

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
Wind Prospect Developments Ltd

Boundary Lane Wind Farm  
near Whittonstall  
Northumberland

geophysical survey

report 2399  
May 2010



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## 1. Summary

### The project

- 1.1 This report presents the results of a geophysical survey conducted in advance of a proposed wind farm development at Boundary Lane, near Whittonstall in Northumberland. The works comprised geomagnetic surveys totalling 5.64ha.
- 1.2 The works were commissioned by Wind Prospect Developments Ltd and conducted by Archaeological Services Durham University.

### Results

- 1.3 Former field boundaries were identified in Areas 1, 3 and 5.
- 1.4 Probable soil-filled features of possible archaeological origin were identified near the junction of Areas 2 and 6, and in Area 3. In each case the features are of limited extent, presumed to have been truncated by ploughing.
- 1.5 Evidence for probable *in situ* iron-working was detected in Area 5. It is likely that features associated with iron-working are present, including the possible base of one furnace, in addition to a general spread of waste material. Water may have been supplied to this small-scale industrial area from a former drainage ditch and associated channel to the south and west. This area of activity does not extend towards the proposed development footprint.
- 1.6 No traces of former ridge and furrow cultivation were identified.
- 1.7 Land drains were detected in each survey area.

## 2. Project background

### Location (Figures 1 & 2)

- 2.1 The study area was located to the north of Boundary Lane and to the south of Whittonstall, in the civil parish of Shotley Low Quarter, Northumberland (NGR centre: NZ 074 561). Five surveys totalling 5.64ha were conducted in three land parcels. The proposed development area is surrounded on all sides by farmland with belts of trees to the north and east.

### Development proposal

- 2.2 The proposed development comprises a three-turbine wind farm, associated access and a construction compound. The footprint of the proposed development covers approximately 1.4ha. A planning application was submitted by Wind Prospect Developments Ltd to Tynedale District Council in May 2009.

### Objectives

- 2.3 The geophysical survey was undertaken in order to:
1. clarify the results of the cultural heritage assessment included within the Environmental Statement (Wind Prospect Developments Ltd 2009)
  2. establish the location and extent of an area of industrial slag, probably indicative of a metal-working site, identified to the east of turbine T3 but outwith the footprint of the proposed development
  3. assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the development

### Methods statement

- 2.4 The surveys have been undertaken in accordance with a brief prepared by Peter Cardwell for Wind Prospect Developments Ltd, and approved by Northumberland County Council, and a Written Scheme of Investigation prepared by Archaeological Services Durham University. The survey covered the principal components of the wind farm, namely the turbine foundations and associated areas of hardstanding, the construction compound and all lengths of access road, together with an additional area around each of these locations.

### Dates

- 2.5 Fieldwork was undertaken on 22nd and 23rd April 2010. This report was prepared for 6th May 2010.

### Personnel

- 2.6 Fieldwork was conducted by Duncan Hale and Richie Willis (Supervisor). Geophysical data processing and report preparation were conducted by Duncan Hale, the Project Manager, with illustrations by Janine Watson.

### Archive/OASIS

- 2.7 The site code is **EBL10**, for **Ebchester Boundary Lane 2010**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course.

Archaeological Services Durham University is registered with the **Online AccesS** to the **Index of archaeological investigationS** project (**OASIS**). The OASIS ID number for this project is **archaeol3-76497**.

### **3. Historical and archaeological background**

3.1 The information below is taken from the survey brief and summarises information presented in the desk-based assessment (Wind Prospect Developments Ltd 2009).

#### **The prehistoric period (up to AD 70)**

3.2 No sites or finds of prehistoric date are recorded within the footprint of the proposed development or within the immediate vicinity. The closest recorded finds of earlier prehistoric date are worked tools and waste flakes of Mesolithic and Neolithic date recovered from the eastern side of Greymare Hill some 1.9km to the west. Barbed and tanged arrowheads of Bronze Age date have also been recovered from Greymare Hill, while burial mounds have been recorded further afield at Apperley Dene, near Shotley Bridge and at Broomhill near Mickley.

3.3 No sites or finds of Iron Age date are recorded within the area of the proposed development or the immediate vicinity. Evidence of Iron Age occupation is located further to the east, with a possible promontory fort (now quarried away) being located on an elevated plateau to the north-west of Ebchester, possibly on the site of earlier prehistoric activity. A subrectangular cropmark enclosure of probable Iron Age date has been recorded by aerial photography some 900m to the north-east of the proposed development and the extent more recently confirmed by geophysical survey.

#### **The Roman period (AD 70 to 5th century)**

3.4 There are no sites or finds of Roman date recorded within the footprint of the proposed wind farm or the immediate vicinity. The development site is however located some 700m to the south of the Dere Street Roman road running on a north-west to south-east alignment to the north-east (and mostly along the route of the existing B6309). The road at this location represents that length between the Roman forts or stations located at Ebchester to the south-east and Corbridge to the north-west. The course of Dere Street was a focus for settlement, and initially at least principally military settlement, although a possible Roman fort site identified some 370m to the north of Dere Street and north-east of Whittonstall Hall Farm has been discounted by recent evaluation (Archaeological Services Durham University 2009). The principal Roman settlement within the wider area was the fort or station located at Ebchester some 2.7km to the east of the proposed development, while a probable Romano-British farmstead is located on a ridge to the west of Dere Street near Apperley Dene, some 2.5km to the north-west of the proposed wind farm.

#### **The medieval period (5th century to 1540)**

3.5 There are no recorded sites or finds of medieval date within the footprint of the proposed development (with the possible exception of Highfield). Settlement prior to the Norman Conquest within the vicinity of the proposed development at Whittonstall is suggested from place-name evidence. The village of Whittonstall is located on the course of Dere Street, with a manor house located to the south that was excavated in advance of opencast mining. The land that made up the manor of Whittonstall was added to by ground taken out of unenclosed land, including what

later became a hamlet under the name of Newlands. There are references to cultivated and enclosed land (usually enclosed by a ditch and hedge) in documentary sources, and most of the manor appears to have been pasture land that had common rights. This included the wood within the common pasture, which was used to provide timber for building as well as free warren. There are also references to meadow land, and overall the manor appears to have predominantly been based upon pastoral agriculture.

- 3.6 Deserted settlements of medieval date are recorded within the vicinity of the proposed development. These include the vill of Fairley, located to the west in the area of Fairley Farm, and the possible settlement at Highfield, though this is less certain as it does not appear in early post-medieval rental lists.
- 3.7 Although the documentary sources suggest that the medieval settlements recorded within the vicinity were essentially agricultural, there is also evidence of extractive industry within the area during the medieval period. There is a reference to coal mines in Whittonstall in both 1292 and 1299, while in 1307 there was a law suit over iron mines in Whittonstall and Newlands involving the digging of ore without licence. The location of these mines is not recorded, but those of the coal mines at least can be presumed to be at similar locations to those recorded in the post-medieval period.

