Archaeological Services
University of Durham

Park Wall North Surface Coal Mining Site, near Crook, County Durham

geophysical surveys

on behalf of
UK Coal Mining Ltd

Report 1720
October 2007

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Harworth Park, Blyth Road, Harworth, Doncaster, South Yorkshire DN11 8DB

Contents

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted in advance of proposed surface coal mining Park Wall North near Crook in County Durham. The works comprised 19 geomagnetic surveys in 14 land parcels.

1.2 The works were commissioned by UK Coal Mining Ltd and conducted by Archaeological Services in accordance with a Written Scheme of Investigation prepared by RPS.

Results

1.3 The surveys have determined part of the course of a former waggonway that served mines in the area in the early 19th century. The course of the waggonway followed a gentler gradient than its successor, an inclined railway built in 1845.

1.4 Whilst some of the anomalies in Area 2 may represent rubble and footings from former buildings, there has been so much disturbance there that it has been difficult to identify features with certainty. Former buildings, allotments, field boundaries, sewage pipes and possibly also the waggonway have all contributed to the palimpsest of anomalies detected there.

1.5 Possible traces of medieval/post-medieval ridge and furrow cultivation have been detected in several locations, principally in Area 3, and the remains of former field boundaries may have been detected in Areas 2, 3 and 7.

1.6 The only other features identified which may be of archaeological interest comprise miscellaneous possible ditches in Areas 3 and 6.

2. Project background

Location (Figures 1 & 2)

2.1 The Park Wall North proposed development area comprises approximately 126 hectares located 12 miles south-west of Durham City in the Wear Valley Disrict (NGR centre: NZ 1410 3760). The site is bounded to the north by land adjacent to Sunniside and the B6299 Brancepeth to Tow Law road, to the west by land adjacent to the A68 road and to the south by a minor road between Roddymoor and Park Wall Farm. Nineteen surveys were conducted in 14 land parcels, covering approximately 21 hectares.

Development proposal

2.2 Planning permission is currently being sought for the establishment of a surface coal mining facility and associated infrastructure.

Objective

2.3 The principal aim of the surveys was to 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 advance of development.

Methods statement

2.4 The surveys have been undertaken in accordance with a Written Scheme of Investigation (WSI; Appendix I) prepared by RPS on behalf of UK Coal Mining Ltd and approved by the Assistant County Archaeologist at Durham County Council. The WSI allowed for a contingency of an additional 10% of the application area to be surveyed geophysically. Following the initial programme of survey (Areas 1-3) the Assistant County Archaeologist requested that the contingency for further survey was used to investigate specific additional areas.

Dates

2.5 Fieldwork was undertaken between 13th August and 28th September 2007. This report was prepared between 1st and 11th October 2007.

Personnel

2.6 Fieldwork was conducted by Jamie Armstrong, Graeme Attwood (Supervisor), Bryan Atkinson, Aidan Bell, Lorne Elliott (Supervisor), Duncan Hale, Natalie Swann (Supervisor) and Richie Villis. This report was prepared by Duncan Hale and Graeme Attwood with illustrations by David Graham and Dr David Webster. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **DPN07**, for **D**urham **P**ark Wall **N**orth 20**07**. The survey archive will be supplied on CD to the Bowes Museum. Archaeological Services is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological

investigation**S** project (OASIS). The OASIS ID number for this project is **archaeol3-32359**.

3. Archaeological and historical background

3.1 A baseline assessment of the known and potential cultural heritage resources in the immediate vicinity of the proposed development was prepared (RPS 2006) as the initial part of an Environmental Impact Assessment (EIA). A brief summary is provided below.

3.2 Two prehistoric flint findspots are recorded (SMR 1053 and1802) at Grange Farm to the north of survey Area 2.

3.3 Three silver coins (SMR 6995) of medieval date were discovered in a garden in Sunniside, to the north of the application area.

3.4 Ridge and furrow earthworks of post-medieval and possibly medieval date are present in two areas of the proposal site.

3.5 Remains of industrial activities associated with coal mining are present within and adjacent to the proposal site; indeed considerable areas of the site were mined in the 19th and 20th centuries. A section of now disused railway line (SMR 7019) crosses through the proposed development area. Built in 1845, it rises up a steep incline from Roddymore in the south-east to Sunniside in the north-west. It required an engine house at the top of this incline to pull the wagons up the hill. The line was replaced in 1867 with a new section of line which circumnavigated the hill. The route of the line is still present in the form of a track. A waggonway (SMR 3128), possibly a precursor to the inclined railway, is believed to have crossed the proposal site although its exact course is not known as it does not appear on available map sources.

3.6 A school house is known to have been built in Area 1 in the late 19th century and demolished in the mid-20th century.

4. Landuse, topography and geology

4.1 Surveys were undertaken in 13 pasture fields and one area of scrub and rubbish dumps (Area 1). It was not possible to conduct survey in the dense scrub land between Areas 4 and 5.

4.2 The study area slopes gently southward and eastward, from its highest point in the north-west at about 290m OD down to 240m OD in the south and 230m OD in the east.

4.3 The solid geology of the area consists of Westphalian Coal Measures comprising thinly bedded sandstones, mudstones and coal seams, overlain by boulder clay.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation* (David 1995); the Institute of Field 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 2001).

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistance, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of 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 the cultural heritage assessment, it was considered likely that cut features, such as ditches and pits, might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting each of the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record minute 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 30m grid was established across all the survey areas except Area 3, where a 20% sampling strategy was more suited to a 20m grid.

5.6 The survey locations were recorded and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system (GPS) with real-time correction providing sub-metre accuracy.

5.7 In Areas 1-7 and 9, measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. In Areas 7 and 10-12, the same measurements were determined using a Geoscan FM256 dual fluxgate gradiometer system. A zig-zag traverse scheme was employed and data were logged in 30m or 20m grid units. The instrument sensitivity was set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m,

thus providing 3600 sample measurements per 30m grid unit and 1600 per 20m grid unit.

5.8 Data were downloaded on-site into laptop computers for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.9 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 (unfiltered) data. The greyscale images and interpretations are presented in Figures 3-5; the trace plots are provided in Appendix II. 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.

5.10 The following basic processing functions have been applied to each dataset:

clip	clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.
zero mean traverse	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.
despike	locates and suppresses random iron spikes in gradiometer data.
destagger	corrects for displacement of anomalies caused by alternate zig-zag traverses.
interpolate	increases the number of data points in a survey to match sample and traverse intervals; in this instance the gradiometer data have been interpolated to 0.25m x 0.25m intervals.

Interpretation: anomaly types

5.11 Colour-coded geophysical interpretation plans are provided. Three types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	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.
negative magnetic	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.

dipolar magnetic	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

5.12 Colour-coded archaeological interpretation plans are provided.

5.13 Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as furrows, ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.14 Series of parallel weak positive magnetic anomalies, almost certainly reflecting former ridge and furrow cultivation, have been detected in several surveys, principally the transects in Area 3.

5.15 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plans, however, they have been omitted from the archaeological interpretation plans and the following discussion.

Area 1

5.16 Area 1 was specified to target the site of a former school house, demolished in the mid-20th century. The area sloped steeply down from both the north and south towards a central channel. From old Ordnance Survey (OS) maps, the school buildings were located in the south-western corner of the survey area. A concentration of dipolar magnetic anomalies was detected here, which almost certainly reflects brick and other rubble from the school house.

5.17 There is a high concentration of intense dipolar magnetic anomalies across most of this survey area; for clarity, many of these are omitted from the interpretation drawings. These are likely to reflect the remains of the rows of buildings that were present near the site and the former allotment gardens that are noted on early OS maps in the east of the area.

5.18 Two linear positive magnetic anomalies in the central part of this survey are aligned perpendicular to each other and appear reflect former continuations of field boundaries. Other short positive magnetic anomalies have been detected to the south of these, which may also reflect former boundaries or ditches. Negative magnetic lineations also detected here could possibly reflect stone wall-footings, though they broadly correspond to the locations of known underground sewers, approximately adjacent to the possible former field boundaries.

