyn Beili (PRN12167) which translates as Bush Bailey. It is possible that this refers to a structure which has subsequently been destroyed.
- 2.2.14 The majority of the archaeological sites in the area date from the post-medieval period. These can be subdivided into industrial, residential, religious and other sites.
- 2.2.15 There are twelve quarries scattered around the proposed solar farm site. There are two woollen mills, Esgair Mill (PRN15785) and Esger View (PRN35590), and two mill races (PRNs 35588 and 35589).
- 2.2.16 There are a variety of dwellings some of which are quite substantial but the majority of which are small cottages. Of these several are dual purpose premises with Penyparc (PRN35480) and Pantbach (PRN35487) being hosiery workshops, and Cilcraig (PRN35482) and Bryn (PRN35496) being weaving workshops. These lie within the Drefach and Felindre Historic Characterisation Area and contribute to its designation.
- 2.2.17 As is typical of rural Wales, the area is well served by a range of chapels there being five in total within the 2km search radius. These are Capel Pen'r Heol (PRN15713), Capel Tan-glwst (PRN15894), Capel Pant-y-bwlch (PRN15894), Clawddoch Baptist Church (NPRN6259) and Pantybwllch Chapel (NPRN6613). There is also one cemetery, Llain Ddineu (PRN5260) which possibly goes back to the early medieval period.
- 2.2.18 There are two public houses in the area – Clyn Gosen (PRN3378) and The Eden Arms (PRN22471).

- 2.2.19 The only modern structure noted in the archaeological records is Blaen Bowi Wind Farm (NPRN412096). This is located directly adjacent to the proposed solar farm, comprising three large turbines.
- 2.2.20 As a general overview there is evidence of the area being inhabited since the Neolithic period, with funerary and ritual monuments dating from the Bronze Age. There is then a hiatus during the Iron Age/Roman period, then continuous usage until the present day.
- 2.2.21 It is most likely that the area would initially have been used for rough grazing during the Bronze Age, where there was a pastoral society. Burial mounds and standing stones are also present in the region attesting to the occupation and usage of the general area.
- 2.2.22 This pattern of agriculture is likely to have continued for millennia bearing in mind the exposed position of the hilltops and poor quality of the soil.
- 2.2.23 The Normans did have a military presence here for presumably during the 12th and 13th centuries, and it is possible that the current road follows an earlier route way across the hills, which the motte and bailey was guarding.
- 2.2.24 During the post-medieval period industries established themselves in the area. The woollen industry becomes established in the valleys nearby which undoubtedly relied on wool from the local flocks for its raw material.
- 2.2.25 The fields of the proposed solar park are presently improved pastureland, improved in the latter part of the 20th century. The Blaen Bowi wind farm directly adjacent to the site is a more recent development.
- 2.2.26 Overall the site potential is highest for prehistoric activity specifically Bronze Age remains associated with the barrow cemetery on the hill. Recent work on sites in similar topographic locations, fairly close by in Ceredigion, have revealed evidence for round barrows to be present on lower slopes of hills, as opposed to merely being located on their summits. Later Iron Age activity, potentially focussing on these earlier barrow sites has also been found, including occupation activity. Such features include ring ditches for round barrows – or potentially for hut circles; ditches for enclosures; or hearths or pyres.

3. METHODOLOGY

3.1 Geophysical Survey Methodology

- 3.1.1 A fluxgate gradiometer with a DL601 data logger was used to conduct the detailed survey, which detects variations in the earth's magnetic field. A sample interval of 0.25m (four readings per metre) was used with 1m wide traverses across 30m x 30m grids using the zigzag traverse method of collecting data. The gradiometers sensitivity was set to detect a magnetic variation in the order of 0.1 nanoTesla.
- 3.1.2 The survey grid was tied in to the local Ordnance Survey grid using a Trimble Total Station (TST).
- 3.1.4 The data was processed using *Terrasurveyor 3.0* and is presented with a minimum of processing. The presence of high values caused by ferrous objects, which tend to hide fine details and obscure archaeological features, have been 'clipped' to remove the extreme values allowing the finer details to show through.
- 3.1.5 The processed data has been presented as a grey-scale plot, overlaid on local topographical features. The main magnetic anomalies have been identified and an interpretation of those results is also given.
- 3.1.6 The resulting survey results and interpretation diagrams should not be seen as a definitive model of what lies beneath the ground surface, not all buried features will provide a magnetic response that can be identified by the gradiometer. In interpreting those features that are recorded the shape is the principal diagnostic tool, along with comparison with known features from other surveys. The intensity of the magnetic response could provide further information, a strong response for example indicates burning, high ferric content or thermoremnancy in geology. The context may provide further clues but the interpretation of many of these features is still largely subjective.
- 3.1.7 All measurements given will be approximate as accurate measurements are difficult to determine from fluxgate gradiometer surveys. The width and length of identified features can be affected by its relative depth and magnetic strength.

4. RESULTS

4.1 Introduction

- 4.1.1 The site was surveyed in April 2015.
- 4.1.2 In total 4 fields were surveyed as well as a 30m corridor running along the potential line of a proposed cable run that would link the southern and northern solar park areas. In total an area of approximately 13.4ha in size was surveyed (See Figure 2).
- 4.1.3 The areas will be discussed below individually with a conclusion given for the site as a whole, however certain elements of the surveys are best dealt with en masse to save repetition. In the geophysical interpretation images, dipolar features are represented in red, positive features are represented in green, and negative features appear in blue.
- 4.1.4 Numerous small dipolar features can be seen to cover the areas surveyed. These are likely to represent small ferrous objects such as horseshoes or nails, which are commonly found distributed across sites. Unless these features form a pattern or a part of a larger geophysical feature, they will not be discussed further.
- 4.1.5 Where a field boundary contains ferrous material such as wire-fencing, a dipolar effect can be seen where the survey encroaches near to it. This dipolar 'shadow' is visible in nearly all instances where the survey meets the field boundaries.

