



Awel y Môr Offshore Wind Farm

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Summary

A detailed gradiometer survey was conducted over land between the coastline East of Rhyl, through the west of Rhuddlan, and to the West of St. Asaph, Denbighshire, Wales (NGR 303703 382186, to NGR 301287 373311). The project was commissioned by Awel y Môr Offshore Wind Farm Limited with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a Development Consent Order application for the route of underground cabling associated with an offshore windfarm from landfall to an onshore substation, a distance of approximately 12 km. The cable route has been broken down into a number of numbered areas.

The detailed gradiometer survey has been successful in detecting anomalies of archaeological origin. These are prevalent across much of the southern half the scheme specifically Area 6, 7, and 8.

Three distinct areas of probable settlement activity have been identified in Area 7. These comprise numerous ring-ditch features that indicate possible settlement activity such as roundhouses and/or funerary monuments as well as recti-linear, curvi-linear, and linear ditch-like features. These can date to the Neolithic – Iron Age period. Recti-linear features are more prevalent across later periods such as the Iron Age – Romano-British, or even to as late as the early medieval period. It is not clear from the results of the geophysical survey which period these features are associated with, and it is possible multiple phases of activity have been identified.

Less concentrated areas of archaeological activity have been identified within Area 6 and 8. These comprise ring ditches and linear ditch-like anomalies, but do not show the same level of activity as in Area 7. While these are still considered archaeology, it is more likely that they relate to agricultural activity surrounding the more complex areas of settlement.

Several areas of anomalies identified as possibly archaeological in origin have been identified by the survey. These are predominantly located across the northern areas of the survey in Area 2 and 3. In places these are similar in form to the archaeological anomalies across the south of the scheme. However, they are generally weaker and more isolated from any surrounding archaeological anomalies or known activity.

In addition, anomalies associated with the mid-20th century have also been identified. These likely pertain to the location of a documented former chain radar station. While this feature is not widely documented on historical mapping, the anomalies are consistent with the footings of former towers. The historic pattern of land division that is visible on OS mapping dating to the later part of the 19th century has been partially realised by the geophysical survey. In addition, notable areas of ridge and furrow cultivation have been identified.

The remaining anomalies are likely to be modern or natural in origin. The modern anomalies are associated with agricultural regimes, as well as land drains and services.



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The fieldwork was undertaken by Chris Hirst, Cameron Ray, Amy Dunn, Andres Perez Arana, and Jo Instone-Brewer. Alexander Schmidt processed and interpreted the geophysical data and wrote the report. The geophysical work was quality controlled by Tom Richardson and Nicholas Crabb. Illustrations were prepared by Rok Plesnicar and Alexander Schmidt. The project was managed on behalf of Wessex Archaeology by Chris Breeden.



Awel y Mor Offshore Wind Farm

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology were commissioned by Awel y Môr Offshore Wind Farm to carry out a geophysical survey over land between the coastline East of Rhyl, through the west of Rhuddlan, and continuing south-west to the west of St. Asaph, in the county of Denbighshire, Wales (between NGR 303703 382186 (north) and NGR 301287 373311 (south)) (**Figure 1**).
- 1.1.2 The survey forms part of an ongoing programme of archaeological works being undertaken in support of a Development Consent Order application for the installation of underground cabling and a proposed substation between a landfall point for the export cable and the existing National Grid Bodelwyddan Substation.

1.2 Scope of document

- 1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The Onshore Export Cable Corridor (ECC) & Temporary Construction Compounds (TCC)

- 1.3.1 The geophysical surveys were conducted in support of the production of a Preliminary Environmental Information Report (PEIR) and route selection for the subsequent Environmental Statement.
- 1.3.2 The Onshore ECC at time of survey comprised of a 40 m – 60 m wide preferred cable corridor, which encompassed cable trenching, haul road and stockpiling areas associated with cable construction. All references to the ECC within this document explicitly refer to the former preferred cable corridor route.
- 1.3.3 In addition to the ECC, the survey was conducted across a series of potential temporary construction compounds that were under consideration as options for work areas during the construction phase. For clarity the combined survey area of the Onshore ECC and Temporary Construction Compounds shall be referred to as 'The Scheme'.
- 1.3.4 The Scheme covers an area of approximately 137.8 ha along a linear route over 12 km in length. The northern extent of the route is located within fields located to the south of Lyons Robin Hood Holiday Park and the North Wales Coastal Railway to the north, that is approximately 500 m north-east of Rhyl. Further open agricultural land falls to the west, east, and south of the remaining survey area. The linear route is approximately 40 to 60 m wide and extends southwards from the Holiday Park turning across the north of and traversing west of Rhuddlan. The route then passes west of Pengwern and east of Bodelwyddan. The scheme then continues southwards to the west of and turning south of St. Asaph Business Park towards Bodelwyddan Substation. The proposed substation is located to the west of St Asaph Business Park.



- 1.3.5 The scheme has been divided into eight areas (Area 1-8; **Figure 1**). These cover numerous land parcels, the majority of which are currently utilised for a mixture of agricultural purposes, including pasture and arable land. For ease of reference, each land parcel has been given an alphabetical identifier (e.g. 1A) and the geophysical survey results for each area are discussed in turn.
- 1.3.6 The Scheme covers a significant length and subsequently a varied landscape. The topography is gently undulating falling from the south to the north towards the coast, sloping from 52 m above Ordnance Datum (aOD) at the southern edge to 4 m aOD in the north.
- 1.3.7 The geology of the area also varies across the scheme but is predominantly comprised of superficial deposits such as Tidal Mud Flats or Devensian Till. Whilst it is possible that these deposits can affect the archaeological record and preservation, soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.
- 1.3.8 A more detailed summary of the specific underlying geology, soil, and local topography for each area is outlined in the results section.

2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

- 2.1.1 An Onshore Archaeology and Cultural Heritage Chapter (Volume 3, Chapter 8 (application ref: 6.3.8)) and Archaeological Desk-Based Assessment (DBA) (application 6.5.8.1) was prepared for part of an overarching Environmental Impact Assessment (EIA) for the onshore section of the Awel y Mor scheme which examined the potential for the survival of buried archaeological remains within the Onshore ECC, onshore substation and a 1 km study area (Wessex Archaeology 2021). The following background is not exhaustive but is summarised from aspects that are considered relevant to the interpretation of the geophysical survey data.

2.2 Summary of the archaeological resource

Prehistoric

- 2.2.1 The northern sections of The Scheme within this landscape, would have likely been favourable to early to late prehistoric populations, due to its proximity to the Irish Sea and the resources therein. Evidence in Pontnewydd Cave, near Llandudno, 22 km to the west-north-west, produced evidence of human occupation dating to c. 225 ka (thousand years) Before Present (BP). Further Mesolithic and Neolithic deposits have been discovered along areas of nearby coastline at Prestatyn (1.5 km to the east), whereas outcrops of Holocene Forest stumps have been recorded at Rhyl during low tide.
- 2.2.2 Prehistoric occupation of the surrounding landscape continues with evidence of Mesolithic occupational activity identified close to the River Clwyd near Rhuddlan, 45 m south-east of Area 3Q, in the form of worked flint, hazelnut shells, and other charred plant remains, some of which came from small pits (Clwyd-Powys Archaeological Trust (CPAT): 35030). Further Mesolithic and Neolithic evidence was discovered in Rhuddlan, in the form of a Neolithic axe (CPAT: 102029) and further flints and cherts found at excavations at Gwindy Street, Rhuddlan (CPAT: 81662), 880 m south-east of Area 3Q.
- 2.2.3 There is little evidence for Prehistoric activity further south within The Scheme. A possible cairn was noted in 1911, 300 m to the south-west of the survey extents, after a visit by Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), where a mound of stones was speculated to be a possible cairn (CPAT: 101478). In the wider study

area, a Neolithic chambered tomb lies 1 km to the south of Area 8 at Cefn Meiriadog (Tyddyn Bleiddyn Burial Chamber Scheduled Monument; DE007). The lack of further evidence has been attributed to the lack of archaeological investigation in these areas.

Bronze Age

- 2.2.4 Multiple Bronze Age settlement sites have been discovered along the North Wales coastline. However, it is not until the scheme intersects with the land west of Rhuddlan that Bronze Age evidence becomes apparent. Bronze Age activity within Rhuddlan suggestive of a refuse tip (CPAT: 55749), and a further pit containing pottery (CPAT: 57747) were found during excavation. Furthermore, field names suggest that there was a Bronze Age cairn located in the landscape of the southern part of the scheme.

Romano-British

- 2.2.5 It has been noted within the DBA that there is a distinct absence of Romano-British evidence within this landscape, reflected as a theme across the north-eastern region of Wales. However, Bryn Cwnin cropmark (CPAT: 102650) has been interpreted as a Romano-British enclosure located within the proposed survey extents of Area 2X (not surveyed as of June 2021). A site assessment was conducted in 1995 and the site was considered flat with no above ground expression of the cropmark. A 'C-shape' cropmark can be seen in this location on the 2006 aerial images however, it cannot be identified on any of the other more recent aerial images. The LiDAR data in this area shows a sub-rectangular feature of unknown origin to the south of the Historic Environment Record (HER) point, but this is unlikely to relate to the cropmark.
- 2.2.6 A Romano-British enclosure is recorded 380 m to the north of the route of Area 3N, this has been identified from aerial photographs, and is believed to be a possible defended enclosure (101858; CPAT 2008).
- 2.2.7 There has been Romano-British rural settlement evidence identified at Rhuddlan, in close proximity to the River Clwyd. There is also a conjectural Romano-British Road, which runs east – west across the landscape, to the south of St Asaph between Areas 7J, 7K, 7L, and 8A towards the southern extent of the survey areas. The road leads west from the legionary fortress of *Deva* (Chester) to the forts at *Canovium* (Conwy) and *Segontium* (Caernarvon) (CPAT: 46826-46830/104607/104608/102985). Due to the proximity to this major routeway, it is likely The Scheme runs through what would have been a part of the Romano-British agricultural hinterlands, with smaller rural settlements to support the agricultural production within the landscape. It has also been suggested that St Asaph could be a location of a documented Roman Fort, recorded as *Verae*, as this lies at the crossroads of two roman roads and links to an occupation site at Prestatyn.

Medieval

- 2.2.8 The Domesday Survey of 1086 indicates that the landscape was settled by the medieval period, with a number of small settlements running along the route, situated within the historic county of Cheshire (Cefn Du, Cwybr Bach, Cwybr, Rhuddlan, and Llan Elwy). There is no evidence of Saxon activity within the landscape; however, these sparse settlements may have originated in earlier Saxon settlements.
- 2.2.9 Rhuddlan was one of the principal centres of activity in the area during the medieval period. The burh of *Cledemutha* (the name perhaps derived from 'Clwydmouth;') is documented as having been constructed by Edward the Elder in 921. Excavations have revealed that Rhuddlan, which was enclosed by a large ditch and bank earthwork (the town ditch), may represent the late Saxon burgh. Earlier evidence dating to the Roman period indicate that Rhuddlan was already an important early medieval centre before construction of the burgh.



- 2.2.10 Historical maps mark the site of the Battle of Morfa Rhuddlan which was a battle between the Welsh and the Saxons in 795. The Welsh were defeated, and their King Carradog was slain by the Saxons. The exact location of the battle is unknown although the label on the 1st edition Ordnance Survey (OS) map is positioned over Gipsy Lane, which lies directly adjacent to Area 4C and 4D.
- 2.2.11 There have been a number of targeted excavations within Rhuddlan that have been able to trace the development of the town through the medieval period. During the 11th century, a much smaller area of Norman occupation was established in the north-western corner of the Saxon burgh. A motte and bailey castle was built in 1073 by Robert of Rhuddlan. After Edward I's defeat of an uprising at Rhuddlan in 1277, he built a large stone castle in the north-western corner of the former Saxon burgh and established it as a new town. Around the same period the course of the River Clwyd was straightened by a new channel to allow sea-going vessels access to Rhuddlan from the sea, establishing it as a port. Excavations at Rhuddlan have revealed the remains of a stone-built Norman church, medieval houses, and other timber buildings, burgage plots, defensive ditches, and pottery kilns.
- 2.2.12 It is likely that the majority of the landscape covered by The Scheme continued to be predominantly agricultural in nature during the early medieval and medieval periods, comprising regularly formed fields of ridge and furrow.
- 2.2.13 It is thought that St Asaph may have been the site of a monastery and an episcopal see, as early as 560 CE by St Kentigern. St Asaph is thought to have succeeded Kentigern as bishop. The earlier settlement was referred to as Llanuile (Llanelwy) in the Domesday book but around the middle of the 12th century the name was changed to St Asaph. In 1239 construction for a cathedral began but this was burned by the troops of Edward I in 1282.

Post-medieval

- 2.2.14 The HER records that almost all of the area covered by the Onshore ECC and proposed substation was previously ridge and furrow. This has been identified from aerial photographs and LiDAR, although this was only clearly visible within a single field to the south-east of Faenol-Bropor Farmstead (500 m west of Area 7A, and 280 m north-west of Area 7H). However, it is possible that remnants of this ridge and furrow that have not survived topographically could exist as below ground remains in other areas.
- 2.2.15 The Scheme runs along the boundary of the Bodelwyddan Castle Park, with documentary evidence suggesting that the estate originated at least in the 15th century. The current layout of the estate dates to the mid-19th century refurbishment, including the estate wall and formal garden. The house and pleasure grounds lie on the western side of the park and to the east and south-east are a fishpond and a mill with related ponds. The castle structure continues to be used as a Warner's Hotel and is Grade II* listed (CPAT: 1383), within 1 km to the west of Area 7. A number of structures within the grounds of the Bodelwyddan estate are also listed including the terrace wall, garden structures, and part of the estate wall.

Modern

- 2.2.16 Rhyl Marsh was enclosed in 1842 and the Tithe map indicates that the landscape had been fully enclosed by 1845. This agricultural development is reflected in the development of the Rhyd-wen (or Rhydorddwy-wen) dating to the 17th century and Rhydorddwy Fawr Farmhouse dating to the mid-19th century, to the west and east of the northern survey areas respectively (CPAT: 14986 and 14984).
- 2.2.17 This agricultural development is also recorded at Bryn Cwnin Farm within the extents of Area 2 South. The current farmhouse is Grade II listed and dates to 1820, although fragments of earlier buildings suggest that the farm had been established well before that time. An associated range of farm buildings (also Grade II listed CPAT: 1378) are thought to date to the late 18th century.



- 2.2.18 The remainder of Area 2 South and Area 2 North are characterised on the historical maps by small and medium square and rectangular fields with a few pockets of woodland. A number of the fields on the first edition map have small square ponds/depressions. A small number of these are labelled as gravel pits, suggesting extraction was taking place in this area. The low-lying nature of the area would have resulted in disused gravel pits filling with water to create ponds.
- 2.2.19 The grounds at Bodelwyddan Castle Park contain a scheduled monument relating to WWI practice trenches which extend beyond the scheduled area over several hectares (FL186). These were initially excavated for practice to excavate the trenches and then subsequently used for infantry combat training. Frontline trenches are identifiable from their crenelated shape with zig zag communication lines linking back to the reserve lines. It appears that several distinct groups were created perhaps as opposing lines. Circular craters across much of the area indicate that the practice was intended to be as realistic as possible, replicating the battlefield landscape. Overlooking the training area is what is thought to be a remote command post on slightly higher ground (CPAT 2014).
- 2.2.20 Within an area of woodland to the west of Pengwern Farm are the remains of a Chain Radar Station at Erw'r-gaseg within Area 6B, known as the Rhuddlan Chain Home Radar Station. The station is not shown on the historical maps for security reasons and due to the closure of the archive at the time of writing little information is available on the Radar Station at present.
- 2.2.21 A single large building was identified within the woodland on a site visit, however internal access was not possible due to health and safety constraints. The LiDAR coverage of this area shows the main building, which was identified on the site visit and visible on the aerial photographs, but also shows another possible structure to the south-east. The dense tree coverage and undergrowth within the area prevented this from being identified on the site visit. Another slightly less identifiable square feature can be seen further south-west.

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 26 April – 19 November 2021. Field conditions were mostly fine throughout the period of survey. An overall coverage of 121 ha was achieved. Several fields have not been subject to survey due to the presence of crop, livestock, or other obstructions. Some areas could also not get a suitable level of access arranged prior to deployment of the site team.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:
- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
 - To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:

- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
- To clarify the presence/absence of anomalies of archaeological potential; and
- Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

3.3.1 The cart-based gradiometer system used a Leica Captivate RTK GNSS instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey of Great Britain (OS) and Leica Geosystems. Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceeds European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).

3.3.2 The detailed gradiometer survey was undertaken using either four Bartington Grad-01-1000L or SenSYS FGM650 gradiometers spaced at 1 m intervals and mounted on a non-magnetic cart. Data were collected with an effective sensitivity of 0.03 nT at a rate of 10 Hz, producing intervals of 0.15 m along transects spaced 4 m apart.

3.4 Data processing

3.4.1 Data from the survey were subjected to minimal correction processes. These comprise a 'DeStripe' function (± 5 nT thresholds), applied to correct for any variation between the sensors, and an interpolation used to grid the data and discard overlaps where transects have been collected too close together.

3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

4.1.1 The detailed gradiometer survey has identified magnetic anomalies across The Scheme. Results are presented as a series of greyscale plots and archaeological interpretations at a scale of 1:2,000 (**Figures 2 to 37**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale images.

4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends (**Figure 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

4.1.5 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and

appropriate equipment (e.g., CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

4.2 Gradiometer survey results and interpretation

Introduction

- 4.2.1 The following sections present the results of the geophysical survey for Areas 1 – 8. Each area is interpreted using a corresponding number series (e.g. 1000>) and are discussed in terms of their archaeological potential.
- 4.2.2 The geophysical survey has identified several anomalies that are confidently interpreted as associated with archaeological remains. These are predominantly located in Areas 6, 7, and 8, and comprise a series of circular, linear, and curvilinear ditch-like features, as well as several pit-like anomalies. These are discussed in detail below in their respective sub-sections.
- 4.2.3 Numerous weakly positive, discrete anomalies have been identified throughout the entire survey area and are not referred to unless considered relevant to the presence of additional anomalies thought to be archaeological in origin. These anomalies could indicate wider settlement activity such as extraction or refuse pits. However, it is equally possible the anomalies are natural in origin pertaining to localised variation in the magnetic susceptibility of the underlying topsoil or superficial geological deposits recorded throughout the survey area.

Area 1 (Figure 2-5)

- 4.2.4 Area 1 is on a steady incline, sloping from 4 m above Ordnance Datum (aOD) at the northern edge to 9 m aOD at the southern edge. The area extends between NGR 303597 382155 and 303608 381261 and covers some 8.8 ha of arable land. This extends from Lyons Robin Hood Holiday Park at the north to the B5119 to the south. All areas were subject to survey, with only minimal reductions surrounding the existing land parcels (1a – 1f).
- 4.2.5 The solid geology underlying Area 1 comprises Sandstone of the Kinnerton Formation. Overlying superficial geological deposits of clay, silt, and sand (Tidal Flat Deposits) are recorded across the northern portion of the area, with Devensian Till (Diamiction) recorded to the south (BGS 2021).
- 4.2.6 The soils underlying the north of the area are likely to consist of peo-alluvial gley soils of the 813f (Wallasea 1) association. The soils underlying the south of the area are likely to be typical stagnogley soils of the 711m (Salop) association (SSEW SE Sheet 2 1983).

Results

- 4.2.7 In Area 1a, a linear anomaly on a north-north-west to south-south-east alignment has been identified at **1000 (Figure 3)**. The anomaly is 159 m long with a 15 m gap towards its northern end. The response is comprised of weakly dipolar magnetic responses. This corresponds to a former field boundary visible on 1872 mapping.
- 4.2.8 Four areas of notably increased magnetic response have been identified through the area (**Figure 3 and 5**). The responses at **1001 – 1003** in Area 1a, 1d, and 1f respectively, are more tentatively considered to be of possible archaeological origin. They each measure approximately 14 – 16 m in diameter and are composed of moderately strong positive and negative responses. Such anomalies are indicative of infilled pit-features, although the origin of which cannot be determined by the results of the geophysical survey alone. They do not correspond to any recorded features on available historical mapping. However, as, ponds and/or extraction pits are recorded in the surrounding landscape on 1872 mapping, it is possible that they may also relate to such activity.

- 4.2.9 In the west of Area 1a, a fourth area of increased magnetic response has been identified at **1004**. The response is weaker than those at **1001 – 1003** and covers a larger area (43 x 60 m). This is likely more modern than those at **1001 – 1003**, possibly relating to a modern agricultural spread. However, it is also possible that this may be associated with the variable superficial geological deposits recorded in the area.
- 4.2.10 A highly magnetic, dipolar linear anomaly has been identified traversing Area 1f on an east-north-east to west-south-west alignment at **1005 (Figure 5)**. This response indicates an underlying service, such as a pipe or cable.
- 4.2.11 Amorphous areas of variably positive response have been detected across Area 1a – 1d. These are interpreted as natural in origin and likely pertain to the Tidal Flat Deposits recorded across the northern portion of Area 1.

Area 2 (Figure 6-17)

- 4.2.12 Area 2 traverses land between NGR 303557 381267 and 302597 379174, covering 25.4 ha of pasture and arable land. The area covers land between the B5119 to the north and the A525 to the south-west. Area 2b, 2d – 2j, 2l, 2t, and 2x were not surveyed due to the presence of high crop or livestock.
- 4.2.13 The solid geology underlying Area 2 comprises Sandstone of the Kinnerton Formation with overlying superficial geological deposits of Diamicton (Till) recorded across the majority of the area. Glaciofluvial Deposits of sand and gravel are recorded towards the southern end of Area 2 (BGS 2021).
- 4.2.14 The soils underlying the north of the area are likely to consist of typical stagnogley soils of the 711m (Salop) association. The soils underlying the south of the area are likely to consist of typical brown earths of the 551d (Newport 1) association (SSEW SE Sheet 2 1983).
- 4.2.15 A single set of overhead cables crosses the northern portion of Area 2 on an east – west alignment.

Results

- 4.2.16 No anomalies have been identified that can confidently be interpreted as archaeological in origin in Area 2. However, there are a small number that are interpreted as possible archaeology.
- 4.2.17 In the north of Area 2a, a weakly positive rectilinear anomaly has been identified in the north-west of the dataset at **2000 (Figure 7)**. The anomaly measures 11 m north – south and protrudes from the western boundary for 12 m. This may indicate a possible ditch-feature, possibly associated with an enclosure. However, the isolated position and notably weak response, suggests it is perhaps more likely related to modern agricultural activity, such as ploughing.
- 4.2.18 Several weak parallel linear trends have been identified that could indicate ridge and furrow cultivation in Area 2c (**Figure 7**). These are spaced 9 – 11 m apart. However, some of these may equally be associated with more recent agricultural activity as additional linear anomalies are also noted perpendicular to these trends that correspond to the modern ploughing regime.
- 4.2.19 In the north-east of Area 2j, two weakly positive penannular anomalies have been identified at **2001**. These anomalies are 6 – 7 m in diameter, up to 1 m wide and indicate ditch features. It is possible that these relate to ring-ditches associated with a possible Bronze Age round barrow or an Iron Age – Romano-British roundhouse. However, their incomplete and notably weak nature make more confident interpretation difficult an alternative agricultural origin cannot also be entirely ruled out. As such, further investigation would be required to determine the exact origin of these anomalies.



- 4.2.20 To the south of the anomalies at **2001**, several disarticulated linear and curvilinear, weakly positive anomalies have been identified at **2002 (Figure 11)**. The anomalies are up to 1 m wide and between 10 m and 13 m in length. These are indicative of ditch features and could be a further indication of archaeological activity surrounding the possible ring-ditch features at **2001**.
- 4.2.21 A cluster of moderately strong positive anomalies covering a small rectangular area has been identified at **2003** in Area 2j, immediately adjacent to the responses at **2001** and **2002**. This comprises three discrete anomalies covering an area of 7 x 5 m. The anomalies could indicate an archaeological feature such as a series of pits. However, the anomalies could equally be natural in origin, pertaining to localised natural pitting or variation in the magnetic susceptibility of the underlying geological deposits. Further investigation would be required to confirm this.
- 4.2.22 In Area 2j, 115 m to the south-west of **2001/2002**, an L-shaped, weakly positive recti-linear anomaly has been identified at **2004**. This measures 20 x 16 m in breadth but is not fully realised on its north-eastern side as it seemingly continues beyond the extent of the survey. The anomaly is indicative of a ditch feature, possibly forming partial remains of a rectangular enclosure. However, only the eastern and southern side are visible in the data, making confident interpretation difficult. The anomaly parallel to a former boundary feature noted directly to the east at **2005**, suggesting that there is some relationship between the features. The broader, weakly positive linear anomaly at **2005** corresponds to a former boundary visible on 1872 mapping.
- 4.2.23 An area of increased magnetic response is noted in the north-east of Area 2j at **2006 (Figure 11)**. While the anomaly does not correspond to any feature visible on historic OS mapping, this type of response is typical of an area of infilling and could relate to an area of extraction activity.
- 4.2.24 A weakly positive linear anomaly is noted in the south-west of Area 2n on a north-west to south-east alignment at **2007 (Figure 13)**. This anomaly corresponds to a former boundary visible on 1872 mapping. A second, weakly positive linear anomaly is noted parallel to the projected location of the former boundary. This is broadly recti-linear and interpreted as possible archaeology. This could form part of a ditched enclosure. However, it is equally possible the anomaly is evidence of an earlier iteration of the field boundary at **2007** or a track alongside the boundary.
- 4.2.25 Several anomalies that are interpreted as possible archaeology have been identified in Area 2p, 2r, and 2s. At **2008 (Figure 15)**, in the south of 2p, a weakly positive curvi-linear anomaly has been identified. This anomaly measures 17 m in diameter and is 1 m wide. The anomaly is indicative of a ditch feature and could relate to further evidence for a ring-ditch, although it is not fully realised on its south-western side.
- 4.2.26 A dipolar anomaly is noted in the centre of Area 2p on a north-west to south-east alignment at **2009**. This corresponds to a former boundary visible on 1872 mapping.
- 4.2.27 To the south of **2008** at **2010**, a linear anomaly is noted on a north-east to south-west alignment. This is 47 m long and 1 m wide. The response is perpendicular to the former boundary at **2009** and also broadly coincides with the southern edge of the response at **2008**. The origin of this anomaly is not clear, although it most likely indicates a boundary feature associated with that at **2009**.
- 4.2.28 Three positive penannular anomalies have been identified in the centre of 2r (**2011 – 2013**). These are between 4.5 m and 12.5 m in diameter and are up to 1 m wide. The responses all appear to have openings on their southern sides and could indicate ring-ditch features associated with Iron Age to Romano-British roundhouses or perhaps the ploughed down remains of earlier round barrows. However, a natural or agricultural origin cannot be ruled

out and this type of anomaly could conceivably evidence the turning location for agricultural vehicles.