Area 2

5.19 A broad band of magnetic anomalies, approximately 20 wide, has been detected crossing the area roughly east-west. This is likely to be the course of a former waggonway that served the mines in the area before being replaced by the inclined railway in the mid-19th century. Some of the survey contingency was subsequently used to survey areas to the east and west of this field (Areas 4, 10, 11 & 12) in order to determine more of the course of the waggonway.

5.20 A large dipolar magnetic anomaly has been detected in the north-western corner of the survey area. This may correspond to a capped mineshaft which is shown in the cultural heritage assessment as being just over the field boundary to the west (RPS 2006).

5.21 A former plough regime has been detected as a series of positive magnetic anomalies which traverse the field north-south.

5.22 A chain of intense dipolar magnetic anomalies traverses this area north-west/south-east, almost certainly representing a ferrous service pipe.

5.23 A mass of dipolar magnetic anomalies has been detected in the south-western corner of the field. These reflect the large steel gated entrance to the field and associated hardcore of rubble/clinker.

Areas 3a-3h

5.24 Upstanding ridge and furrow earthworks were present in Area 3d. Traces of former ridge and furrow were detected as magnetic anomalies in Areas 3a, 3c, 3e, 3f and 3g. Two possible phases of former ridge and furrow cultivation were detected at the western end of transect 3e.

5.25 Additional positive magnetic anomalies have been detected at the western end of transect 3a. Two of these may reflect a pair of ditches or a double-ditched trackway. These cross or are crossed by a further positive magnetic anomaly which may reflect a former field boundary or ditch. Survey was subsequently extended to investigate more of this area, between transects 3a and 3b (Area 9, below).

5.26 A concentration of dipolar magnetic anomalies at the eastern end of transect 3d reflects the presence of ferrous items including a broken and twisted wire fence and an old steel bath tub amongst other items.

5.27 A large dipolar magnetic anomaly detected at the eastern end of transect 3f may reflect another former mineshaft.

5.28 A chain of dipolar magnetic anomalies crossing transect 3g almost certainly reflects a modern service.

Area 4

5.29 The broad band of intense dipolar anomalies detected in Area 2 continues across the southern part of this field and is again presumed to reflect the remains of the waggonway.

5.30 Apparent chains of anomalies traversing the field north-west/south-east may represent some form of land drainage.

Area 5

5.31 A series of parallel linear anomalies across this area almost certainly reflects a system of land drains.

5.32 A chain of intense dipolar magnetic anomalies aligned north-west/south-east across the northern part of the field broadly corresponds to the location of a private water service shown on supplied project drawings. Another service pipe runs parallel to the south-eastern field boundary; manholes were present in the field.

Area 6

5.33 The majority of linear anomalies here appear to reflect land drains. A service pipe runs along the southern boundary. Two pylons were also present in the field and are apparent in the data as large intense dipolar magnetic anomalies. Other large intense anomalies almost certainly reflect large ferrous items.

5.34 A number of possible soil-filled features were detected in the northern part of the area, indicated by rather weak and diffuse magnetic anomalies. It is possible that these have an archaeological origin.

Area 7

5.35 A large mound noted in the field corresponds to a concentration of intense dipolar magnetic anomalies, almost certainly indicating the artificial nature of the mound. Similar large dipolar anomalies almost certainly reflect further dumped materials here.

5.36 Two lines of small dipolar and positive magnetic anomalies traversing the field appear to line up with existing field boundaries and presumably reflect former boundaries.

Area 8

5.37 Chains of small dipolar and positive magnetic anomalies here are again interpreted as land drains.

5.38 There appears to be a relatively high concentration of ferrous debris in the south-eastern part of the field.

Area 9

5.39 This survey increased the coverage around the earlier Areas 3a and 3b, where probable ditch features had been detected. Some of the features were found to

extend further north, one probably being a former field boundary, the other possibly a truncated double-ditched trackway.

5.40 Possible, very weak, traces of ridge and furrow were detected aligned north-south across part of the area.

Areas 10 and 11

5.41 Given the presumed remains of the waggonway in Area 2 to the west it was anticipated that similar anomalies would be detected in these fields. However, the only indications that the waggonway continued here are slightly higher concentrations of dipolar magnetic anomalies in the south-west of Area 10, the north-west of Area 11 and a weak, discontinuous anomaly crossing part of Area 11.

5.42 Probable field drains were detected aligned north-east/south-west across both fields.

5.43 A negative magnetic lineation near the western boundary of Area 11 broadly corresponds to the location of a sewer pipe shown on project drawings.

Area 12

5.44 This survey was also undertaken to try to determine the course of the waggonway. This may have been detected as a concentration of small dipolar magnetic anomalies, as in Areas 2 and 4 to the east, in the central part of the survey.

5.45 A chain of dipolar magnetic anomalies in the northern part of the survey almost certainly reflect a service pipe. The location of this is anomaly is broadly similar to the location of a private water service shown on supplied plans.

6. Conclusions

6.1 Geomagnetic surveys have been undertaken at various locations within an area proposed for surface mining at Park Wall North near Crook in County Durham.

6.2 Very few remains of potential archaeological significance have been identified in the surveys.

6.3 The surveys have determined part of the course of a former waggonway that served mines in the area in the early 19th century. The course of the waggonway followed a gentler gradient than its successor, an inclined railway built in 1845.

6.4 Whilst some of the anomalies in Area 2 may represent rubble and footings from former buildings, there has been so much disturbance there that it has been difficult to identify features with certainty. Former buildings, allotments,

field boundaries, sewage pipes and probably also the waggonway have all contributed to the palimpsest of anomalies detected there.

6.5 Possible traces of medieval/post-medieval ridge and furrow cultivation have been detected in several locations, principally in Area 3.

6.6 The remains of former field boundaries may have been detected in Areas 2, 3 and 7.

6.7 The only other features identified which may be of archaeological interest comprise miscellaneous possible ditches in Areas 3 and 6.

7. Sources

David, A, 1995 *Geophysical survey in archaeological field evaluation,* Research and Professional Services Guideline **1**, English Heritage

Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists

RPS 2006 *Cultural heritage assessment for Park Wall North Surface Coal Mining Site, near Crook, County Durham*. Unpublished report for UK Coal Mining Ltd.

Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice,* Archaeology Data Service, Arts and Humanities Data Service

Appendix I: Written Scheme of Investigation

UK COAL MINING LTD

WRITTEN SCHEME OF INVESTIGATION (WSI) FOR A PROGRAMME OF GEOPHYSICAL EVALUATION AT THE PROPOSED PARK WALL NORTH SURFACE COAL MINING SITE, NEAR CROOK, COUNTY DURHAM

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WRITTEN SCHEME OF INVESTIGATION (WSI) FOR A PROGRAMME OF ARCHAEOLOGICAL EVALUATION AT THE PROPOSED PARK WALL NORTH SURFACE COAL MINING SITE NEAR CROOK, COUNTY DURHAM

1 Introduction

1.1 This document represents a Written Scheme of Investigation (WSI) for a phased programme of archaeological evaluation of land associated with the site of a proposed surface coal mining facility at Park Wall North, near Tow Law, County Durham.

1.2 Planning permission is currently being sought for the establishment of a surface coal mining facility and associated infrastructure on land known as Park Wall North, near Tow Law.

1.3 The planning application is supported by an Environmental Statement (ES) that sets out information regarding the environmental effects of the proposed development. This was achieved through a process of Environmental Impact Assessment (EIA) in which a number of environmental topics were appraised and likely significant effects were identified.

1.4 One chapter of the ES was concerned with the potential effects of the proposed development on cultural heritage resources, including buried archaeological remains, historic buildings and the remnants of earlier industrial activities including previous surface mining of coal.

1.5 A baseline assessment of the known and potential cultural heritage resources in the immediate vicinity of the proposed development was prepared as the initial part of the EIA. This was produced as a stand-alone document (RPS 2006) and was submitted to the Archaeology Section, Durham County Council for comment.

1.6 The baseline assessment was subsequently used to inform the assessment stage of the EIA, which concluded with a review of the likely significant effects of the proposed development on identified and potential cultural heritage resources.

