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**Proposed Pannal to Nether Kellet Gas Pipeline
Sites near Embsay and Burton-in-Lonsdale
North Yorkshire**

Geophysical Surveys

October 2004

Report No. 1305

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Proposed Pannal to Nether Kellet Gas Pipeline

Sites near Embsay and Burton-in-Lonsdale

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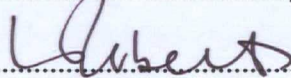
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Summary

Geophysical surveys were undertaken at two sites in North Yorkshire along the proposed route of the Pannal to Nether Kellet Gas Pipeline. At the Embsay site there is evidence of ridge and furrow ploughing but buried pipes and ferrous fencing has adversely affected the data over quite a wide area. On the basis of the magnetic survey the archaeological potential of this site is considered to be low. At the Burton-in-Lonsdale site numerous magnetic anomalies have been identified, especially along the central section of the corridor. However, this section of the route traverses particularly sloping and uneven terrain and consequently most of the anomalies are interpreted as being due to natural topographical or pedological/geological variation. Some weak trends in the data are also noted but these too are considered most likely to be caused by modern and/or agricultural activity although archaeological origins cannot be completely dismissed. The results from the resistance transects are similarly inconclusive. One area of high resistance in roughly the right location and on approximately the right alignment to the postulated route of the Roman road has been identified. However, a natural origin is considered more probable given the topography.

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1. Introduction and Archaeological Background

- 1.1 Archaeological Services WYAS was commissioned by Ms Linda Bonnor, Archaeological Advisor to Transco (the clients), to carry out geophysical surveys at two sites along the proposed route of the Pannal to Nether Kellet gas pipeline in order to assist in the final routing of the pipeline. This report will also form part of the Environmental Impact Assessment programme.
- 1.2 Two sites, both in North Yorkshire, one at Embsay, north of Skipton and the other south of Burton-in-Lonsdale (see Figs 1 and 2) have been identified as of significant concern at this time. At Embsay the archaeological curator for the Yorkshire Dales National Park has identified an area adjacent to Kirkby Lane, immediately south of Embsay Kirk, that may contain remains associated with the former medieval priory of St Mary and St Cuthbert (SMR Ref. NY23658) whilst the possible course of a Roman road (SMR Ref. YD4342) may be significantly impacted at the Burton-in-Lonsdale site to the west.
- 1.3 At the Embsay site a rectangular area of approximately 4 hectares was surveyed immediately to the south of Embsay Kirk, centred at SE 4011 4542. The ground cover here comprised permanent pasture and no problems were encountered during the fieldwork.
- 1.4 The survey area at Burton-in-Lonsdale comprised a corridor 1km long and 60m in width (an area of 6 hectares), orientated broadly from east to west, between SD 3647 4711 in the west and SD 3657 4711 in the east. All of the surveyed area comprised permanent pasture or rough grazing. No particular problems were encountered during survey at this site but the field at the eastern end of the corridor was extremely boggy and another was primarily covered in reeds and sedge. In both these areas the quality of the data was compromised by the prevailing ground conditions. Access was also denied in the field at the extreme western end of the survey corridor. The topography was undulating from west to east with a general downslope to the north of the corridor, towards a stream.
- 1.5 At the Burton-in-Lonsdale site the underlying geology comprised Namurian millstone grit whilst at Embsay Tournaisian Carboniferous limestone formed the solid strata. At both sites the prevailing soils were the same being classified in the Brickfield 2 Soil Association. These soils derive from drift from Palaeozoic and Mesozoic sandstone and shale and are described as slowly permeable, seasonally waterlogged fine loamy soils.

2. Methodology and Presentation

- 2.1 The primary objective of the geophysical surveys were to:-
 - locate, delimit and provide detail on the known sites
 - locate, delimit and characterise any hitherto unknown sites
 - identify areas of archaeological potential for further investigation
 - provide information to guide subsequent evaluative work for which avoidance is not possible or desirable at this stage
 - to provide information for the design of site specific mitigatory measures.

- 2.2 The survey methodology and report comply with the recommendations outlined in the English Heritage Guidelines (David 1995) as a minimum standard. All figures reproduced from Ordnance Survey mapping are done so with the permission of the controller of Her Majesty's Stationery Office. © Crown copyright.
- 2.3 General site plans, incorporating the 1:50000 Ordnance Survey mapping, locate the sites in Figures 1 and 2. Figures 3, 4 and 5 are more detailed location plans, showing the processed geophysical data superimposed onto a digital base map, at scale of 1:5000 and 1:10000 respectively. The processed magnetic data, together with the interpretations, are presented in Figures 6 to 13 inclusive at a scale of 1:1000. The processed resistance data is presented and interpreted at a scale of 1:500 in Figures 14 to 27 inclusive.
- 2.4 Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1 and Appendix 2. Appendix 3 details the survey location information and Appendix 4 describes the composition and location of the archive.