4.2 Field A

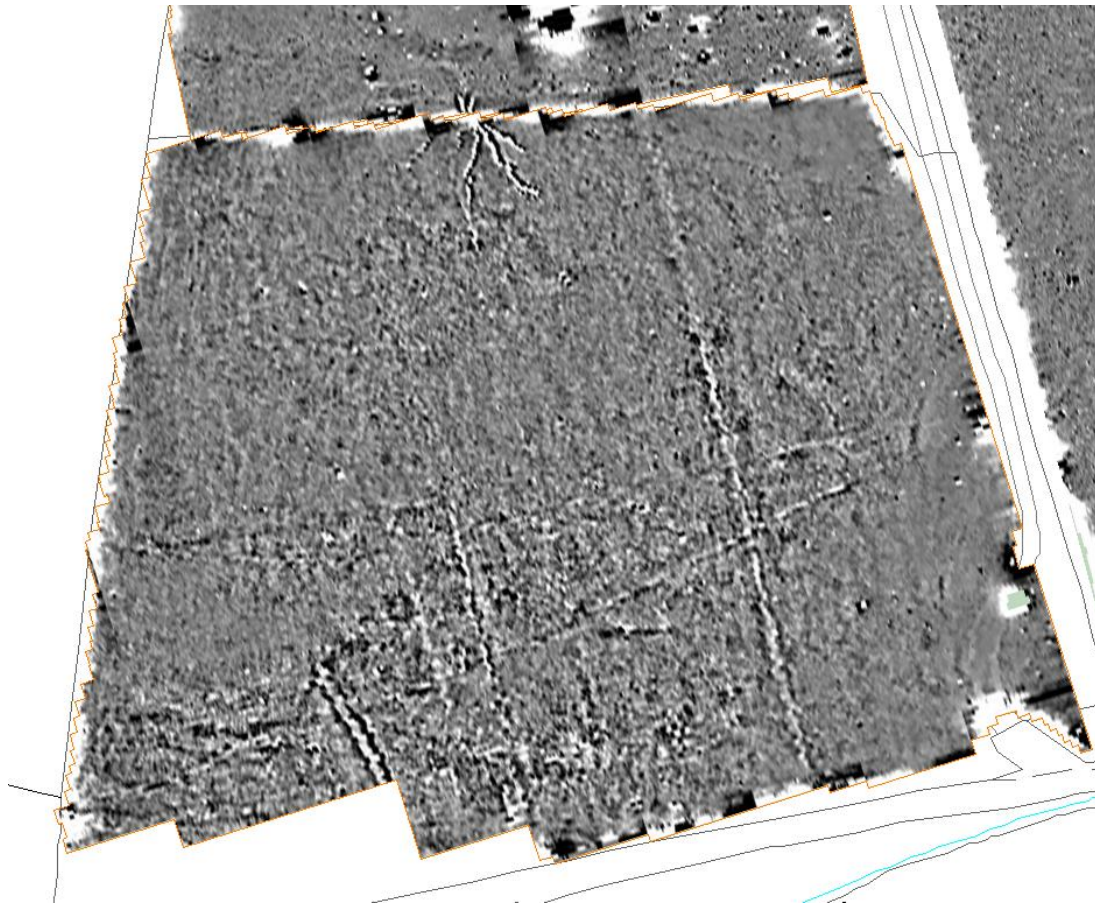


Figure 3: Processed data as grey-scale plot overlaid on local topographical features for Field A

- 4.2.1 Field A was split into two parts due to the presence of temporary fencing. This part of the field covered an area of c.4.34ha and was broadly sloping from north to south, with the gradient shallow at the east end and steeply stepped to the west.
- 4.2.2 The south west corner of the field was very steep and a decision was made to omit the area from the survey, due to the increased risk surveying it presented.
- 4.2.3 The results are presented at $\pm 8\text{nt}$ (Figure 3) and an interpretation plot of the results is also provided (Figure 4).
- 4.2.4 The positive and negative linear features visible in the south west corner of the field (a) are likely to represent a geological feature known as soil-creep, as the lines run perpendicular to the gradient of the slope.
- 4.2.5 This dipolar linear with a negative linear immediately to the north of it (b) corresponds with a shallow linear depression visible on the ground. This may represent the route of a former trackway and/or separation boundary between field use types especially given the way it respects the eastern field boundary.
- 4.2.6 Two faint, near circular features (c) can be seen in the south west of the field. These coincide with a stepped gradient of the slope in that field.

The stepping is thought likely to be the result of natural geological formations below ground level, but the circular features may represent quarrying activity.

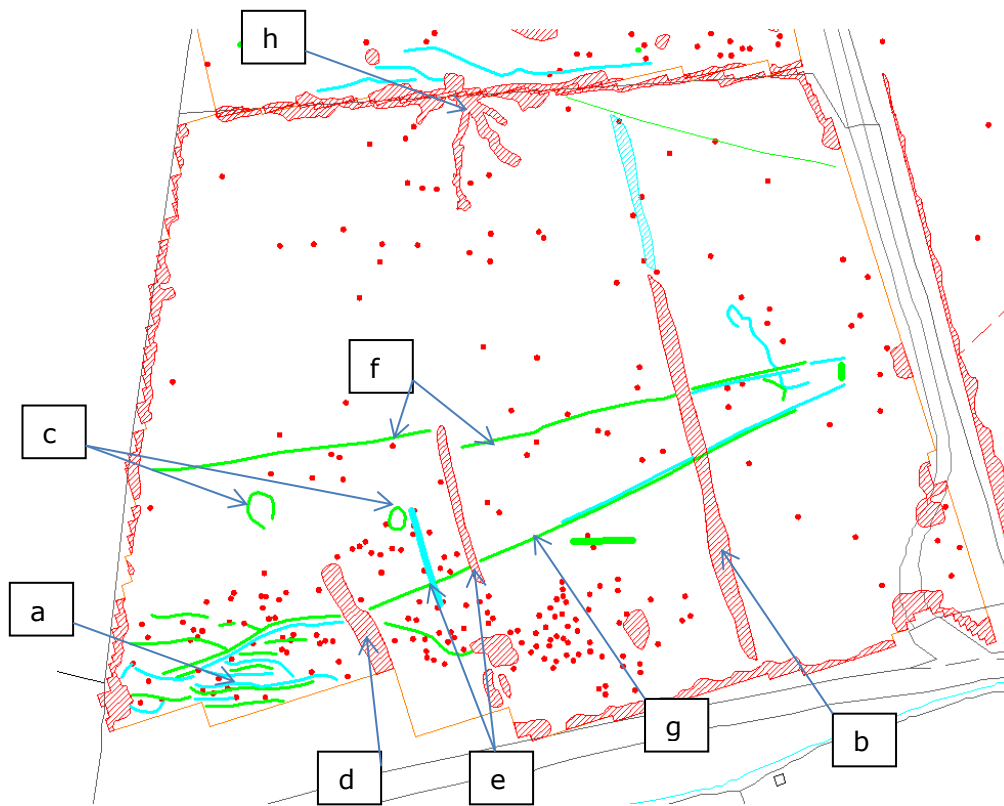


Figure 4: Interpretation Plot of survey results within Field A.

Dipolar features are represented in red; positive features are represented in green: and negative features appear in blue.

- 4.2.7 A very bold dipolar linear (d) is thought to represent a former trackway, but no evidence could be seen on the ground or in the hedgerow to indicate its location. It may be linked to the circular features to the north of it (c).
- 4.2.8 Two parallel linear features (e), one negative and one dipolar are similar in nature to feature (b) and so are likely to represent former access tracks during a different field use.
- 4.2.9 Two faint positive linear features (f) and (g) can be seen running almost the whole width of the field from east to west. Where these terminate water tanks were visible in the hedgerow, and so they are thought to represent pipe trenches.
- 4.2.10 An irregularly shaped dipolar feature (h) can be seen in the middle of the field on its northern edge. This feature, is not immediately relatable to an archaeological feature type, but bears a visual similarity with upland watercourses. It may be that a ferrous sediment has filled a palaeochannel (former streambed), although further investigation would be required to provide a conclusive answer.