1.7 Guidance on the handling of archaeological matters within the planning process is provided in the document *Planning Policy Guidance 16: Archaeology and Planning* (PPG16 - Department of the Environment, November 1990). Para. 21 of PPG16 states '*Where early discussions with local planning authorities or the developer's own research indicate that important archaeological remains may exist, it is reasonable for the planning authority to request the prospective developer to arrange for a field evaluation to be carried out before any decision on the planning application is undertaken.*'

1.8 The baseline assessment did not find anything to indicate that important archaeological remains may be present within the proposal site. However initial discussions with the Archaeology Section, Durham County Council, indicated a preference for some form of archaeological evaluation to be undertaken at the proposal site as part of the process of determination and mitigation.

1.9 This WSI outlines the findings of the desk-based assessment and proposes a phased programme of archaeological evaluation through geophysical survey and trial trenching.

1.10 The work will be carried out in accordance with current good practice, as well taking into account the standards and guidance issued by the Institute of Field Archaeologists, and other relevant bodies (including such briefs as may be issued by the Local Authority). Additional consultation regarding the need for and location of further geophysical survey, and the number and location of the trial trenches will be undertaken with the Archaeology Section, Durham County Council.

2 Location, Topography and Geology

2.1 The Park Wall North proposal site comprises an area of land measuring approximately 126 hectares located 12 miles south-west of Durham City within the Wear Valley District of County Durham, centred on NGR NZ 1410 3760 (**Figure 1**). It is bounded to the north by land adjacent to the B6299 Brancepeth to Tow Law road, to the west by land adjacent to the A68 road and to the south by a minor road between Roddymoor and Park Wall Farm. Two south-east flowing watercourses cross the proposal site.

2.2 The current land use is predominantly agricultural, the land being mainly under pasture with some arable fields. Farm buildings are present at Old White Lea Farm, which will be retained as part of the proposals, and a group of buildings of likely agricultural use are located at the north of the site, adjacent to the Sunniside Incline.

2.3 The solid geology of the area consists of Westphalian Coal Measures comprising thinly bedded sandstones, mudstones and coal seams, with boulder clay or till on the lower valley slopes.

2.4 The central part of the proposal area will be subject to surface coal extraction. The remainder of the site will be used for topsoil and subsoil storage bunds and for ancillary purposes.

3 Archaeological Background

3.1 The Cultural Heritage chapter of the Environmental Statement submitted in support of the planning application set out the archaeological background to the site, using records of known sites, features and finds. A desk-based study of the historic environment was provided as Technical Appendix to the Environmental Statement. It is not proposed to repeat that information here, however a brief summary is provided.

3.2 Two findspots of worked flint are located just to the north of the proposal site, and are possibly associated with a transit route along the ridge-line. Ridge and furrow earthworks of post-medieval and possibly medieval date are present in two areas within the proposal site. Remnants of industrial activity associated with coal mining and related infrastructure including a number of waggonways and railways are present

within and adjacent to the proposal site. There is no evidence to suggest that any of the industrial activity had taken place prior to the 19th century.

3.3 No significant built heritage remains are present on the proposal site, nor are there any designated historic environment sites or areas within the proposal site or within a two kilometre radius.

4. Aims and Objectives

4.1 A programme of archaeological evaluation has been devised to address the issue of the possible impacts of the proposed development on the known and potential cultural heritage resource base.

4.2 The evaluation will aim to establish the presence/absence, extent, date, nature and significance of any cultural heritage features within the proposal site. A report will be produced that will present the results of the evaluation in an easily understandable format. The report will form the basis of any proposals for further archaeological mitigation, and will define any research priorities that may be relevant if further mitigation is undertaken. Research priorities will be defined in accordance with the recent document *Shared Visions: The North-East Regional Research Framework for the Historic Environment* (D. Petts & C Gerrard, Durham County Council, 2006). Further archaeological mitigation could include preservation of significant remains in situ through design amendments, or preservation by record through a programme of investigation, monitoring and recording.

5 Evaluation

Introduction

5.1 A staged archaeological evaluation is proposed. An initial stage of detailed geophysical survey will examine certain areas within which no previous major disturbance can be demonstrated and which will experience substantial impact as a result of the proposed development. These areas contain identified historic environment features and will be used to test the efficiency and suitability of the geophysical survey methodology. In other areas geophysical survey will be undertaken in the form of transects that result in 20% coverage of the area under examination.

5.2 If the methodology is found to be successful then further areas will be subject to detailed geophysical survey. The geophysical survey will then be followed by a stage of trial trenching which will examine areas of potential archaeological interest identified through geophysical survey along with other areas shown by geophysical survey to be archaeologically 'blank' or which were not examined by geophysical survey but are still considered to have some potential for the presence of significant archaeological remains.

5.3 The evaluation will allow informed decisions to be made regarding the need for, and nature of, any further archaeological mitigation that may be required prior to or during development at the site.

Geophysical survey

5.4 A total of *c.* 8.3 hectares will initially be subject to detailed fluxgate gradiometer (magnetometer) survey (**Figure 2**). Area 1 contains the site of a former schoolhouse that was built in the late 19th century and demolished in the mid-20th century (RPS 2006, site 16). Area 2 is crossed by the route of a former waggonway that may have been a precursor to the inclined railway that is still present as a public footpath (RPS 2006, site 23). The waggonway is likely to have been built in the early 18th century, and was disused by the mid 18th century. This area is also close to the two locations (outside of the proposal site) where finds of prehistoric worked flint have been recorded. Area 3 is a *c.* 17.6 hectare block of land predominantly within the proposed excavation area that will be sampled at 20% through the use of 20m wide transects as shown on **Figure 2**, thereby resulting in a sample area of *c.* 3.5 hectares.

5.5 The geophysical survey will be carried out in line with guidelines set out in the documents *The Use of Geophysical Surveys in Archaeological Evaluations* (Institute of Field Archaeologists' Technical Paper No. 9, 1991) and *Geophysical Survey in Archaeological Field Evaluation* (English Heritage Research and Professional Service Guideline No. 1, 1995).

5.6 A fluxgate gradiometer will be used for the geophysical survey, with two fluxgate sensors mounted vertically 1m apart and two sets of sensors mounted on a single frame 1m apart horizontally. Data collection will be on traverses 1m apart and at 0.25m centres, and separated into 30m x 30m grids resulting in 3600 recorded measurements per grid. Surveys grids will be located using GPS and /or total station.

5.7 The geophysical survey will be undertaken by an experienced specialist contractor monitored by the nominated RPS Archaeology Project Manager.

5.8 A separate report will be produced showing the results of the geophysical survey. Minimal processing using ArchaeoSurveyor version 2.0.4.3 or similar will be used for the enhancement of results. The results will be presented as grey-scale figures, although raw data will also be shown as a separate traceplot.

5.9 Following assessment of the results of the initial stage of geophysical survey by the nominated RPS Archaeology Project Manager, the County Archaeological Officer and the applicant, further geophysical survey may be undertaken covering additional areas within the proposal site or the evaluation may move directly into a stage of trial trenching.

Contingency

5.10 In some circumstances a programme of geophysical survey may, in answering the questions posed, also raise others of an unexpected nature. Every attempt should be made to deal with the problem by agreed modification of the specification while fieldwork is in progress.

5.11 A contingency sum should be allowed for additional geophysical survey work to address particular issues which may arise once the initial data has been processed. The contingency should comprise 10% of the application area. Failure to make this

allowance, where appropriate, may necessitate further evaluation work being recommended to the local authority and a delay in the decision making process.

5.12 The activation of the contingency must only be undertaken after discussion with, and with the agreement of the County Archaeological Officer. A representative of the developer/owner etc should be present at such discussions.

6 Post excavation work, archive, and report preparation

Site Archive

6.1. The archive must be deposited in the appropriate local museum, within 6 months of completion of the post-excavation work and report. This should comprise

i)A copy of the report
ii)Raw data and original illustrations that are not included in the report
iii)A digital copy of the report and illustrations, where appropriate

6.2. Before the commencement of fieldwork, contact should be made with the landowners and with the appropriate local museum to make the relevant arrangements. Details of land ownership should be provided by the developer. Details of the appropriate museum can be provided by the Assistant County Archaeologist.