- 4.2.29 In the west of Area 2r, a weakly positive recti-linear anomaly has been identified at **2014** (**Figure 15**). This measures 9.5 x 10.5 m although is not fully realised on its southern side. A second is noted to the south of **2011 – 2013** at **2015**, which measures 9.5 x 4 m. Both features are likely composed of ditched features but do not represent complete enclosures, and there are no corresponding anomalies on the southern and western sides. However, they may have been heavily ploughed down as there are numerous ploughing trends recorded in this area.
- 4.2.30 To the south of **2015**, a rectangular, positive anomaly is noted at **2016**. The anomaly measures 10.5 x 6 m and is interpreted as possible archaeology. This is indicative of a cut feature that could be evidence of earlier extraction activity. However, it is equally possible this anomaly is natural in origin, given the broad band of geological variation identified immediately to the north.
- 4.2.31 A further weakly positive linear anomaly is noted in the south of Area 2r. This is on a west-south-west to east-south-east alignment at **2017** and corresponds with a former field boundary visible on 1872 mapping.
- 4.2.32 Further north in Area 2u, several linear and recti-linear anomalies and weaker trends have been identified (**Figure 17**). These are interpreted as possible archaeology. At **2018** and **2019**, two linear anomalies are noted traversing the area on a broadly north-west to south-east alignment. These are spaced 44 m apart and measure 32 m and 64 m in length, respectively. A third linear anomaly is noted south of **2019** at **2020**. This is 12 m long and is on the same alignment. These anomalies indicate ditch-features and therefore could be evidence of an archaeological field system. However, a more recent agricultural origin cannot be ruled out.
- 4.2.33 Between the responses at **2018** and **2019**, several weaker, linear, and recti-linear anomalies have been identified on alternative alignments (**2021-2025**). At **2021**, a positive anomaly that measures 8 x 11 m has been identified. Although the northern extent of this is beyond the survey area, it may be associated with a recti-linear enclosure on a north-east – south-west alignment. A second linear anomaly is noted parallel to the south-east of this, suggesting that there may be a double-ditched element to the feature.
- 4.2.34 At **2022**, a weakly positive, 1 m wide linear anomaly has been identified that might relate to a larger recti-linear ditched feature. This extends for 14 m on a north-south orientation and turns approximately ninety degrees to continue for a further 24 m to the east at the northern extent. Similar to the response at **2021**, a parallel linear anomaly is also noted on its northern side (**2023**). A further weakly positive recti-linear anomaly is also noted within this at **2024**, which measures 15 m east – west and 12 m north – south from the anomaly at **2022**. In addition, a smaller, positive recti-linear anomaly is also noted at **2025**, which measures 3 x 5 m. Collectively, the anomalies at **2021 – 2025** could indicate a series of enclosures associated with a small field system or an area of settlement activity. However, a more confident interpretation is not possible due to the weak magnitude of these anomalies.
- 4.2.35 Two highly magnetic dipolar linear anomalies are noted. The first is in Area 2g on a north-east – south-west alignment (**2026**). The second is to the south of Area 2 in 2x on the same alignment (**2027**). These anomalies indicate underlying modern services such as pipes or cables.
- 4.2.36 The modern land use is highly prevalent in the datasets from the surveyed areas in Area 2. Closely spaced, parallel linear trends have been identified on alignments corresponding to

current or recent agricultural regimes visible on aerial imagery. These are considered to be modern in origin.

- 4.2.37 Several weakly dipolar, parallel, linear anomalies have been identified in various portions of Area 2 (e.g., 2k). This type of anomaly is typical of material that has been burnt or fired, such as ceramic, and, as such, these are interpreted as field drains.
- 4.2.38 Amorphous and sinuous anomalies are noted throughout some datasets in Area 2 (2n, 2r, 2s, 2u, 2v). These are interpreted as natural in origin and present as weakly positive anomalies with no clear shape or form. These are likely associated with localised changes in the Glaciofluvial Deposits identified across the southern portion of Area 2.
- 4.2.39 Several uncertain trends have been identified throughout Area 2. While an archaeological origin cannot be ruled out for these, they are likely to be modern in their origin and associated with agricultural activity.

Area 3 (Figure 18-21)

- 4.2.40 Area 3 incorporates land between NGR 302446 379312 and 301507 378628, covering 10.5 ha of pasture and arable land. The area covers land between the A515 in the north-east and the River Clwyd in the south-west. Only Area 3a, 3p, and 3q were subject to survey, with the remaining areas containing livestock at the times of survey.
- 4.2.41 The solid geology underlying Area 3 comprises Sandstone of the Kinnerton Formation. Overlying superficial deposits of Diamicton (Till) are recorded in the north-east of the area along with Glaciofluvial sand and gravel. The south-west of Area 2 is likely to have underlying superficial deposits of clay, silt, and sand (Tidal Flat Deposits) with smaller areas of Diamicton (Till) also recorded (BGS 2021).
- 4.2.42 The soils underlying the north-east of the area are likely to consist of typical brown earths of the 551d (Newport 1) association. To the south-west, the soils are likely to consist of pelo-alluvial gley soils of the 813f (Wallasea 1) association (SSEW SE Sheet 2 1983).

Results

- 4.2.43 The background magnetic response in Area 3a is notably increased (**Figure 21**). This is likely to be the result of the area's modern use as a horse paddock and due to the presence of obstacles associated with this use on site. However, a positive linear anomaly is noted in the north of the area on a west-south-west to east-south-east alignment at **3000**. This corresponds with a former enclosure south of a farm visible on 1872 mapping.
- 4.2.44 A highly magnetic, dipolar linear anomaly is noted on an east-north-east to west-south-west alignment in the north-east of Area 3a (**3001**). A second is noted perpendicular to this on a north-north-west to south-south-east alignment at **3002**. These both indicate modern services.
- 4.2.45 Across the west of Area 3p, three circular/curvi-linear anomalies have been identified at **3003 – 3005 (Figure 21)**. These measure 5.5 m – 9.5 m in diameter and could be evidence of ring-ditch features. However, their extremely weak magnitude prevents a more confident interpretation and they could equally relate to modern agricultural activity.
- 4.2.46 In the west of Area 3p, a larger semi-circular/curvi-linear anomaly is noted circumnavigating an area of increased magnetic response at **3006 (Figure 21)**. This is 11 m in breadth and is open towards the south. The response could be evidence of a ring-ditch but is notably more elongated. The area of increased magnetic response may also suggest the potential for internal features but the nature of this activity is not clear. As with the anomalies at **3003 – 3005**, a more recent agricultural origin cannot be ruled out such as a plough turn for the circular element or an area of possible extraction for the increased response.

- 4.2.47 In the north-east of Area 3q, two weakly positive recti-linear anomalies have been identified. At **3007**, the anomaly covers 21 m x 6.5 m on an east – west alignment with a curved form to its eastern end. At **3008**, the anomaly covers 12 m x 7 m, although is not fully realised on its northern side. This is on a north-east to south-west alignment. These anomalies are likely associated with ditch features but their isolated location from any other archaeological activity may equally imply a modern agricultural origin.
- 4.2.48 In the east of Area 3q, an amorphous area of positive response is noted at **3009**. This measures 14 x 4 m and is interpreted as possible archaeological extraction activity. However, a natural origin cannot be ruled out for this response, particularly given the proximity to the Tidal Flat Deposits noted to the south-west.
- 4.2.49 Four highly magnetic dipolar linear anomalies have been identified across Area 3n (**3010/3011**), 3o (**3012**) and 3j (**3013**) (**Figure 19**). These anomalies indicate underlying services such as pipes or cables.
- 4.2.50 Weakly positive, variable magnetic response has been identified in the south-west of Area 3q. This is interpreted as natural in origin and likely pertains to underlying Tidal Flat Deposits of clay, silt, and sand recorded in this area.
- 4.2.51 A weakly positive sinuous linear anomaly has been identified traversing Area 3n on a west – east alignment into Area 3m (**3014**). This is interpreted as natural in origin and broadly corresponds to similar cropmarks in aerial imagery indicating former, relatively recent water courses.

Area 4 (Figure 22-25)

- 4.2.52 Area 4 extends between NGR 301347 378482 and 301067 377733 and covers 6.6 ha of pasture and arable land. The area extends from the River Clwyd at the north-east to the A547 in the south-west. All areas were subject to survey (4a – 4d).
- 4.2.53 The solid geology underlying Area 4 comprises Sandstone of the Kinnerton Formation with overlying superficial deposits of clay, silt, and sand (Tidal Flat Deposits) (BGS 2021).
- 4.2.54 The soils underlying the site are likely to consist of pelo-alluvial gley soils of the 813f (Wallasea 1) association (SSEW SE Sheet 2 1983).

Results

- 4.2.55 The route of the former London and North-Western Railway Line bisects Area 4 between 4a and 4b. An area of increased magnetic response is noted traversing the eastern boundary of Area 4a, perpendicular to the route of the former railway at **4000** (**Figure 23**). This anomaly may be associated with activity dating to the period of this railway line's use (up to the mid-19th century based on historical mapping). However, it is equally possible this anomaly is associated with an unclear feature recorded on 1872 mapping. The feature could be a former drain or field boundary. The increased magnetic response is the likely result of the infilling and/or dismantling of the feature. A more confident interpretation is not possible due to the limit of the survey in this area falling on the anomaly.
- 4.2.56 A highly magnetic, dipolar linear anomaly has been identified traversing Area 4c on an east-north-east to west-south-west alignment at **4001** (**Figure 25**). This response indicates an underlying service, such as a pipe or cable.
- 4.2.57 Amorphous and sinuous areas of variably positive and negative responses have been detected across Area 4a – 4d (**Figures 23** and **25**). These are interpreted as natural in origin and likely pertain to variably composed pelo-alluvial gley soils and/or tidal flat deposits recorded across the area as well as the position of former run off water channels, some of which are still visible in aerial imagery. This is not considered to have impacted the

identification of potential archaeological anomalies, as several anomalies considered to be anthropogenic have been identified.

Area 5 (Figure 26-29)

- 4.2.58 Area 5 traverses between NGR 301050 377687 and 301525 376786, covering 11.6 ha of pasture and arable land. The area extends from the A547 in the north to Bodelwyddan Road in the south.
- 4.2.59 Underlying the northern half of Area 5, the solid geology comprises Sandstone of the Kinnerton Formation. The southern half is comprised of Mudstone, Siltstone, and Sandstone of the Warwickshire Group. The majority of the area is likely to contain superficial deposits of clay, silt, and sand (Tidal Flat Deposits), with small areas of Diamicton (Till) recorded in the south (BGS 2021).
- 4.2.60 The soils underlying the site are likely to consist of pelo-alluvial gley soils of the 813f (Wallasea 1) association to the north-west. In the south-east, the soils are recorded as typical stagnogley soils of the 711m (Salop) association (SSEW SE Sheet 2 1983).

Results

In Area 5b, two curving, positive parallel linear anomalies are noted at **5000 (Figure 27)**. These anomalies extend from the eastern boundary curving south-west then to the south for 205 m and are spaced 2 m apart. Each anomaly measures 1 m wide. A notable 4 – 8 m break is noted towards the west of the anomaly. These are interpreted as possible archaeology and could indicate ditch-features, forming part of a larger enclosure or boundary feature. However, while the anomalies appear anthropogenic a natural origin cannot be ruled out. The anomaly follows the curve of the clear natural anomalies associated with tidal flat deposits recorded in the area.

In Area 5f, two positive parallel linear anomalies have been identified at **5001 (Figure 29)**. These anomalies are on an east – west alignment and spaced 13 m apart. They are each up to 1 m wide. The anomalies are interpreted as possibly archaeological in origin and indicate underlying ditch features. However, the anomalies could equally indicate modern land drains as noted to the north Area 5c. The limited linear survey area prevents a more detailed understanding of these anomalies.

A larger, positive, recti-linear anomaly is noted in Area 5g has been identified at **5002 (Figure 29)**. The anomaly protrudes from the southern boundary for 77 m on a south-south-east – north-north-west alignment and then turns to the east-north-east and continues for a further 78 m. The anomaly indicates a ditch feature and could indicate an earlier boundary feature of uncertain origin. However, the anomaly could equally evidence land drains.

A series of smaller, short and discrete linear anomalies have been identified to the south-east of Area 5g (**5003**). These anomalies are also interpreted as possible archaeology and may evidence small enclosures or boundary features of uncertain origin. However, these anomalies could equally be associated with more recent agricultural activity.

In the centre of Area 5g, an area of weakly positive response has been identified (**5004**). This anomaly could evidence a localised surface spread or shallow pit-feature and has tentatively been interpreted as archaeological in origin. However, the anomaly could equally be evidence of localised variation in the superficial geological deposits, such as has been identified further north in Area 5c and 5d.

A weakly positive linear trend is noted traversing Area 5b on a north – south alignment (**5005**). This corresponds to a trackway visible in aerial imagery.

Geological anomalies identified in the south of Area 4d appear to also be prevalent across Area 5b (**5006**). Similar weakly enhanced areas of magnetisation have been identified to

the south throughout Area 5c (**5007**), 5d (**5008**) and 5h (**5009**) that are also interpreted as superficial geological variation.

Highly magnetic, dipolar linear anomalies have been identified traversing Area 5c on a north-west – south-east alignment (**5010**), and Area 5g on a broadly east – west alignment (**5011**). These anomalies indicate modern services such as pipes or cables.

To the north of Area 5c, weakly dipolar linear anomalies have been identified on varying alignments (**5012**). Similar parallel linear anomalies have been identified on a broadly north – south alignment in Area 5h (**5013**). These anomalies indicate material that has been burnt or fired such as ceramic and due to their layout are interpreted as evidence of land drains.

Area 6 (Figure 30-37)

- 4.2.61 Area 6 details land between NGR 301407 376711 and 301468 375042, covering 30.4 ha of pasture and arable land. The area is located between Bodelwyddan Road in the north and the A55 in the south. 6a, 6c, 6e, and 6g were not suitable for survey due to the presence of high crops or livestock.
- 4.2.62 The solid geology underlying Area 6 comprises Mudstone, Siltstone, and Sandstone of the Warwickshire Group with overlying superficial geological deposits of Diamicton (Till) (BGS 2021).
- 4.2.63 The soils underlying the site are likely to consist of typical stagnogley soils of the 711m (Salop) association (SSEW SE Sheet 2 1983).

Results

- 4.2.64 Archaeological anomalies pertaining to a number of different periods have been identified throughout Area 6. In Area 6b, 13 highly magnetic, dipolar anomalies have been identified at **6000** (**Figure 31**). 10 of these anomalies are arranged in a square array (64 x 64 m) with 3 anomalies projecting in different directions (1 to the north and 2 to the east). Several positive trends are also noted interconnecting these responses. The anomalies at **6000** are interpreted as archaeological in origin and likely pertain to the site's former use for military operations during WWII. These anomalies are likely associated with features used during the site's use as a chain radar station, such as the bases of former towers.
- 4.2.65 To the south of 6000, a weakly dipolar linear anomaly is noted traversing the survey area on a broadly east – west alignment (**6001**). This corresponds to a former boundary visible on 1871 – 1872 OS mapping.
- 4.2.66 In the south of Area 6b, a small area of increased magnetic response has been identified at **6002**. This type of response is indicative of an area of infilling and could evidence an earlier extraction pit. This does not correspond to any features visible on available historical mapping, although a number of these features are noted in the surrounding landscape.
- 4.2.67 In Area 6d, several weakly positive linear anomalies are interpreted as archaeological in origin (**6003-6009**; **Figure 31**). These appear to form a small area of interconnected recti-linear and curvi-linear anomalies. At **6003**, a small, positive circular anomaly measuring 4 m in diameter has been identified. This appears to have an opening on its south-eastern side and indicates a ring-ditch feature.
- 4.2.68 To the north in Area 6d, a small network of anomalies is noted (**Figure 31**). At **6004**, a fragmented recti-linear enclosure has been identified covering 48 m east – west by 23 m north – south. Extending south from this anomaly are several interconnected linear and recti-linear anomalies.
- 4.2.69 At **6005**, the western boundary of the enclosure at **6004** extends to the south for 15 before coinciding with a curvi-linear / penannular anomaly at **6006**. This is 11 m in diameter and indicates a possible ring-ditch. To the south of the circular anomaly, a recti-linear anomaly

- is noted on a north-north-west to south-south-east alignment (**6007**). This measures 15 x 15 m but is not fully realised on its north-north-western side.
- 4.2.70 A linear anomaly is noted 30 m north of the enclosure (**6004**) at **6008**. This is also interpreted as archaeological in origin and likely indicates a former boundary ditch or smaller enclosure.
- 4.2.71 A smaller, semi-circular anomaly is noted in the west of Area 6d at **6009 (Figure 31)**. This is 7 m in diameter but is not fully realised on its western side. The anomaly could indicate a ring-ditch feature. However, a more recent agricultural origin such as ploughing cannot be ruled out for this anomaly.
- 4.2.72 The anomalies at **6003 – 6009** are interpreted as evidence of peripheral settlement activity or evidence of an archaeological field system. Although the anomalies are too weak and isolated to interpret more confidently, this type of anomaly could date to the Iron Age – Romano-British period.
- 4.2.73 In the south of Area 6d, a small positive recti-linear anomaly has been identified at **6010 (Figure 33)**. This anomaly covers 15 x 10 m on a broadly south-west to north-east alignment. This indicates a small enclosure ditch. Extending east from the southern boundary of the enclosure, a positive linear anomaly is noted for 36 m. Halfway along this, a linear anomaly is noted perpendicular extending to the north-west for 39 m at **6011**. Two further anomalies are noted extending to the north-east of **6011** becoming weaker towards their north-eastern ends at **6012**. This grouping of anomalies indicates a field system or possible settlement activity of unknown date.
- 4.2.74 Two linear anomalies are noted traversing Area 6d on a broadly east – west alignment at **6013 – 6014**. These correspond to former boundary features visible on 1871 – 1872 OS mapping.
- 4.2.75 In Area 6i, a positive circular anomaly has been identified at **6015 (Figure 37)**. This is 12 m in diameter and up to 1 m wide and is interpreted as archaeological in origin. There is a break in the anomaly on its northern side which could suggest an entranceway. The response indicates a potential ring-ditch though the magnetic signature is relatively weak.
- 4.2.76 Adjacent to the ring-ditch (**6015**), a linear anomaly is noted traversing the survey area at **6016**. This response spans the length of the survey area on a north – south alignment for 98 m, although is notably fragmented. This indicates a ditch boundary feature. However, it is not possible to determine what relationship, if any, the anomalies at **6015** and **6016** have from the results of the geophysical survey alone.
- 4.2.77 Two penannular positive anomalies have been identified in Area 6k (**Figure 37**). The anomaly at **6017** is 11 m in diameter and the anomaly at **6018** is 10 m in diameter. Both anomalies have openings that face towards each other, on their east and west sides, respectively. These may be ring-ditch features potentially associated with iron Age or Romano-British roundhouse, however, their extremely weak nature prevents a more confident interpretation.
- 4.2.78 Two parallel positive linear anomalies are noted on a north – south alignment (**6019** and **6020**). These measure 50 m and 72 m long respectively and broadly enclose the features at **6017** and **6018**. The response at **6019** also appears to turn sharply to the east at its northern end perpendicular to the response at **6020**.
- 4.2.79 In Area 6j and 6l, several positive linear anomalies are interpreted as possible archaeology (**Figure 37**). For example, at **6021**, a positive circular anomaly is noted with a gap in its eastern side. This is 6 m in diameter and indicates a possible ring-ditch feature. Surrounding this anomaly are several linear anomalies. At **6022**, a positive linear anomaly is noted on a north-east to south-west alignment (**Figure 37**). This passes the anomaly at **6021** on its

side, similar to the responses in Area 6k and 6l. The anomaly at **6022** is 107 m long and up to 2 m wide, and likely indicates a boundary feature.

- 4.2.80 At the southern end of **6022**, a positive curvilinear anomaly protrudes to the south-west and turns to a south-south-west alignment at **6023**. This continues for a further 52 m and is also likely to indicate a boundary feature.
- 4.2.81 A negative linear anomaly is adjacent to the anomaly at **6022** at **6024**. This is 61.5 m long and is up to 2 m wide on a north – south alignment. This is interpreted as possibly archaeological in origin. The anomaly indicates a bank feature and may form a boundary. The response is perpendicular to ridge and furrow interpreted in this area, suggesting a medieval date. None of these features are visible on Ordnance Survey historic mapping.
- 4.2.82 A further curvi-linear anomaly is noted in the north of Area 6l (**6025**; **Figure 35**). This is 45 m long and 1 m wide. The response suggests a further ditch feature. However, the response is isolated, and it is unclear what origin this anomaly could have.
- 4.2.83 Traversing Area 6j on a broadly east – west alignment is a weakly positive linear anomaly (**6026**). This corresponds to a former boundary noted on 1871 – 1872 OS mapping. An area of increased magnetic response is noted along the former boundary. This most likely pertains to an area of metalling at a former entranceway or infilling of a former pond.
- 4.2.84 A highly magnetised area of increased magnetic response and ferrous anomalies is noted on the southern boundary of Area 6i at **6027**. This is likely to be modern and thought to be made ground associated with the construction of the adjacent junction of the A55.

Area 7 (Figure 38-43; 45; 47)

- 4.2.85 Area 7 traverse land between NGR 301409 374906 and 300907 373941, covering 33.2 ha of pasture and arable land. The area is between the A55 in the north and Glascoed Road in the south. All areas were subject to survey with the exception of small portions in 7a due to livestock and 7c due to presence of high crops.
- 4.2.86 The solid geology underlying the majority of Area 7 comprises Mudstone, Siltstone, and Sandstone of the Warwickshire Group with overlying superficial geological deposits of Diamicton (Till). Solid deposits of Limestone (Clwyd Group) are recorded to the very south of the area (BGS 2021).
- 4.2.87 The soils underlying the site are likely to consist of typical stagnogley soils of the 711m (Salop) association (SSEW SE Sheet 2 1983).
- 4.2.88 Overhead cables traverse the south-eastern corner of Area 7 on a north-east to south-west alignment.

Results

- 4.2.89 The majority of the archaeology highlighted by the geophysical survey has been identified in Area 7. Within this area there are three distinct concentrations of circular anomalies as well as interconnected linear and recti-linear positive anomalies. The first of these is located in the centre of Area 7h, where eight positive circular, penannular and semi-circular anomalies have been identified (**7000 – 7007**) (**Figure 41**). These are thought to relate to evidence for settlement, comprising at least eight probable Iron-Age to Romano-British roundhouse. However, the precise form and orientation of these feature varies slightly and these details are outlined below
- 4.2.90 At **7000 – 7003**, four positive circular anomalies are noted on a north-west – south-east alignment. These are between 7 – 9 m in diameter and appear to have openings predominantly on the east or south-east side. The anomalies also appear to have internal pit-like features.



- 4.2.91 At **7004**, a 10 m in diameter semi-circular positive anomaly has been identified, which is open on the southern side. This indicates a probable additional ring-ditch feature, which has likely been heavily ploughed down in the southern extent.
- 4.2.92 Two larger circular anomalies are noted at **7005** and **7006** to the south of the group of anomalies (**Figure 41** and **43**). The anomaly at **7005** is 14 m in diameter. This appears to have several positive anomalies contained within it that imply that both discrete and linear internal features may be present. The anomaly has a linear anomaly extending from its southern side towards **7006**. This is 25 m long and could indicate an enclosing boundary ditch. Two similar anomalies also extend to the north-north-west of the circular anomaly at **7005** for 16.5 m.
- 4.2.93 The circular anomaly at **7006** is 12.5 m in diameter and again appears to have internal features present, including the indication of a concentric ditch-feature. Similar to the anomaly at **7005**, two linear anomalies extend to the north-east and south-east, extending some 28 m to the north-east. It is not clear whether these anomalies are contemporary with the circular anomaly and further investigation would be required to confirm this.
- 4.2.94 There is a more isolated eighth circular anomaly noted approximately 65 m to the north of the grouping of anomalies at **7007**. This is 7 m in diameter and appears to have an opening on its southern side. This is also indicative of a ring-ditch and may relate to an extension of the settlement activity recorded to the south.
- 4.2.95 A possible ninth circular ring-ditch has been identified at **7008**, approximately 16 m to the south-east of **7001 - 7003**. This is 13 m in diameter but is notably fragmented and open on the north-eastern side.
- 4.2.96 Surrounding the anomalies at **7000 – 7008** are numerous further positive linear anomalies that may also be of archaeological origin. These are predominantly located on the south-west (**7009**), north-west (**7010**), and north-east (**7011**) sides of the grouping (**Figure 41** and **43**). These are interpreted as possibly archaeological in origin and could indicate peripheral ditch-features surrounding the more concentrated area of potential settlement activity. However, it is also possible that this is associated with more recent agricultural activity.
- 4.2.97 Approximately 165 m to the east of the anomalies at **7000 – 7011**, a second smaller grouping of circular anomalies has been identified at **7012 – 7014** in Area 7j. These are also thought to be associated with a series of ring-ditch features, but in this case there is a clear sub-rectangular enclosure surrounding this.
- 4.2.98 At **7012** is 13 m in diameter and appears to have further internal features. The anomaly at **7013** is weaker and 9 m in diameter, immediately east of the response at **7012**. The response at **7014** is 5 m in diameter.
- 4.2.99 These anomalies appear to be enclosed by a fragmented and weakly positive curvi linear anomaly (**7015**). This covers a sub-rectangular area and measures 73 m north-east to south-west and 56 m north-west to south-east. The response is weak and could indicate a ditch feature forming a boundary or enclosure. However, due to its weak magnitude, further investigation would be required to determine the origin of the anomaly.
- 4.2.100 Numerous additional anomalies are noted elsewhere in the south-eastern corner of **7015**. These comprise positive linear ditch and pit-like features and are likely associated with further elements of settlement activity.
- 4.2.101 Two weaker positive circular anomalies are located outside and to the south-east of the larger enclosure at **7015**. The anomaly at **7016** is 8 m in diameter and the anomaly at **7017** is 6 m in diameter. These are interpreted as possible archaeology due to their fragmented form.



- 4.2.102 In Area 7d, a third area of anomalies interpreted as archaeological in origin have been identified (**7019 – 7024**) (**Figure 39**). While confidently interpreted, the anomalies are moderately occluded by the presence of a modern service traversing the area on a north – south alignment (**7018**).
- 4.2.103 To the west of **7018**, an alignment of 21 positive anomalies is noted traversing the survey area on a north – south alignment at **7019** (**Figure 39**). The anomalies are 1 – 2 m in diameter with regular 2 – 3 m gaps between and span the breadth of the survey area. This is interpreted as archaeological in origin and is thought to indicate a pit-alignment or segmented ditch. Such anomalies often form prehistoric boundary features and it is not visible on Ordnance Survey historic mapping.
- 4.2.104 Immediately west of the pit alignment, a positive anomaly is noted at **7020**. This is 8 m in diameter and up to 1 m wide with an opening on its eastern side. The response indicates probable ring-ditch feature.
- 4.2.105 Further to the south-west of **7020**, a recti-linear enclosure has been identified at **7021** on an east – west alignment. A positive anomaly measuring 16 x 10 m is noted consisting of the southern and western sides of the enclosure along with a short portion of the eastern perimeter at its southern extent.
- 4.2.106 To the east of **7018**, a large positive recti-linear anomaly measuring 45 x 22 m has been identified at **7022**. This is on a broadly north – south / east – west alignment but not fully complete at its south-western side due to the presence of the service and the limited survey area. This indicates a larger enclosure ditch feature.
- 4.2.107 A smaller, weaker positive recti-linear anomaly is noted within the larger enclosure (**7023**) (**Figure 39**). This measures 50 x 23 m on the same alignment as **7022**. This indicates internal divisions within the larger enclosure. However, this anomaly has also been impacted by the service at **7018**, appearing to continue either side of the response on its northern side.
- 4.2.108 The anomalies at **7019 – 7024** indicate archaeological settlement activity including a small ring-ditch that is possible evidence of a roundhouse or funerary monument, as well as an enclosure and linear boundary features. These could date to the Bronze Age – Iron Age or as late as the Romano-British period.
- 4.2.109 In the south-west of Area 7i, a positive semi-circular anomaly has been identified at **7025**. This has been interpreted as archaeological in origin due to its size and form and indicates an additional ring-ditch outside of the main concentrations of activity recorded elsewhere.
- 4.2.110 Several weaker positive circular anomalies are noted sporadically throughout Area 7 (**7026** and **7027** in 7b, **7028** in 7h). Feature **7026** lies north-east of the large service that bisects area 7b and consists of a sub-circular anomaly approximately 12 m in diameter and open at its south-eastern edge. Approximately 40 m to the south of the service lies feature **7027**, this is also sub-circular with a 10 m diameter and is also three-sided being open on its north-eastern side. Feature **7028** forms a near complete circle with a diameter of 7.5 m and has a possible entrance at its south-eastern extent.
- 4.2.111 In Area 7k, a positive linear anomaly could indicate a further ditch-feature (**7029**). The anomaly is 43 m long on a north-east to south-west alignment. This could evidence a portion of an enclosure due to the protrusions on the north and south ends of the anomaly. However, due to the limited survey area and lack of further detection, further investigation would be required to determine the origin of this anomaly.
- 4.2.112 An irregular anomaly roughly keyhole shaped is noted in Area 7i (**7030**), having an uneven magnetic response which becomes more positive at its north-eastern and south-western extents. The circular portion of the anomaly is 13 m in diameter and has a protrusion on its

north-east side measuring 10 m in length. This anomaly is considered possible archaeology and could indicate a cut-feature such as a pit. However, due to the diffuse nature of the response, it could equally be natural in origin. Further investigation would be required to determine any anthropogenic nature of this anomaly.