#### **The post-medieval period (1541 to 1899)**

- 3.8 In the post-medieval period the settlement pattern continued to be centred upon the two villages of Whittonstall and Newlands together with the smaller hamlet of Fairley, and the nature of the townships remained essentially agricultural and based upon livestock farming. The principal change in ownership came in 1715 when the estates were forfeited as a result of the involvement of James Radcliffe, the 3rd Earl of Derwentwater, in the 1715 Jacobite rebellion. In 1735 the estates passed to Greenwich Hospital, who remained the sole owners of the estate until it was sold to James Laycock in 1872. Throughout this period all of the land on the estate, including the proposed development area, was farmed by tenant farmers who held their land on a lease from Greenwich Hospital.
- 3.9 The only ridge and furrow cultivation surviving within the immediate vicinity of the proposed development (and therefore likely evidence for former common land holdings) is located in existing pasture fields immediately to the south and south-east. No surviving earthwork or aerial photographic evidence for ridge and furrow cultivation survives within the footprint of the proposed development.
- 3.10 Both land holdings and the field pattern within the area of the proposed wind farm changed in the first half of the 18th century. By the time the land was taken over by Greenwich Hospital the common holdings appear to have ended and a number of smaller farms established. However, after 1735 a division into larger more regular holdings was proposed; this had been carried out by 1740. A sketch for an estate map of 1805 represents the first detailed mapping of the area and indicates the field boundaries with the new farms, including Highfield to the west. The similar size and regular layout of the fields suggest that these were laid out at the same time as the reorganisation of the farms in the first half of the 18th century, hence the farms being considered “ancient enclosures” in 1805. The layout mapped in 1805 is the same as that shown on the subsequent tithe map of 1841 and includes all of the fields within which the proposed wind farm will be located. None of the field names

recorded on the 1841 tithe map suggests the presence of any previously unrecorded archaeological sites or activities within the footprint of the proposed development. Some of the names, such as those incorporating 'scroggs' or 'allery' in fields immediately to the south, suggest bush or brushwood and alders respectively, possibly indicating the type of landscape at the time of enclosure. Others such as 'hagg' refer to a fenced enclosure. Those incorporating 'pasture' suggest initial use of the land for grazing (all of the fields within the development footprint currently being arable).

- 3.11 The historic landscape character is therefore essentially that of 'surveyed enclosure', in this case mostly 18th century in date. The exceptions to this are areas of woodland, although Old Wood (formerly Old Field Wood) immediately to the east of the proposed turbines may be contemporary or earlier in date. The field boundaries within the footprint of the proposed development (excluding the northern edge) are mostly defined by modern post and wire fence lines and associated parallel streams or drainage ditches. Only occasional and intermittent lengths of hedgerow survive.
- 3.12 Although the area within the townships of Whittonstall and Newlands in the vicinity of the proposed development was essentially agricultural during this period, small scale industrial activity involving coal mining, ore mining and quarrying is also recorded. Coal mining is first recorded in the manor of Whittonstall in the late 13th century although these workings cannot be specifically related to any of those recorded in the post-medieval period. Bell pits identified near Whittonstall Sproats Farm to the north are believed to pre-date 1700. Other probable early workings are in the area of Greymare Hill to the west. Coal mining is recorded in a number of rental and rate lists in the post-medieval period from the 17th century onwards and in 1762 three collieries are recorded in Whittonstall. The coal working was essentially small in scale, and was both mined by local miners and used locally. However, during the 19th century a number of small pits were opened throughout Whittonstall and to a lesser extent in Newlands, possibly because the use of wood by the tenant farmers was restricted by the landlords. No coal mines of this date are recorded within the area of the proposed development or the immediate vicinity. The closest recorded mine shafts to the proposed turbines are those to the south-east of Whittonstall Hall Farm and immediately south of Morrowfield, located some 740m to the north-east and 870m to the east respectively. These mines do not appear to have been in use for any great length of time, as neither is mapped by the Ordnance Survey in 1865 while both sites are labelled as 'Old Shaft' by 1898.
- 3.13 The only recorded post-medieval ironstone workings are located some 2km to the west.
- 3.14 Evidence of industrial activity, comprising an area of industrial waste or slag, was identified during the site walkover inspection approximately 130m east of turbine T3. This was evident as an area of slag, mostly concentrated within an area of some 20m by 10m above the edge of a slope down to a former tributary for a stream to the west. The material has the appearance of 'tapped' slag from the iron smelting process, while analysis indicates a high proportion of iron and low sulphur content within the slag. The low sulphur content, in particular, suggests that the slag dates from before the introduction of coke as a fuel (i.e. before the 18th century) and may be of greater antiquity (P Clogg, pers comm).

- 3.15 Small scale quarrying is recorded throughout most of the surrounding area although the closest recorded quarries are those some 960m to the south along or to the south of the Yecklish Burn.
- 3.16 Other sites recorded within the area of the proposed development include buildings of post-medieval date, such as mills and farmhouses, and also a number of wells. None of these are located within the footprint of the proposed development although Greenlane Well (**NHER 9869**) is located some 500m to the north-east.

**The modern period (1900 to present)**

- 3.17 The principal change to the layout of the agricultural landscape within the area of the proposed development in the 20th century was that brought about by post-War opencast coal mining. This was mostly undertaken during the 1970s and was largely restricted to the areas to the north and west, extending to the west and north of Highfield as far as Whittonstall and eastwards to the B6309. To the east of Highfield the extent of the area was to the south of the existing access road (established as part of the opencasting). This appears to have included some of the area of the proposed construction compound and the field to the north of turbine T1. The area of opencast mining had been fully restored before 1982, with the layout of the fields that was established differing from the previous enclosure field pattern, and specifically as this was replaced by larger, more regular fields. The restoration also included extensive areas of new woodland plantations to the west and north of Highfield. Since this date a number of the field boundaries to the south within the footprint of the proposed development have also been removed to create larger fields, while during the post-War period most of the fields within the vicinity of the proposed development that were previously pasture (and specifically those in which turbines T2 and T3 would be located) have been brought under arable cultivation.

**4. Landuse, topography and geology**

- 4.1 At the time of survey the proposed development area comprised two fields of oilseed rape in the south and one field of cereal in the north. Erosion gullies are present along the western edge of Areas 1, 4 and 6, and along the southern edge of Area 2. A large manure heap occupies the north-western corner of Area 4 and a steel water trough is located on the field boundary at the southern end of Area 1. A large tree stands at the north-eastern edge of Area 5 (next to the area of iron-working slag), which prevented further survey in that direction.
- 4.2 The proposed development area occupies a gentle south-east facing slope to the east of Highfield Farm. The land slopes down from approximately 205m OD on the northern edge of the site to approximately 170m OD in the vicinity of turbine T2.
- 4.3 The solid geology within the area is Langsettian (Westphalian A) Sandstone, part of the Pennine Lower Coal Measures Formation, which is overlain by Devensian till. The soils within the area are slowly permeable, seasonally waterlogged fine loamy to clayey soils of the Brickfield 3 association.



## 5. Geophysical survey Standards

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2002).

### Technique selection

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.
- 5.3 In this instance, based on desk-based research and a walkover inspection, it was considered possible that the remains of features such as ditches, pits and former field boundaries might survive on the site, and that other types of feature such as trackways, wall foundations and features associated with iron-smelting and coal or iron ore mining might also be present.
- 5.4 Given the anticipated nature and depth of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate. This technique uses hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

### Field methods

- 5.5 A 20m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system with real-time correction.
- 5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was 0.03nT, the sample interval 0.25m and the traverse interval 1.0m, thus providing 1,600 sample measurements per 20m grid unit.
- 5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

### Data processing

- 5.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (minimally processed) data. The greyscale images and interpretations are presented in Figures 2-5; the trace plots are provided in Figure 6. In the greyscale images, positive magnetic

anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to the data:

<i>clip</i>	clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.
<i>zero mean traverse</i>	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities.
<i>destagger</i>	corrects for displacement of anomalies caused by alternate zig-zag traverses.
<i>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals. In this instance the data have been interpolated to 0.25m x 0.25m intervals.

#### **Interpretation: anomaly types**

5.10 Colour-coded geophysical interpretations are provided. Three types of geomagnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.
<i>negative magnetic</i>	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids.
<i>dipolar magnetic</i>	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

#### **Interpretation: features**

##### **General comments**

5.11 Colour-coded archaeological interpretations are provided.

5.12 Except where stated otherwise in the text below, a low concentration of small, discrete dipolar magnetic anomalies has been detected in each survey area. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and usually have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plans but they have been omitted from the archaeological interpretation plans and the following discussion. In the case of Area 5, however, many such anomalies are associated with former iron-working, as discussed below.