6.3. Durham County Council will require confirmation that the archive had been submitted in a satisfactory form to the relevant museum.

Report

6.4. The geophysical survey is the second stage in a potential multi-staged programme of archaeological work and has been requested prior to the determination of planning permission.

6.5. Due to the strict deadlines laid out in the planning system, the archaeological contractor or consultant should submit copies of the report to Durham County Council Conservation Team and their client within 28 working days of being commissioned to carry out the work, unless agreed in advance with all relevant parties.

6.6. The Conservation Team require two copies of the report (one bound and one unbound)

6.7. Each page and paragraph should be numbered within the report and illustrations cross-referenced within the text.

The report should include as a minimum the following:

i) Planning application number, Durham County Council Conservation Team reference, OASIS reference number and an 8 figure grid reference
ii) A location plan of the site at an appropriate scale of at least 1:10 000
iii) A location plan showing the location of the blocks of geophysical survey. This must be at a recognisable planning scale, and located with reference to the national grid, to allow the results to be accurately plotted on the Sites and Monuments Record
iv) Copies of the following plots:

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i) trace
ii) grey scale
iii) interpretative

v) A summary statement of the results
vi) A discussion and interpretation of the results of the survey
vii) Any variation to the above requirements should be approved by the planning authority prior to work being submitted

6.8. Copyright of the report will be retained by the contractor under the terms of the *Copyright, Designs and Patents Act* (1988) with all rights reserved, excepting that the contractor provides an exclusive licence to the respective client and to the local planning authority for the use of the report in all matters relating to the project.

6.9. The project archive consists of the records relating to the evaluation, including written records, photographs, drawings and artefacts. The contractor will ensure that the archive is fully catalogued, indexed, cross-referenced and checked for consistency.

6.10. The archive will be prepared in accordance with procedures outlined in *Standards in the Museum Care of Archaeological Collections* (Museums and Galleries Commission 1992) and any procedures adopted by the recipient museum.

6.11. The retained artefacts remain the property of the landowner with the exception of human remains and any artefacts that fall within the remit of the *Treasure Act* 1996. Subject to obtaining written consent from the landowner, the artefacts will be deposited along with the rest of the archive. Arrangements for the finds to be viewed by the landowner will be made on request.

6.12. A programme of monitoring of the evaluation in the field shall be agreed in advance between the contractor, the client, RPS and the County Archaeological Officer. The timing of each monitoring visit will be agreed in advance with all parties.

6.13. Any variation or modification to the evaluation methodology will be fully discussed in advance and agreed by the contractor, RPS, the client and the County Archaeological Officer.

6.14. The involvement of the County Archaeological Officer shall be acknowledged in any report or publication generated by this project.

7 Programme

7.1 It is envisaged that the proposed evaluation would take approximately two weeks to complete in the field, with a further three weeks required for reporting.

8 Media

8.1 Enquiries or releases through the media on archaeological finds and material found during the evaluation will, in the first instance, be directed through the client. Whilst UK COAL support media coverage on archaeological finds and will be happy to co-ordinate such coverage, it is recommended that relevant information is released after completion of all stages of archaeological fieldwork in order to ensure that the integrity of the resource is maintained.

9 References

IfA 1994 *Standard and Guidance for Archaeological Field Evaluation*, Institute of Field Archaeologists 1994 (Revised 1999) (Amended 2001).

English Heritage 1991 *Management of Archaeological Projects*, 2nd Edition.

RPS 2006 *Park Wall North: Historic Environment Desk-Based Study*, RPS Planning, Transport and Environment September 2006, unpublished client report.

10. Staff

10.1 The Consultant will identify the main staff that will be employed on this work. The names of the overall Project Manager and the principle in each of the subject areas are required.

11. Access

11.1 Access to the site shall be arranged with David Miller on 01302 755149

12. Pricing

12.1 The work is to be tendered on a Fixed Lump Sum basis.

12.2 You are requested to provide additional rates for the following:-

i. Additional Geophysical Survey price per Ha.

12.3 Following appointment, the Consultant will identify the limitations of the above specified work and, where necessary, make recommendations for further works identifying the benefits that would be achieved. No additional works are to be undertaken without the express agreement of the Company.

13. Invite

13.1 You are invited to submit a proposal for this work. Should you choose to bid for this work, you should set out the methodology and standards you would apply in your impact assessment of the site, together with your Lump Sum Fixed Price at Form of Tender Part II.

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14 Insurance

14.1 The Consultant shall be required to provide evidence of Public Liability, Employers and Professional Indemnity Insurance.

15. Confidentiality & Intellectual Property

15.1 The successful consultant shall exercise discretion and confidentiality at all times whilst representing the Authority.

15.2 The Consultant hereby undertakes with the Authority, that he will not at any time hereafter use, divulge or communicate to any other person, nor allow to be used, divulged or communicated, save with the consent of the Authority, any information concerning any aspect of this Contract, or the contents of any drawings, reports, specification, bills of quantities, calculations or other similar documents relating to the Works, or any other dealings, transactions or affairs of the Authority, which may come to his knowledge or into his possession and that he shall use his best endeavours to prevent the publication or disclosure of any such items of information.

15.3 The Consultant shall not act in any manner which could conflict with the interests of the Authority.

16. Information to be supplied to the Consultant

16.1 The Authority shall supply to the Consultant without charge and within a reasonable time, all necessary and relevant data and information in the possession of the Authority and shall give such assistance as shall reasonably be required by the Consultant in the performance of his services under this Contract. None of the said data or information shall be used by the Consultant for any purpose other than in connection with this Contract without the prior written approval of the Authority.

16.2 The Authority shall give its decision on all sketches, drawings, reports, recommendations, and other matters properly referred to him for decision by the Consultant in such reasonable time as to avoid undue delay or disruption to the performance of the Consultant in carrying out the Works.

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17 Authority's Representative

The Authority has appointed as his Representative for the Consultancy:-

Mr R Cory
Senior Geologist
UK Coal Mining Ltd,
Harworth Park
Blyth Road
Harworth
Doncaster
DN11 8DB

Tel No:01302 755159
or any duly authorised nominee.

18 Payment

18.1 Invoices shall be sent upon satisfactory completion of the works as directed by the S.O. and in accordance with contractual time scales and prices quoted in Form of Tender Part II - Schedule of Prices.

18.2 Invoices should be addressed to:-
Accounts Dept
UK Coal Mining Ltd
Harworth Park,
Blyth Road,
Harworth,
Doncaster,
DN11 8DB.

18.3 All invoices should be clearly addressed for the attention of the Accounts Dept quoting the contract reference number (MB/PWALL/2350), all descriptions to be in accordance with the Form of Tender Part II, payments shall be made by the Authority in accordance with Form of Tender Part IV.

18.4 In addition to his fees the Consultant shall be entitled to claim from the Authority the amount of V.A.T. properly chargeable on the goods and services supplied by him in the performance of the Consultancy.

19. Variations

19.1 The Supervising Officer may require to vary the Services to be provided under this Contract. The value of any variation order shall be added to or deducted from the price payable under the Contract, and shall be calculated in accordance with the Schedule of Prices at Form of Tender Part II. No variation shall invalidate the Contract nor shall it entitle the Consultant to any compensation for loss of profit in

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respect of work which may no longer be required nor to any other payment except as provided for in the variation order.

20. Conditions of Engagement

20.1 The Conditions of Engagement shall be UK Coal Mining Ltd General Conditions of Contract Consultancy 2007.

20.2 In the case of conflict, terms and conditions stated herein shall take precedence.

21. Limits of Site

21.1 The Consultant shall ensure that his employees and agents and the employees and agents of his sub-contractors keep within the limits of:-

(i) The site occupied by the Works;

(ii) Any other area or premises made available to him in connection with the Contracted Works.