- 4.2.113 Three former boundary features have been identified in Area 7. These are all noted on a north-west to south-east alignment and recorded on 1871 – 1872 mapping. These are noted in 7h at **7031** and **7032** and in 7i at **7033**.
- 4.2.114 Several areas on increased magnetic response are noted throughout the southern portion of Area 7 (**7034 – 7037**) (**Figure 43**). The responses in these areas are typical of infilling associated with a series of former extraction pits. While these anomalies do not correspond with features recorded on historical mapping, such features are recorded in the surrounding landscape.
- 4.2.115 A highly magnetic, dipolar linear anomaly is noted in Area 7b (**7037**). This indicates a modern service, such as a pipe or cable.

Area 8 (Figure 42-47)

- 4.2.116 Area 8 is located at the southern end of the scheme between NGR 300757 373884 and 301405 373438 and covers 13.9 ha of pasture and arable land. This area is located between Glascoed Road to the north-west and the existing National Grid Bodelwyddan Substation to the east. Area 8b, 8f, and 8g were not suitable for survey due to the presence of livestock.
- 4.2.117 The solid geology underlying the west of Area 8 comprises Limestone of the Clwyd Group with Mudstone, Siltstone, and Sandstone of the Warwickshire Group noted to the east. Overlying superficial geological deposits of Diamicton (Till) are recorded throughout the area (BGS 2021).
- 4.2.118 The soils underlying the site are likely to consist of typical stagnogley soils of the 711m (Salop) association (SSEW SE Sheet 2 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

Results

- 4.2.119 A positive curvi-linear anomaly has been identified to the north of Area 8e (**8000**) (**Figure 43**). This is 15 m in diameter and 1 m wide and is roughly semi-circular in form. It is possible that it is associated with a ring-ditch, which is not fully realised on its north-eastern side due to the modern field boundary and an area of ferrous response associated with the boundary.
- 4.2.120 In the south of Area 8a, a linear and recti-linear anomaly have been identified on a west-north-west to east-south-east alignment at **8001** (**Figure 43**). The linear portion of the anomaly is on a broadly east – west alignment and is 17 m long by 2 m wide. The recti-linear portion covers a 23 x 10 m area. The responses could indicate portions of one or more recti-linear ditched enclosures. However, the anomaly is broadly parallel and perpendicular to weakly dipolar anomalies interpreted as field drains suggesting a more recent origin.
- 4.2.121 Amorphous areas of positive response have been identified within the possible recti-linear enclosure (**8002**) (**Figure 43**). These could relate to internal features such as underlying depressions or underlying former surfaces associated with the possible enclosure. However, a natural origin cannot be ruled out. The anomalies are diffuse in their appearance which is typical of localised variation in the magnetic susceptibility of underlying geological deposits.
- 4.2.122 A positive linear anomaly is noted to the south of Area 8h at **8003** (**Figure 47**). The anomaly is fragmented on a north – south alignment and is up to 54 m in length by 1 m wide. To the

south in Area 8j a second linear anomaly is noted perpendicular to this response on an east – west alignment at **8004 (Figure 47)**. This is 33 m long and 1 m wide and appears to turn to the north at the point the projected line of the anomaly at **8003** would coincide with this response. While no relationship can be confidently determined, it is considered these anomalies could form part of an unrecorded field system. A curvi-linear anomaly protrudes from the northern end of **8003** at **8005**. This appears to form a small curvi-linear enclosure adjacent to the supposed former boundary.

- 4.2.123 In Area 8d, a positive linear anomaly is noted on a north-north-east to south-south-west alignment at **8006 (Figure 45)**. This covers the length of the area and corresponds to former boundary visible on 1872 mapping. A second anomaly corresponding to a former boundary on the same mapping is noted to the south-east in 8e at **8007**. However, this anomaly is only visible for 23 m and is on a more north-east to south-west alignment.
- 4.2.124 In addition, broadly spaced (5 m) parallel linear trends have been identified throughout Area 8 on a north-east to south-west alignment. These are generally parallel to the modern and historic pattern of land division and are interpreted as evidence of ridge and furrow cultivation.
- 4.2.125 An area of increased magnetic response is noted traversing the survey area in 8e parallel to the former boundary (**8006**) at **8008 (Figure 45)**. This corresponds to a footpath on modern mapping.
- 4.2.126 A number of responses interpreted as natural in origin have been identified. While the underlying superficial geology is recorded as Till throughout, it is possible these anomalies indicate localised variation in the magnetic susceptibility of these or other variable superficial deposits. A larger, stronger response is noted at **8009** in Area 8d. This is interpreted as natural but could indicate an unrecorded boundary feature or spread of agricultural material.
- 4.2.127 Four highly magnetic dipolar linear anomalies are noted traversing Area 8h on a broadly east – west alignment (**8010 – 8013**) (**Figure 47**). These project towards or from the Substation noted to the east of the survey area and are evidence of modern services, such as pipes or cables. These responses have had an impact on the detectability of any potential archaeological features in this area.

5 DISCUSSION

- 5.1.1 The detailed gradiometer survey has been successful in detecting anomalies of archaeological origin. These are prevalent across much of the southern half The Scheme and proposed substation areas specifically Area 6, 7, and 8.
- 5.1.2 Three distinct areas of probable settlement activity have been identified in Area 7. These comprise numerous ring-ditch features that indicate possible settlement activity such as roundhouses and/or funerary monuments as well as recti-linear, curvi-linear, and linear ditch-like features. These typically extend surrounding the circular features to form, albeit weak and poorly defined in places, networks of enclosures and other boundary features that indicate earlier iterations of field systems in the landscape.
- 5.1.3 As stated, circular ring-ditch features can indicate settlement activity such as funerary monuments or roundhouses. These can date to the Bronze age – Iron Age period. Recti-linear features are more prevalent across later periods such as the Iron Age – Romano-British, or even to as late as the early medieval period. It is not clear from the results of the geophysical survey which period these features are associated with, and it is possible multiple phases of activity have been identified.



- 5.1.4 Less concentrated areas of archaeological activity have been identified within Area 6 and 8. These comprise ring ditches and linear ditch-like anomalies, but do not show the same level of activity as in Area 7. While these are still considered archaeology, it is more likely that they relate to agricultural activity surrounding the more complex areas of settlement.
- 5.1.5 Several areas of anomalies identified as possibly archaeological in origin have been identified by the survey. These are predominantly located across the northern areas of the survey in Area 2 and 3. In places these are similar in form to the archaeological anomalies across the south of the scheme. However, they are generally weaker and more isolated from any surrounding archaeological anomalies or known activity. While an archaeological origin cannot be ruled out for these anomalies, further investigation would be required to confirm their origin. Many of these anomalies could equally relate to modern ploughing activity or natural variations in the underlying deposits.
- 5.1.6 In addition, anomalies associated with the mid-20th century have also been identified. These likely pertain to the location of a documented former chain radar station. While this feature is not widely documented on historical mapping, the anomalies are consistent with the footings of former towers.
- 5.1.7 The historic pattern of land division that is visible on OS mapping dating to the later part of the 19th century has been partially realised by the geophysical survey. In addition, notable areas of ridge and furrow cultivation have been identified. These have been located in Areas 2, 6, and 8.
- 5.1.8 The vast majority of the survey area is recorded to contain underlying superficial geological deposits. These have been widely realised by the survey particularly where Tidal Flat Deposits and Glaciofluvial Deposits have been identified. This is not considered to have had any impact on the success of the survey as numerous anomalies that are confidently interpreted as archaeological in origin have been identified.
- 5.1.9 The remaining anomalies are likely to be modern and associated with agricultural regimes, as well as land drains and services.



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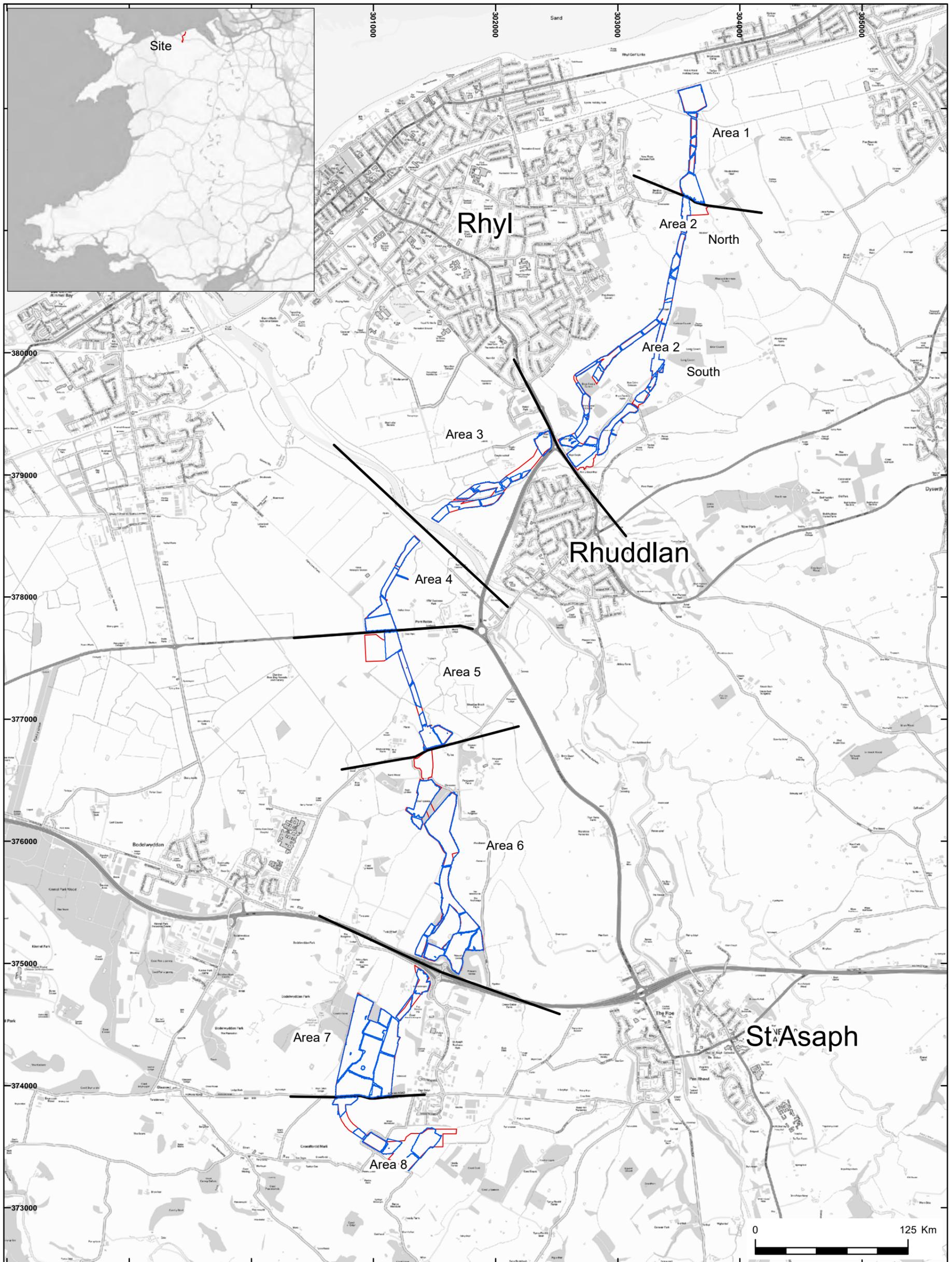
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- Detailed survey extents
- Site boundary



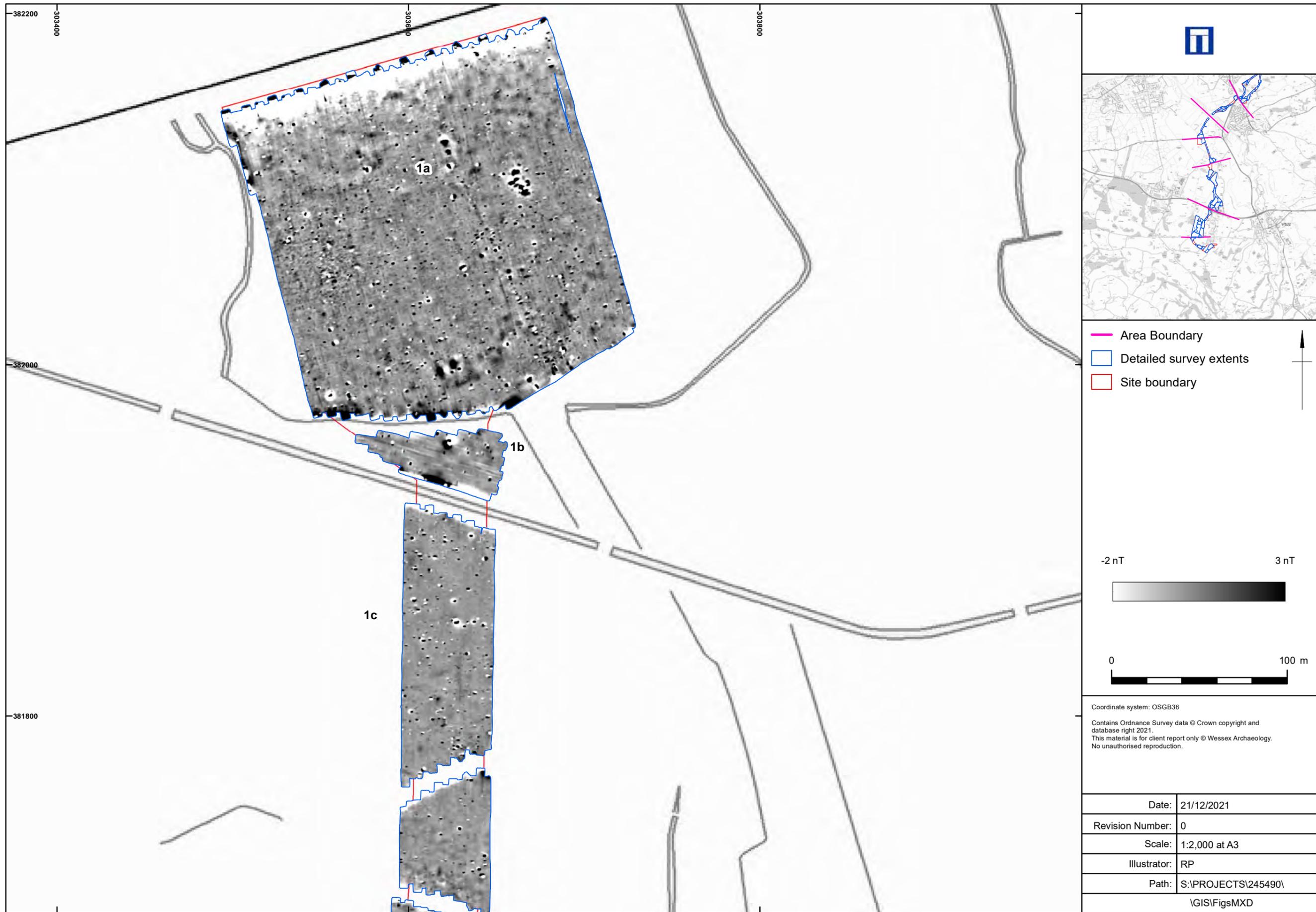
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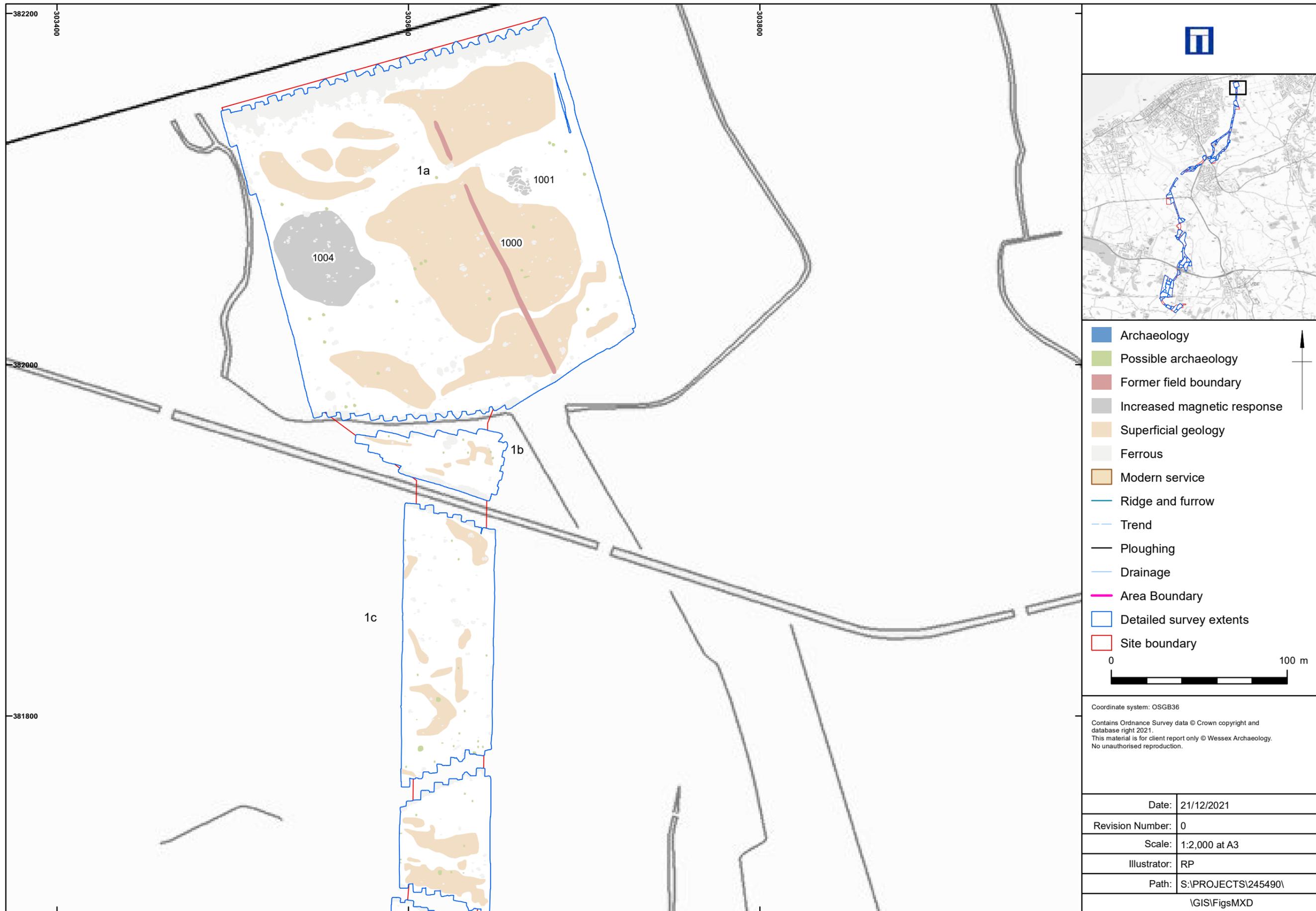
Site location and survey extent

Figure 1



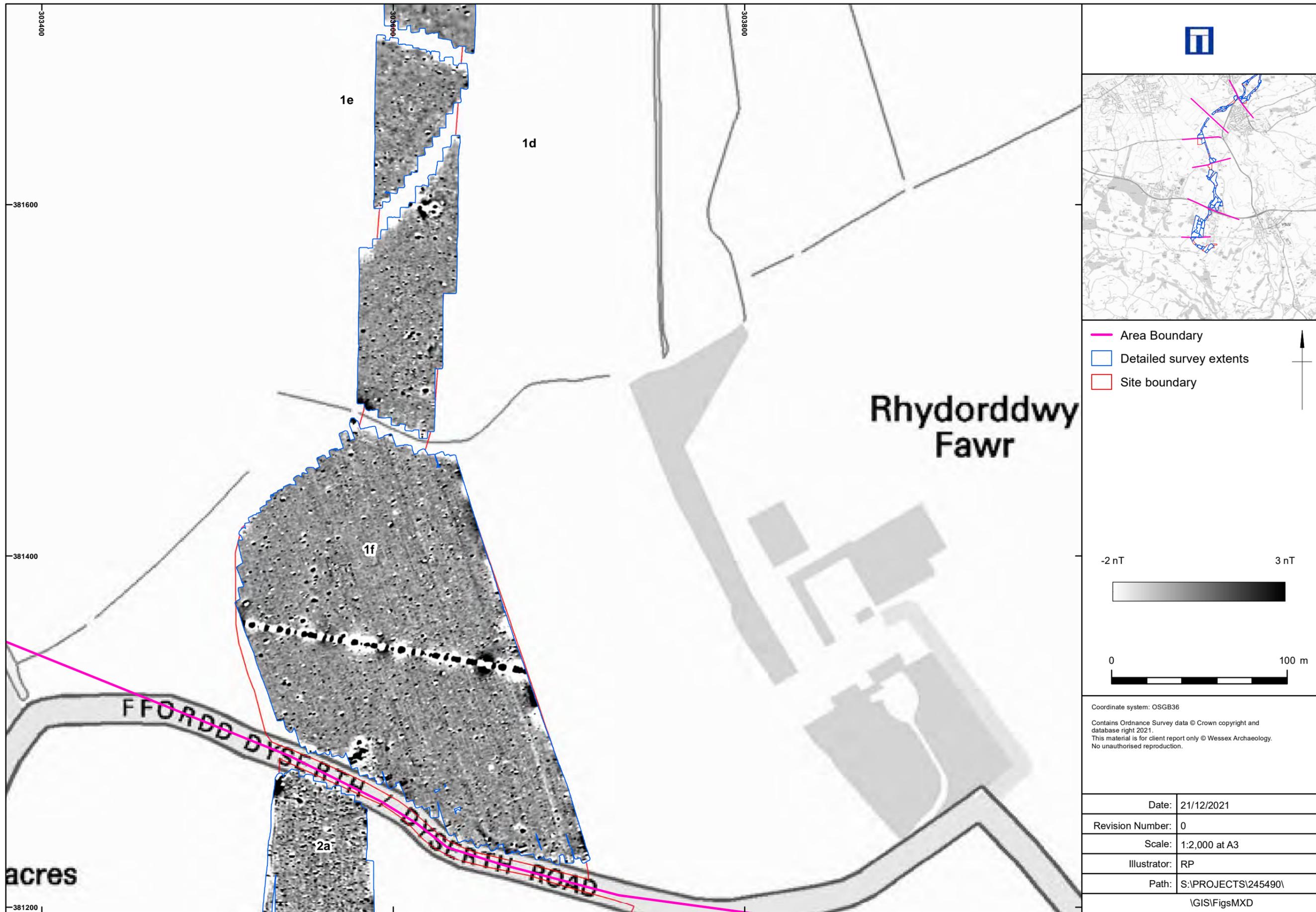
Detailed gradiometer survey results: greyscale plot Area 1 (north)

Figure 2



Detailed gradiometer survey results: interpretation Area 1 (north)