4.3 Field A(1)

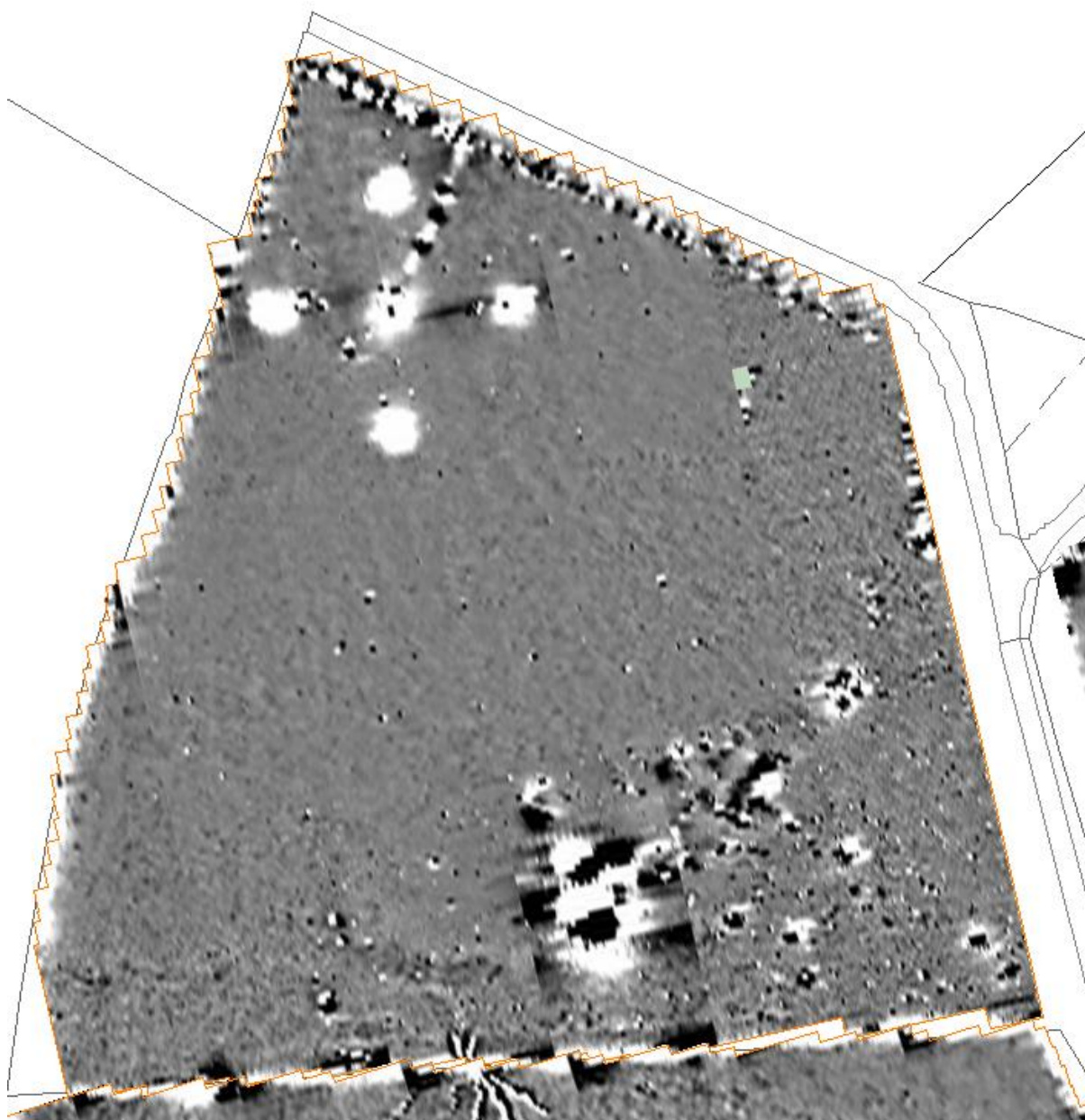


Figure 5: Processed data as grey-scale plot overlaid on local topographical features for Field A(1)

- 4.3.1 The field covered an area of 2.54ha and was gently sloping from north to south.
- 4.3.2 The results are presented at $\pm 10\text{nt}$ (Figure 5) and an interpretation plot of the results is also provided (Figure 6).
- 4.3.3 The five rounded dipolar areas in the northern end of the field (a) are thought to represent the location of footings for a former tower or mast, associated with the construction of the adjacent wind turbines. A dipolar linear (b) can be seen running from this feature to the north towards the hedge line, where it meets with a northwest to southeast dipolar linear (c). These dipolar linear features are likely to be buried cables associated with the furniture erected at (a).

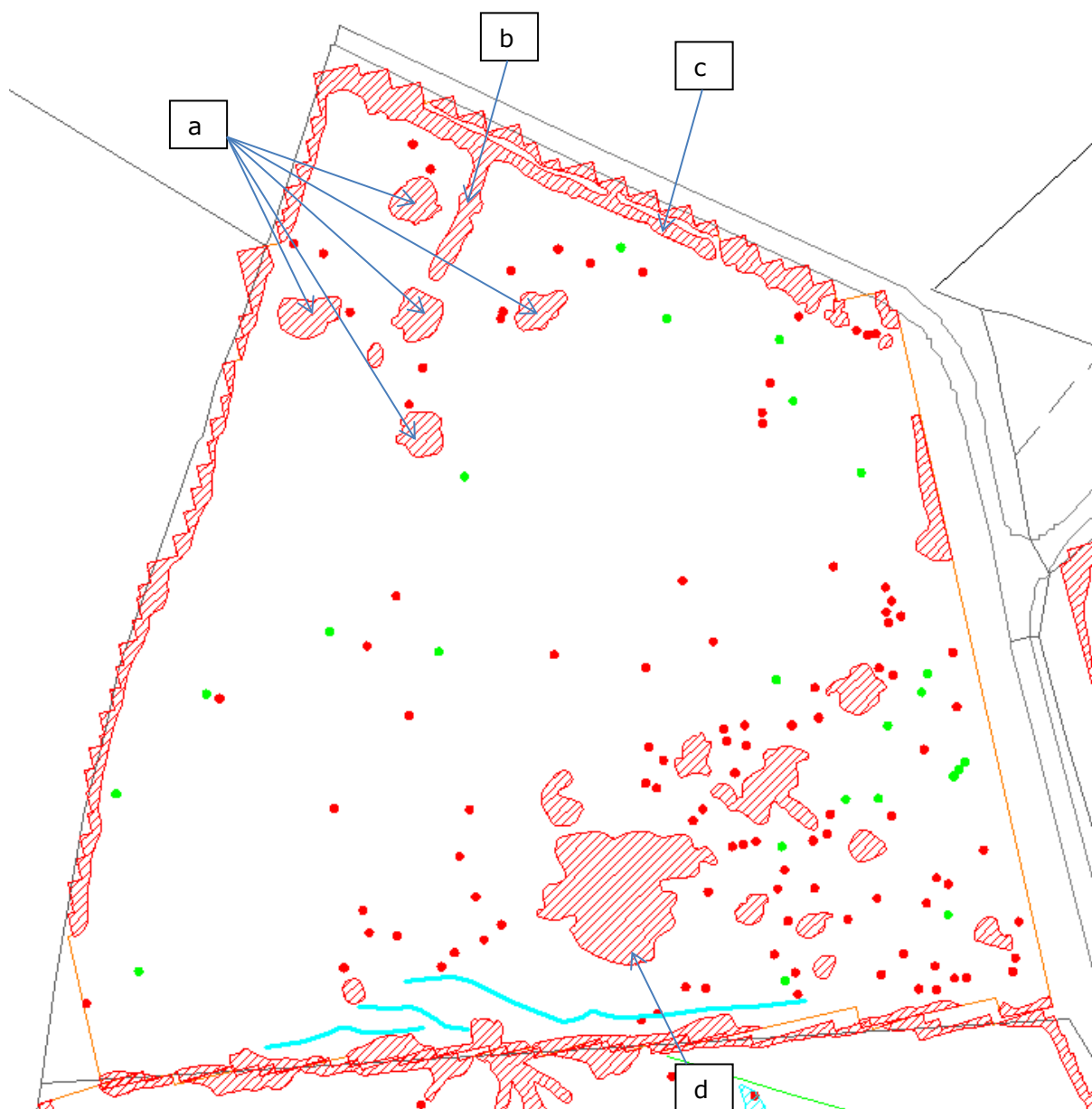


Figure 6: Interpretation Plot of survey results within Field A(1).

Dipolar features are represented in red; positive features are represented in green: and negative features appear in blue.

- 4.3.4 A large dipolar area can be seen in the south of the field (d) surrounded by lots of dipolar dots and smaller dipolar areas. These likely represent an area of disturbed ground that contains a large amount of ferrous material.
- 4.3.5 Some small, roughly circular features can be seen throughout the survey results. These may represent tree or shrub boles, associated with upland nature of the site prior to enclosure.