The figures in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

3. Results

3.1 Site 1: Embsay (Figs 1, 3, 6 and 7)

Magnetometer Survey

- 3.1.1 The most obvious anomalies in the data from this site are those caused by ferrous material. The western part of the survey area is criss-crossed by three dipolar, linear anomalies that are caused by sub-surface pipes. Six large magnetically disturbed areas, caused by iron paling fencing around the trunks of mature trees, are also prominent. East of Kirkby Lane other areas of magnetic disturbance are caused by animal feed pens and troughs.
- 3.1.2 Also common across the whole survey area are the broad, parallel linear anomalies aligned from north-west to south-east that are caused by the former agricultural practice of ridge and furrow ploughing. Even when the visible earthworks have been ploughed out the magnetic contrast between the infilled furrows and the former ridges result in the characteristic striped magnetic effect.
- 3.1.3 No anomalies of probable archaeological origin have been identified at this site.

3.2 Site 2: Burton-in-Lonsdale (Figs 2, 4, 5 and 8-27 inclusive)

Magnetometer Survey; western section

- 3.2.1 In the most westerly field only isolated dipolar ('iron spike') anomalies have been identified. These anomalies are indicative of ferrous objects or other magnetic material in the topsoil/subsoil and, although archaeological artefacts may cause them, they are more often caused by modern cultural debris that has

been introduced into the topsoil. There is no apparent clustering to these anomalies and consequently they are not considered to be archaeologically significant. Only the strongest of these responses have been shown on the interpretation figures.

- 3.2.2 The relative paucity of this type of anomaly in the fields along the remainder of this section suggests that this first field may have been under arable cultivation in the recent past with the ferrous material possibly introduced as a consequence of manuring. Certainly the pasture along the rest of this section remains unimproved with a large area of rushes, sedges and generally boggy ground in the next field. The magnetic background is also generally much more variable here and several broad linear areas where the readings are above or below (positive or negative relative to) the median background have been highlighted on the interpretation figure. There appears to be a general trend in the orientation of these anomalies from south-west to north-east. However, it is considered that these anomalies are not archaeological but are a natural consequence of variations in the composition and depth of the soils and the underlying solid geology.
- 3.2.3 Vague linear trend anomalies have also been identified at either end of this section. No definitive interpretation can be given for these anomalies although a modern or agricultural origin is considered most likely.
- 3.2.4 Also on the eastern edge of this section, is an area of pronounced magnetic enhancement that correlates with the location of a fairly steep, broad gully that runs down to the north towards the stream. It is not clear whether this gully is natural or man-made but the anomalies are considered more likely to be caused by modern activity although an archaeological origin cannot be discounted.

Magnetometer survey; central section

- 3.2.5 A plethora of 'iron spike' anomalies can be seen in both the fields in this section. Again the concentration is not considered to be archaeologically significant but rather to reflect the proximity of the outbuildings at Egerton Lodge Farm.
- 3.2.6 In the first field two linear trend anomalies have been highlighted, running from north to south. The fact that they are aligned parallel with the current field boundaries lends weight to the interpretation that their origins are recent, probably caused by rutting or by field drains. In the next field an intermittent linear trend anomaly aligned from south-east to north-west could be caused by a culvert or drain carrying the stream (issues) which otherwise appears to terminate at the western field boundary (see Fig. 11).
- 3.2.7 An area of magnetic disturbance, prominent in the north-west corner of the next field, is likely to be caused by modern ferrous material as is the bigger spread at the eastern end of the field.
- 3.2.8 Three broad areas of magnetic enhancement have also been identified which are interpreted as being caused by natural variations in the composition of the topsoil or by topographical changes.

Magnetometer survey; eastern section

- 3.2.9 No anomalies other than those caused by modern ferrous debris have been identified in this section.

Resistance Survey

- 3.2.10 As the magnetometer survey did not provide any conclusive evidence for the presence/absence or alignment of the Roman road detailed resistance survey was undertaken in compliance with the specification. Six transects, each covering 600m² (60m by 10m), were surveyed at right angles to the proposed pipe corridor (see Fig. 5). Three transects were also surveyed parallel with the corridor.
- 3.2.11 Broad changes in resistance can be seen in all the survey transects and consequently discrete areas of high or low resistance have been identified on the interpretation figures. However, except where described below, this variation in resistance is considered to be due to differences in soil water content (which in turn is affected by natural changes in topography, pedology and geology) rather than by any man-made (archaeological) features.
- 3.2.12 In the field at the eastern end of the corridor a distinct linear, high resistance anomaly can be seen. This anomaly is probably caused by a feature such as a stone capped drain; the anomaly is not broad enough to be caused by a surface such as the packed stone top of a Roman road.
- 3.2.13 In the central section of the corridor a broad, roughly linear area of very high resistance can be clearly seen. The linearity and width of this anomaly could be consistent with the surface of a Roman road and its bearing and location are approximately in the right area. However, the topography is fairly steep at this location and on balance it is considered more likely that the observed anomaly is the product of topographical and/or geological change rather than a man made feature.