Figure 3

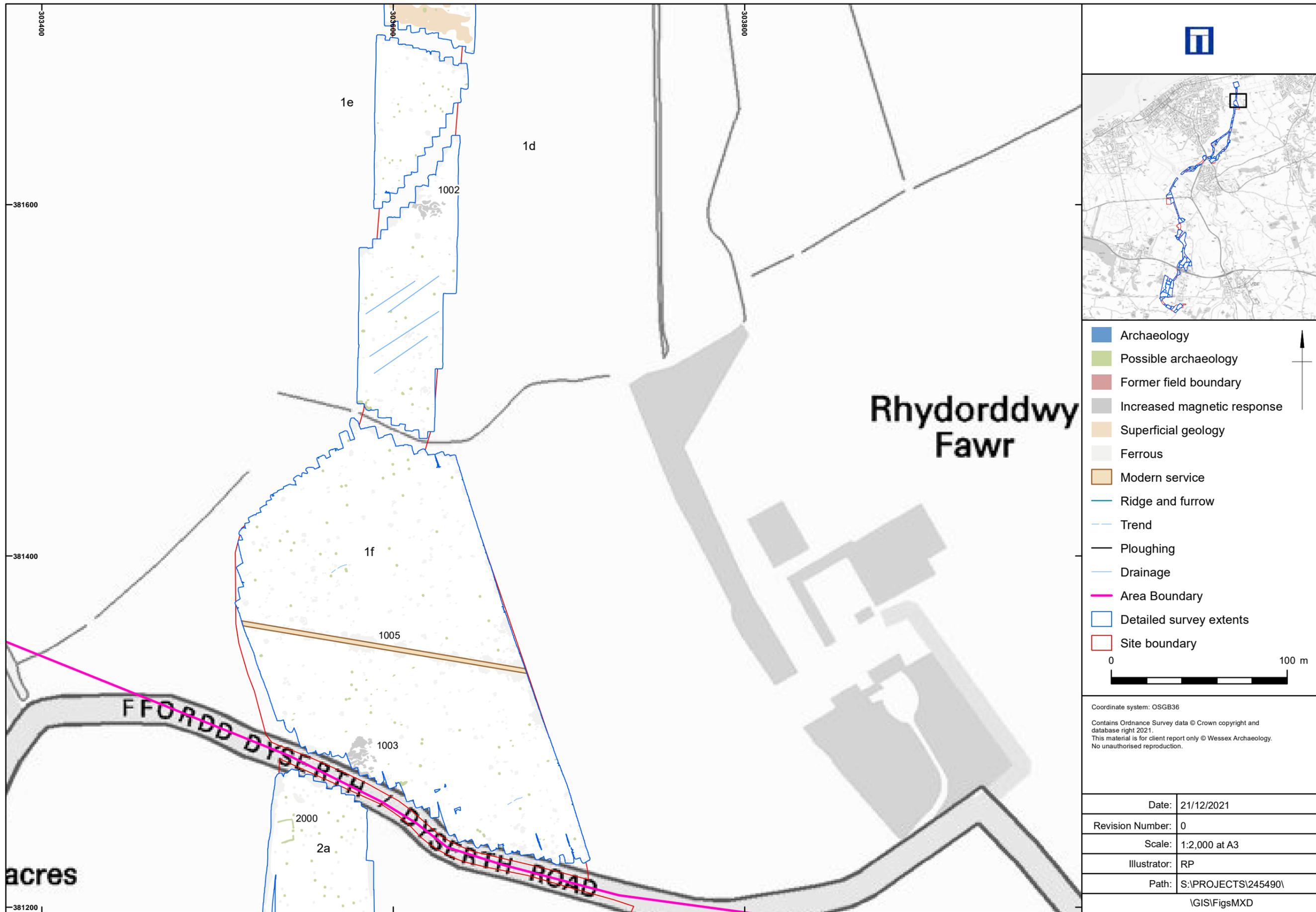


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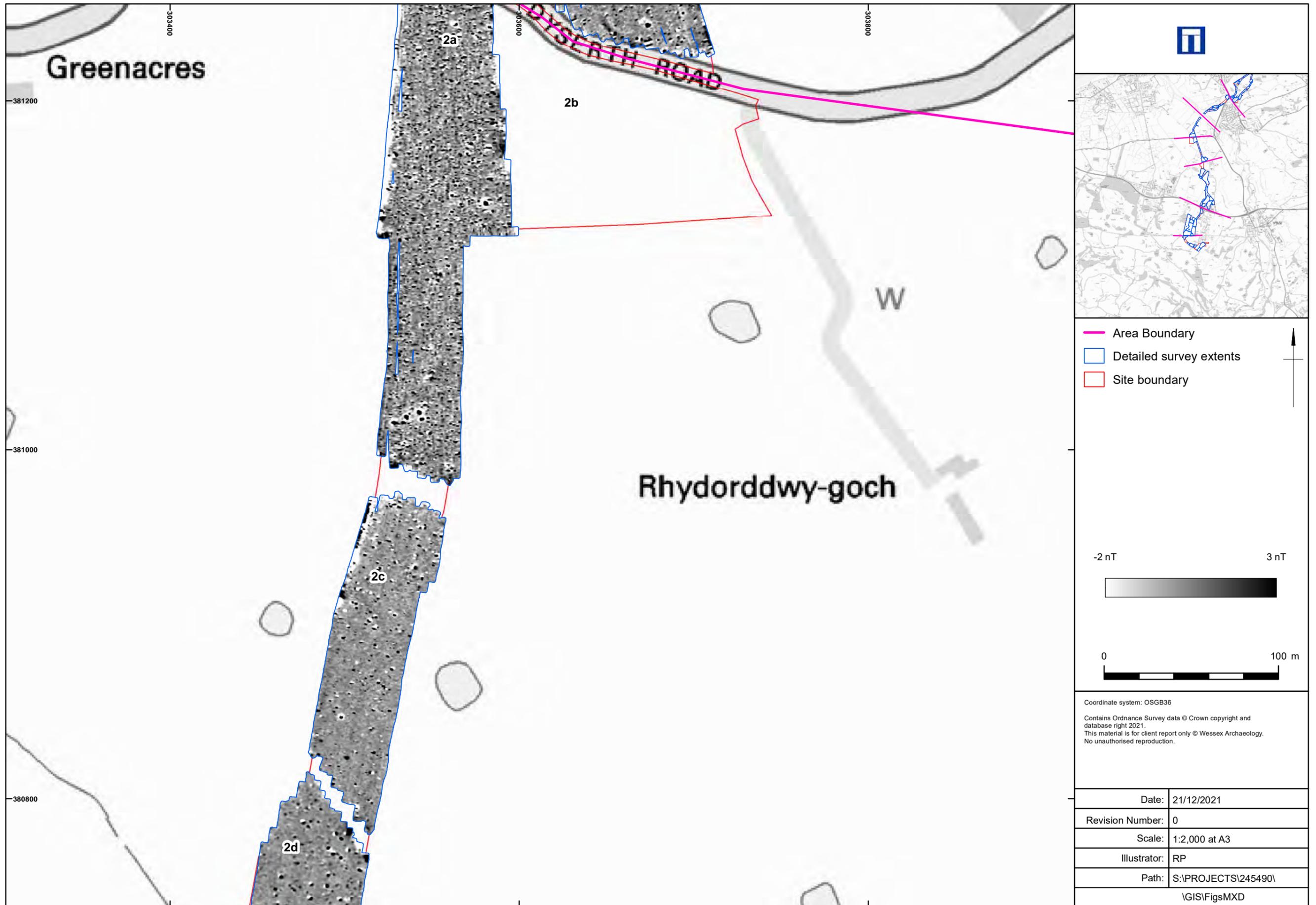
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Figure 4



Detailed gradiometer survey results: interpretation Area 1 (south)

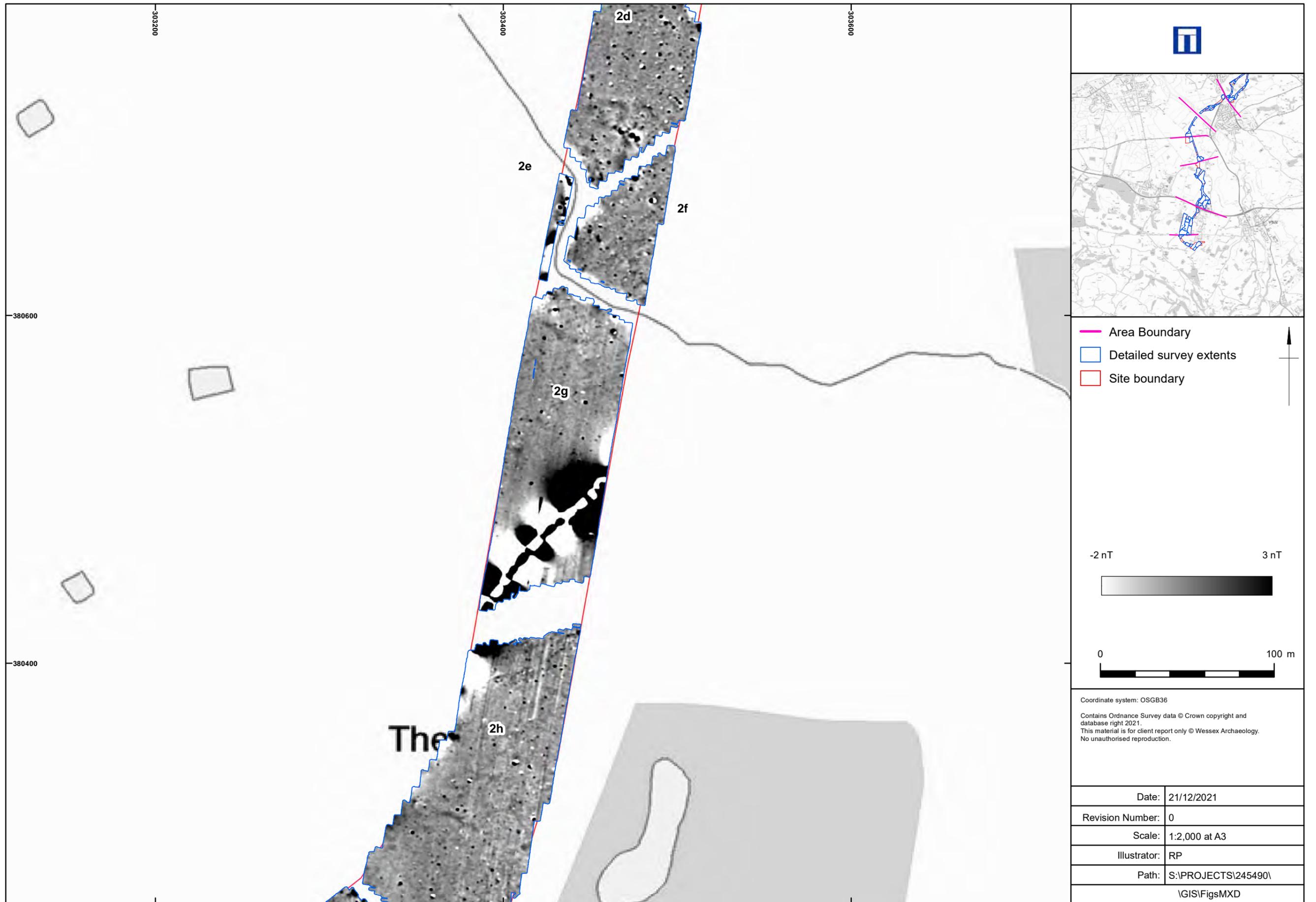
Figure 5



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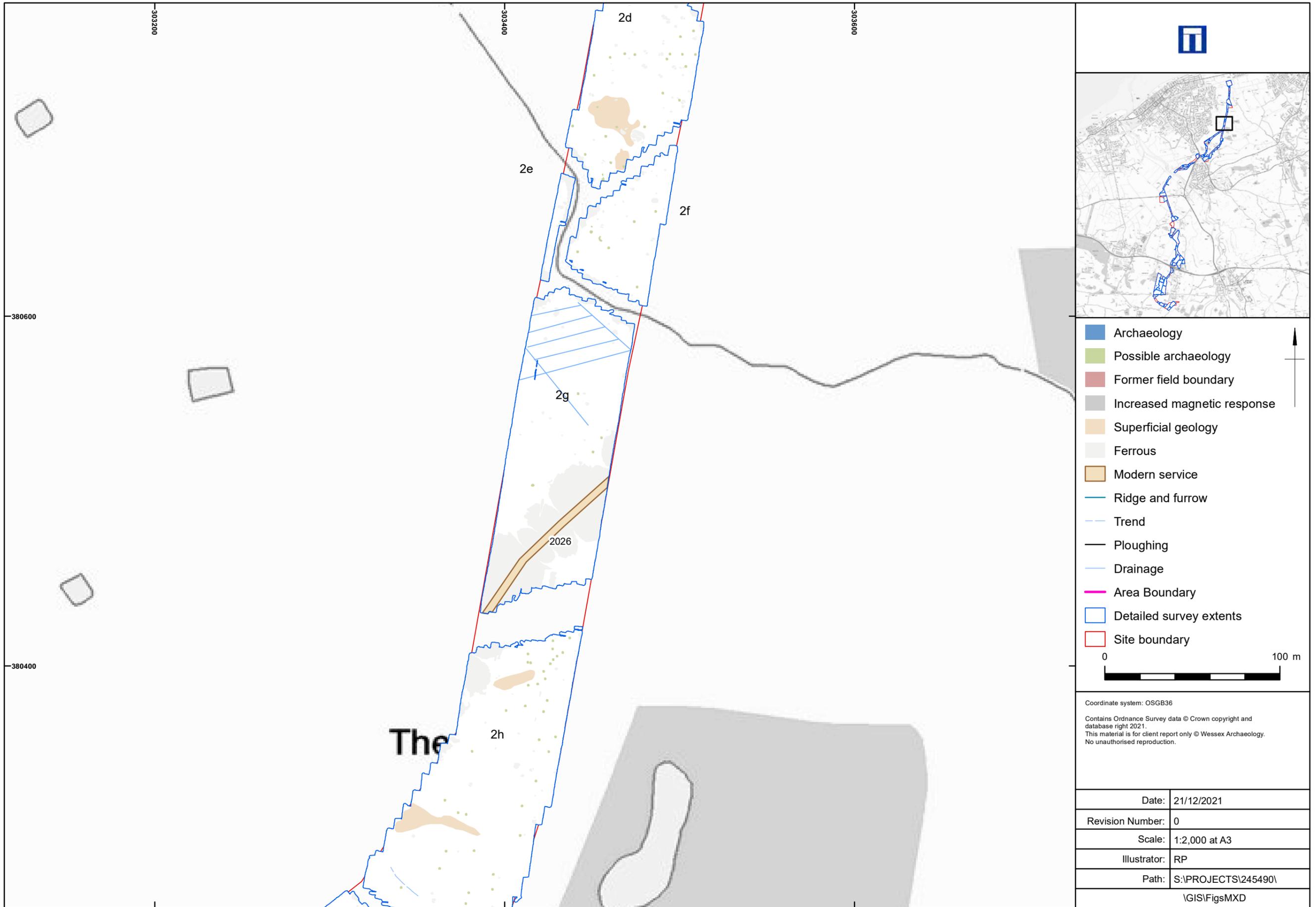
Figure 6

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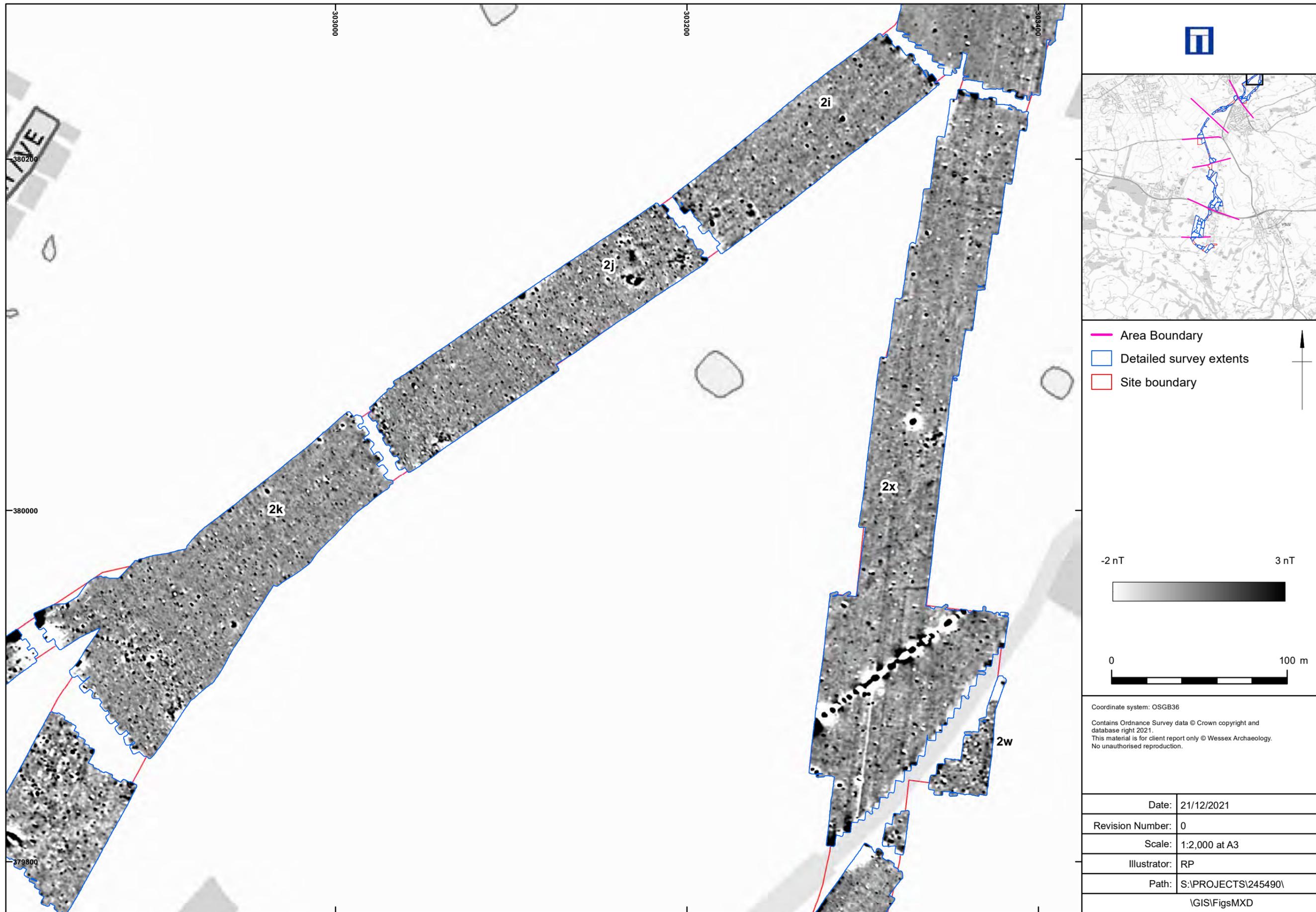
Detailed gradiometer survey results: greyscale plot Area 2 (centre/north)

Figure 8

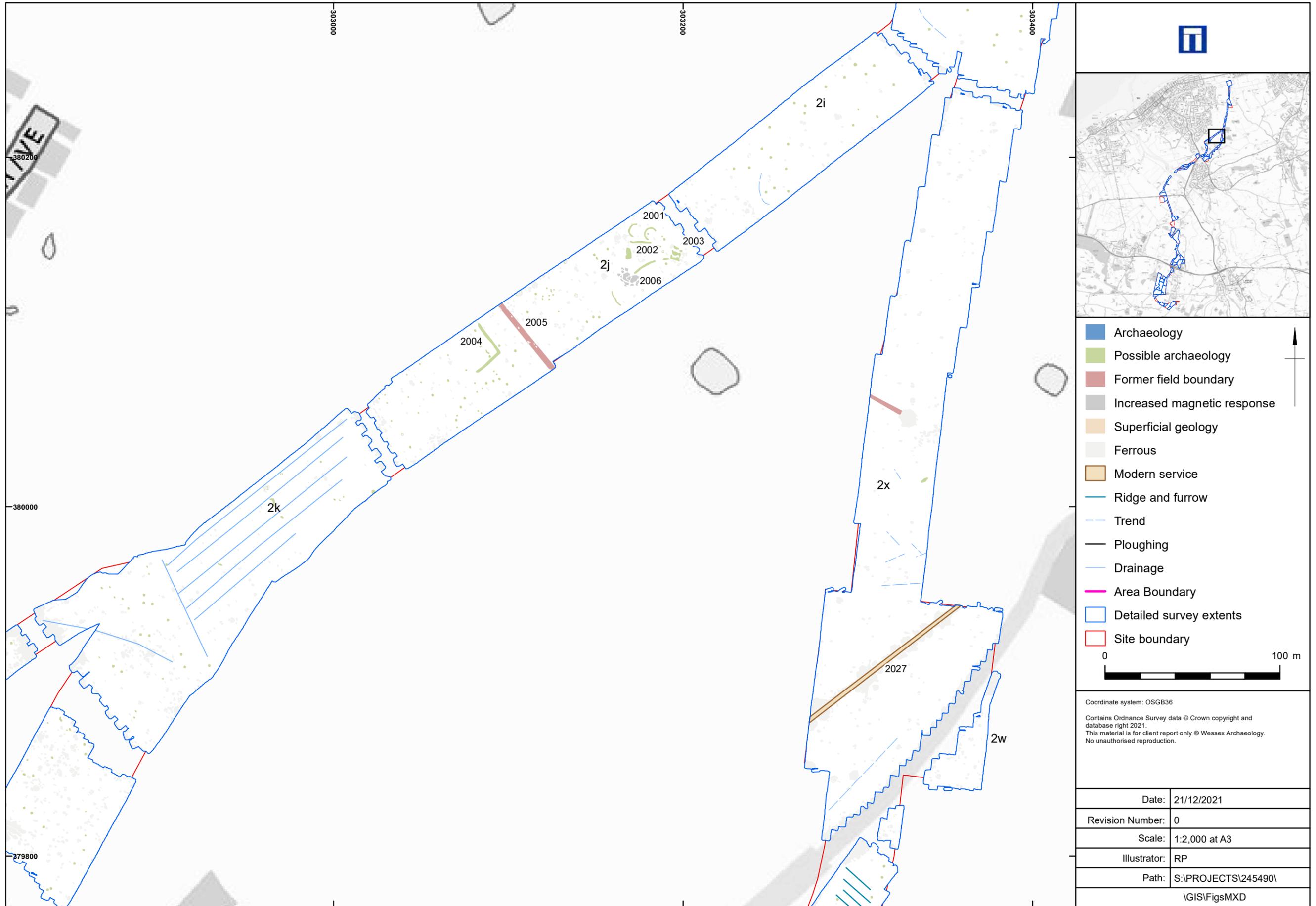


Detailed gradiometer survey results: interpretation Area 2 (centre/north)

Figure 9

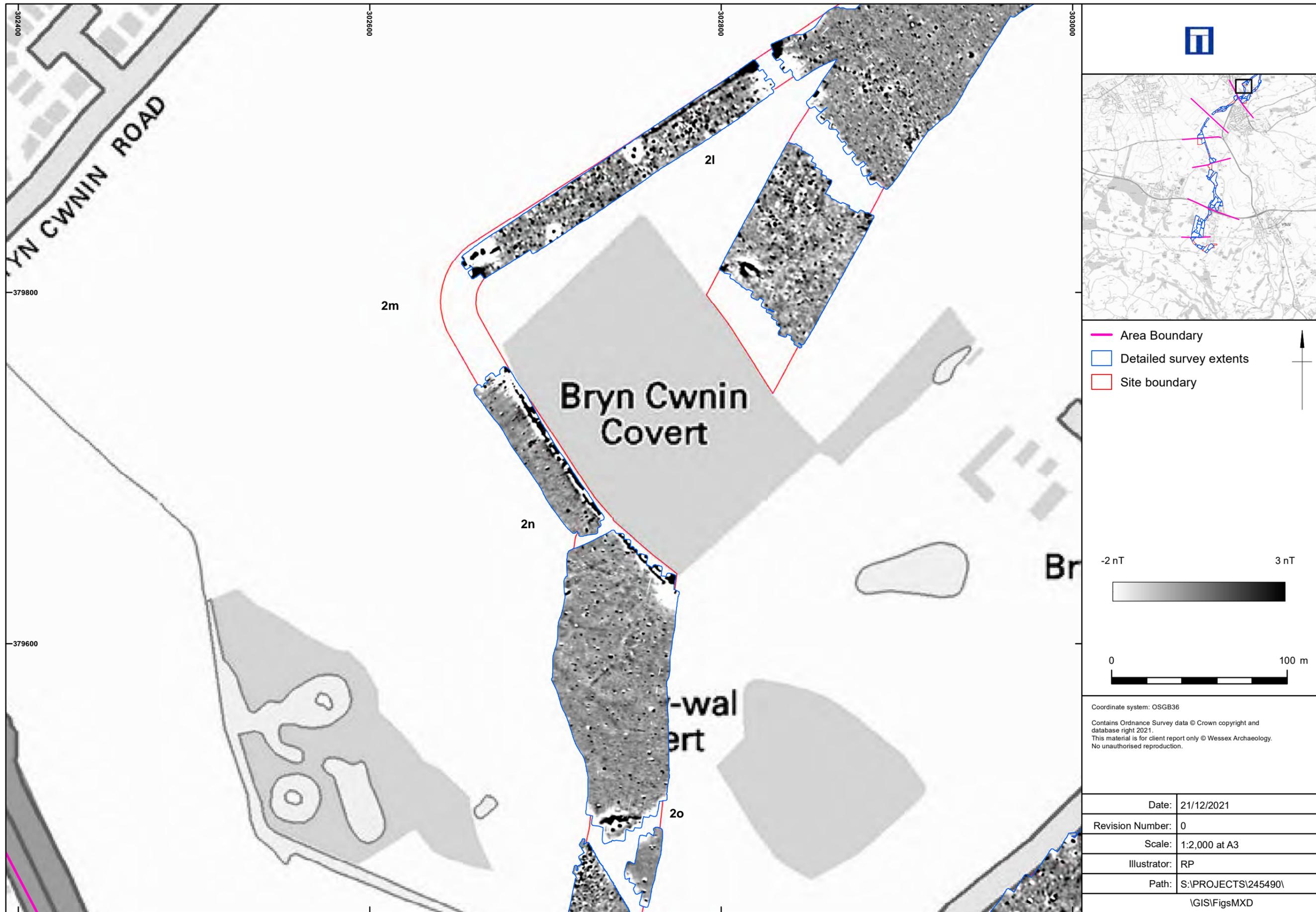


Detailed gradiometer survey results: greyscale plot Area 2 (centre)



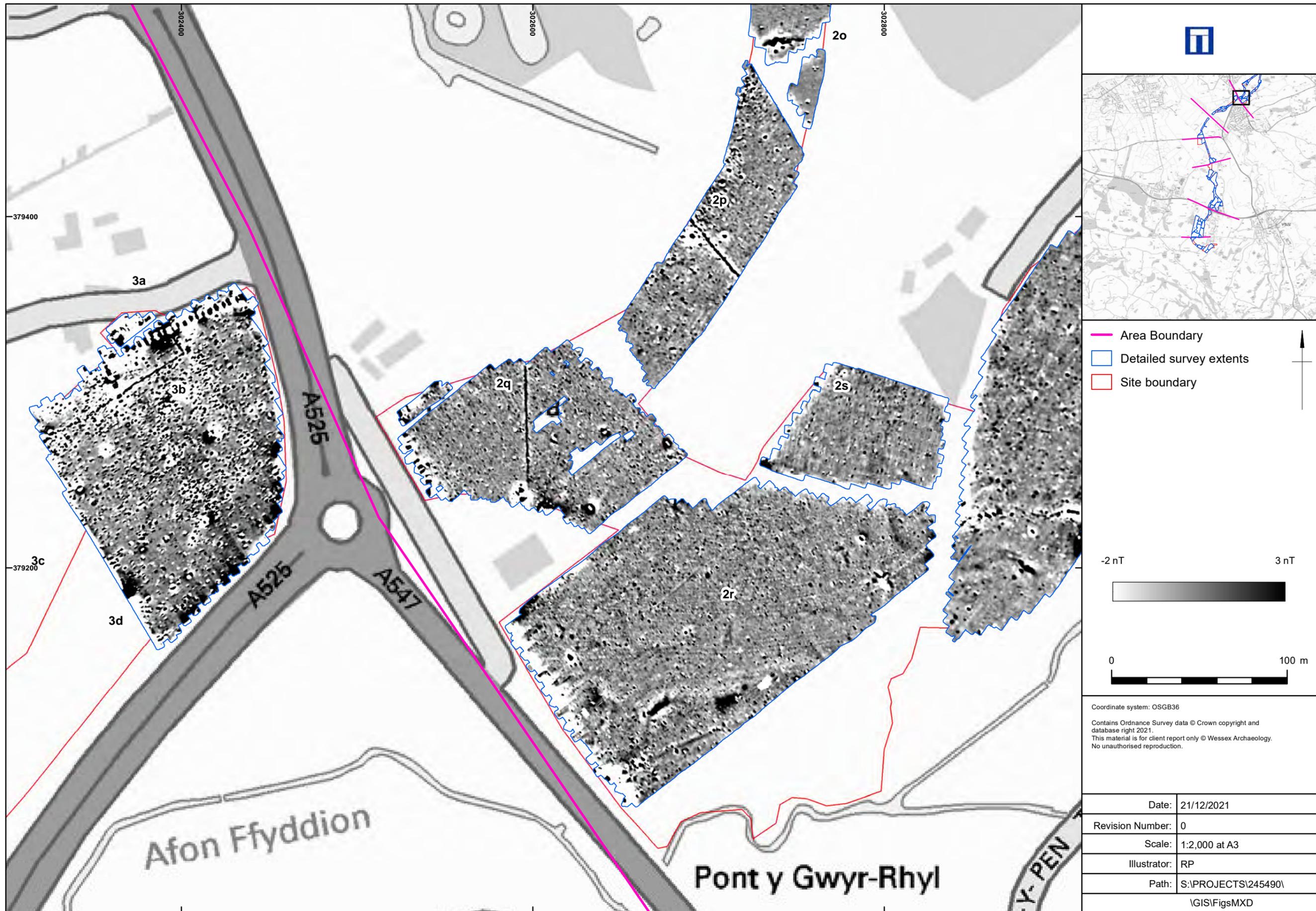
Detailed gradiometer survey results: interpretation Area 2 (centre)