4.4 Field D

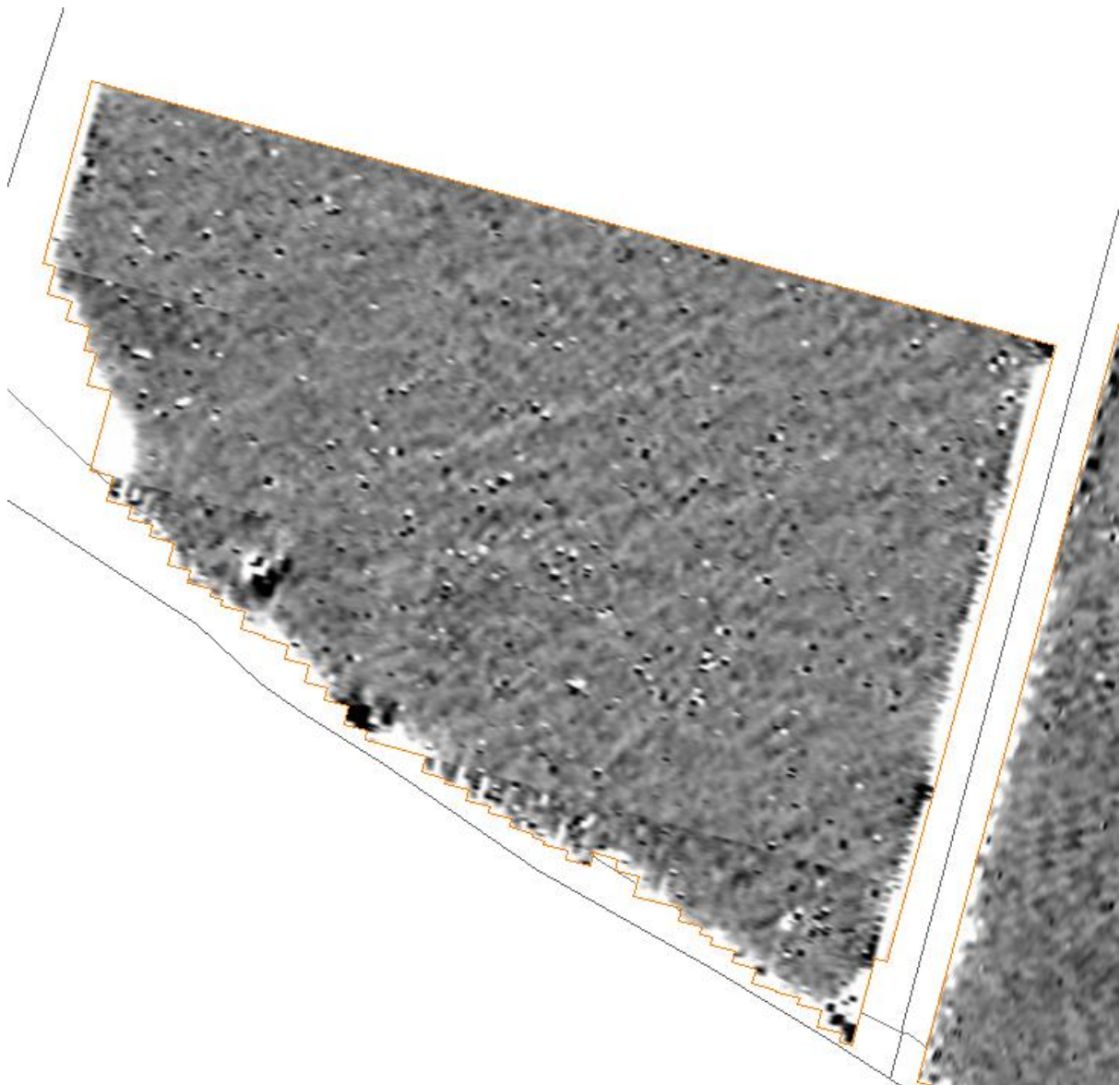


Figure 7: Processed data as grey-scale plot overlaid on local topographical features for Field D

- 4.4.1 Field D covered an area of 1.38ha and was gently sloping from northeast to southwest.
- 4.4.2 The results are presented at $\pm 5\text{nt}$ (Figure 7) and an interpretation plot of the results is also provided (Figure 8).
- 4.4.3 The parallel negative features (a) that can be seen running roughly east to west across this field are likely to be geological in origin, as they follow the direction of the slope of this field.

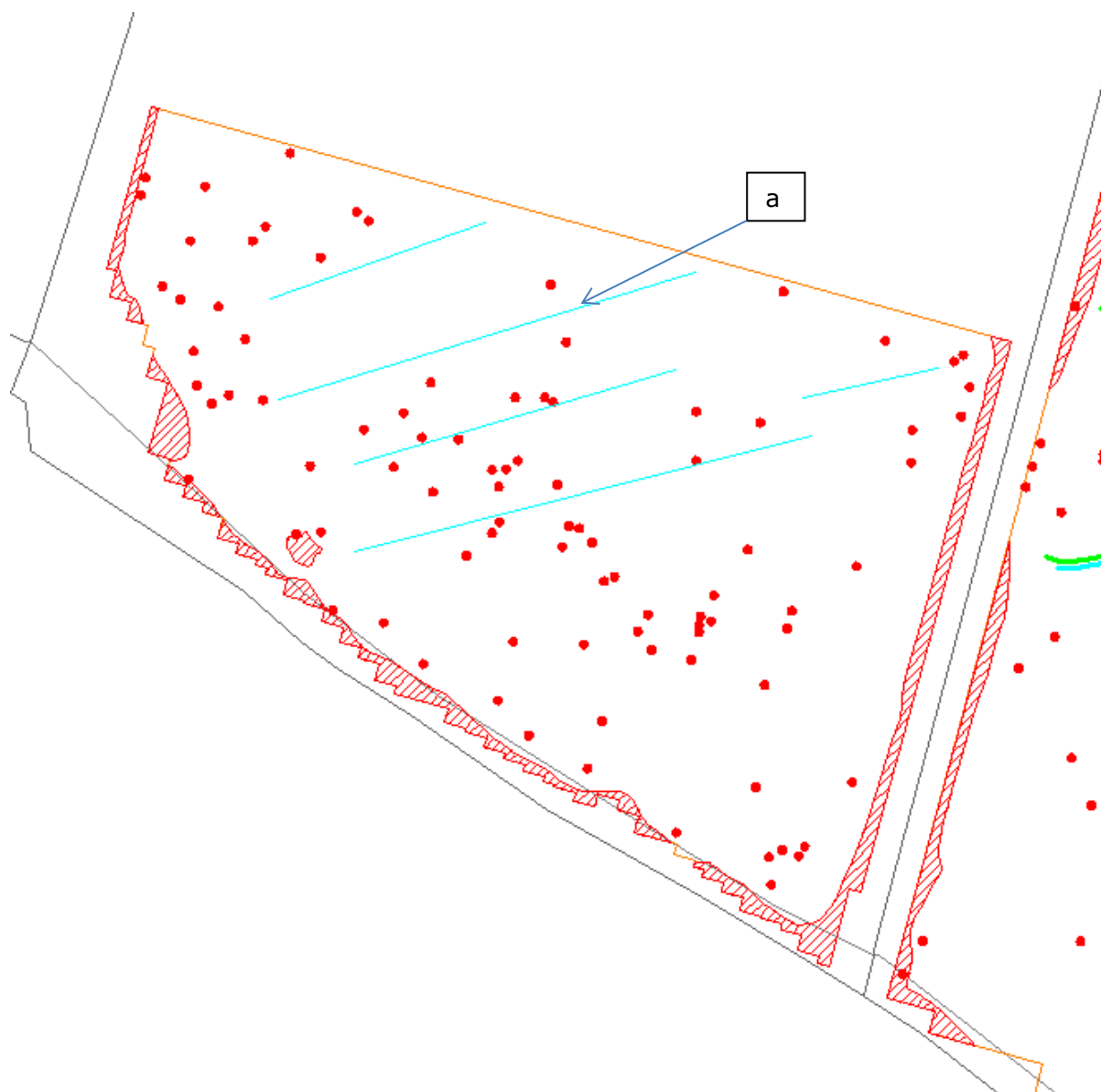


Figure 8: Interpretation Plot of survey results within Field D.

Dipolar features are represented in red; positive features are represented in green: and negative features appear in blue.