4. Discussion and Conclusions

- 4.1 The geophysical surveys carried out at both sites have been essentially disappointing from an archaeological viewpoint. At Embsay no anomalies of a probable archaeological origin have been identified although there is evidence of ridge and furrow ploughing having taken place. Pipes and ferrous fencing has resulted in a lot of disturbed data in the area immediately south of Embsay Kirk and it is conceivable that this disturbance could be masking the much weaker responses from any sub-surface archaeological features. However, on the basis of the magnetic survey, the archaeological potential of this site is considered to be low.
- 4.2 At the Burton-in-Lonsdale site numerous magnetic anomalies have been identified, especially along the central section of the corridor. However, this section of the route traverses particularly sloping and uneven terrain and consequently most of the anomalies are interpreted as being due to natural topographical or pedological/geological variation. Some weak trends in the data are also noted but these too are considered more likely to be caused by modern and/or agricultural activity although an archaeological origin could not be categorically dismissed. The results from the resistance transects are

similarly inconclusive with much variation noted along the corridor also interpreted as essentially due to natural causes. Overall no geophysical anomalies have been identified to locate the route of the Roman road.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

Bibliography

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Acknowledgements

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Report

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Appendices

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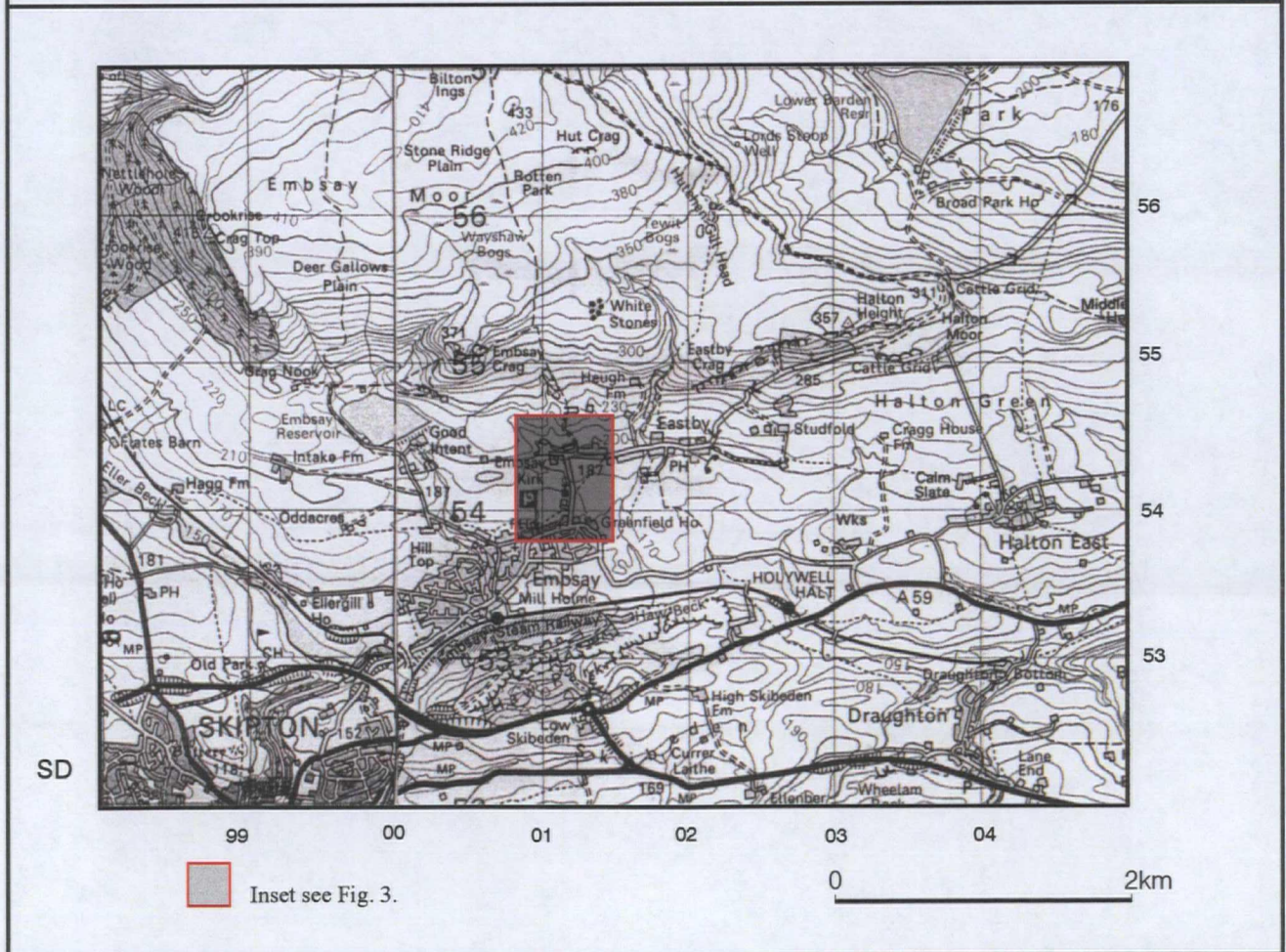
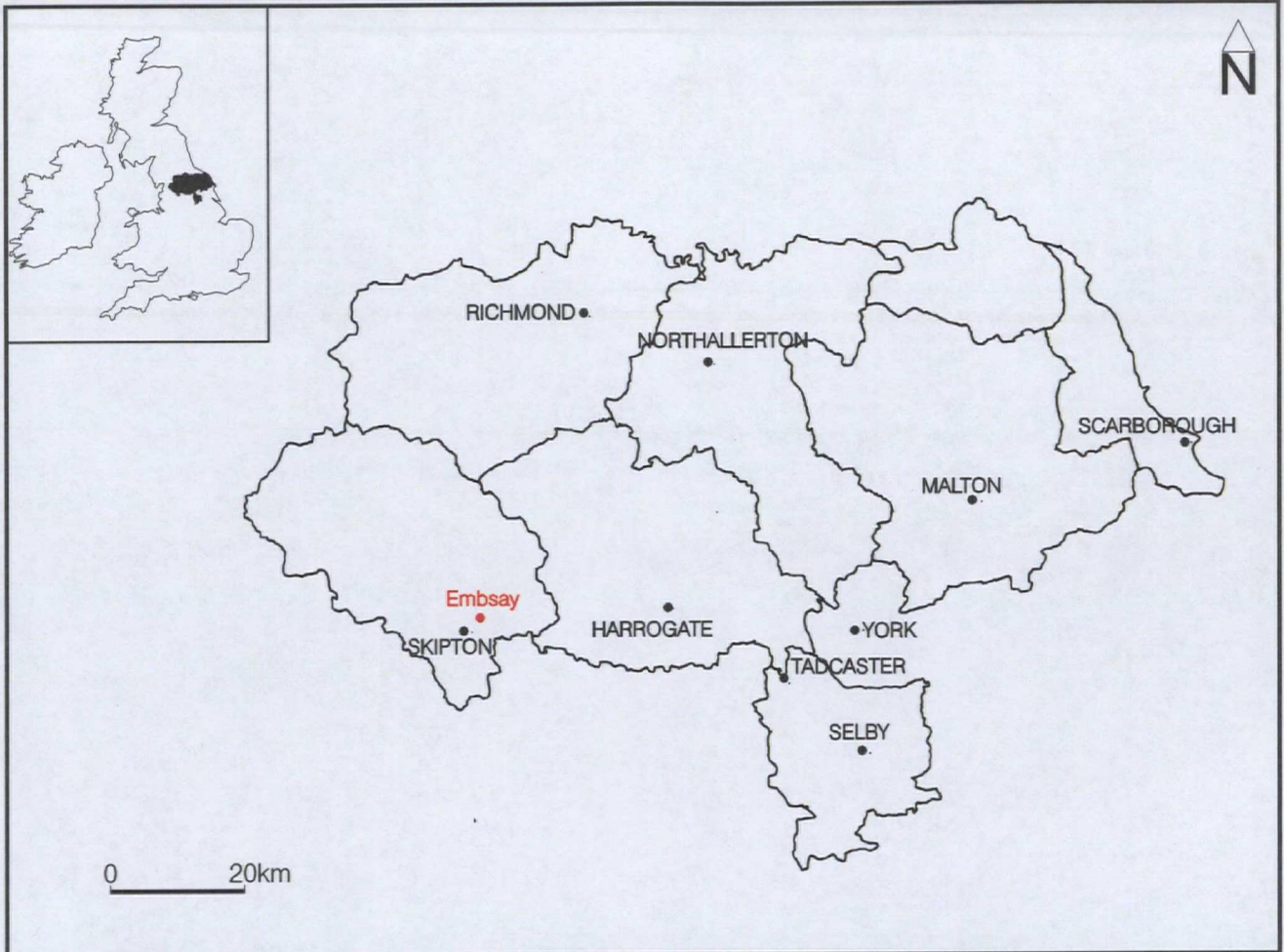


Fig. 1. Site 1 location