Figure 11

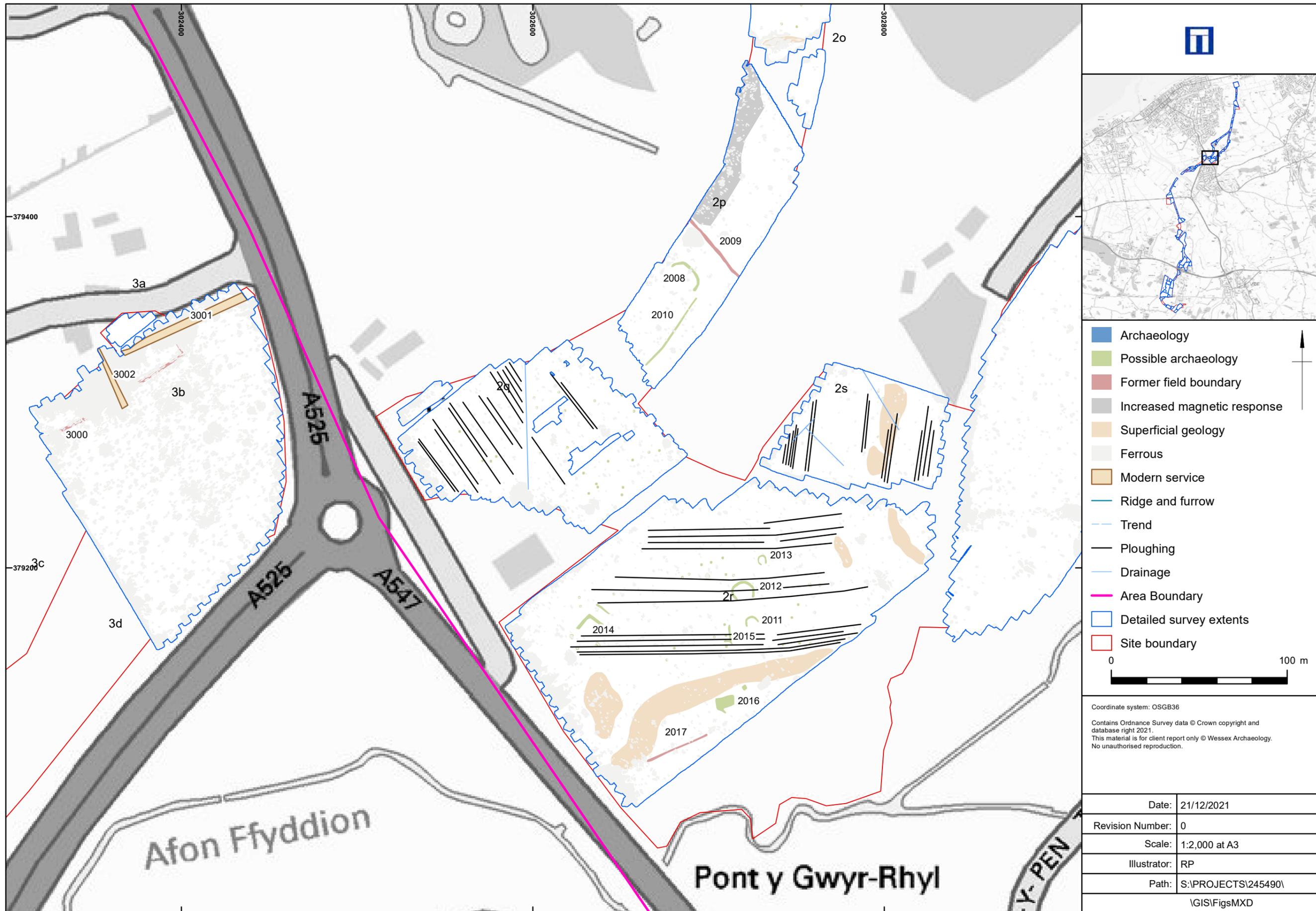


Detailed gradiometer survey results: greyscale plot Area 2 (south)

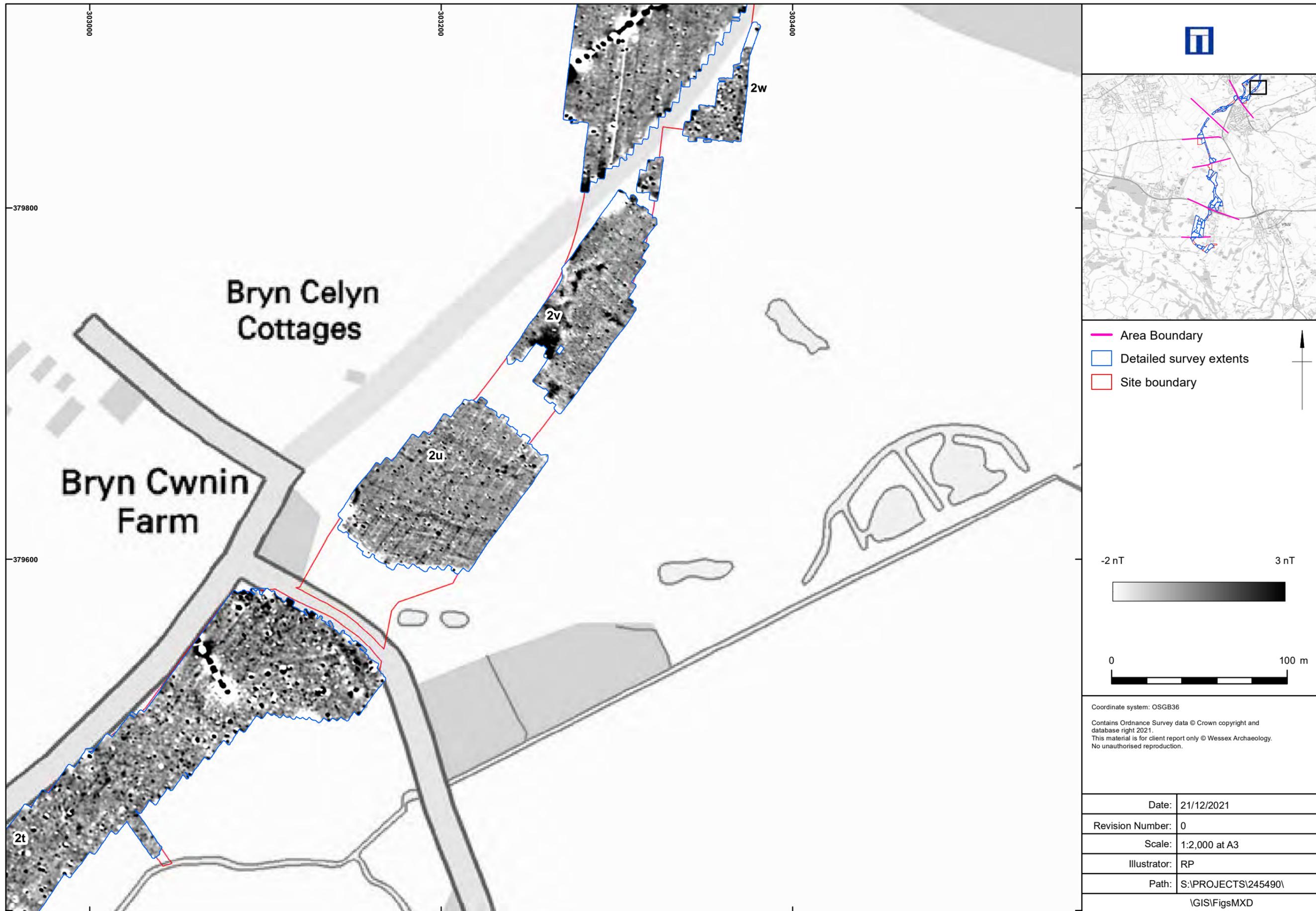
Figure 12



Detailed gradiometer survey results: greyscale plot Area 2 (south) / Area 3 (north-east)

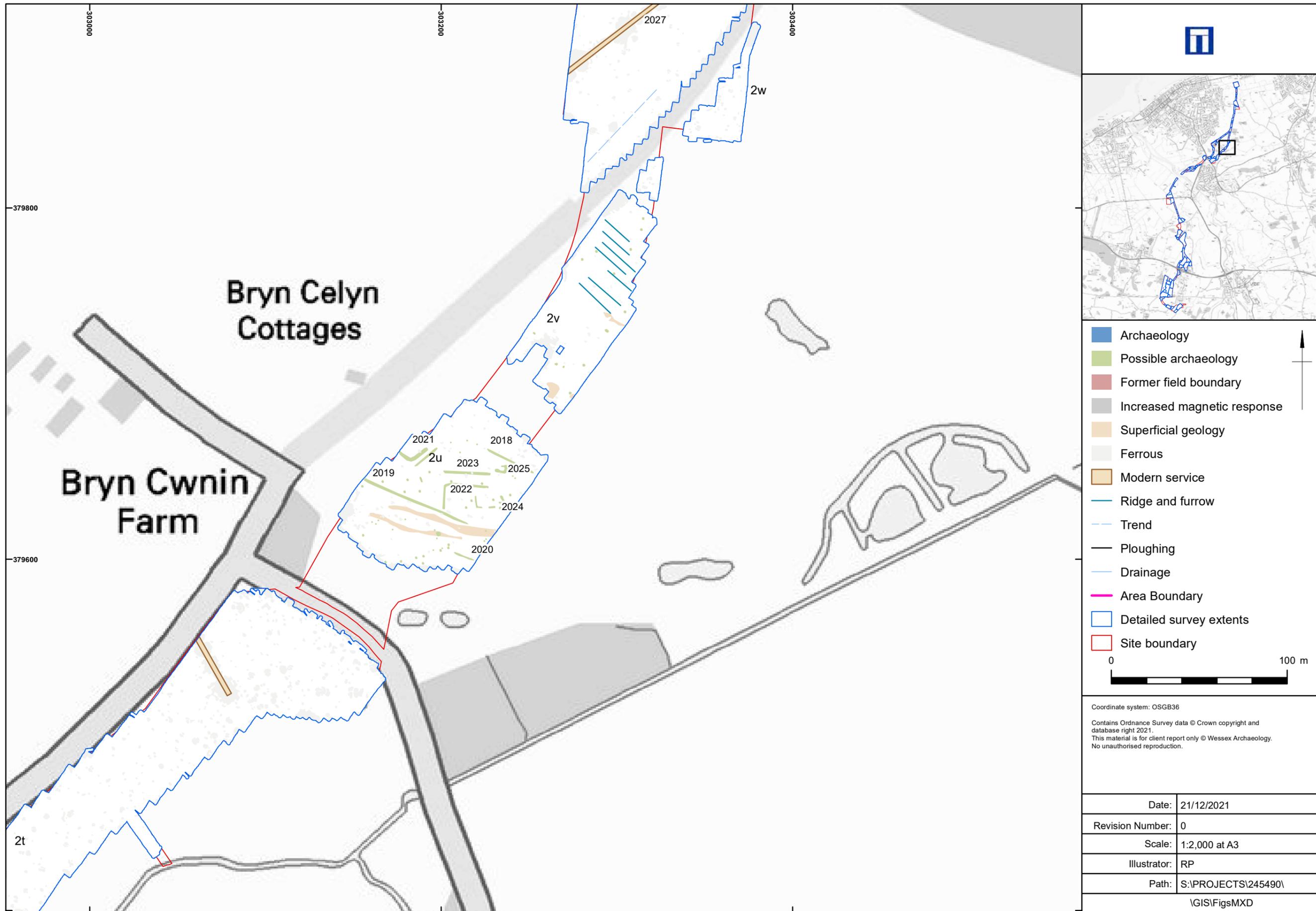


Detailed gradiometer survey results: interpretation Area 2 (south) / Area 3 (north-east)



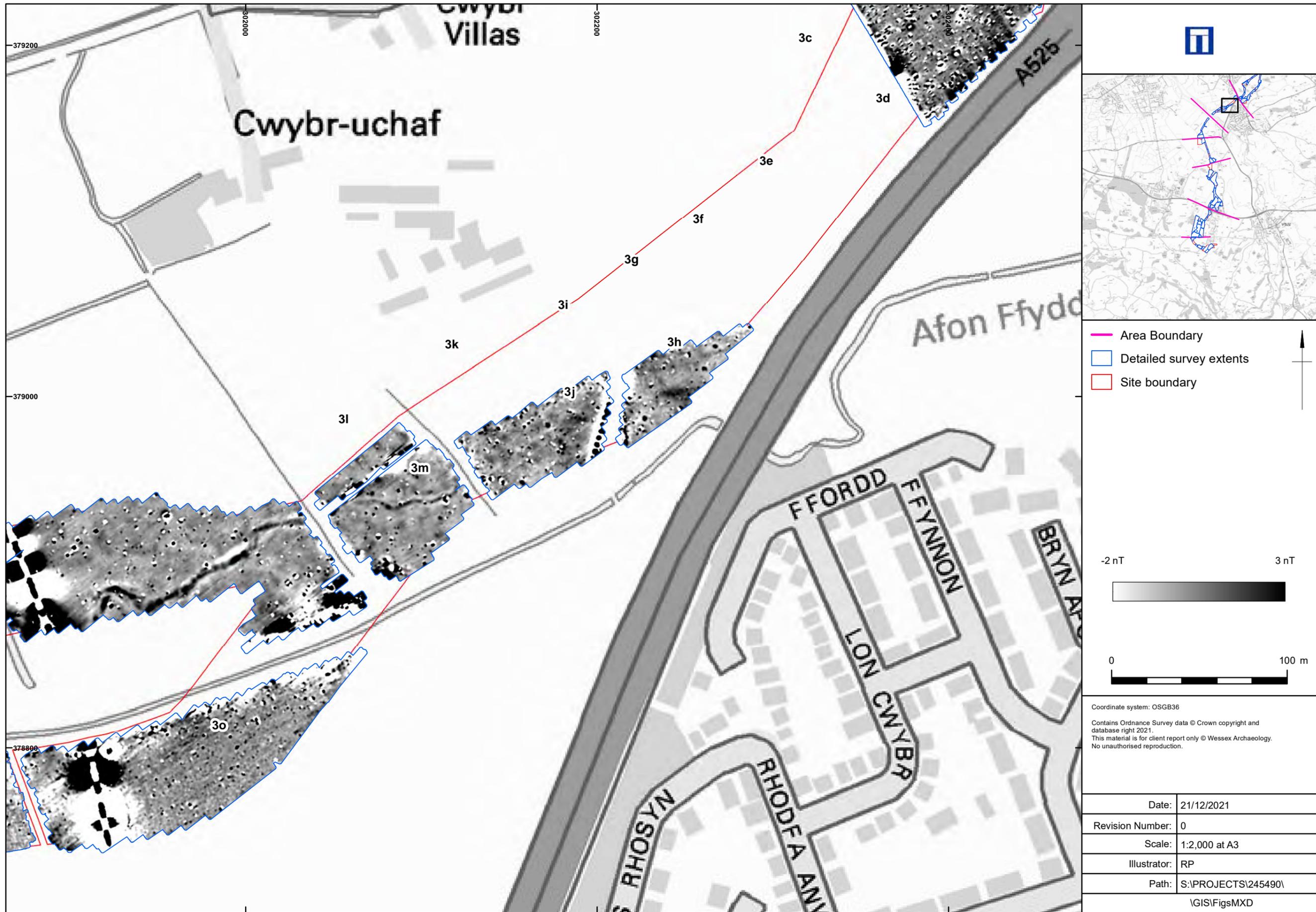
Detailed gradiometer survey results: greyscale plot Area 2 (east)

Figure 16

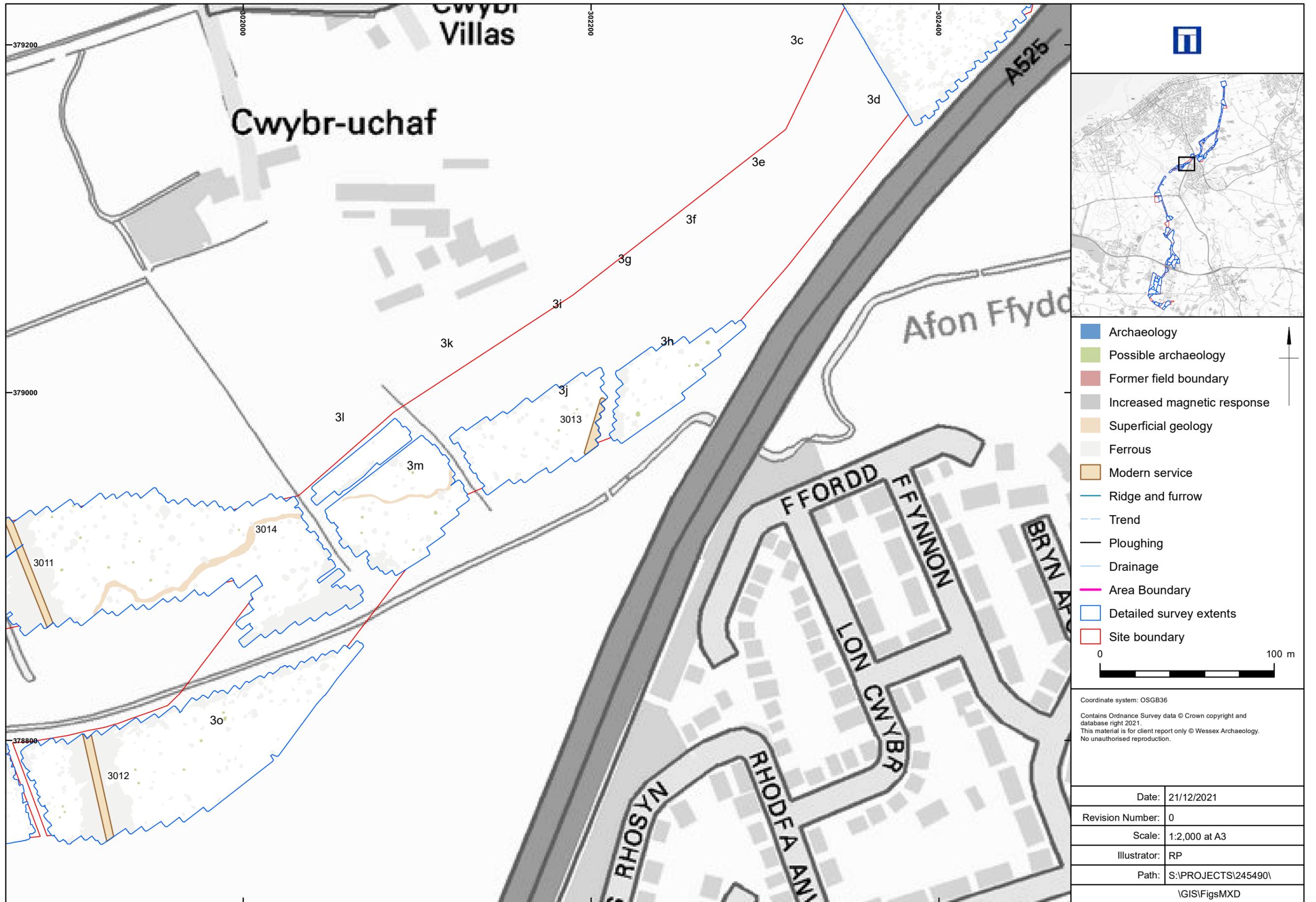


Detailed gradiometer survey results: interpretation Area 2 (east)

Figure 17



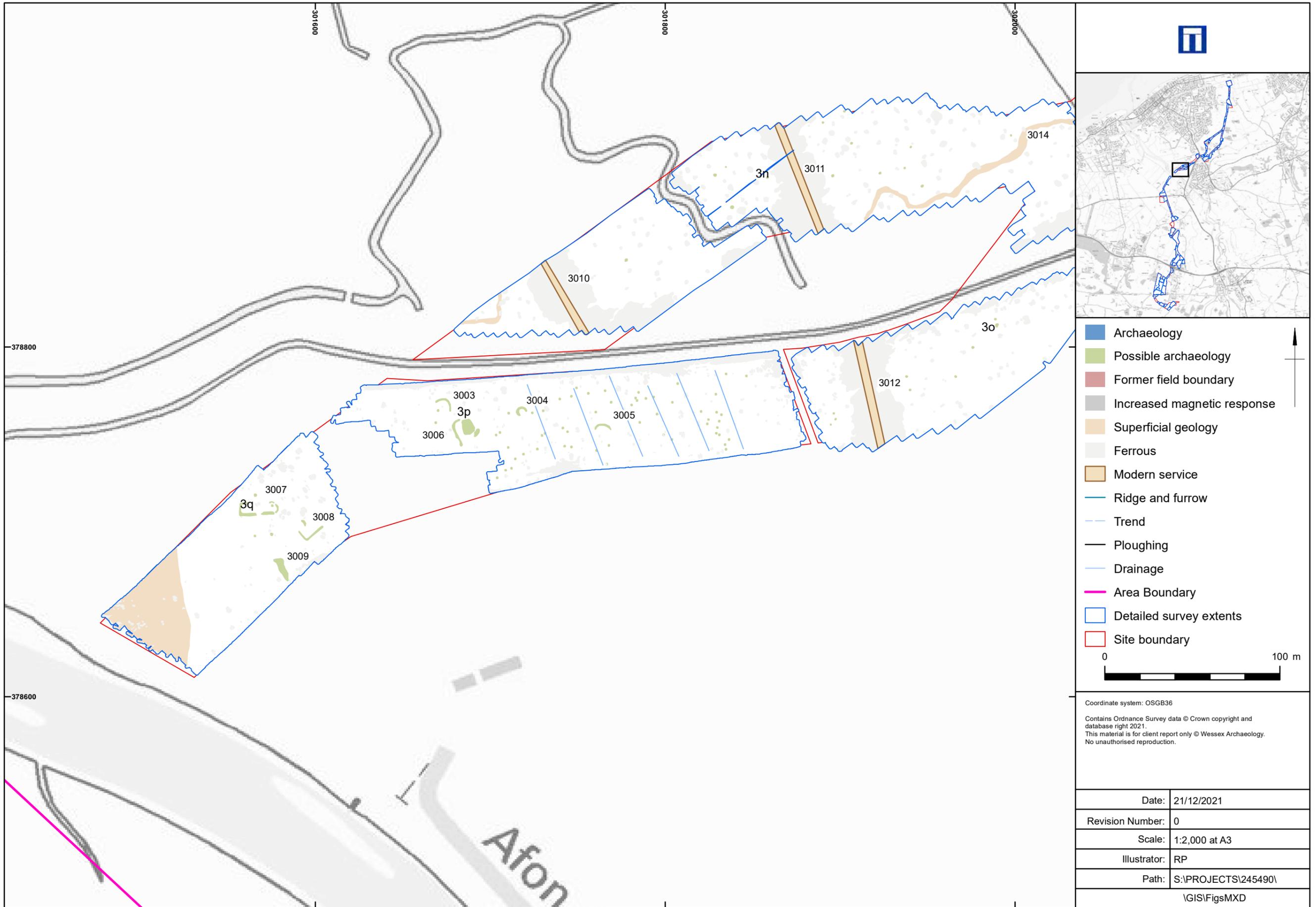
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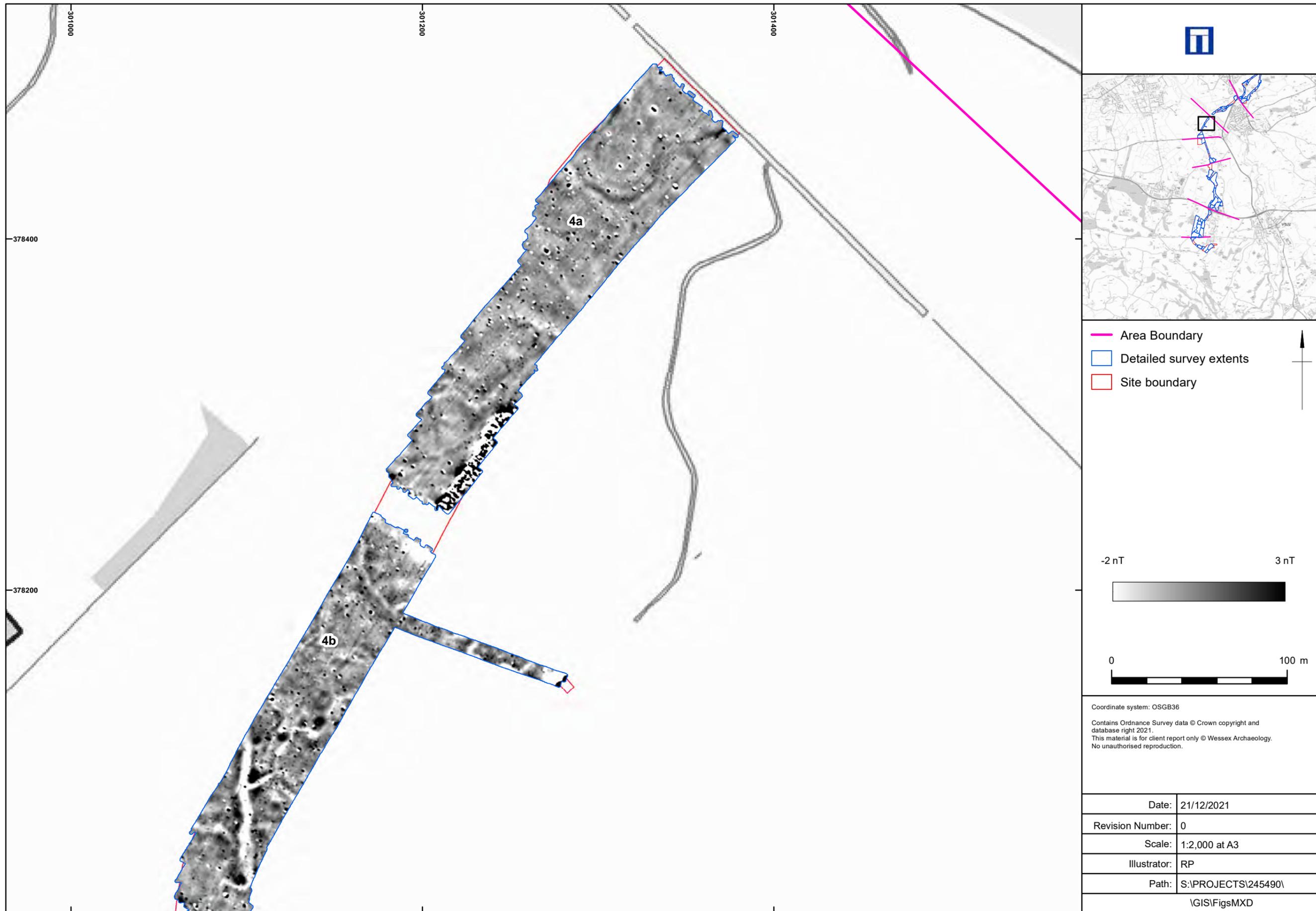


Detailed gradiometer survey results: greyscale plot Area 3 (south)



Detailed gradiometer survey results: interpretation Area 3 (south)