- 5.13 Positive magnetic anomalies generally reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.
- 5.14 In this instance, sets of parallel, weak positive magnetic anomalies have been detected across each survey area. The anomalies are straight and narrow and evenly spaced at approximately 10m intervals; these almost certainly reflect land drains rather than former ridge and furrow cultivation. Those in Area 2 become more intense and dipolar in the eastern half of that survey, indicating the use of fired clay for the land drains there.
- 5.15 Weak parallel negative magnetic anomalies have been detected in some areas, which correspond to existing tram-lines in the fields.

#### **Areas 1 and 4**

- 5.16 Survey of the proposed turbine T1 and construction compound locations (Areas 1 and 4, respectively) was undertaken as one contiguous area. In addition to the land drains, the most prominent anomalies detected in this area are diffuse and irregular and correspond to the course of an existing track through the field; the track forks into two towards the north-western corner of the field. An erosion gully between the track and the western field boundary has been detected as a narrow negative magnetic anomaly.
- 5.17 Unlike the rest of the survey area, there is a high concentration of small, discrete dipolar magnetic anomalies along the northern edge near the metallised track and layby, in the area of the proposed construction compound. This area broadly corresponds to the southern limit of former open-cast workings to the immediate north. The anomalies almost certainly reflect items of near-surface ferrous and/or fired debris associated with those workings.
- 5.18 A linear positive magnetic anomaly (**A1**) crosses the proposed access track perpendicularly, between the construction compound and turbine T1. This anomaly corresponds to a former field boundary shown on early Ordnance Survey (OS) map editions. A second similar anomaly (**A2**) has been detected crossing the proposed access track obliquely and continuing across a corner of the survey area just north of the proposed hardstanding for T1. This anomaly probably also reflects a soil-filled ditch feature, perhaps another, earlier, field boundary as it is not shown on OS maps.

#### **Area 2**

- 5.19 In addition to the land drains mentioned above, the survey has detected evidence for several possible soil-filled features in the western part of the survey. These potentially comprise the truncated remains of two pits (**A3, A4**) and some short lengths of ditch (**A5**).
- 5.20 A small, intense anomaly in the north-eastern part of the survey corresponds to a ranging rod.

#### **Area 3**

- 5.21 Land drains have been detected across the western part of the survey. The drains appear to be delimited on their east side by a similar but discontinuous anomaly

(A6), most evident at its northern end. This truncated soil-filled feature corresponds to a former ditched field boundary, which continues into Area 5, below.

- 5.22 The eastern arm of this survey, along the proposed access track, is almost devoid of anomalies but some soil-filled features of potential archaeological origin have been detected in the larger, western part. These include a possible small oval ditch (A7) and several other short lengths of ditch (A8, A9, A10).

### Area 5

- 5.23 This small survey was just south-east of Area 3, within the same field, and targeted an area of iron-working slag identified on the surface during an earlier walkover inspection. The area is outside the proposed development footprint.
- 5.24 Several relatively large and intense magnetic anomalies were detected, corresponding to the area of slag noted on the surface. The area, which measures approximately 40m by 20m, is characterised by a concentration of magnetic anomalies, but five of these are larger and more intense than the others. These almost certainly reflect features rather than the general scatter of waste. One intense, circular positive magnetic anomaly (A11) measures approximately 2m across and has an associated negative magnetic 'shadow' on its northern side. The nature and magnitude of the anomaly indicates that the material here may have acquired thermoremanent magnetism *in situ*; this anomaly could reflect the base of, or a pit at the base of, a smelting furnace. While some of the other anomalies are of similar magnitude (eg A12) they lack the directional component and could reflect concentrated dumps of material or other structural remains. A linear feature to the north-west of the possible furnace could possibly reflect wall remains, perhaps a wind-break. This area of small-scale industrial activity is constrained and does not extend towards the proposed development footprint.
- 5.25 A little south-west of the iron-working area is the probable continuation of the former ditched boundary detected in Area 3. A very weak negative magnetic anomaly (A13) runs down the gentle slope adjacent to the former boundary and then turns towards the iron-working area. It is likely that this reflects a former channel to divert and supply water for the iron-working.
- 5.26 Probable field drains have been detected to the south of the former field boundary.

### Area 6

- 5.27 Land drains have been detected within this narrow transect, as in Area 2, which is also in this field.
- 5.28 Some very weak and diffuse positive magnetic anomalies correspond to an existing track down the western side of the field. An erosion gully between the track and the western field boundary has been detected as a narrow negative magnetic anomaly.
- 5.29 The only anomalies detected which might be of potential archaeological origin comprise a possible pit and two very short remnants of ditch (A14) towards the southern end of the transect.

## 6. Conclusions

- 6.1 5.64ha of geomagnetic survey was undertaken on land to the north of Boundary Lane, near Whittonstall in Northumberland, prior to a proposed three-turbine wind farm development.
- 6.2 Former field boundaries were identified in Areas 1, 3 and 5.
- 6.3 Probable soil-filled features of possible archaeological origin were identified near the junction of Areas 2 and 6, and in Area 3. In each case the features are of limited extent, presumed to have been truncated by ploughing.
- 6.4 Evidence for probable *in situ* iron-working was detected in Area 5. It is likely that features associated with iron-working are present, including the possible base of one furnace, in addition to a general spread of waste material. Water may have been supplied to this small-scale industrial area from a former drainage ditch and associated channel to the south and west. This area of activity does not extend towards the proposed development footprint.
- 6.5 No traces of former ridge and furrow cultivation were identified.
- 6.6 Land drains were detected in each survey area.

## 7. Sources

- Archaeological Services Durham University 2009 *Land at Hoodsclose, Whittonstall, Northumberland: archaeological evaluation*. Unpublished report **2261**, Archaeological Services Durham University
- David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage
- Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. Technical Paper **6**, Institute of Field Archaeologists
- Schmidt, A, 2002 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service, Arts and Humanities Data Service

## Appendix: Project brief

### WIND PROSPECT DEVELOPMENTS LTD BOUNDARY LANE WIND FARM NORTHUMBERLAND BRIEF FOR GEOPHYSICAL SURVEY

#### 1.0 INTRODUCTION

- 1.1 This document represents a brief for undertaking a detailed magnetometer survey totalling some 5.1ha of the area of a proposed wind farm at Boundary Lane to the south of Whittonstall in Northumberland (centred at NZ 074 561). A planning application for the three turbine wind farm was submitted by Wind Prospect Developments Ltd to Tynedale District Council in May 2009. The document has been prepared in order to outline both the scale and scope of the survey to Northumberland County Council and also in order that potential archaeological contractors can cost for the proposed survey. A more detailed Written Scheme of Investigation would be prepared by the archaeological contractor and submitted to Northumberland County Council.
- 1.2 The footprint of the proposed development extends to some 1.4ha. The proposed area of survey will cover the area of the principal components of the wind farm, namely the turbine foundations, associated areas of hardstanding, the construction compound location and all lengths of access road together with an additional area around all of these locations.
- 1.3 The survey area is located entirely within the County of Northumberland and within the civil parish of Shotley Low Quarter (**Figure 1**). The area of the proposed development is located on a gentle south-east facing slope to the east of Highfield Farm and currently consists of arable farmland. The land slopes from some 205m on the northern edge of the development proposal in the vicinity of the construction compound down to some 175m in the vicinity of turbine T2. The solid geology within the area is Westphalian (Langsettian) coal measures of Carboniferous date, overlain by drift deposits of sandstone and shale. The soils within the area are slowly permeable seasonally waterlogged fine loamy to clayey soils of the Brickfield 3 association. All of the proposed survey areas currently (April 2010) contain sprouted oilseed rape or cereal crops.
- 1.4 The geophysical survey is to be undertaken in order to clarify the results of the cultural heritage assessment included within the Environmental Statement (Wind Prospect Developments Ltd 2009) and specifically to establish the location and extent of an area of industrial slag, probably indicative of a metal-working site, identified to the east of turbine T3 but outwith the footprint of the proposed development. Consultation responses from Northumberland County Council raise the concern that this area of slag may have migrated down slope and that any below ground archaeological remains associated with the activity may survive.