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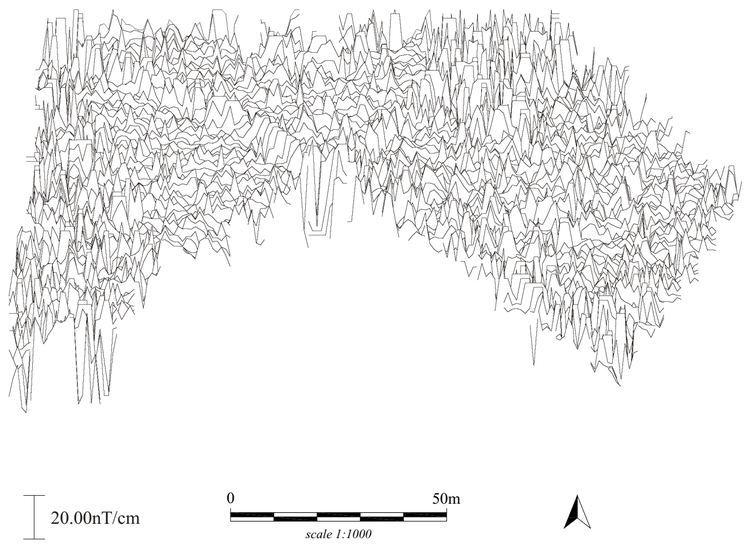
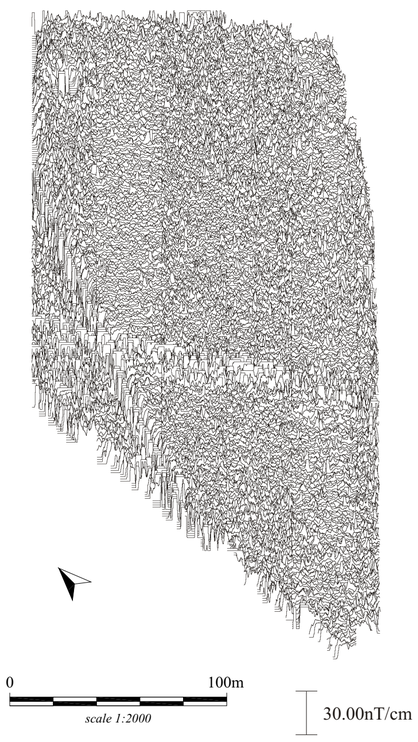
Appendix II: Trace plots of geophysical data

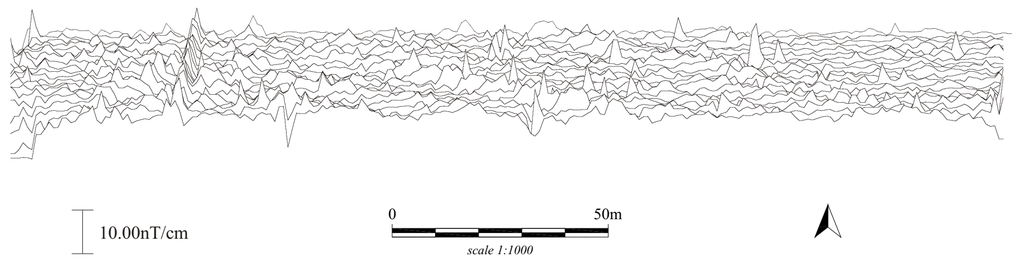
Area 1



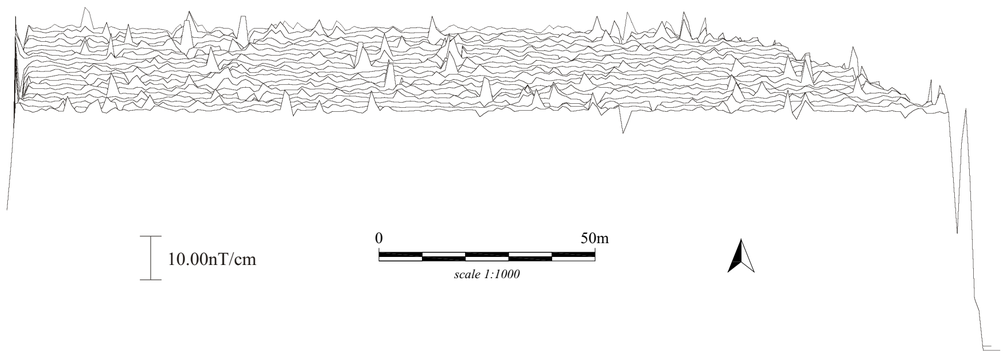
Area 2



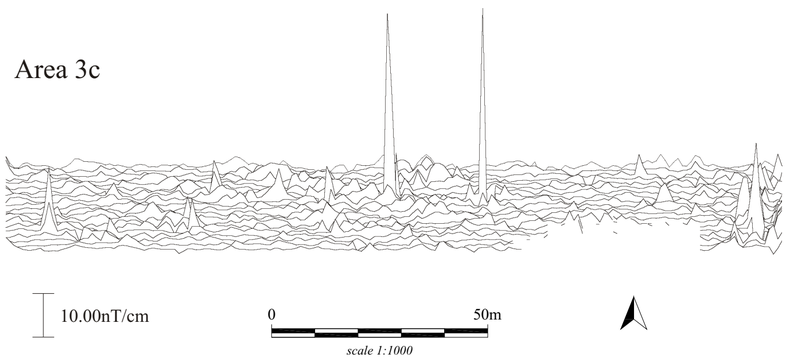
Area 3a



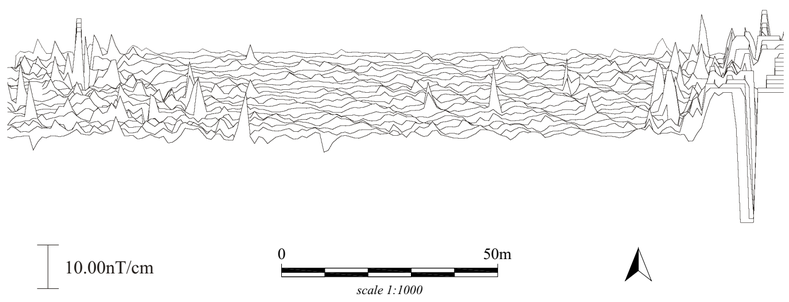
Area 3b



Area 3c



Area 3d



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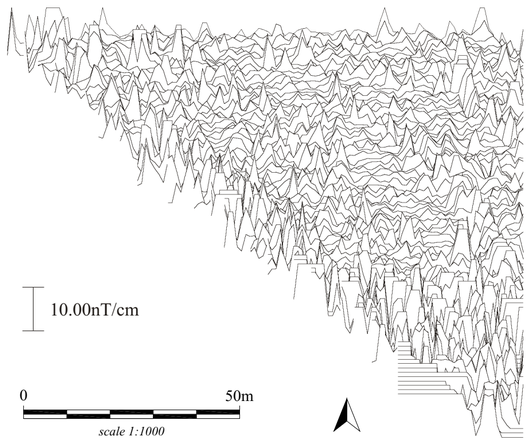