Figure 21

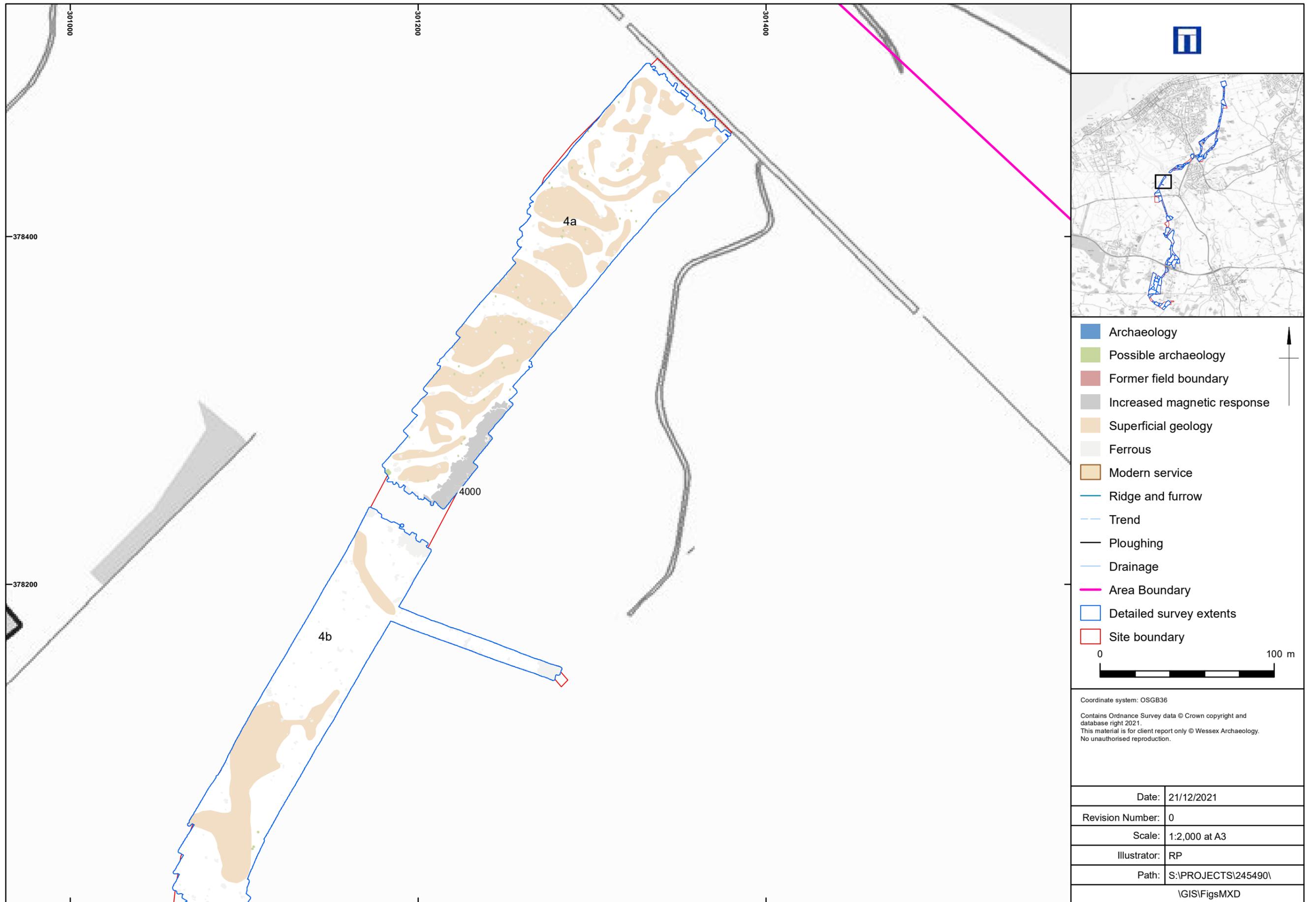


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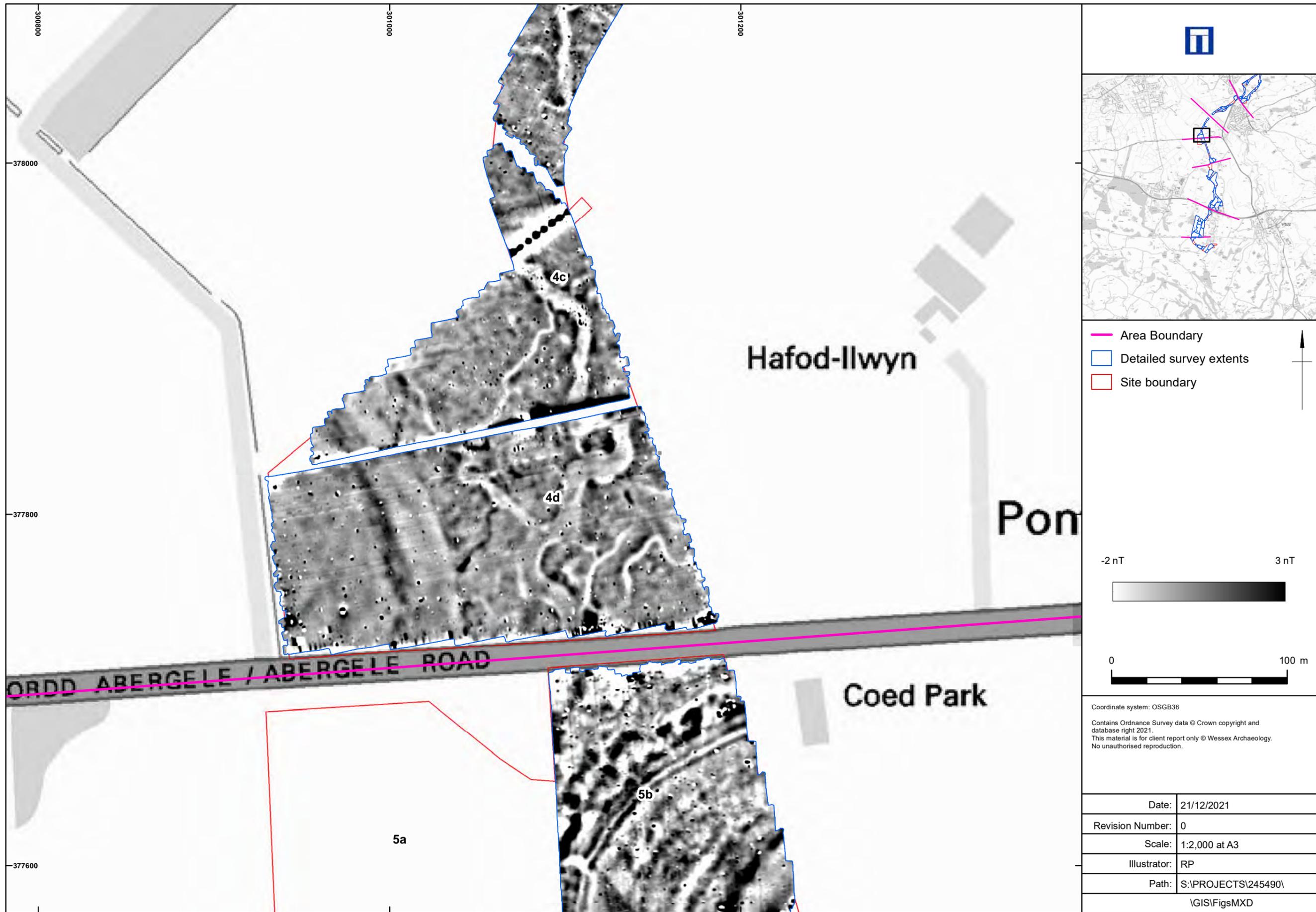
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Figure 22



Detailed gradiometer survey results: interpretation Area 4 (north)

Figure 23

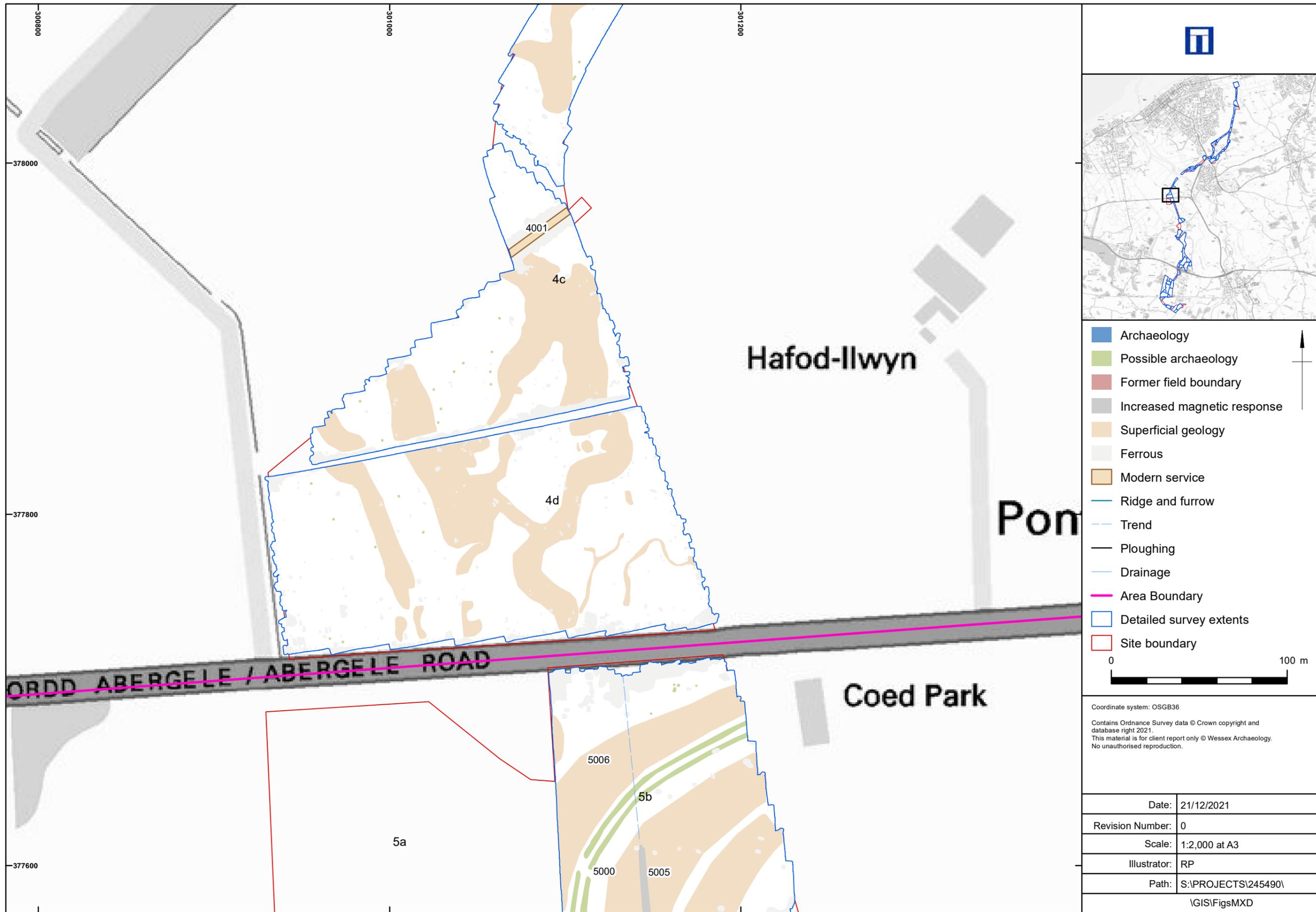


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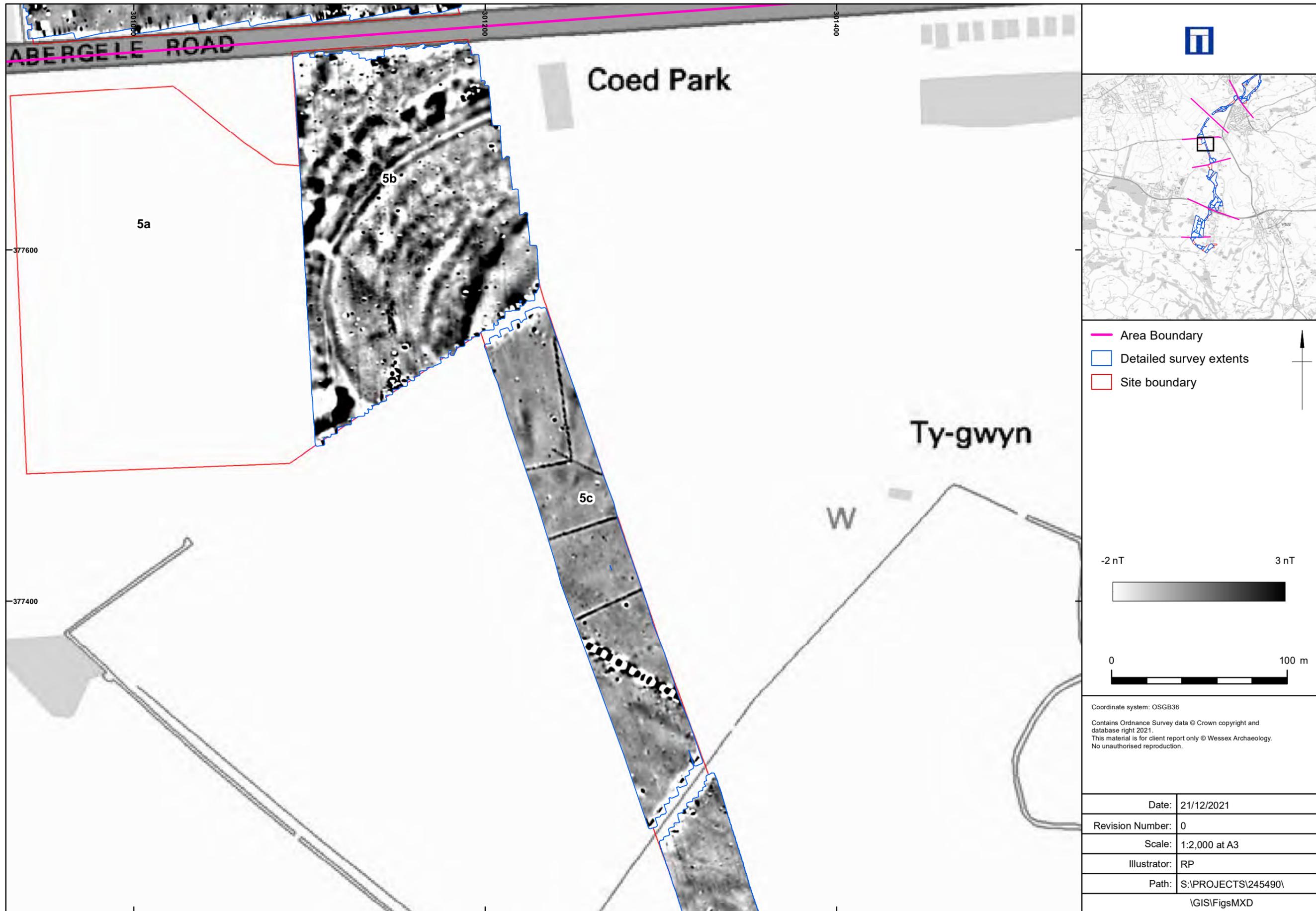
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Figure 24



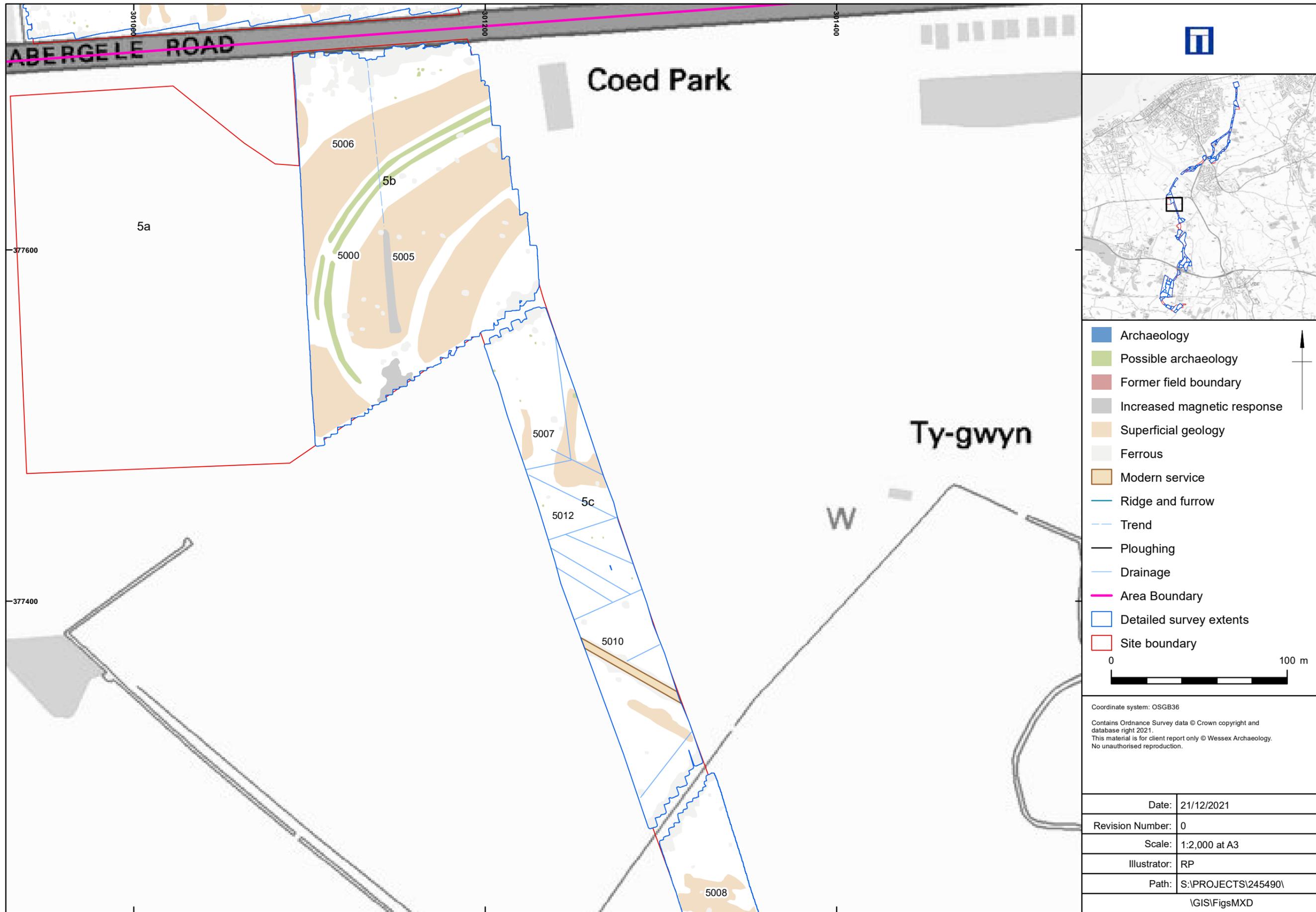
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Figure 25



Detailed gradiometer survey results: greyscale plot Area 5 (north)