#### 2.0 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

- 2.1 The information below summarises specific aspects of information incorporated with the desk-based assessment, and site numbers refer to those previously allocated.
- 2.2 No sites or finds of prehistoric date are recorded within the footprint of the proposed development or within the immediate vicinity. The closest recorded finds of earlier prehistoric date are worked tools and waste flakes of Mesolithic and Neolithic date recovered from the eastern side of Greymare Hill some 1.9km to the west. Barbed and tanged arrowheads of Bronze Age date have also been recovered from Greymare Hill, while burial mounds have been recorded further afield at Apperley Dene, near Shotley Bridge and at Broomhill near Mickley.
- 2.3 No sites or finds of Iron Age date are recorded within the area of the proposed development or the immediate vicinity. Evidence of Iron Age occupation is located further to the east, with a possible promontory fort (now quarried away) being located on an elevated plateau to the north-west of Ebchester, possibly on the site of earlier prehistoric activity. A subrectangular cropmark enclosure of probable Iron Age date has been recorded by aerial photography some 900m to the north-east of the proposed development and the extent more recently confirmed by geophysical survey.
- 2.4 There are no sites or finds of Roman date recorded within the footprint of the proposed wind farm or the immediate vicinity. The development site is however located some 700m to the south of the Dere Street Roman road running on a north-west to south-east alignment to the north-east (and mostly along the route of the existing B6309). The road at this location represents that length between the Roman forts or stations located at Ebchester to the south-east and Corbridge to the north-west. The course of Dere Street was a focus for settlement, and initially at least principally military settlement, although a possible Roman fort site identified some 370m to the north of Dere Street and north-east of Whittonstall Hall Farm has been discounted by recent evaluation. The principal Roman settlement within the wider area was the fort or station located at Ebchester some 2.7km to the east of the proposed development, while a probable Romano-British farmstead is located on the crest of a ridge to the west of Dere Street near Apperley Dene, some 2.5km to the north-west of the proposed wind farm.
- 2.5 There are no recorded sites or finds of medieval date within the footprint of the proposed development (with the possible exception of Highfield). Settlement prior to the Norman Conquest within the vicinity of the proposed development at Whittonstall is suggested from place-name evidence. The village of Whittonstall is located on the course of Dere Street, with a manor house located to the south that was excavated in advance of opencast mining. The land that made up the manor of Whittonstall was added to by ground taken out of unenclosed land, including what later became a hamlet under the name of Newlands. There are references to cultivated and enclosed land (usually enclosed by a ditch and hedge) in documentary sources, and most of the manor appears to have been pasture land that had common rights. This included the wood within the common pasture, which was used to provide timber for building as well as free warren. There are also references to meadow land, and overall the manor appears to have predominantly been based upon pastoral agriculture.
- 2.6 Deserted settlements of medieval date are recorded within the vicinity of the proposed development. These include the vill of Fairley, located to the west in the area of Fairley Farm and the possible settlement at Highfield, though this is less certain as it does not appear in early post-medieval rental lists.
- 2.7 Although the documentary sources suggest that the medieval settlements recorded within the vicinity were essentially agricultural, there is also evidence of extractive industry within the area during the medieval period. There is a reference to coal mines in Whittonstall in both 1292 and 1299, while in 1307 there was a law suit over iron mines in Whittonstall and Newlands involving the digging of ore without licence. The location of these mines is not recorded,

- but those of the coal mines at least can be presumed to be at similar locations to those recorded in the post-medieval period.
- 2.8 In the post-medieval period the settlement pattern continued to be centred upon the two villages of Whittonstall and Newlands together with the smaller hamlet of Fairley, and the nature of the townships remained essentially agricultural and based upon livestock farming. The principal change in ownership came in 1715 when the estates were forfeited as a result of the involvement of James Radcliffe, the 3rd Earl of Derwentwater, in the 1715 Jacobite rebellion. In 1735 the estates passed to Greenwich Hospital, who remained the sole owners of the estate until it was sold to James Laycock in 1872. Throughout this period all of the land on the estate, including the proposed development area, was farmed by tenant farmers who held their land on a lease from Greenwich Hospital.
- 2.9 The only ridge and furrow cultivation surviving within the immediate vicinity of the proposed development (and therefore likely evidence for former common land holdings) is located in existing pasture fields immediately to the south and south-east (**Figures 2**). No surviving earthwork or aerial photographic evidence for ridge and furrow cultivation survives within the footprint of the proposed development.
- 2.10 Both land holdings and the field pattern within the area of the proposed wind farm changed in the first half of the 18th century. By the time the land was taken over by Greenwich Hospital the common holdings appear to have ended and a number of smaller farms established. However, after 1735 a division into larger more regular holdings was proposed; this had been carried out by 1740. A sketch for an estate map of 1805 represents the first detailed mapping of the area and indicates the field boundaries with the new farms, including Highfield to the west. The similar size and regular layout of the fields suggest that these were laid out at the same time as the reorganisation of the farms in the first half of the 18th century, hence the farms being considered “ancient enclosures” in 1805. The layout mapped in 1805 is the same as that shown on the subsequent title map of 1841 and includes all of the fields within which the proposed wind farm will be located (field boundaries subsequently removed being indicated on **Figure 2**). None of the field names recorded on the 1841 tithe map suggests the presence of any previously unrecorded archaeological sites or activities within the footprint of the proposed development. Some of the names, such as those incorporating ‘scroggs’ or ‘allery’ in fields immediately to the south, suggest bush or brushwood and alders respectively, possibly indicating the type of landscape at the time of enclosure. Others such as ‘hagg’ refer to a fenced enclosure. Those incorporating ‘pasture’ suggest initial use of the land for grazing (all of the fields within the development footprint currently being arable).
- 2.11 The historic landscape character is therefore essentially that of ‘surveyed enclosure’, in this case mostly 18th century in date. The exceptions to this are areas of woodland, although Old Wood (formerly Old Field Wood) immediately to the east of the proposed turbines may be contemporary or earlier in date. The field boundaries within the footprint of the proposed development (excluding the northern edge) are mostly defined by modern post and wire fence lines and associated parallel streams or drainage ditches. Only occasional and intermittent lengths of hedgerow survive.
- 2.12 Although the area within the townships of Whittonstall and Newlands in the vicinity of the proposed development was essentially agricultural during this period, small scale industrial activity involving coal mining, ore mining and quarrying is also recorded. Coal mining is first recorded in the manor of Whittonstall in the late 13th century although these workings cannot be specifically related to any of those recorded in the post-medieval period. Bell pits identified near Whittonstall Sproats Farm to the north are believed to pre-date 1700. Other probable early workings are in the area of Greymare Hill to the west. Coal mining is recorded in a number of rental and rate lists in the post-medieval period from the 17th century onwards and in 1762 three collieries are recorded in Whittonstall. The coal working was essentially small in scale, and was both mined by local miners and used locally. However, during the 19th century a number of small pits were opened throughout Whittonstall and to a lesser extent in Newlands, possibly because the use of wood by the tenant farmers was restricted by the landlords. No coal mines of this date are recorded within the area of the proposed development or the immediate vicinity. The closest recorded mine shafts to the proposed turbines are those to the south-east of Whittonstall Hall Farm and immediately south of Morrowfield, located some 740m to the north-east and 870m to the east respectively. These mines do not appear to have been in use for any great length of time, as neither is mapped by the Ordnance Survey in 1865 while both sites are labelled as ‘Old Shaft’ by 1898.
- 2.13 The only recorded post-medieval ironstone workings are located some 2km to the west.
- 2.14 The only evidence of industrial activity within the footprint of the proposed development was an area of industrial waste or slag (**Site B**) identified on the access road to the east of turbine T3 during the site walkover inspection. This was evident as an area of slag, mostly concentrated within an area of some 20m by 10m above the edge of a slope down to a former tributary for a stream to the west. The material has the appearance of ‘tapped’ slag from the iron smelting process, while analysis indicates a high proportion of iron and low sulphur content within the slag. The low sulphur content, in particular, suggests that the slag dates from before the introduction of coke as a fuel (i.e. before the 18th century) and may be of greater antiquity (P Clogg, pers comm).
- 2.15 Small scale quarrying is recorded throughout most of the surrounding area although the closest recorded quarries are those some 960m to the south along or to the south of the Yecklish Burn.
- 2.16 Other sites recorded within the area of the proposed development include buildings of post-medieval date, such as mills and farmhouses, and also a number of wells. None of these are located within the footprint of the proposed development although Greenlane Well (**NHER 9869**) is located some 500m to the north-east.
- 2.17 The principal change to the layout of the agricultural landscape within the area of the proposed development in the 20th century was that brought about by post-War opencast coal mining. This was mostly undertaken during the 1970s and was largely restricted to the areas to the north and west, extending to the west and north of Highfield as far as Whittonstall and eastwards to the B6309. To the east of Highfield the extent of the area was to the south of the existing access road (established as part of the opencasting). This appears to have included some of the area of the proposed construction compound and the field to the north of turbine T1. The area of opencast mining had been fully restored before 1982, with the layout of the fields that was established differing from the previous enclosure field pattern, and specifically as this was replaced by larger, more regular fields. The restoration also included extensive areas of new woodland plantations to the west and north of Highfield. Since this date a number of the field boundaries to the south within the footprint of the proposed development have also been removed to create larger