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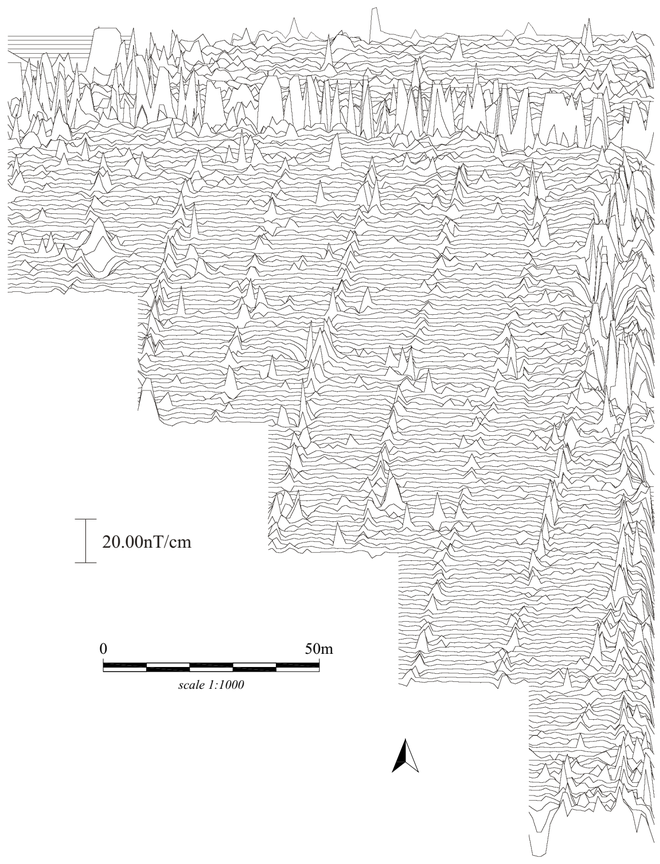
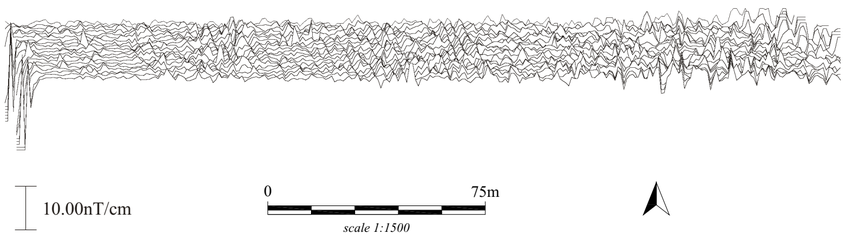


Area 3e



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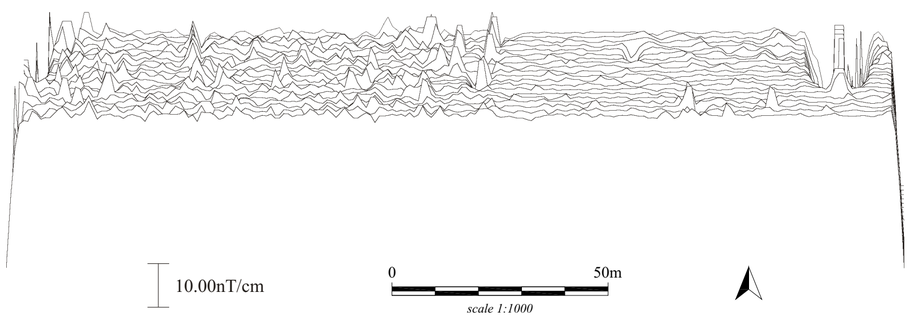

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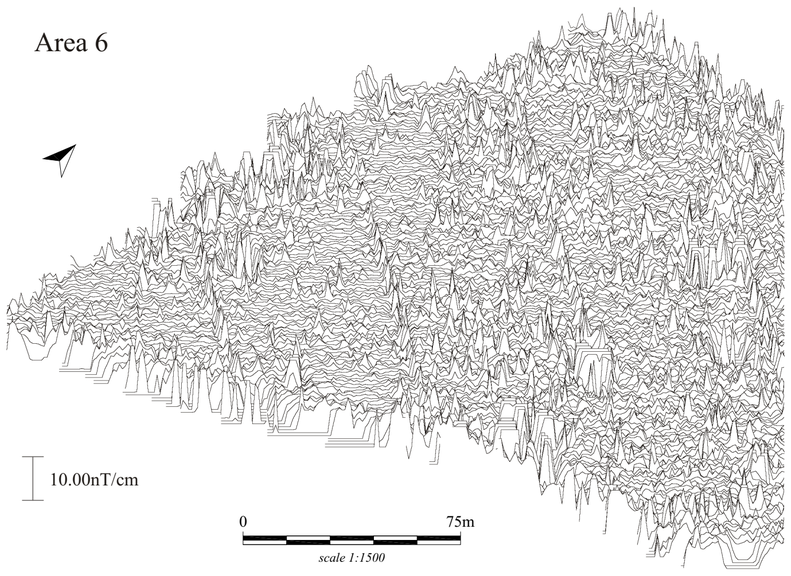

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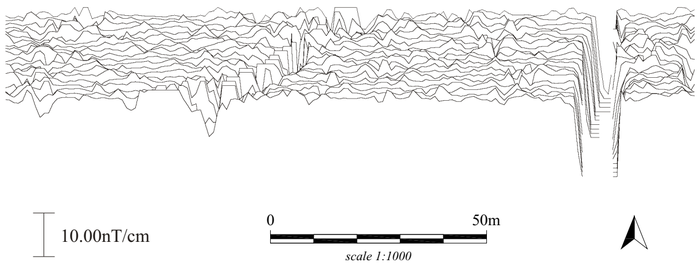
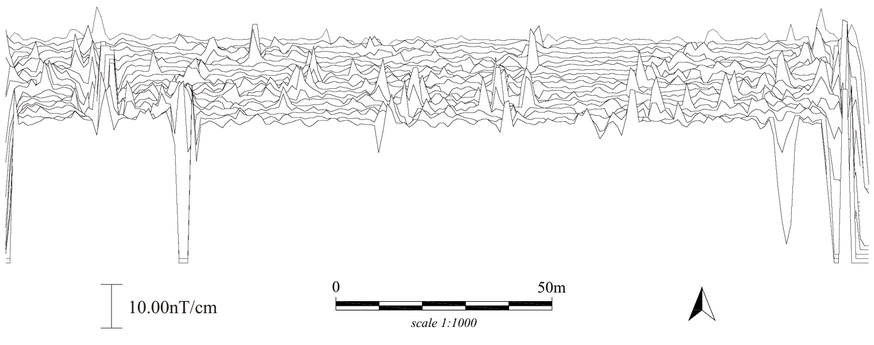