Figure 26

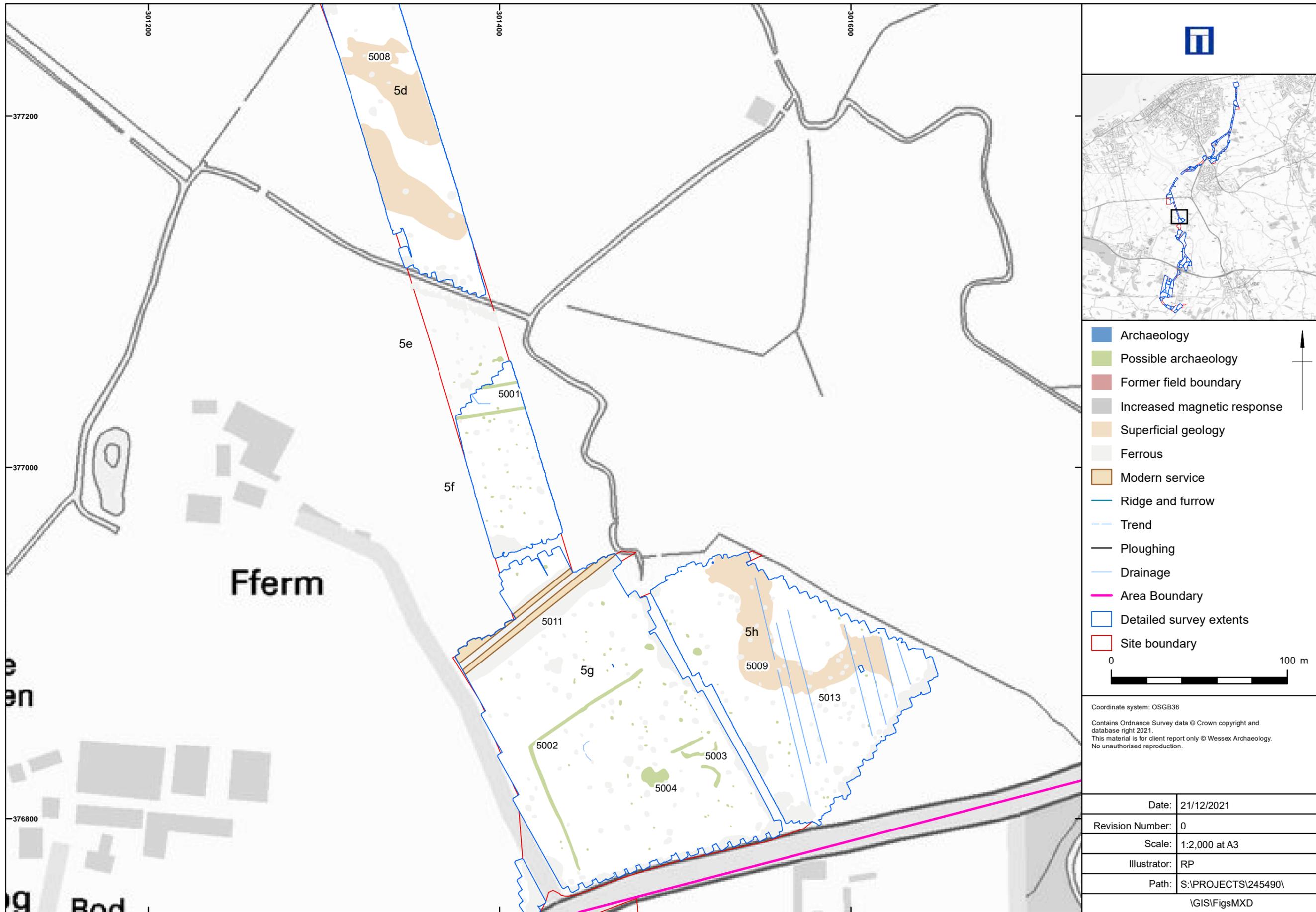


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Figure 27



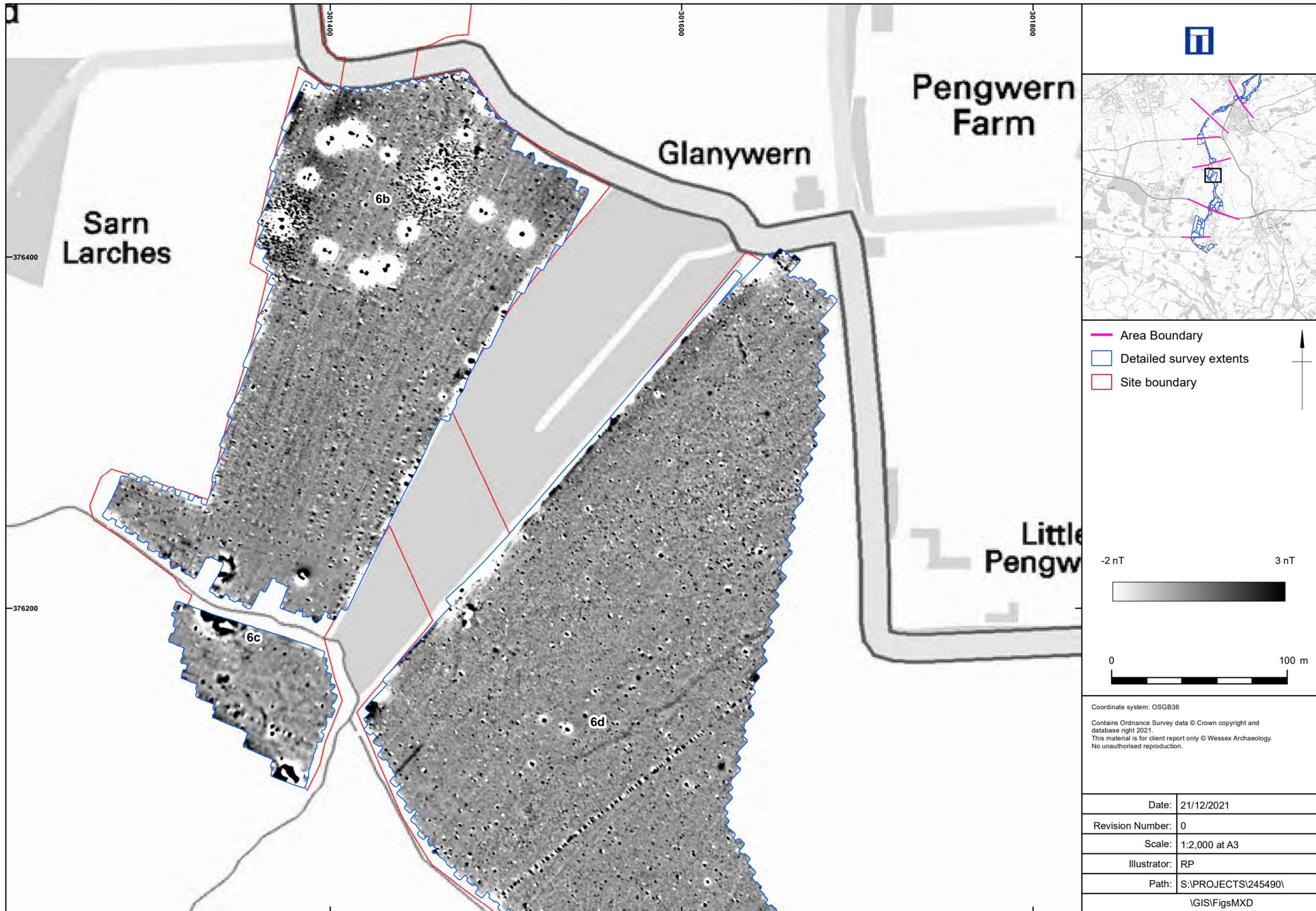
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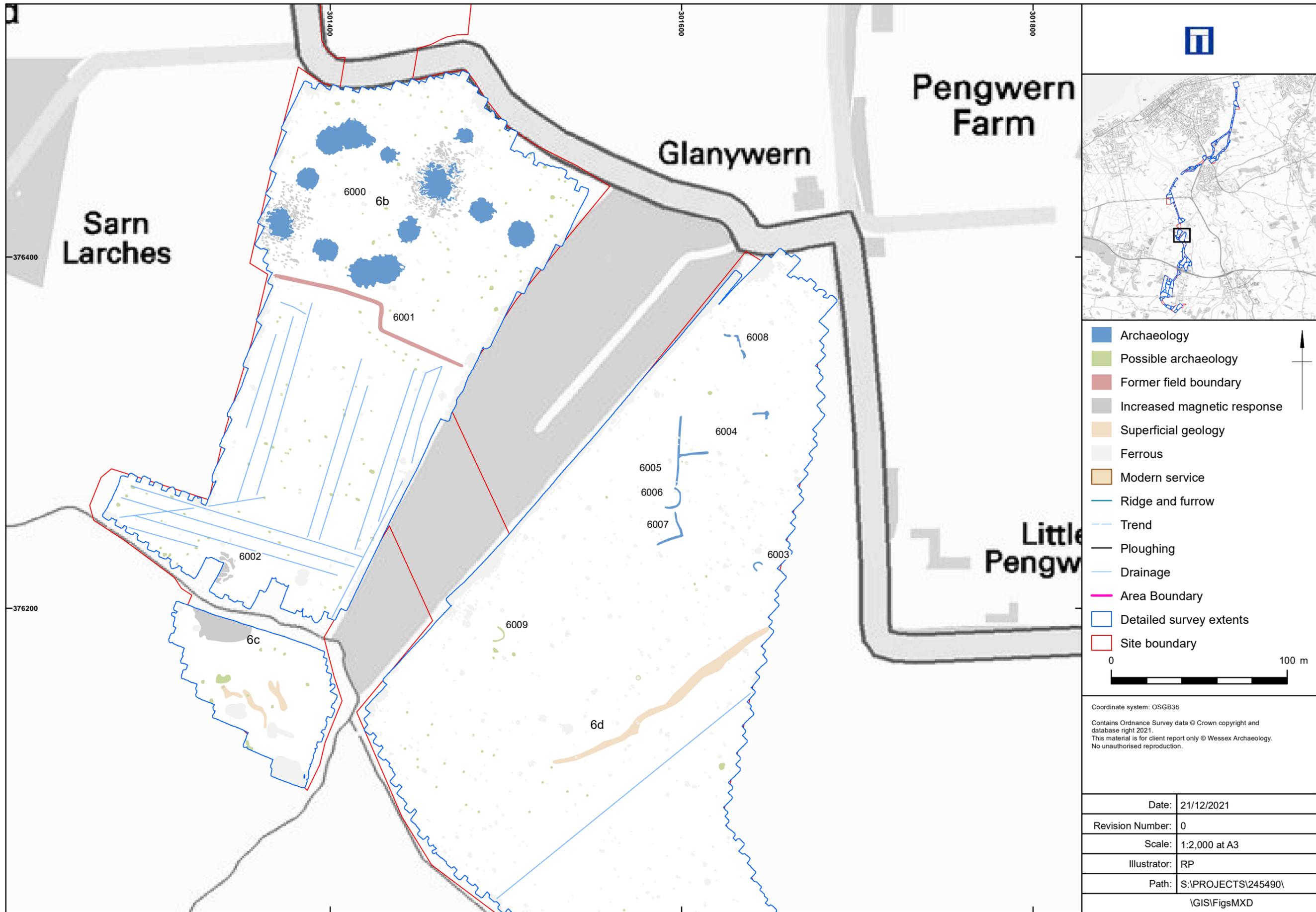
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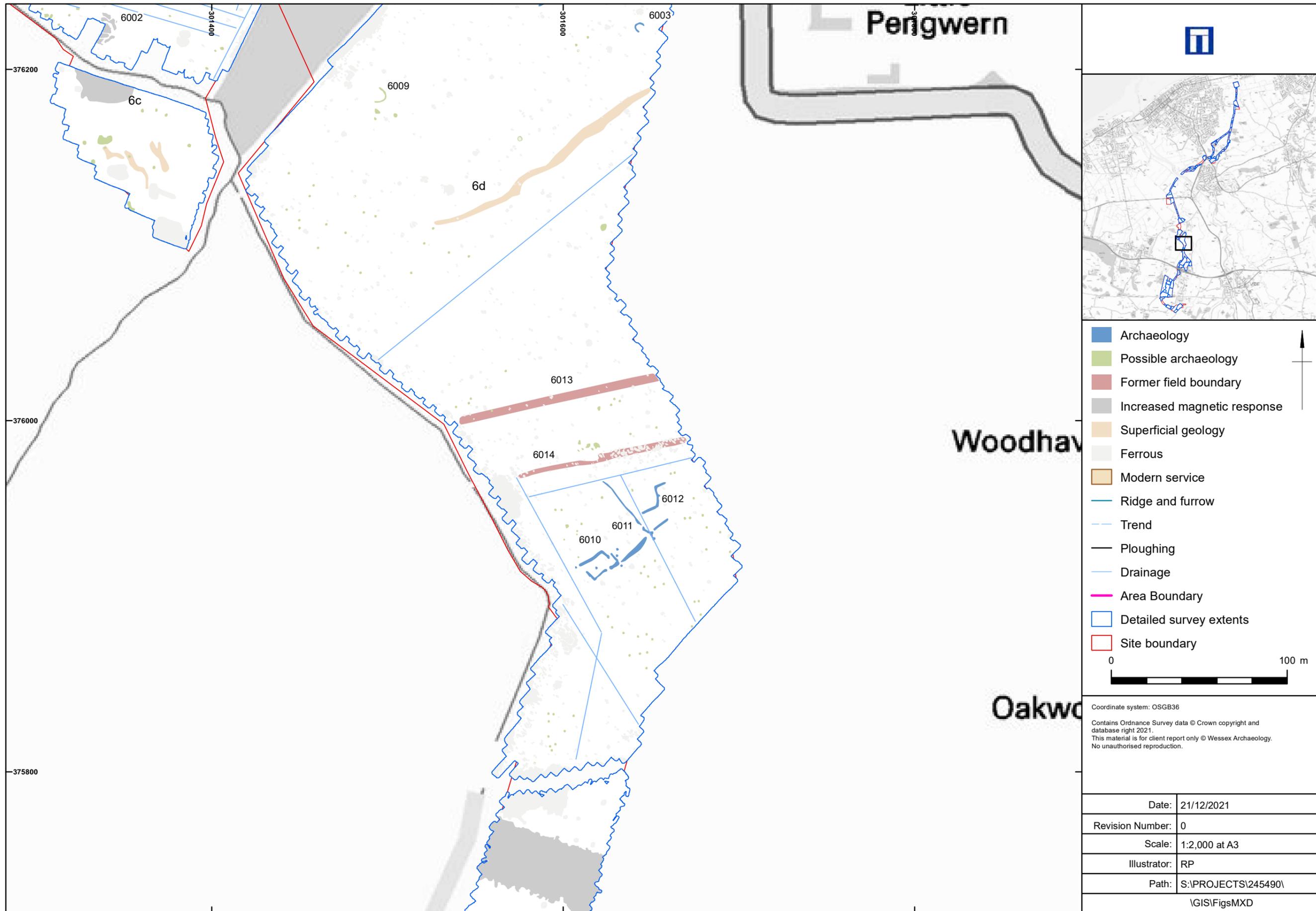
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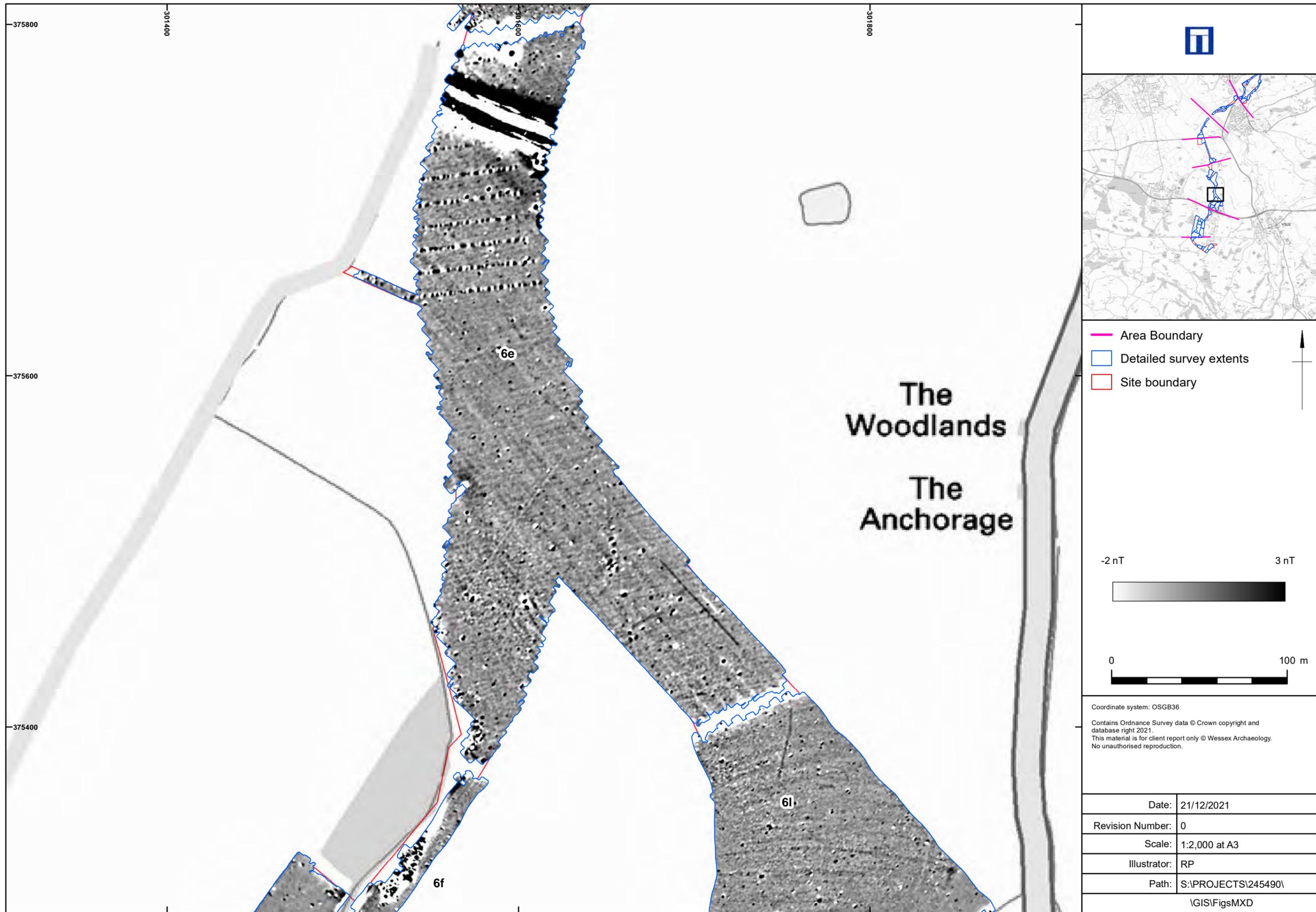
Detailed gradiometer survey results: interpretation Area 6 (north)



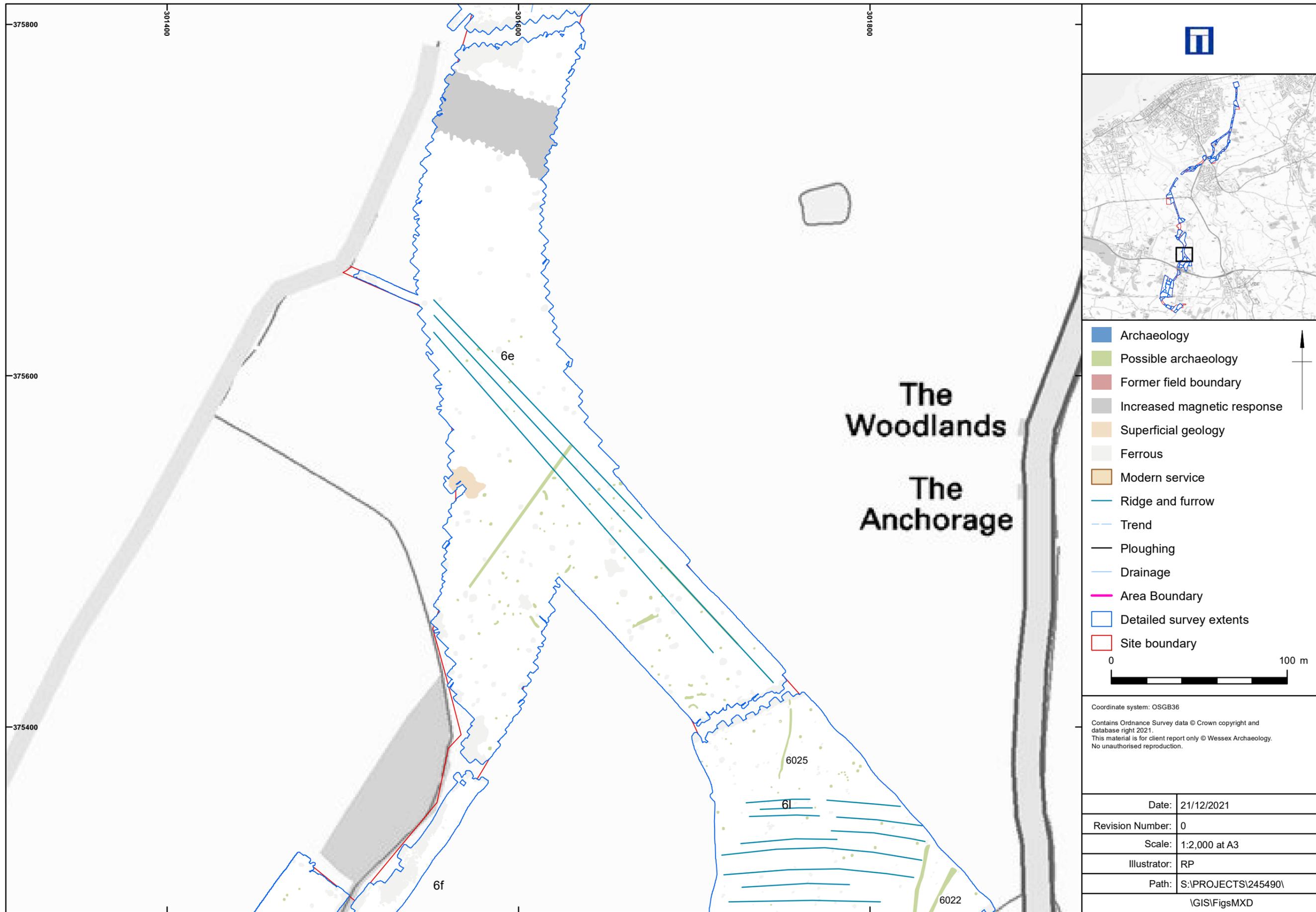
Detailed gradiometer survey results: greyscale plot Area 6 (centre)



Detailed gradiometer survey results: interpretation Area 6 (centre)



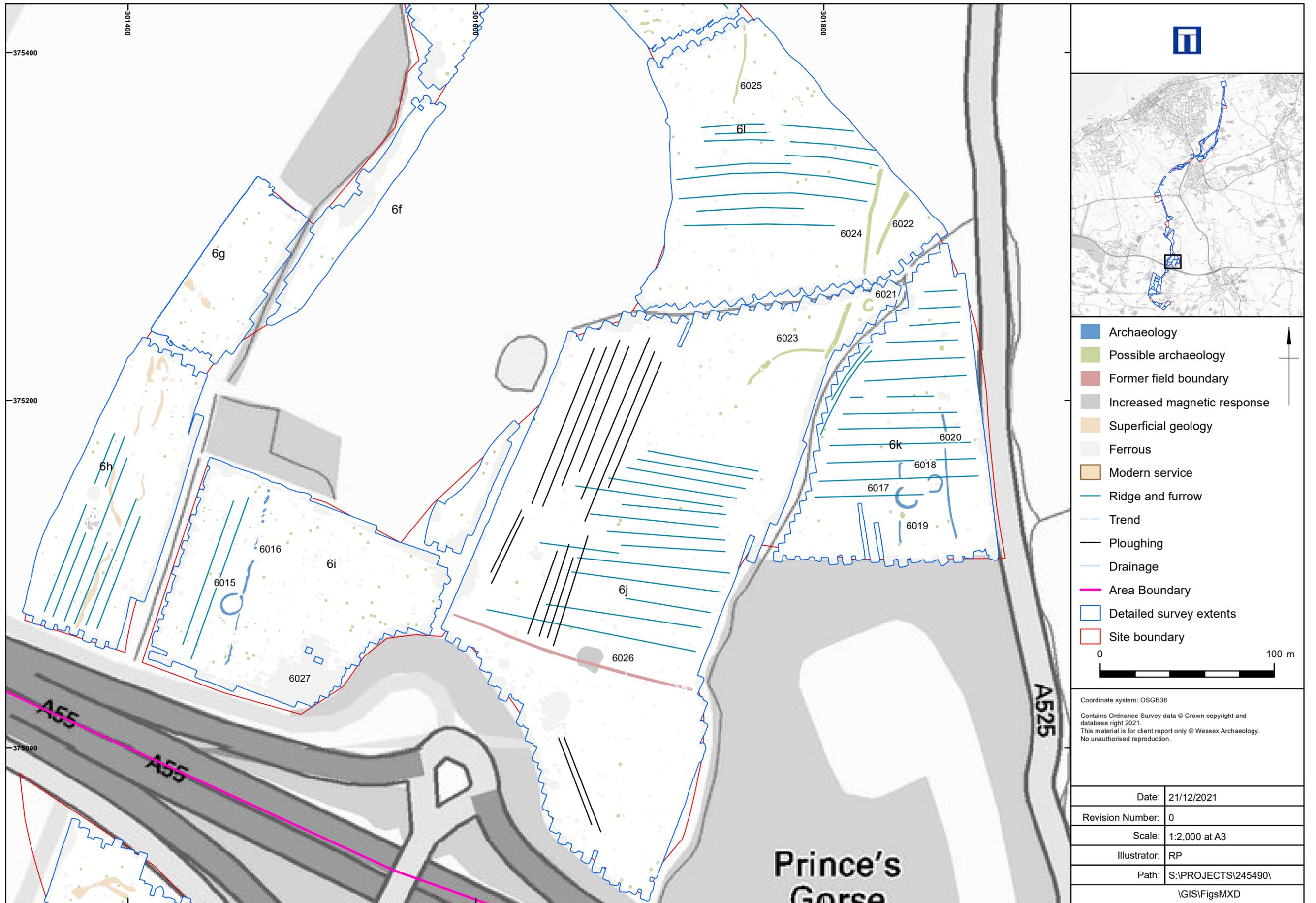
Detailed gradiometer survey results: greyscale plot Area 6 (centre/south)



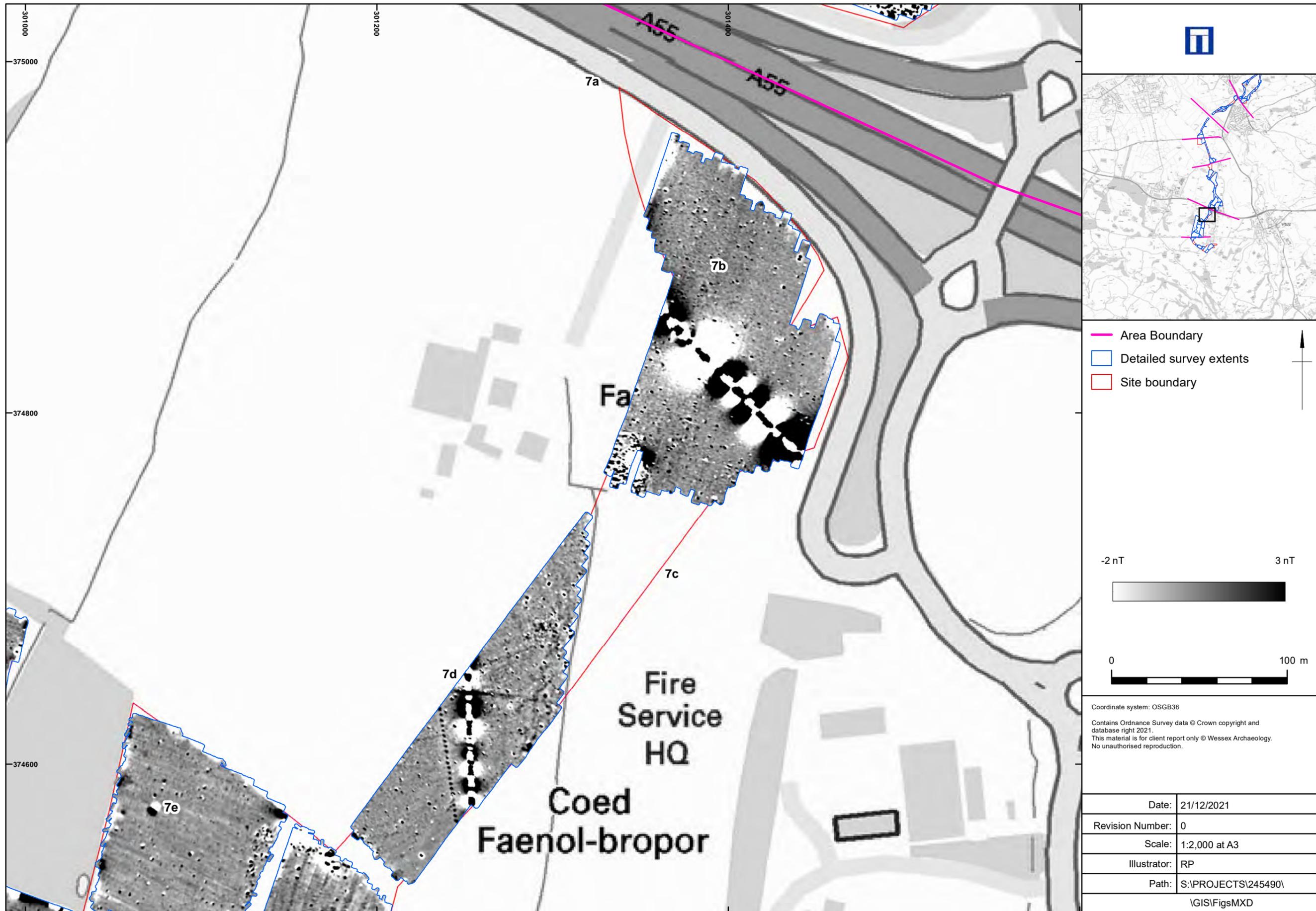
Detailed gradiometer survey results: interpretation Area 6 (centre/south)



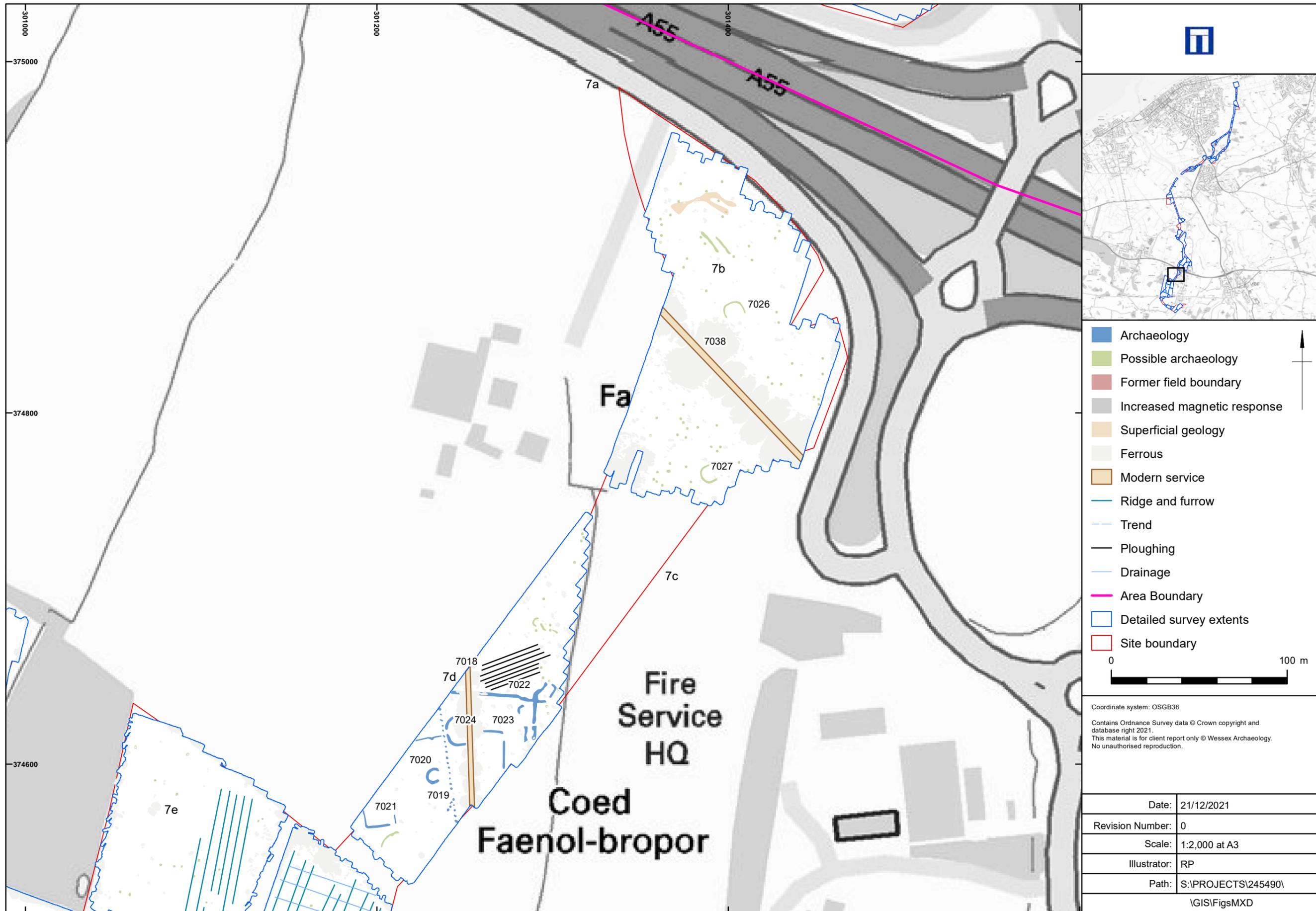
Detailed gradiometer survey results: greyscale plot Area 6 (south)



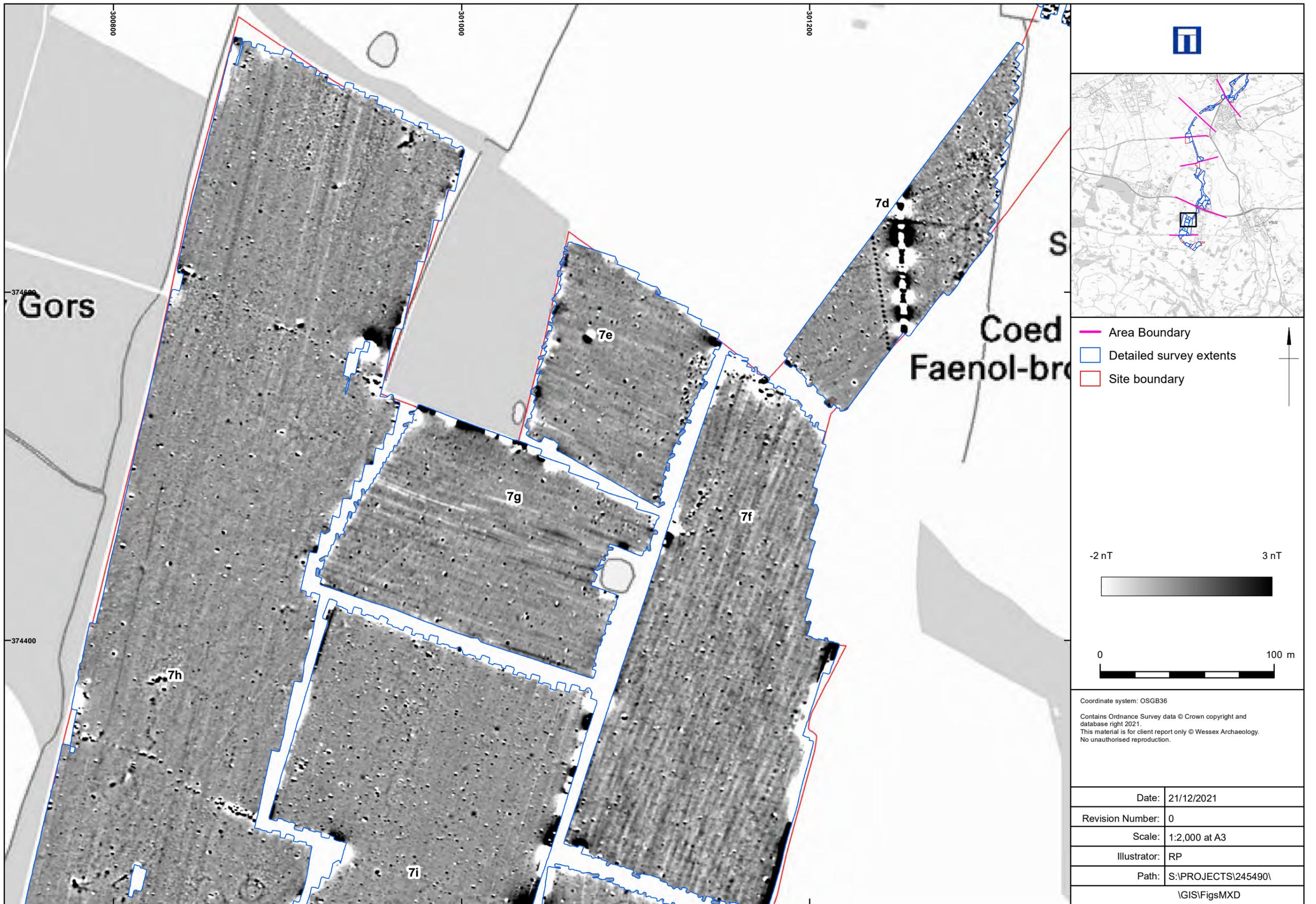
Detailed gradiometer survey results: interpretation Area 6 (south)