4.5 Field E

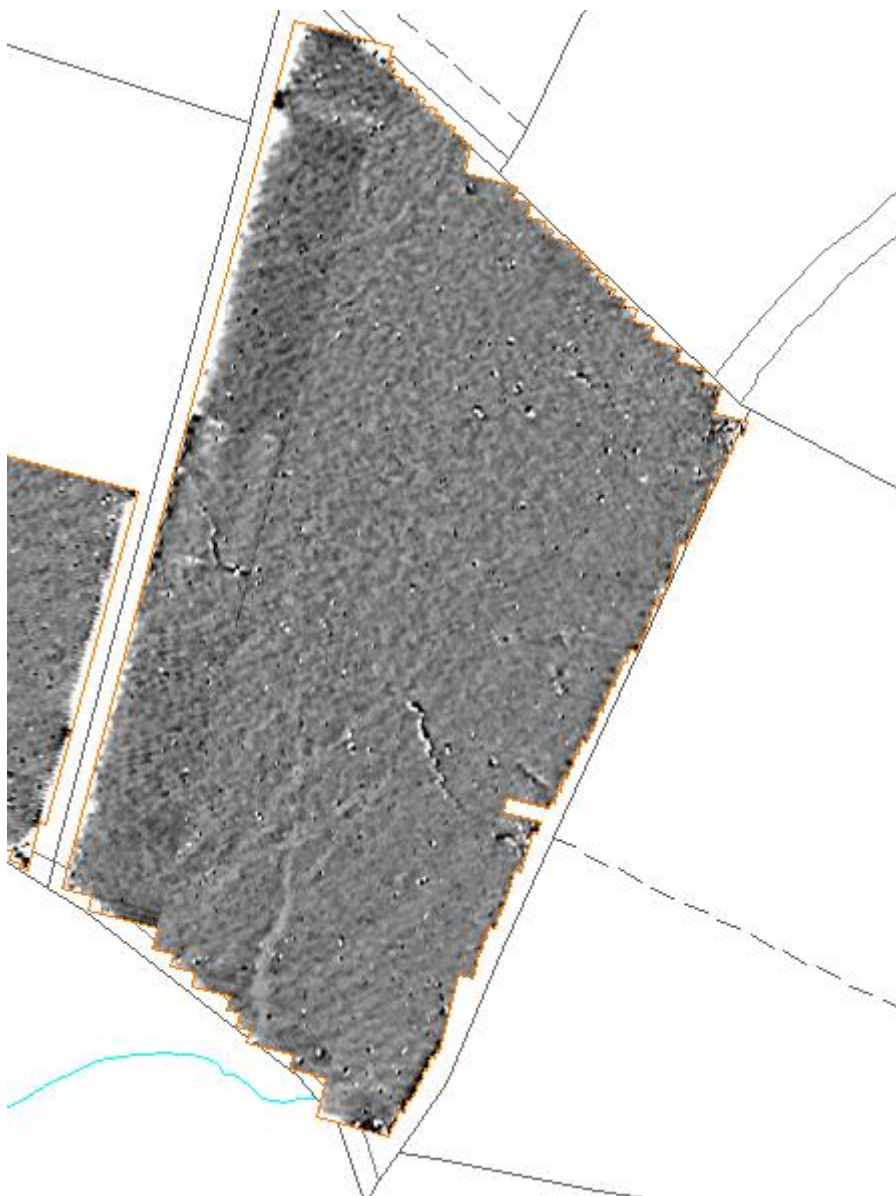


Figure 9: Processed data as grey-scale plot overlaid on local topographical features for Field B

- 4.5.1 Field E covered an area of 3.60ha and was gently sloping from north to south.
- 4.5.2 The results are presented at $\pm 5\text{nt}$ (Figure 9) and an interpretation plot of the results is also provided (Figure 10).
- 4.5.3 A faint negative feature (a) can be seen in the north of this field. It is likely to be a continuation of those features observed in field D (see 4.5.3).
- 4.5.4 An irregularly shaped, faint negative feature (b) can be seen 'branching' across the site from the southern boundary, northwards. Given its proximity to a known stream, it is likely that it represents the natural drainage across this site.

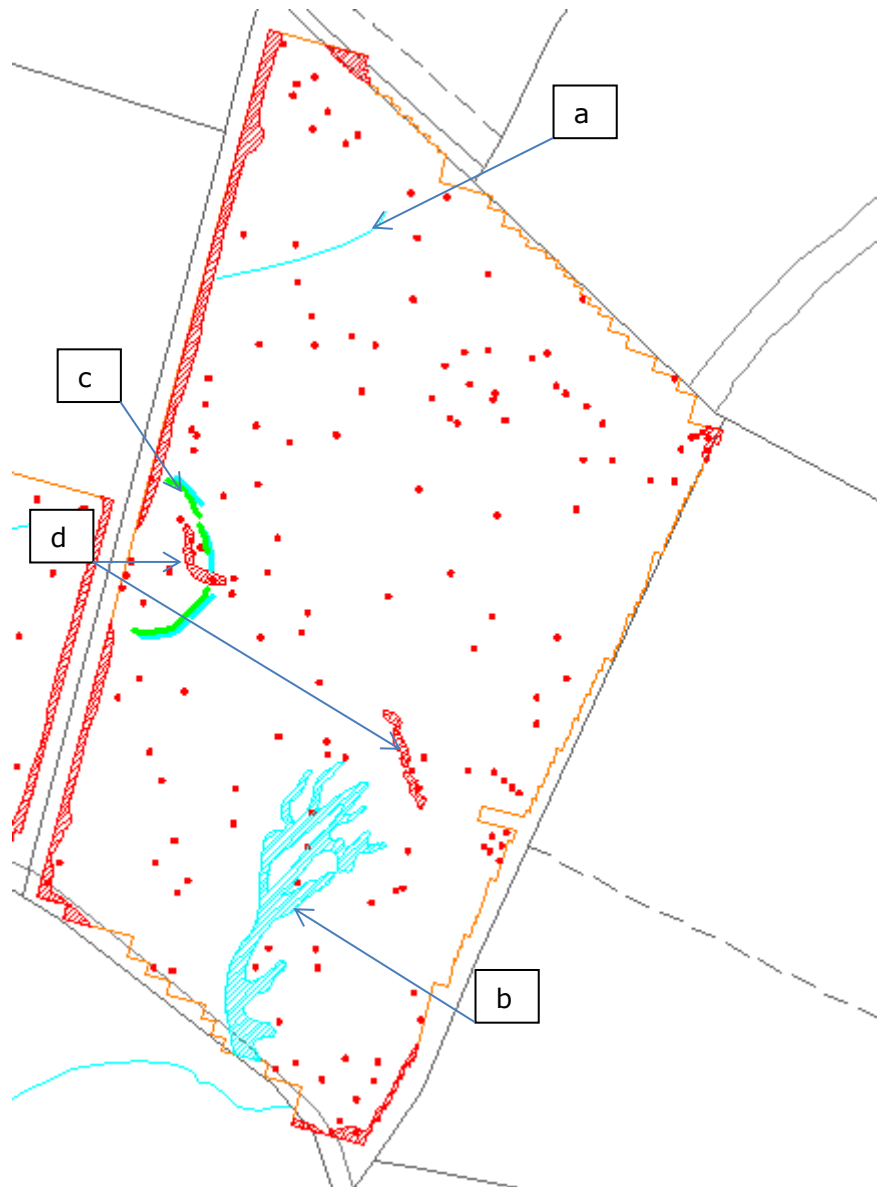


Figure 10: Interpretation Plot of survey results within Field B.

Dipolar features are represented in red; positive features are represented in green: and negative features appear in blue.

- 4.4.5 Near the western boundary can be seen a faint, negative semi-circular feature surrounding a positive semi-circular feature (c). The feature measures roughly 40m across, but does not appear to cross the field boundary as it is not visible in the adjacent Field D. The faint response could indicate that the feature is very shallow, either through truncation or being close to the ground surface.
- 4.5.6 Two dipolar features (d), one curvilinear and one linear can be seen in the central portion of the field. They are similar in characteristics to previously described features in field A, but as they run perpendicular to feature (b) they are unlikely to be natural features. Given their broad alignment with former field boundaries to east and west, they may be related to those.