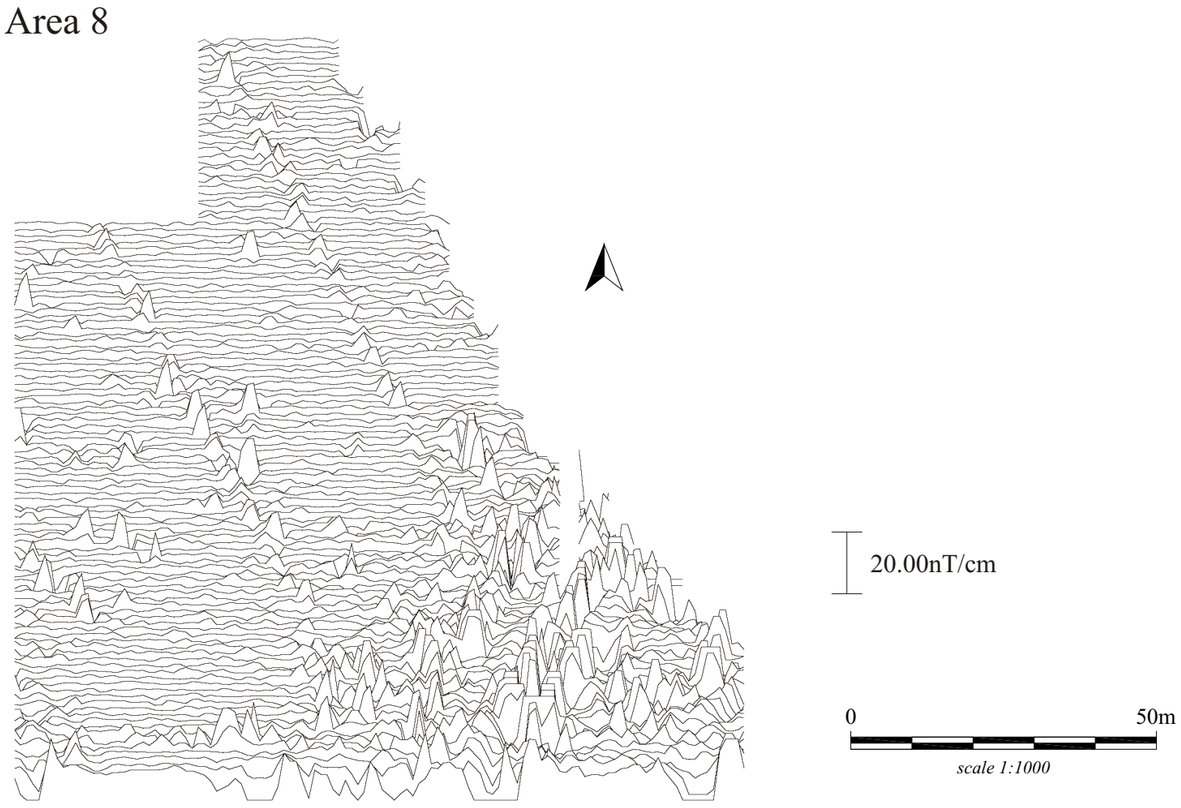
Area 7

Area 3h



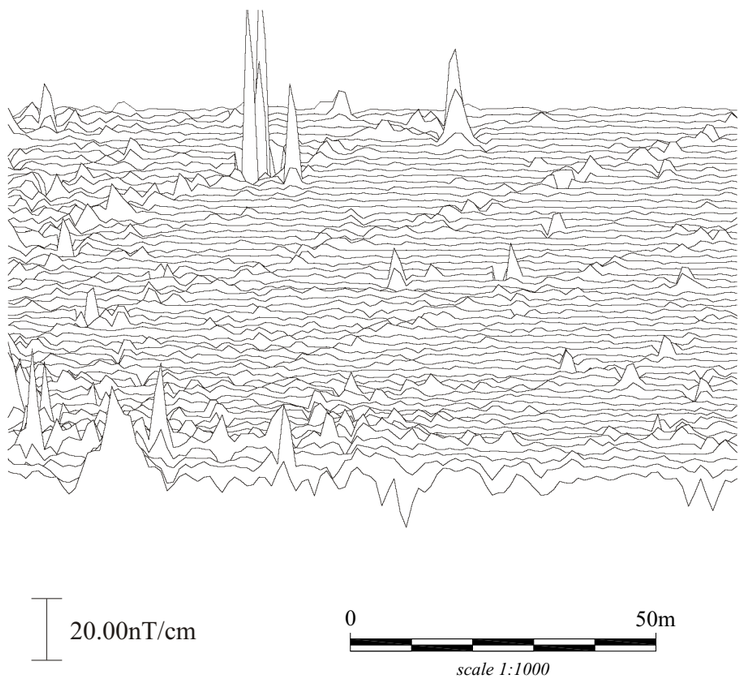
Appendix II: Trace plots of geophysical data

Area 8



Area 9

Area 10



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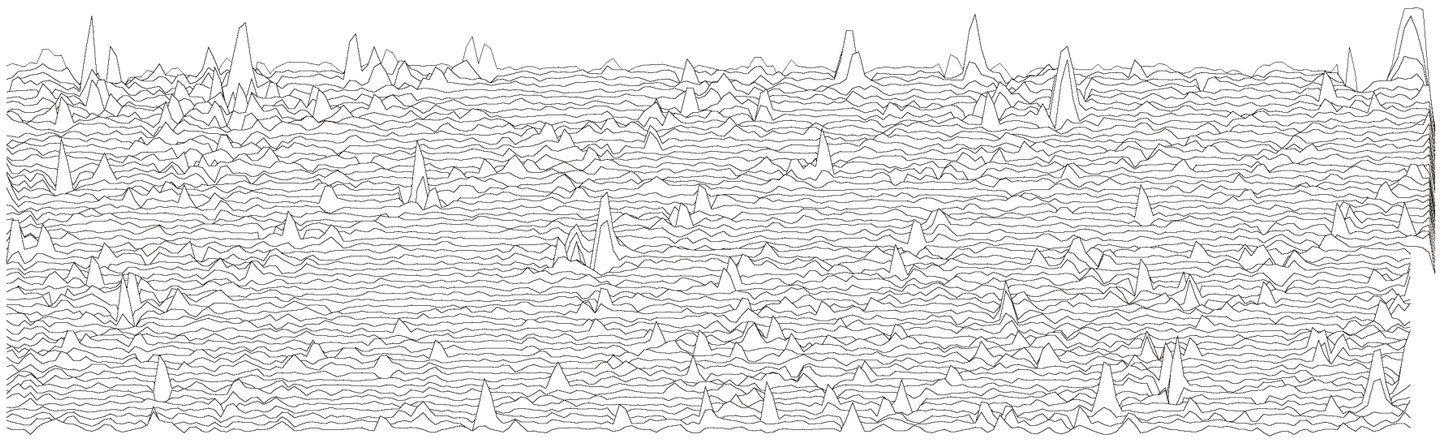
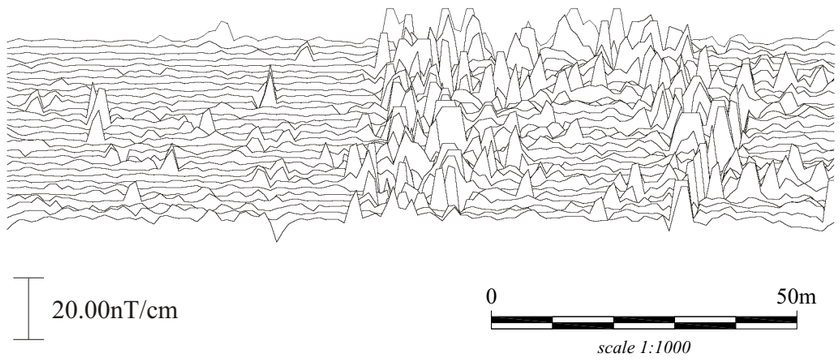


Area 12



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University of Durham

Park Wall North Surface Mining Site, near Crook, County Durham

geophysical surveys

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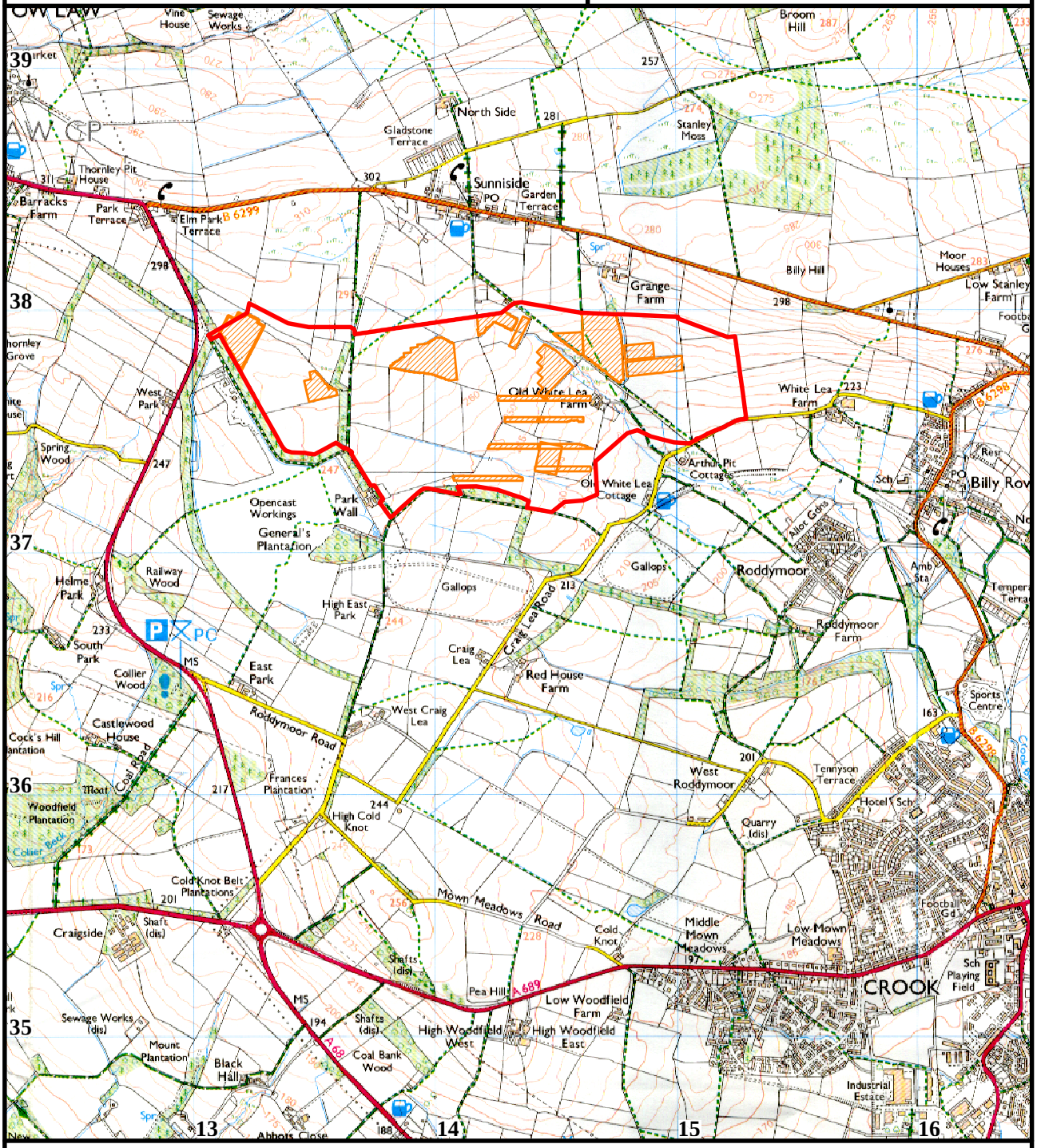
Figure 1 *Location map*