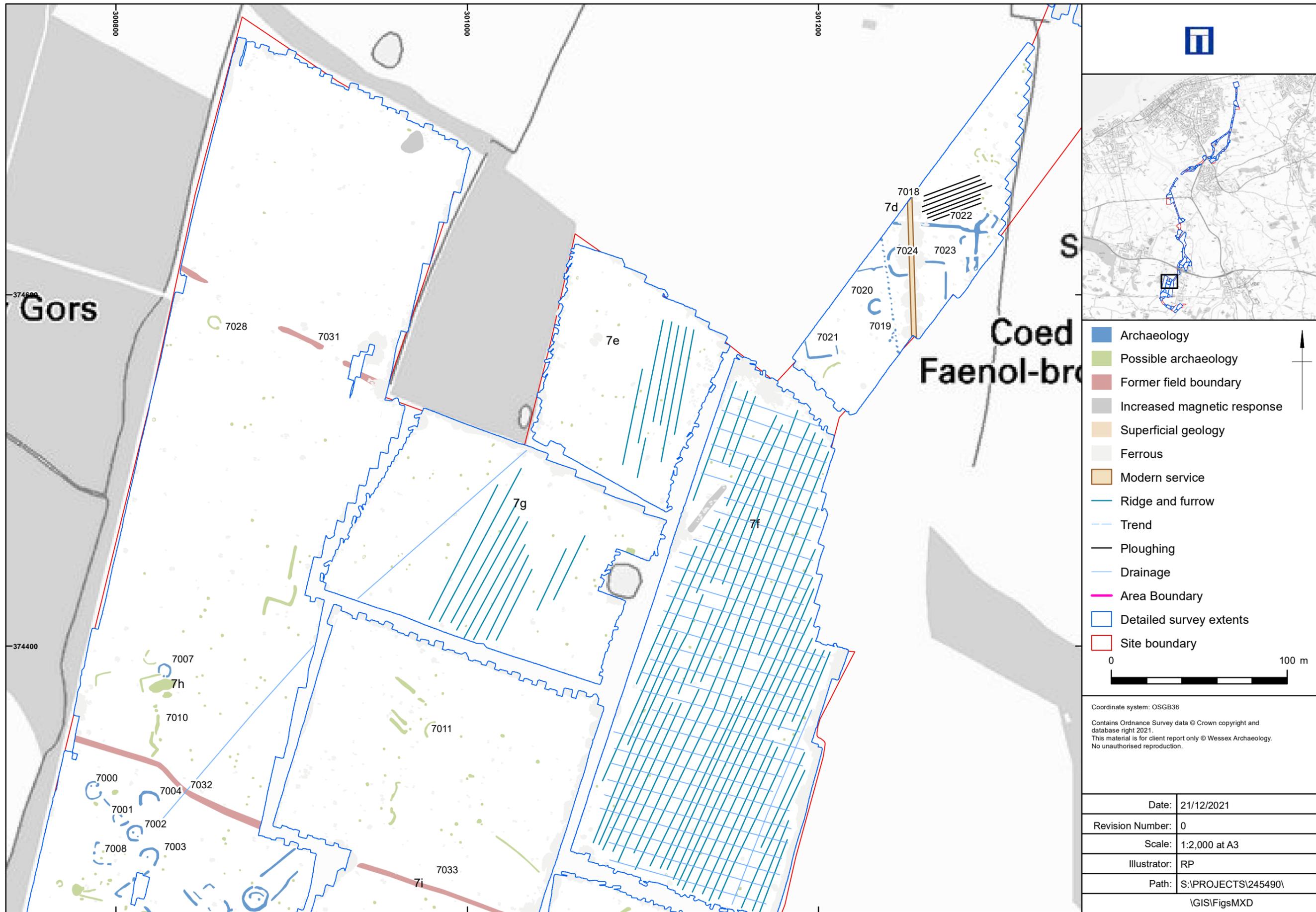
Detailed gradiometer survey results: greyscale plot Area 7 (north)



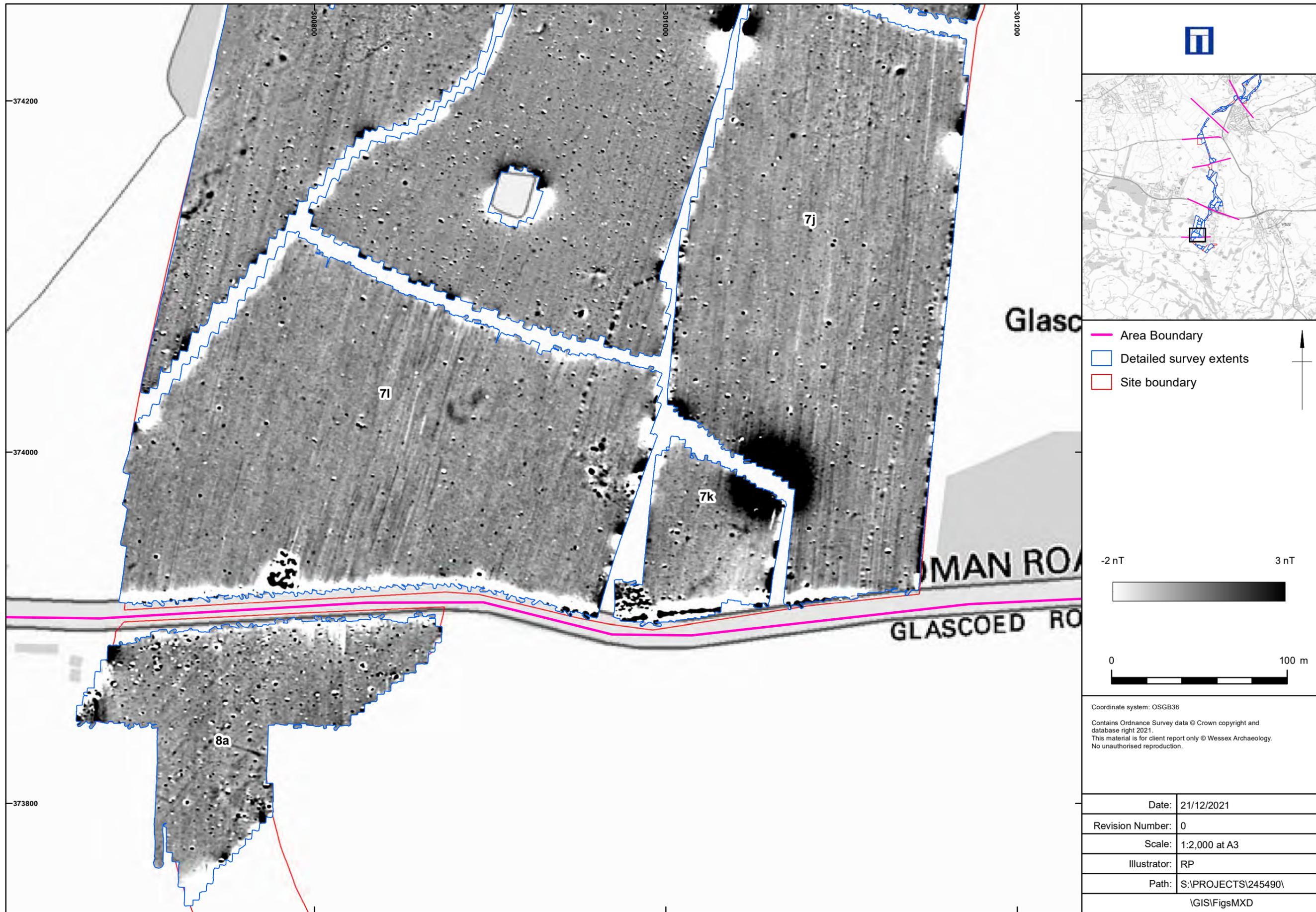
Detailed gradiometer survey results: interpretation Area 7 (north)



Detailed gradiometer survey results: greyscale plot Area 7 (centre)

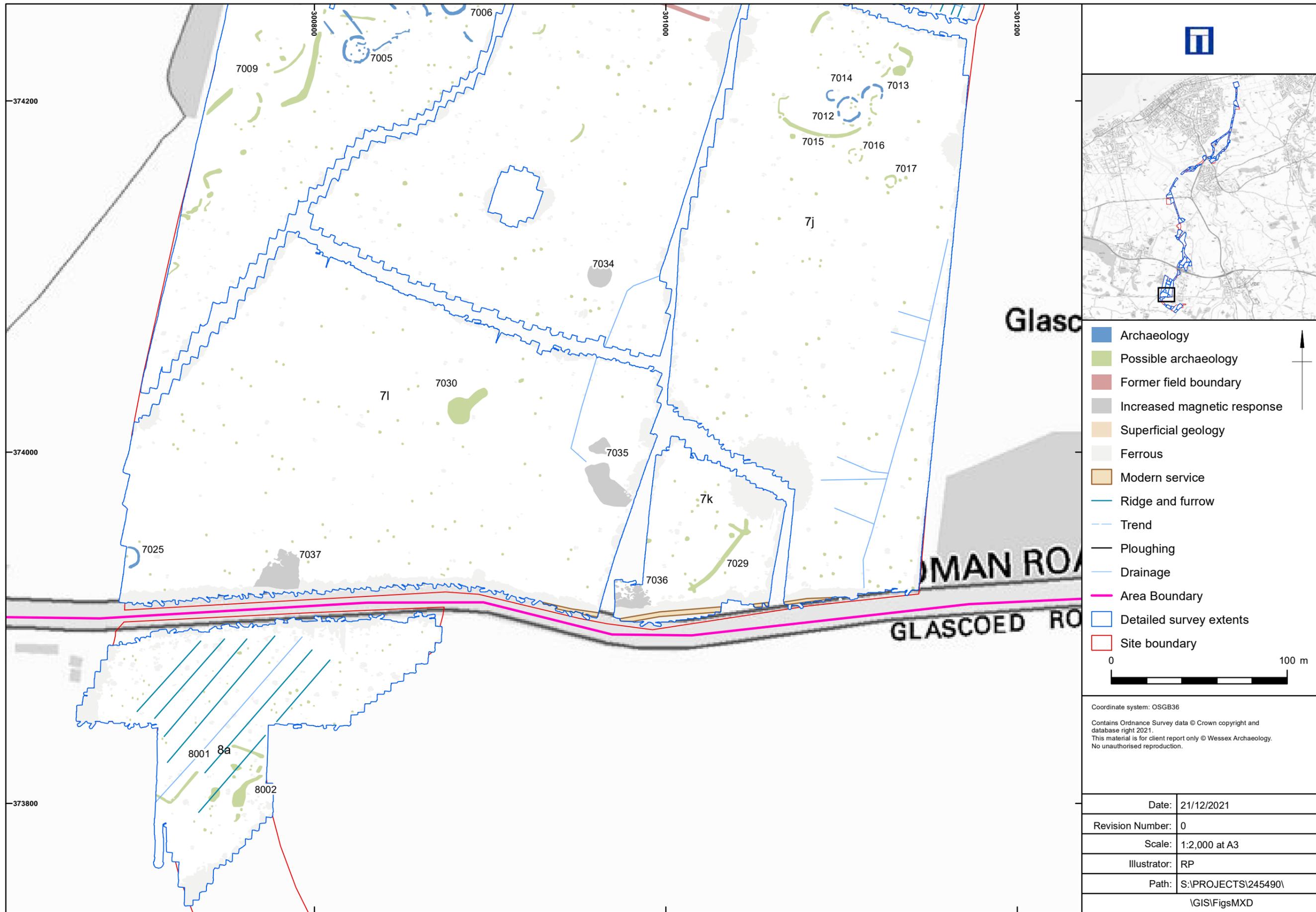


Detailed gradiometer survey results: interpretation Area 7 (centre)

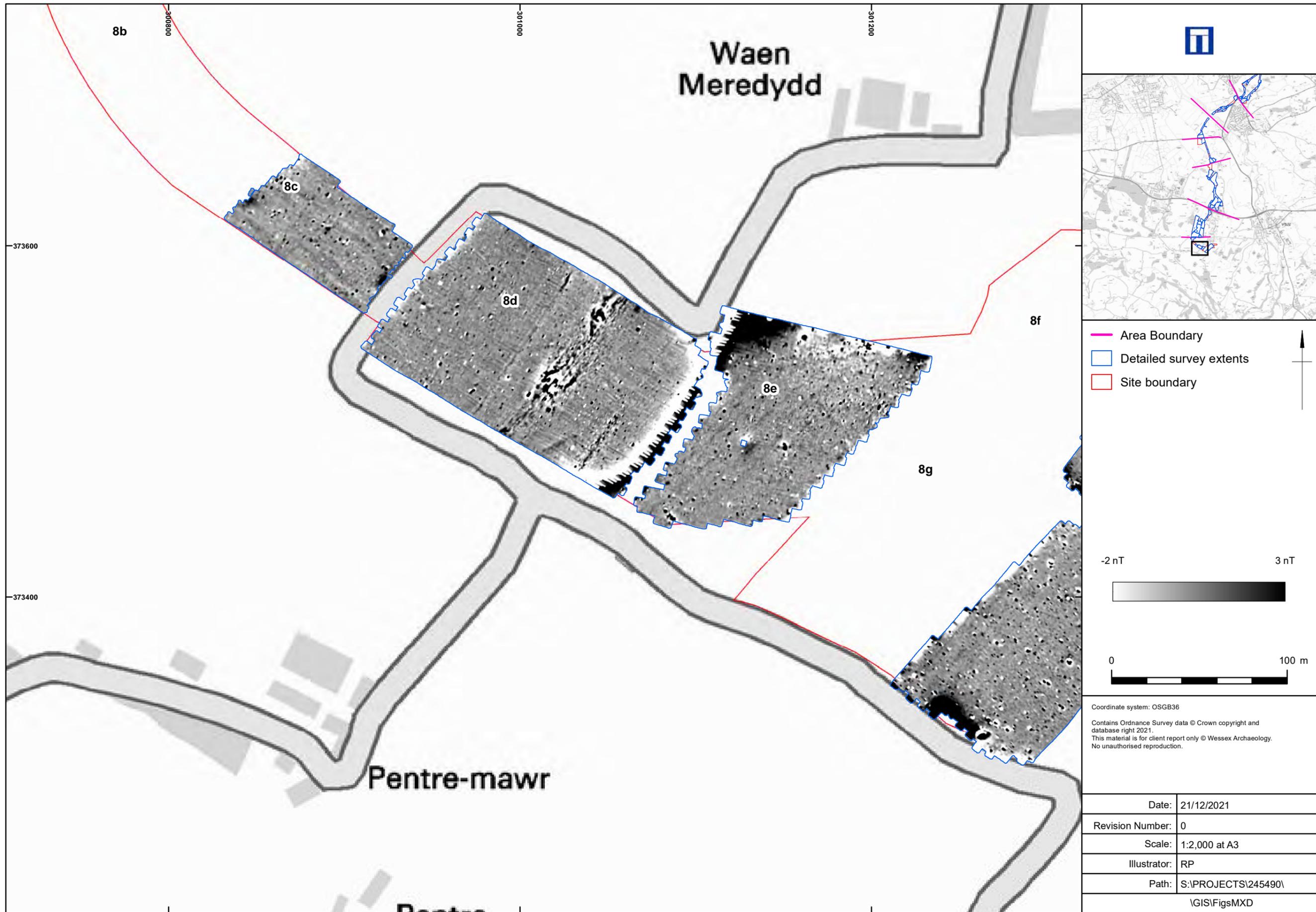


Detailed gradiometer survey results: greyscale plot Area 7 (south) / Area 8 (West)

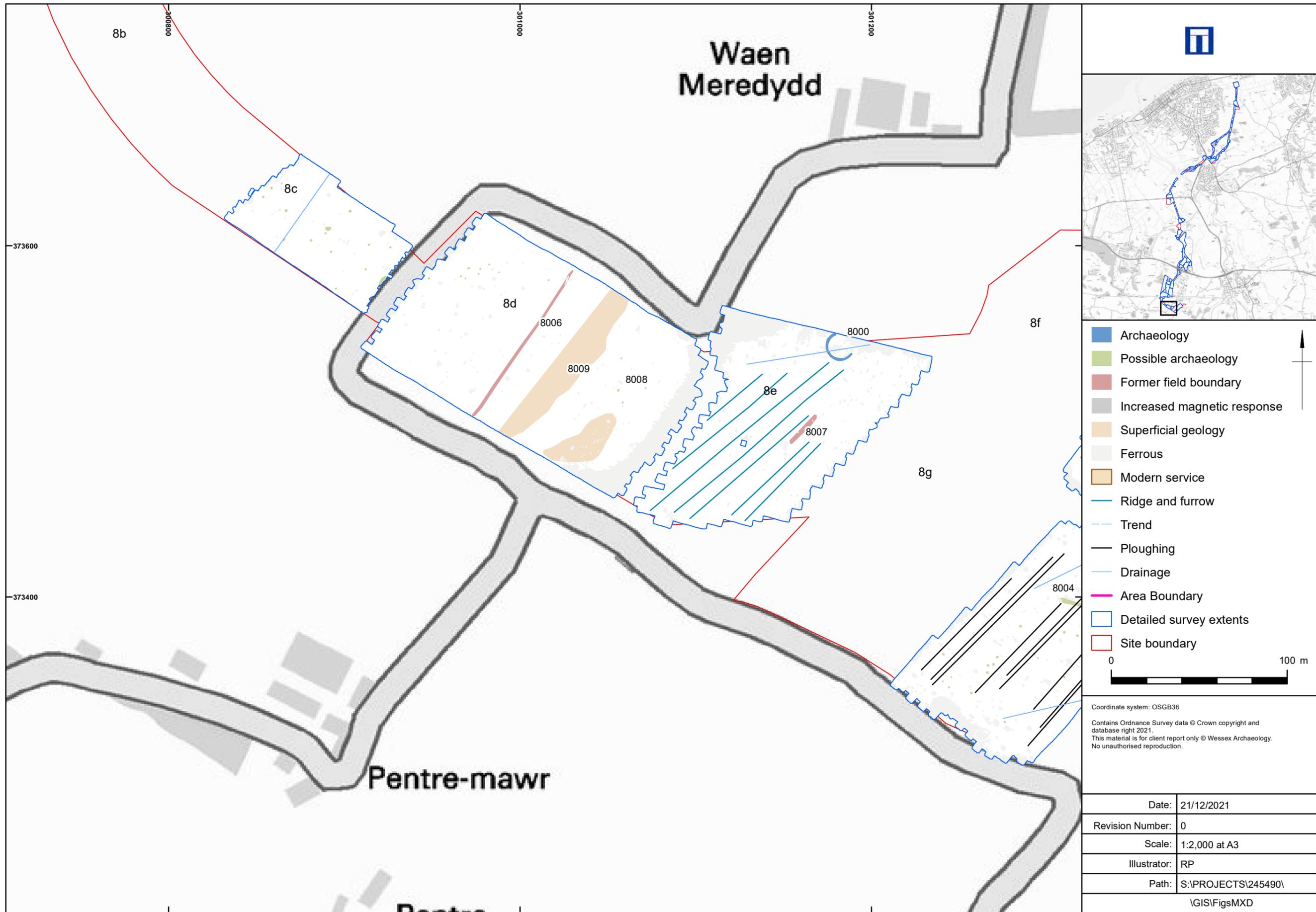
Figure 42



Detailed gradiometer survey results: interpretation Area 7 (south) / Area 8 (West)



Detailed gradiometer survey results: greyscale plot Area 8 (centre)



Coordinate system: OSGB36
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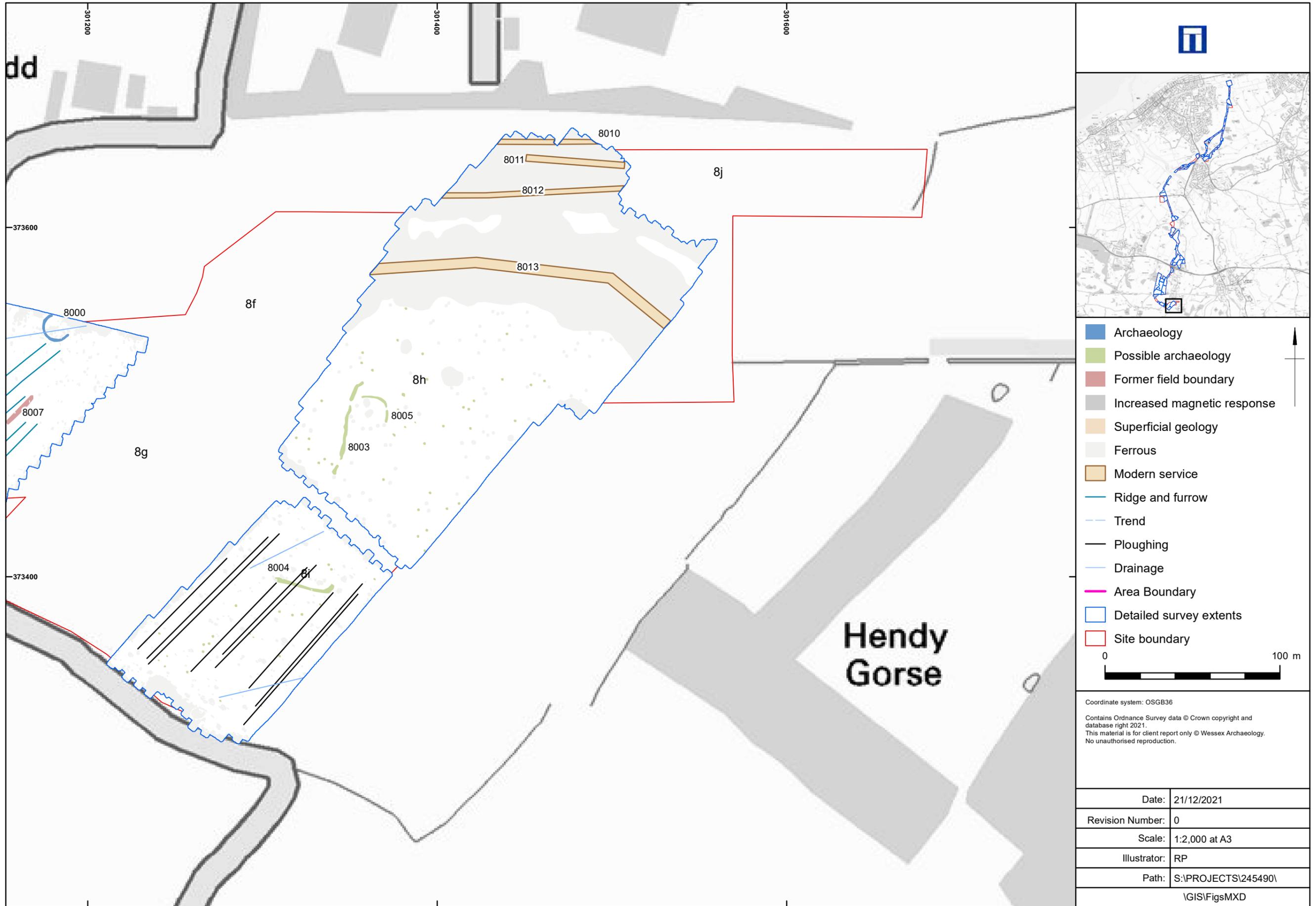
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Detailed gradiometer survey results: interpretation Area 8 (centre)

Figure 45



Detailed gradiometer survey results: greyscale plot Area 8 (east)



Detailed gradiometer survey results: interpretation Area 8 (east)

Figure 47



APPENDICES

Appendix 1: Survey Equipment and Data Processing

Survey methods and equipment

The magnetic data acquired using a non-magnetic cart fitted with 4x Bartington Grad-01-1000L magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03 nT over a ± 100 nT range, and measurements from each sensor are logged at intervals of 0.25 m. All of the data are then relayed to a Leica Viva CS35 tablet, running the MLgrad601 program, which is used to record the survey data from the array of Grad601 probes at a rate of 10 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The magnetic data acquired using a non-magnetic cart fitted with four SenSys FGM650/3 magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03 nT over a ± 100 nT range, and measurements from each sensor are logged at intervals of 0.08 m. All of the data are then relayed to a Leica Viva CS35 tablet, running the MLgrad601 program, which is used to record the survey data from the array of probes at a rate of 20 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Leica Viva system with rover and base station. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125 m intervals along traverses spaced up to 0.25m apart.

Post-processing

The magnetic data collected during the detail survey are downloaded from the Bartington cart system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

The cart-based system generally requires a lesser amount of post-processing than the handheld Bartington Grad 601-2 fluxgate gradiometer instrument. This is largely because mounting the



gradiometers on the cart reduces the occurrence of operator error; caused by inconsistent walking speeds and deviation in traverse position due to varying ground cover and topography.

Typical data and image processing steps may include:

- GPS Destripe – Determines the median of each transect and then subtracts that value from each datapoint in the transect. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.
- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).
- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies. XY trace plots are available upon request.
- Greyscale – Presents the data in plan using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.



Appendix 2: Geophysical Interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



Appendix 3: OASIS form

Project Details:

Project name		Awel y Mor Offshore Windfarm			
Type of project		Detailed gradiometer survey (Field evaluation)			
Project description		A gradiometer survey was conducted over land between the coastline East of Rhyl, through the west of Rhuddlan, and to the West of St. Asaph, Denbighshire, Wales (NE limit of scheme NGR 303703 382186, to SW limit of scheme NGR 301287 373311). The project was commissioned by Awel y Môr Offshore Wind Farm with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site as the route of cabling between an offshore windfarm and onshore substation. The detailed gradiometer survey has been successful in detecting anomalies of archaeological origin. These are prevalent across much of the southern half the scheme specifically Area 6, 7 and 8. Three distinct areas of probable settlement activity have been identified in Area 7. These comprise numerous circular ring-ditch features as well as recti-linear, curvi-linear and linear ditch-like features forming networks of enclosures and other boundary features that are likely to indicate earlier iterations of field systems in the landscape. Such features can indicate settlement activity such as funerary monuments or roundhouses which can date to the Neolithic – Iron Age period. Recti-linear features are more prevalent across later periods such as the Iron Age – Romano-British, or even early Iron Age period. It is not possible to date recti-linear features using the geophysical survey alone and the relative lack of evidence pertaining to this period in the surrounding landscape suggests an early medieval origin. Further investigation would be required to confirm this.			
Project dates		Start: 26-04-2021		End: 01-06-2021	
Previous work		Yes			
Future work		Not known			
Project Code:	245490	HER event no.	N/A	OASIS form ID:	wessexar1-424287
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.					
Site Status		None			
Land use		Cultivated Land 3 – Operations to a depth of more than 0.25 m			
Monument type				Period	
Project Location:					
Site Address	Land between Rhyl and Bodelwyddan Substation			Postcode	Various
County	Denbighshire	District	Maritime (Below WMLS)	Site Name	Awel y Mor
Study Area	140 ha	Height OD	5 – 52 m aOD	NGR	303703 382186 301287 373311
Project Creators:					
Name of Organisation		Wessex Archaeology			
Project brief originator		Awel y Môr Offshore Wind Farm	Project design originator		Wessex Archaeology
Project Manager		Tom Richardson	Project Supervisor		Chris Hirst
Sponsor or funding body		Awel y Môr Offshore Wind Farm	Type of Sponsor		
Project Archive and Bibliography:					
Physical archive	N/A	Digital Archive	Geophysical survey and report	Paper Archive	N/A
Report title	Awel y Mor Offshore Windfarm Detailed Gradiometer Survey Report			Date	2021
Author	Wessex Archaeology	Description	Unpublished report	Report ref.	245490.03



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