4.6 Cable Run



Figure 11: Processed data as grey-scale plot overlaid on local topographical features for the proposed Cable Run area

- 4.6.1 The cable run survey covered an area of 1.54ha. The 2 southern parts of the survey area were generally flat with a slight incline to the northwest, while the northern survey area was more steeply sloped from south to north.
- 4.6.2 The results are presented at $\pm 5\text{nt}$ (Figure 11) and an interpretation plot of the results is also provided (Figure 12).
- 4.6.3 Two linear negative features (a) are likely to represent former field boundaries, as they respect the existing field boundaries to the west.
- 4.6.4 The concentration of positive circular dots in the southern end of the northern survey area would suggest the presence of tree or shrub boles related to former land use.



Figure 12: Interpretation Plot of survey results within the proposed Cable Run area

Dipolar features are represented in red; positive features are represented in green: and negative features appear in blue.

5. CONCLUSION

- 5.1 The gradiometer survey undertaken at the site of the proposed extension areas to the already consented Blaen Bowi solar farm has been successful in demonstrating the presence of a number of buried features within the area. The geology of the site area is evidently well suited to gradiometer survey.
- 5.2 A range of different features were identified within the survey area of Fields A, A(1), D and E and the area of the proposed cable run. A number of these are likely to be post-medieval or modern representing former or existing farm tracks. Other features identified may represent buried services.
- 5.3 Although very few notable features were found during the survey, it is possible for some archaeological features to remain undetected due to lack of variations in the magnetic susceptibility of the feature from the surrounding natural.
- 5.4 Figures 13 and 14 show the amalgamated surveys, including the consented fields for the windfarm (Fields B & C) and the proposed additional areas (processed data and interpretation plots).
- 5.5 Overall the surveys do not indicate intensive archaeological activity as might have been expected from the potential for the site to contain ring ditches associated with Bronze Age round barrows or Iron Age hut circles. There do not appear to be any features representing hearths or other activity which could be associated with settlement.
- 5.6 The results would tend to suggest that the area has been used for pastoral farming possibly since the Bronze Age. The numerous small circular features are thought to represent clearance of scrubland plants or small trees to create larger open fields. The area is shown as moor land on 19th century plans, and potentially the clearance may have occurred when the fields were turned to improved pasture in more recent years.
- 5.7 Through discussions with the client it is understood that the solar farm does not require soils to be stripped in order to install the frames on which solar panels are mounted. Frames are erected by piling. This will involve similar machinery to farm vehicles which will drive on the topsoil (eg through the use of tractors and power take-off to drive the piles in to the ground).
- 5.8 No new roads are proposed on the site as existing access tracks will be used. Track matting will be used if a track surface is required for vehicles.
- 5.9 The only aspects involving intrusive groundworks that could have an impact on buried archaeological remains are the excavation of cable trenches, and for footings of electrical equipment housings and substation. These items of equipment are small and few – for example a substation will have a 6x3m footprint (and only one is required for the solar park), and metering cabinet is c. 2x2m (with less than ten needed throughout the approved solar park and proposed extension). If the locations of these small items coincide with an area identified by geophysical survey as of possible interest, an intensive watching brief can be adopted in these areas. Alternatively, the areas may be avoided by amending the design.
- 5.10 Once the equipment is installed and operational, the land will continue in (sheep) grazing use. The solar equipment requires only minimal maintenance and this would not involve either heavy equipment or trafficking. Maintenance of the land therefore continues in essentially the same way as at present.



Figure 13: Processed data as grey-scale plot overlaid on local topographical features for all surveyed Fields A, A(1), B, C, D & E and the proposed Cable Run

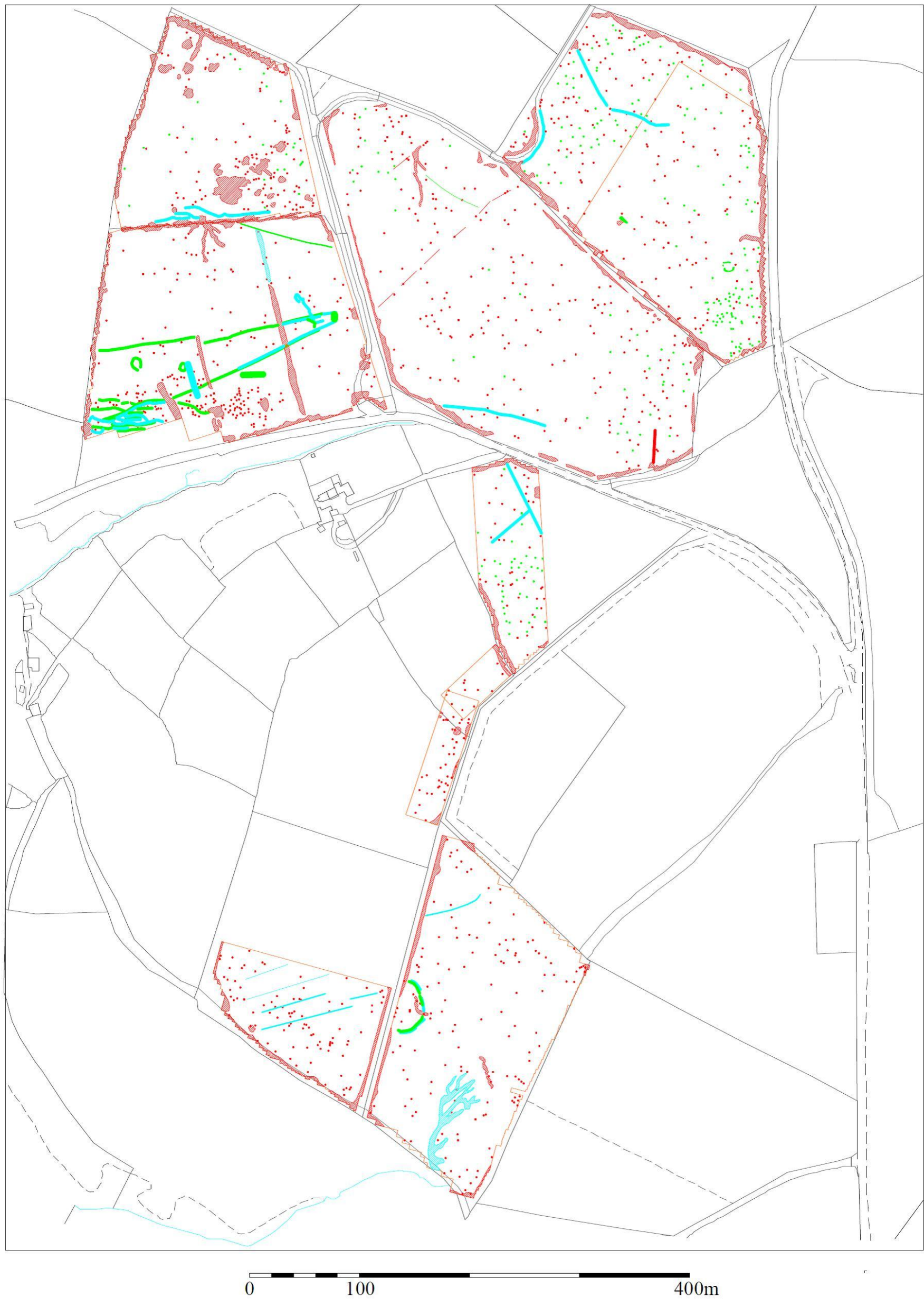


Figure 14: Interpretation Plot of survey results within all surveyed Fields A, A(1), B, C, D & E and the proposed Cable Run

Dipolar features are represented in red; positive features are represented in green; and negative features appear in blue.