fields (**Figure 2**), while during the post-War period most of the fields within the vicinity of the proposed development that were previously pasture (and specifically those in which turbines T2 and T3 would be located) have been brought under arable cultivation.

### 3.0 OBJECTIVES

3.1 The principal objectives of the geophysical surveys are:

- to determine the location and extent of any unrecorded archaeological features (in addition to former field boundaries) within the selected survey areas
- to characterise as far as possible the nature of the any anomalies identified
- to prepare a report summarising the results of the work

3.2 The specific objectives of the survey are:

- to establish the location and extent of the area of industrial slag (Site B) and any associated activity and determine whether this extends into the area of the proposed development
- to identify any areas indicative of past coal or iron ore mining and any associated activities

3.3 The survey areas, and specifically the boundaries of Area 5, would be extended should potentially significant anomalies of archaeological origin be identified the nature of which needed to be clarified by survey of a larger area.

### 4.0 METHODOLOGY

4.1 Areas 1–3 will extend over the area required for the construction of each of the proposed turbine foundations (measuring some 22m by 22m) and the adjacent length of hardstanding (measuring some 50m by 25m) together with an additional area of no less than a further 20m surrounding both of these areas (and incorporating part of the adjacent length of access road). This additional margin would allow any recorded anomalies to be placed within a wider context and would also allow a margin of 30m to compensate for the magnetic footprint of the turbines should the development be constructed. In each case this equates to a survey area of some 115m in length by 65m wide, totalling some 0.75a. A former field boundary is located within Area 3.

4.2 Area 4 will cover the area of the construction compound (measuring some 75m by 50m) together with an additional area of a further 20m on the east, west and south sides (the area is defined by an existing road to the north). This equates to a survey area of up to 115m in length by 70m wide, totalling some 0.8ha (although a manure heap is located on the western side of this area). The northern part of this area may include the edge of the area affected by opencast mining to the north.

4.3 Area 5 will cover the visible extent of the slag recorded at Site B together with an additional margin of some 20m in all directions. The area of survey will measure up to 100m in length by 40m wide and amount to some 0.4ha. The extent of the survey at the north-eastern side is constrained by an existing tree. The survey area would however be extended as necessary to clarify the extent of the slag or any associated subsurface remains. A former field boundary is also located within this survey area.

4.4 The survey would also include a 20m wide corridor along those lengths of the proposed access road between the turbine locations and the construction compound. This area of survey would also include areas adjacent to the road for the associated drainage ditch and the cable trench.

4.5 The survey areas will be divided into grids (as necessary) within which data collection will be undertaken. Where ground conditions permit, magnetic survey measurements will be collected on the basis of a minimum traverse interval of 1.0m with a sample interval 0.25m. The data will be captured in the internal memory of the instrument and then downloaded. Individual grids would then be matched together (as necessary) to produce an overall plan of the survey areas.

4.6 The survey areas will be laid out using a total station theodolite or a GPS of comparable accuracy and tied into permanent landscape features. Semi-permanent marker pegs will be located in order that the survey grid can be geo-referenced to the Ordnance Survey National Grid. This will allow the grid to be re-established to centimetre accuracy by a third party in order that it can be re-instated and related to any later phases of fieldwork. A record sheet will be created for each survey marker established.

4.7 The report on the results of the survey should normally include a title page, summary, introduction, methods statement, results, conclusions, references and appendices. The survey results should be analysed and the data interpreted and presented at an appropriate scale and located on a detailed site survey map base located on the Ordnance Survey National Grid. This should include a location plan of the survey areas and large scale greyscale and X-Y trace plots at a minimum of 1:1000, together with interpretation plans. Locational tie-in information for the survey grid will be included within the report.

4.8 The geophysical survey is to be undertaken in accordance with the guidance provided by English Heritage (2008), the Institute of Field Archaeologists (2002) and Schmidt (2002).

### 5.0 TIMETABLE AND PERSONNEL

5.1 Subject to contract and access arrangements it is proposed that the geophysical survey will be undertaken in April 2010 given the current state of crop growth within the survey areas with a draft report being produced for comment within two weeks of the completion of fieldwork and no later than mid May 2010.

5.2 Five copies of the final report will be provided. Text, plans, plots and primary data will be provided to the client in digital format (as Word, .dwg, .dxf and ASCII files).

5.3 All personnel undertaking the geophysical survey and report preparation must be suitably qualified and have relevant experience. Information on staff and relevant experience will be provided to the Conservation Team of Northumberland County Council in advance of the commencement of the survey.

### 6.0 ARCHIVE

6.1 Formal arrangements for the storage of the archive will be made with the local museum, and would be deposited upon completion of the programme of survey work. This would however be dependent upon any whether further phases of evaluation or mitigation were undertaken.

6.2 Deposition shall be in accordance with relevant written guidelines on the transfer of archives and procedure as stated in Brown (2007).

6.3 A copy of the geophysical survey report will be deposited with the Historic Environment Record of Northumberland County Council and the English Heritage National Monuments Record.