on behalf of

UK Coal Mining Ltd



survey

site boundary

0 1km

scale 1:25 000 - for A4 plot

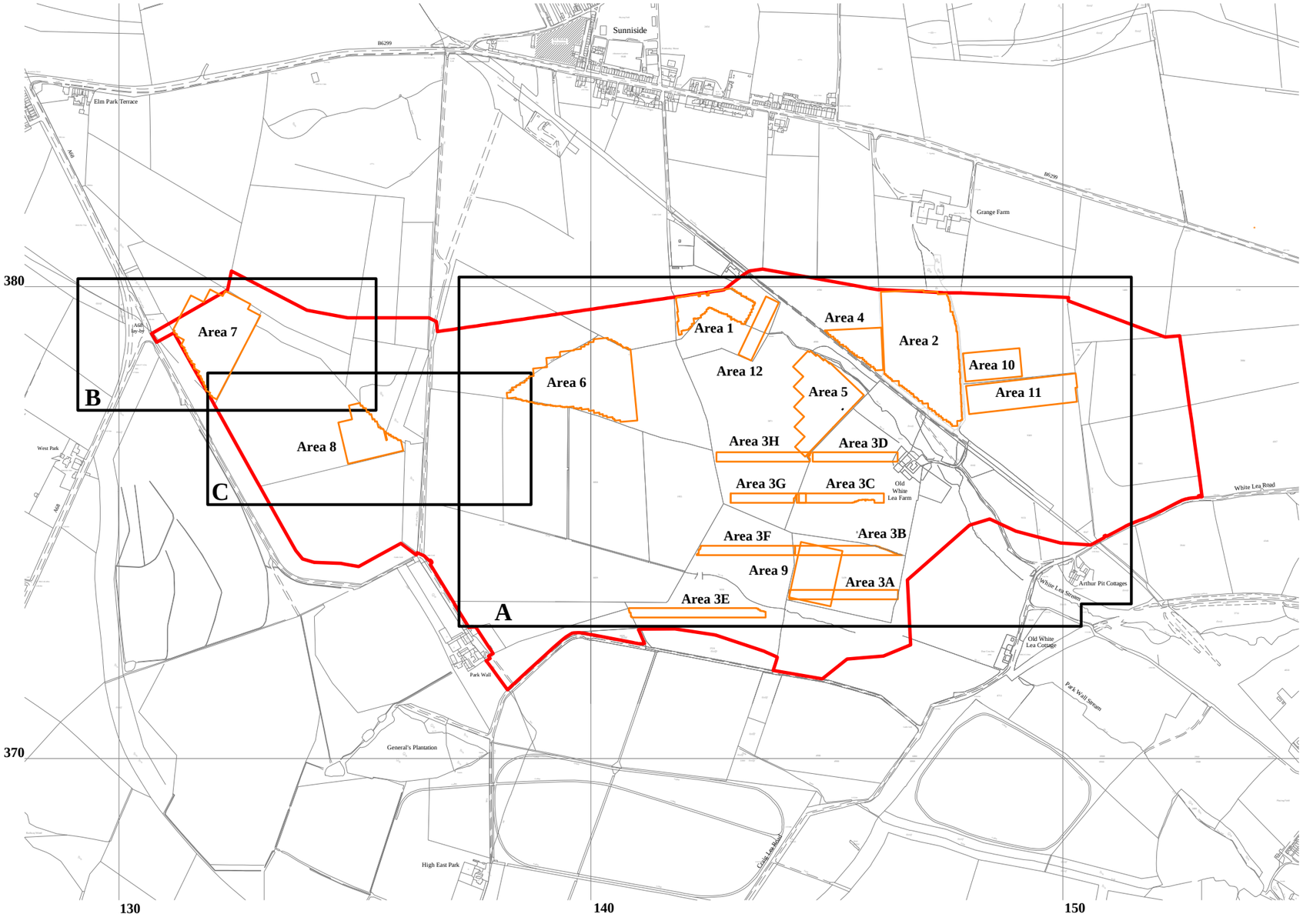


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Figure 2

Location of the geophysical surveys

on behalf of
UK Coal Mining Ltd

0 500m

scale 1:10 000 - for A3 plot

outline of survey area

site boundary

Area 1

Area 2

Area 3A

Area 3B

Area 3C

Area 3D

Area 3E

Area 3F

Area 3G

Area 3H

Area 4

Area 5

Area 6

Area 7

Area 8

Area 9

Area 10

Area 11

Area 12

Old White Lea Farm

Arthur Pit Cottages

White Lea Stream

A68 lay-by

A

B

C

outline of survey area

5.00
4.17
3.33
2.50
1.67
0.83
0.00
-0.83
-1.67
-2.50
-3.33
-4.17
-5.00 nT

0 50m

scale 1:1250 - for A0 plot

on behalf of
UK Coal Mining Ltd

Archaeological Services
University of Durham

Park Wall North Surface Coal Mining Site, near Crook, County Durham

geophysical surveys

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Figure 3

Geophysical surveys

Area 1
Area 2
Area 3A
Area 3B
Area 3C
Area 3D
Area 3E
Area 3F
Area 3G
Area 3H
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9
Area 10
Area 11
Area 12

Old White Lea Farm
Arthur Pit Cottages
White Lea Stream
A68 lay-by

A
B
C

outline of survey area
positive magnetic anomalies
negative magnetic anomalies
dipolar magnetic anomalies

0 50m
scale 1:1250 - for A0 plot

on behalf of
UK Coal Mining Ltd

Archaeological Services
University of Durham

Park Wall North Surface Mining Site, near Crook, County Durham

geophysical surveys

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Figure 4

Geophysical interpretation

Area 1
Area 2
Area 3A
Area 3B
Area 3C
Area 3D
Area 3E
Area 3F
Area 3G
Area 3H
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9
Area 10
Area 11
Area 12

disturbance
disturbance
possible shaft location
possible course of waggonway
presumed course of waggonway
disturbed area
disturbed area
disturbed area
disturbed area
ferrous litter
electricity pylon
electricity pylon
electricity pylon
electricity pylon
electricity pylon
telegraph pole
probable former land boundary

Old White Lea Farm
Arthur Pit Cottages
White Lea Stream
A68 lay-by

A
B
C

outline of survey area
soil-filled features
service pipes
orientation of ridge and furrow
possible ridge and furrow
land drains
possible stone wall footings or sewers

0 50m
scale 1:1250 - for A0 plot

on behalf of
UK Coal Mining Ltd

Archaeological Services
University of Durham

Park Wall North Surface Coal Mining Site, near Crook, County Durham

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Figure 5

Archaeological interpretation