Appendix 1

Summary of known archaeological sites located within 2km of proposed solar farm

PRN	Name	Type	Period	NGR
2273	Tomen Seba NPRN303737	Motte: Thought to be a medieval castle motte: a steep-sided, ditched circular mound, some 32m in diameter & rising 6.4m to a level summit, some 12.5m in diameter, where foundations are said to have been encountered; the ditch is partially water-filled: there are no indications of any further works. Scheduled Ancient Monument CM020	Medieval	SN32553702
2274	Crugiau Moelvre NPRN303736	Round Barrow: One of three round barrows at the top of Moelvre. Part of Scheduled Ancient Monument CM107	Bronze Age	SN3261636127
2275	Crugiau Moelvre NPRN309236	Round Barrow: One of three round barrows at the top of Moelvre 1.6m high barrow severely mutilated by field walls built upon its summit. The western end of the mound is intact, the NE end is partly ploughed, and the southeastern end is flattened completely. Part of Scheduled Ancient Monument CM107	Bronze Age	SN3267636121
2276	Crugiau Moelvre NPRN309235	Round Barrow: One of three round barrows situated at the top of Moelvre barrow 1.6m high with a large mutilation upon its summit (Probably due to quarrying). Slight erosion and cattle treading at its base. Part of Scheduled Ancient Monument CM107	Bronze Age	SN3263636094
2293	Crug Y Gorllwyn NPRN303757	Round Barrow: Round barrow c.2.0m high, 17.0m in diameter in a pasture field (rotovated + reseeded 5 years ago). OS trig point on top of mound slightly to the north area of mutilation on top with paths leading to it. Telegraph pole on SW side, shed recently erected between to the fence + close up against barrow (E side). This is being used as a shelter for cattle and causing trampling particularly on the north-east side. Scheduled Ancient Monument CM108	Bronze Age	SN32183408
2294	Crug Moch NPRN303759	Round Barrow: Crug moch round barrow stands c.0.6m high and measures c17.0m in diameter. It lies at the edge of a level pasture field. A farm track cuts along the Northeast side and a modern hedge line runs parallel to the track along the top of the mound. There is no evidence for a ditch and there are quartz pebbles on the surface on the mound. The mound itself is covered with bracken + bushes.	Bronze Age	SN3342433362
2295	Nant Sais NPRN303760	Round Barrow: Round barrow c.1.2m high, 18.0m in diameter on the west facing slope so higher on downslope side than upslope side. A central depression is being made worse by animal trampling - the hollow is being used as a windbreak - and there are several paths to the hollow. The barrow itself lies in an area of heathland and has a cover of rough grass + gorse. However, the rest of the field to the south has obviously been ploughed and seeded + is much better quality pasture. There is no	Bronze Age	SN34353397

		fence or hedge dividing these two areas and the pasture is only c. 2.0m away from the barrow. Scheduled Ancient Monument CM106		
3377	Blaen Nant-Llin	Findspot: No further information concerning find: no other discoveries.	Post-Medieval	SN313357
3378	Clyn-Gosen	Public House, Cottage: Ruined cottage recorded in 1985 and said by a local inhabitant to have been in use as a public house within his lifetime, with 14 acres of land. An inscribed stone is set into the front of the cottage, bearing the inscription "J I E GLYNN COSEN WIGG VIAND CANTICKO" possibly dated ??64.	Post-Medieval	SN3146136392
5259	Parc Pen Y Garn	Round Barrow: The field surface is irregular with banks and hillslope to the S. It overlooks a valley to the S. The field name Parc Pen Garn is no longer used. It has been ploughed in the past but the owner has not noticed anything unusual.	Bronze Age	SN30953633
5260	Llain Ddineu; Llain Ddimeu	Cemetery: Early medieval D site, ie. possible early medieval origins. The RCAHM record that a field named 'Llain ddineu' or 'Llain ddimeu' ('halfpenny patch') lay on Penrallt Farm in Penboyrr parish (now Llangeler parish), and that there was a local tradition that the field was a 'burial ground' (RCAHM 1917, 227 no.670). The Penboyrr tithe schedule records no field name 'Llain ddineu/ddimeu' on Penrallt Farm or in its environs. In conclusion, it is not known for certain which field the RCAHM are referring to. Might there be an association with the possible barrow cemetery PRN 10594, which lies in the vicinity, but similarly without a precise location?	Unknown, Post-Medieval, Medieval, Early Medieval	SN343368
5261	Parc Y Fyddin NPRN404744	Battle Site: The name is not in use: The owner calls the field Parc Newydd. It has not been ploughed for at least 20 years but nothing has ever been found to the owners knowledge. There are no local tales concerning the field or general area.	Unknown	SN30873543
5262	Parc Yr Arian Tryalau	Unknown	Unknown	SN33443618
7314	Cae Garreg Fawr Clun Gosen	Standing Stone	Bronze Age	SN31393641
7454	Crugiau Moelvre	Finds	Bronze Age	SN327361
7729	Crugynfarch	Round Barrow	Bronze Age	SN34243615
9798	Gwastad	Finds	Prehistoric	SN3318434305
10594	Cefn Hiraeth; Cefn Areth	Round Barrow Cemetery	Bronze Age	SN3437
12167	Llwyn-Beili	No information. re. the place name.	Unknown	SN3435
13736	Rhiwin Coch	Common Land	Post-Medieval, Medieval	SN319341
13768	Rhosblaen Esgair	Common Land	Post-Medieval, Medieval	SN322338

13773	Rhosblaenesgair	Common Land	Post-Medieval, Medieval	SN321344
14387	Grug Y Gorllwyn	An enclosure, partially obscured by the reservoir and radar station, has been identified from aerial photographs. The enclosure appears to be a circular ditch with two parallel linear ditches radiating from the north west side. It surrounds a (possibly earlier) Bronze Age round barrow (PRN 2293, SAM CM108).	Prehistoric	SN32183408
14880	Cropmarks	Natural Feature?: Cropmarks in the north part of field form uncertain possibly geological.	Unknown	SN31453555
14911	Cropmark / Earthwork	Field called Bank war Ffordd in 1840-1 on tithe map. Feature appears as a curving length of cropmark or earthwork on AP's.	Unknown	SN3177134901
15712	Quarry	Quarry	Post-Medieval	SN3130434503
15713	Capel Pen'r Heol	Chapel: Capel y bedyddwyr, Clawddgoch: Built 1870. Extended 1921.	Post-Medieval	SN31293421
15714	Capel Tan-Glwst	Chapel: Branch of Capel Iwan (A): Built 1870: Restored 1954.	Post-Medieval	SN31003397
15740	Quarry	Quarry	Post-Medieval	SN3334
15741	Quarry	Quarry	Post-Medieval	SN32183374
15785	Esgair Mill; Cwmpengraig Mill NPRN40873	Woollen Mill: Large isolated mill building in bottom of deep wooded valley - a "factory" type. Visited due to planning application for conversion to private house. Floors of first floor in too bad a condition to allow more than external and ground floor examination. CMG Feb 1985	Post-Medieval	SN34643652
15894	Capel Pant-Y-Bwlch	Pantybwllch Chapel was built in 1835 and rebuilt in 1888. The present chapel, dated 1888, was built in the Simple Round-Headed style of the long-wall entry type.	Post-Medieval	SN32483683
15895	Gravel Pit	Gravel Pit	Post-Medieval	SN3229635297
15896	Quarry	Quarry	Post-Medieval	SN3388735063
15900	Ffynnon Wen	Quarry	Post-Medieval	SN30853694
15901	Quarry	Quarry	Post-Medieval	SN3187336475
15902	Quarry	Quarry	Post-Medieval	SN3314436783
15903	Quarry	Quarry	Post-Medieval	SN3136635693
15904	Quarry	Quarry	Post-Medieval	SN3243735292
15905	Quarry	Quarry	Post-Medieval	SN32773697
15906	Quarry	Quarry	Post-Medieval	SN3354235271
16126	Ffynnon Wen	Well	Post-Medieval	SN309369
16189	Ffynnon-Wen	Well	Post-Medieval	SN324374
19336	Blaen-Waun-Fach	Cottage: Marked as a cottage on the tithe map	Post-Medieval	SN30483570
19342	Cwtteri	Cottage: Not named on the tithe map.	Post-Medieval	SN30953565
19432	Cottage	Cottage: Not named on the tithe map	Post-Medieval	SN3131235564
19603	Cottage	Cottage: Not named on the tithe map.	Post-Medieval	SN3182135180
19664	Park Y Fynon	Well: Field called Park y Fynon on tithe map.	Unknown	SN31203560