6.4 The results of the geophysical survey will also be submitted online to OASIS (<http://ads.ahds.ac.uk/project/oasis/>).  
Report: 7/2  
Date: April 2009  
Text: Peter Cardwell  
Illustrations: Archaeological Services Durham University

**REFERENCES**

- Brown D H 2007: *Archaeological Archives: A Guide to Best Practice in Creation, Compilation, Transfer and Curation* Archaeological Archives Forum.
- English Heritage 2008: *Geophysical Survey in Archaeological Field Evaluation*
- IFA 2002: *The Use of Geophysical Techniques in Archaeological Evaluations* (Revised Edition) Institute of Field Archaeologists Paper No 6
- Richards J D and Robinson D (eds) *Digital Archives from Excavation and Fieldwork: Guide to Good Practice* Second Edition. AHDS Guides to Good Practice <http://ads.ahds.ac.uk/project/goodguides/excavation/>
- Schmidt A 2002: *Archaeological Geophysics: Guide to Good Practice* AHDS Guides to Good Practice <http://ads.ahds.ac.uk/project/goodguides/geophys/>
- Wind Prospect Developments Ltd 2009: *Boundary Lane Wind Farm – Environmental Statement*

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Area 4

Area 1

Area 2

Area 6

Area 3

Area 5

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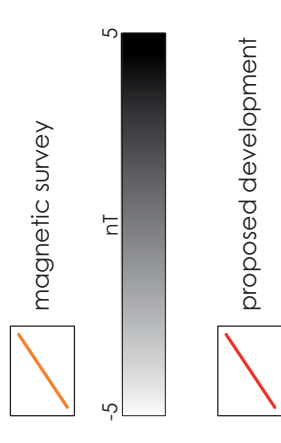
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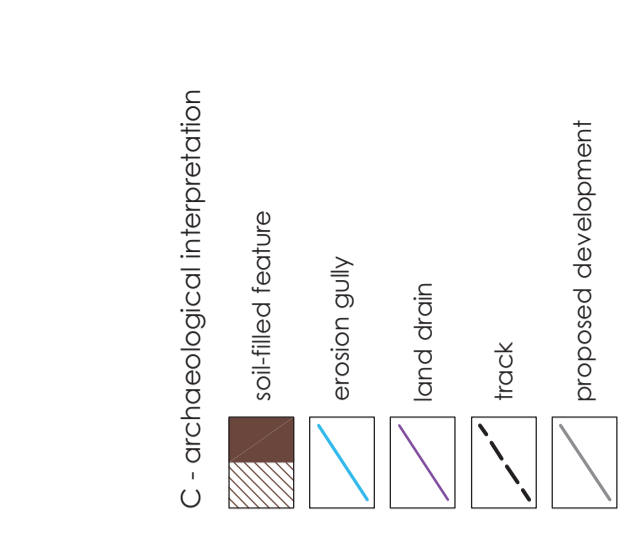
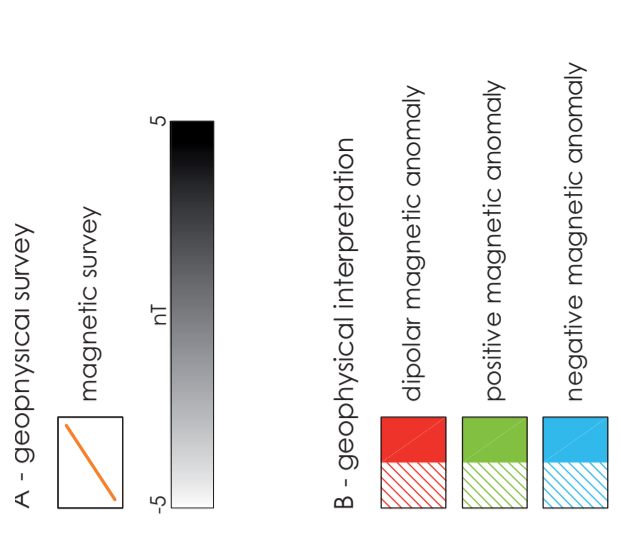
Boundary Lane Wind Farm  
near Whittonstall  
Northumberland

geophysical survey  
report 2399

Figure 2: Geophysical survey overview



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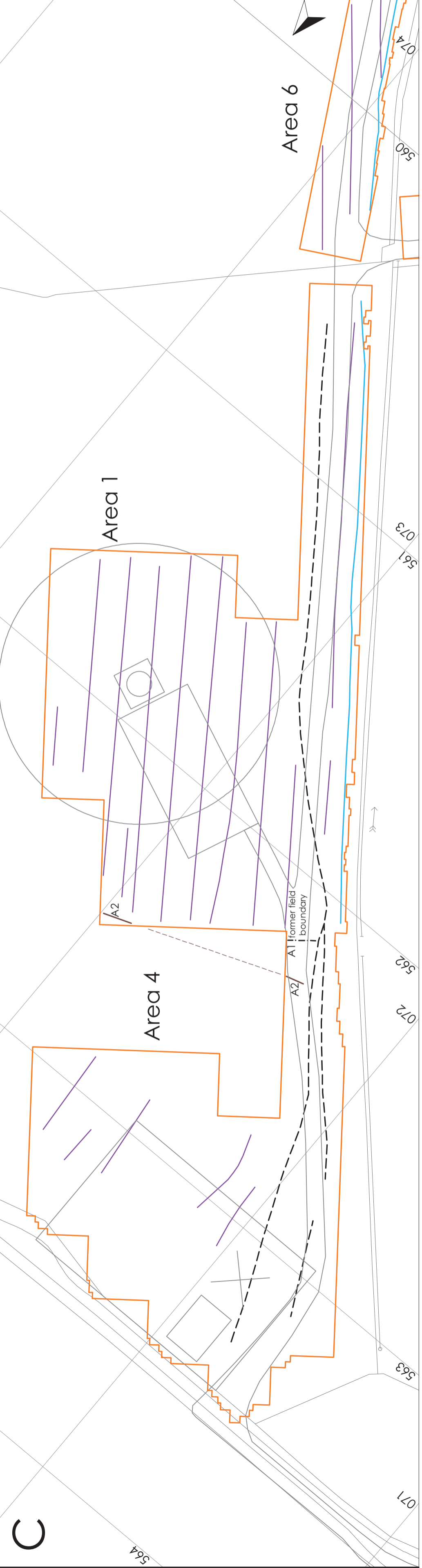
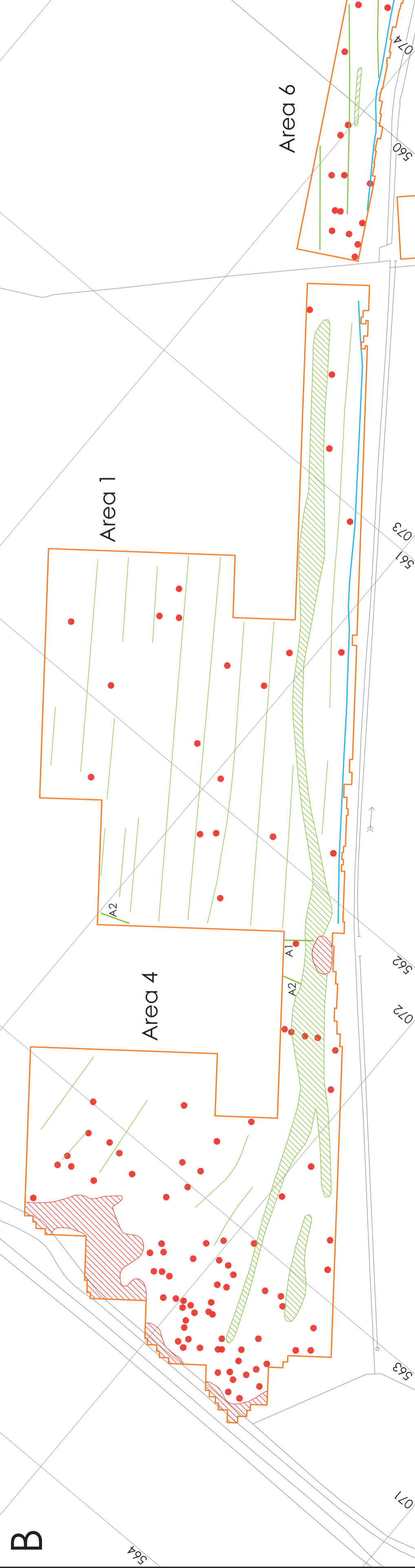
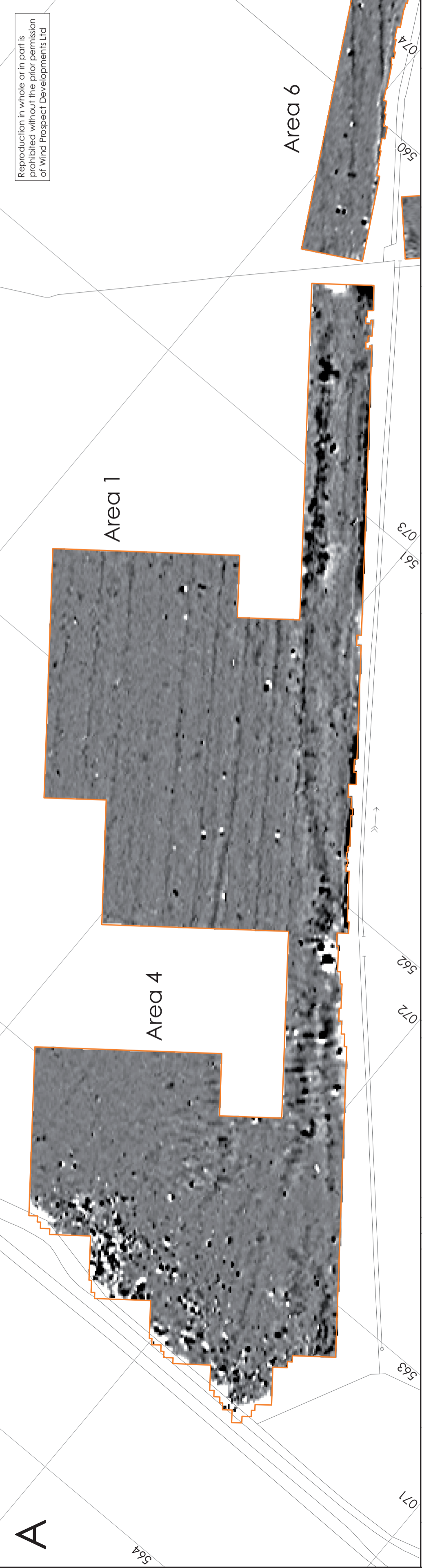