22258	Pant-Y-Bwlch	Site of ruined cottage, reduced to wall bases.	Post-Medieval	SN3232236848
22468	Aber-Gelerch	Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN30893616
22469	Ty-Parc	Cottage shown on 1907 6" OS map. Still standing and occupied in 1994.	Post-Medieval	SN31283556
22470	Waun	Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN3160235548
22471	Eden Arms; Cloglas	Public House	Post-Medieval	SN30483562
22590	Ty-Cefn	Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN32163694
22591	Llain-Ty-Newydd	Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN33233735
22592	Hen-Tryalou	Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN3332536767
22594	Crossroad Cottage	Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN34243682
22595	Pen Pit; Brynhaulwen	Weavers Cottage: Cottage shown on 1907 6" OS map, present condition unknown.	Post-Medieval	SN34563660
22605	Tryal Bach	Cottage shown on 1907 OS 6" map. Present condition unknown.	Post-Medieval	SN32683458
22609	Ty-Newydd	Cottage shown on 1907 6" OS map. Present condition not known.	Post-Medieval	SN3369833538
25090	Lletty'r Gaib	Dwelling: Major dwelling described by Francis Jones in 1987.	Post-Medieval	SN31303668
25566	Pen-Yr-Allt; Penrallt	Dwelling: Historic home described by Francis Jones in 1987.	Post-Medieval	SN33953635
35480	Penyparc	Hosiers Cottage, Farmstead: Present condition unknown. Stocking knitters mentioned as working here in the 1871 census	Post-Medieval	SN34573559
35482	Cilcraig	Cottage which was once used as a weavers workshop.	Post-Medieval	SN34903600
35487	Pantbach	Hosiers Cottage: Home to stocking knitters on 1871 census.	Post-Medieval	SN34243645
35493	Penrhiwfawr	Weavers Cottage: Cottage shown on 1889 6" OS map and associated with the local woollen industry.	Post-Medieval	SN33743637
35494	Plygyrhiw	Hosiers Cottage: Home to stocking knitters on 1871 Census.	Post-Medieval	SN33843634
35496	Bryn	Weavers Cottage: Home to a Handloom Weaver in 19th century.	Post-Medieval	SN34193688
35497	Peneralltfach	Weavers Cottage: Home to a domestic Handloom Weaver in 19th century.	Post-Medieval	SN33913604
35576	Bryn	Weavers Cottage: Handloom Weavers Workshop	Post-Medieval	SN34193688
35588	Mill Race	Mill race taken off the Nant Bargod near Twll-y-graig servicing the dwelling at Cil-graig	Post-Medieval	SN34903590
35589	Mill Race	Mill race for the Woollen Factory at Esger View, Taken off the Nant Esgair by sluice and joined by Aqueduct to the Factory	Post-Medieval	SN34523640
35590	Esger View	Woollen Mill: Woollen Factory in production 1899-1958	Post-Medieval	SN34643652
42510	Crugiau Moelvre	Round Barrow: 4 th Bronze Age Barrow on peak of Moelfre. For some reason not covered by PRN 42569. Part of Scheduled Ancient Monument CM107.	Bronze Age	SN3256936103
42569	Crugiau Moelvre	Round Barrow Cemetery: Group PRN for a group of barrows on top of Moelvre hill. The group consists of a triangular arrangement of three barrows at one end of the hilltop, with a fourth barrow, 42510, lying outside of the group c.50m to the W. A similar arrangement of barrows also occurs on top of the high plateau/local summit at Trychrug, directly	Bronze Age	SN32603610

		intervisible with this site to the SSW (group PRN 45276). Scheduled Ancient Monument CM107		
46544	Bwlchydomen	Toll Gate: Site of a mid-19th century tollgate, owned by the Newcastle Turnpike Trust.	Post-Medieval	SN32573690
47618	Findspot	Findspot for miniature stone axe manufactured from a light greenish coarse-grained igneous rock. The axe has a squat form and flares out towards the blade edge. The surface of the axe is worn, it is uncertain whether the axe is a specialist tool or a 'ritual' item. Length 70mm, width 47mm, thickness 30mm Found at Capel Iwan (NMGW identification)	Neolithic	SN310356
100163	Old Quarry	Quarry recorded on the 1889 1st edition Ordnance Survey map and named Old Quarry on the 1906 2nd edition OS. Marked as disused on modern mapping.	Post-Medieval	SN33153444
100164	Quarry	Quarry recorded on the 1889 1st edition and 1906 2nd edition Ordnance Survey maps. Not shown on modern mapping and presumed disused.	Post-Medieval	SN33183430
102946	Blaenfforest	Wheel Pit: Site of a 19th century waterwheel used to power a chaff-cutter and threshing-machine at Blaenfforest farmstead	Post-Medieval	SN31893761
	Clawddcoch Baptist Church, Clawddcoch NPRN6259	Chapel: Clawddcoch Baptist Church was built in 1905.	Post-medieval	SN31213442
	Tanglwys Independent Sunday School, Tanglwys NPRN6258	Chapel: In 1998 the building was still in Sunday School use.	Post-medieval	SN31003397
	Parc-Yr-Arian, Tryalau NPRN24286	Field name: Tithe Schedule 1476. No explanation of name.	Post-medieval	SN33443618
	Pantbywlch Chapel (Calvinistic Methodist), Pant-Y-Bwlch NPRN6613	Chapel: Pantbywlch Chapel was built in 1835 and rebuilt in 1888. The present chapel, dated 1888, was built in the Simple Round-Headed style of the long-wall entry type.	Post-medieval	SN32493686
	Pillbox, Cynwyl Elfed NPRN270506	Pill Box. No specification.	Post-medieval	SN334337
	Blaen Bowi Wind Farm NPRN412096	Wind Farm: Blaen Bowi wind farm comprises of three, 1.3 MW wind turbines on Moelfre Hill, 3 miles south of Newcastle Emlyn. In 1995 a 25 year lease was entered into by the owner of Blaen Bowi farm and Windjen Power Ltd. The turbines became operational in July 2002.	Modern	SN32443587
	Ffynnon-Wen Farm NPRN412097	Ffynnon-wen farm lies 2 miles south of Newcastle Emlyn.	Multiperiod	SN32403746

BLAEN BOWI SOLAR FARM, PROPOSED EXTENSION AREAS, CARMARTHENSHIRE: GEOPHYSICAL 2015

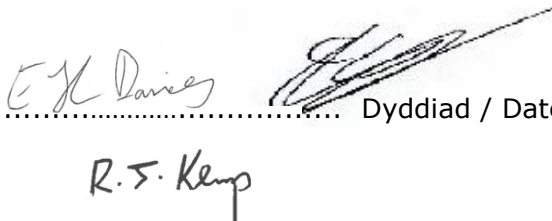
RHIF YR ADRODDIAD / REPORT NUMBER. 2015/22

RHIF YR DIGWYLLIAD / EVENT RECORD NUMBER 108469

Paratowyd yr adroddiad hwn gan / This report has been prepared by
Edward Davies, Charlie Enright and Rhod Kemp

Swydd / Position: **Archaeologists**

Llofnod / Signature Dyddiad / Date 08/05/2015



Mae'r adroddiad hwn wedi ei gael yn gywir a derbyn sêl bendith

This report has been checked and approved by

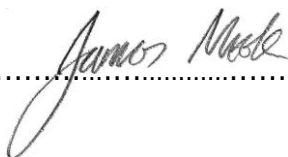
James Meek

ar ran Ymddiriedolaeth Archaeolegol Dyfed Cyf.

on behalf of Dyfed Archaeological Trust Ltd.

Swydd / Position: Head of DAT Archaeological Services

Llofnod / Signature Dyddiad / Date 08/05/2015



Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau
sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

As part of our desire to provide a quality service we would welcome any
comments you may have on the content or presentation of this report