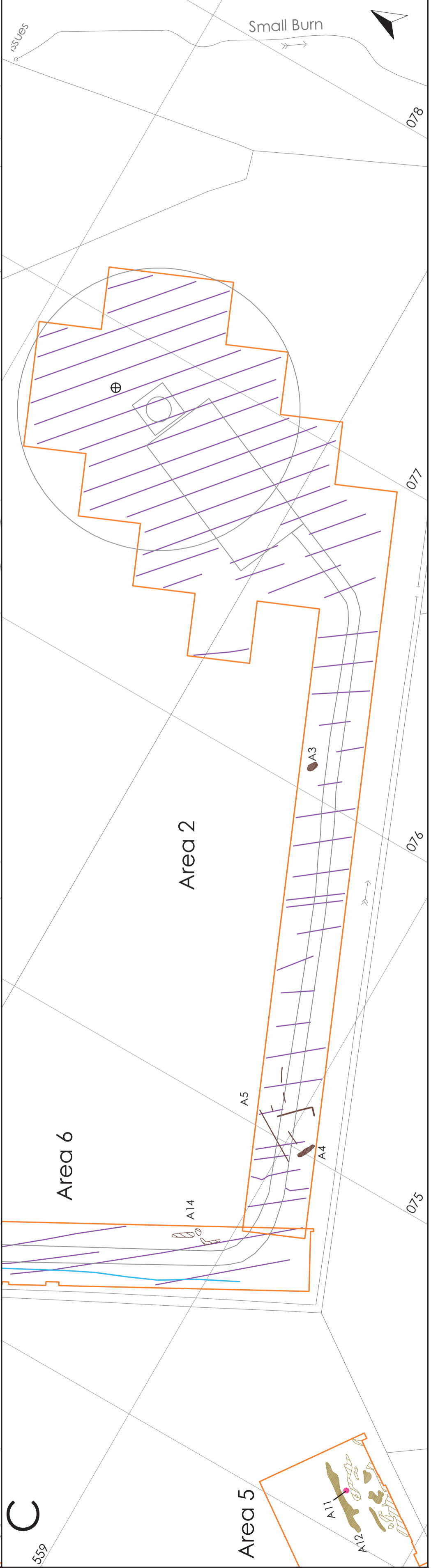
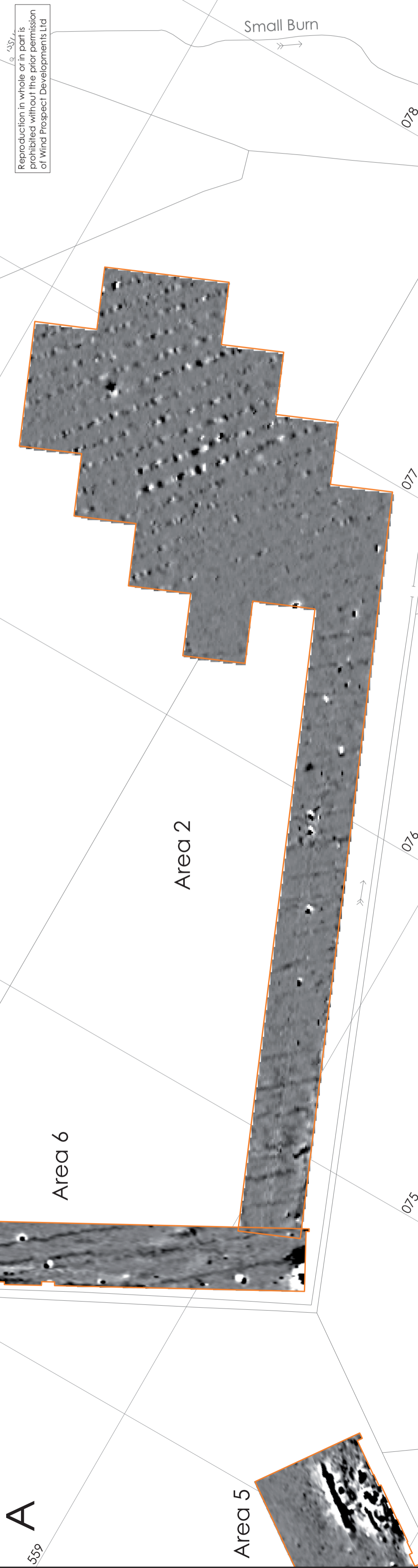
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Figure 3: Areas 1 and 4, geophysical survey and interpretations





**A - geophysical survey**

magnetic survey

0 5 nT

**B - geophysical interpretation**

- dipolar magnetic anomaly
- positive magnetic anomaly
- negative magnetic anomaly

**C - archaeological interpretation**

- soil-filled feature
- erosion gully
- probable iron-working area
- land drain
- ranging rod
- possible furnace
- proposed development

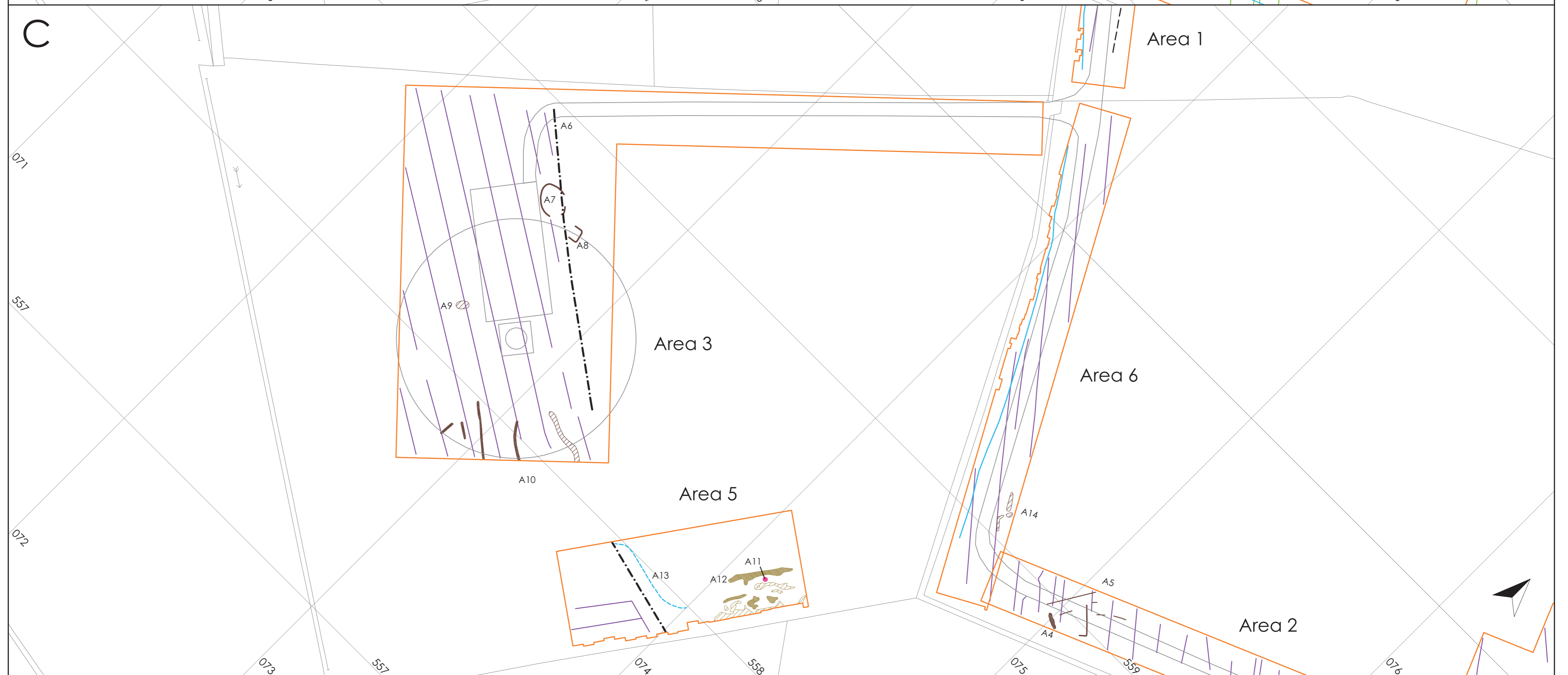
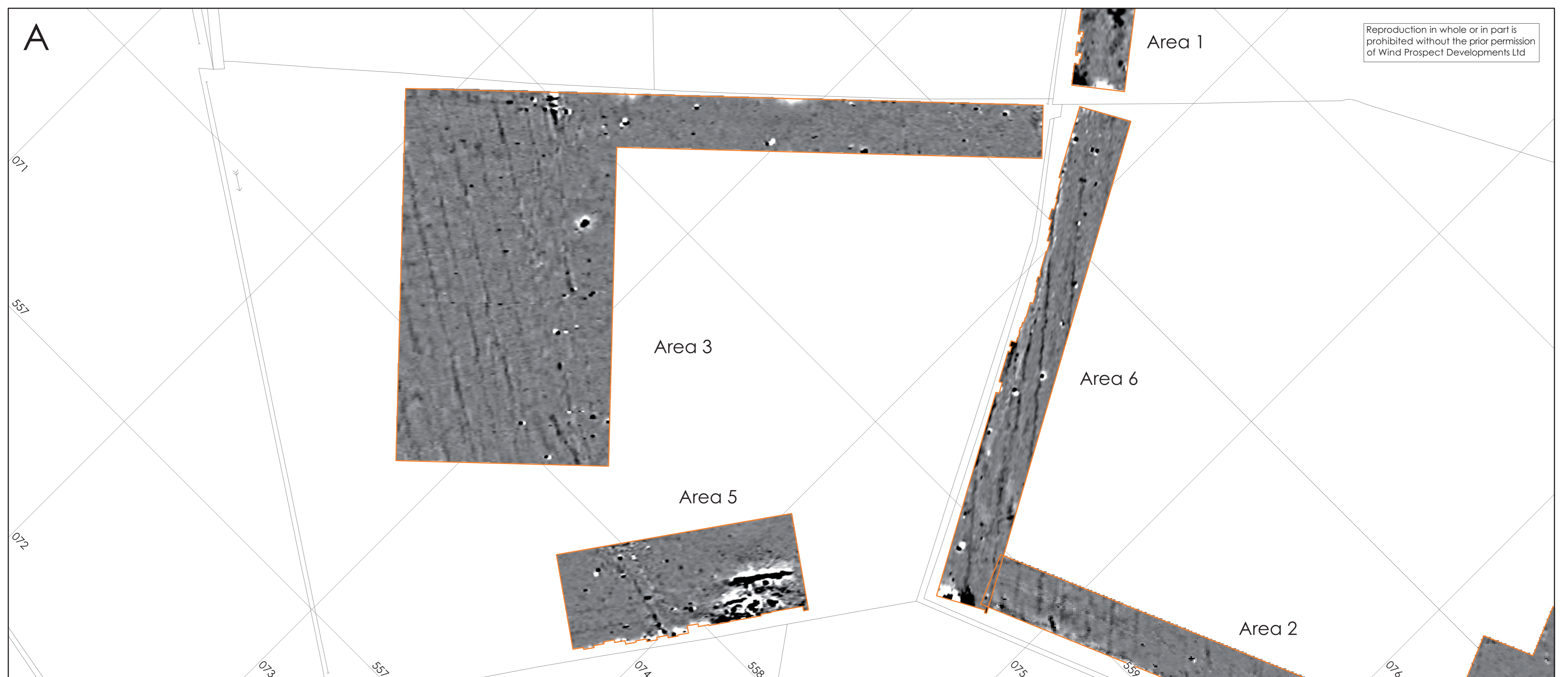
0 50m scale 1:1000 for A2 plot

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Figure 4: Area 2. Geophysical survey and interpretations



<p><b>A - geophysical survey</b></p> <ul style="list-style-type: none"> <li>magnetic survey</li> </ul>	<p><b>B - geophysical interpretation</b></p> <ul style="list-style-type: none"> <li>dipolar magnetic anomaly</li> <li>positive magnetic anomaly</li> <li>negative magnetic anomaly</li> </ul>	<p><b>C - archaeological interpretation</b></p> <ul style="list-style-type: none"> <li>soil-filled feature</li> <li>former field boundary</li> <li>former water channel</li> <li>probable iron-working area</li> <li>possible furnace</li> <li>land drain</li> <li>proposed development</li> <li>erosion gully</li> </ul>	<p>on behalf of Wind Prospect Developments Ltd</p> <p>0 50m scale 1:1000 for A1 plot</p>	<p>ARCHAEOLOGICAL SERVICES DURHAM UNIVERSITY</p>	<p>Boundary Lane Wind Farm near Whittonstall Northumberland</p> <p>geophysical survey report 2399</p> <p>Figure 5: Areas 3, 5 and 6 geophysical survey and interpretations</p>
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Boundary Lane  
near Whittonstall  
Northumberland

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Figure 6:  
Trace plots of geomagnetic data

