

**Whitemoor Haye Quarry  
Alrewas South Proposed Extension  
Alrewas  
Staffordshire**

**Report on Archaeological Geophysical Survey  
2012**

**Surveyed by:**

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**for:**

**Lafarge Aggregates Ltd**

## **Whitemoor Haye Quarry Alrewas South Proposed Extension**

### **Report on Archaeological Geophysical Survey 2012**

#### **Introduction**

A geophysical survey has been carried out as part of an archaeological evaluation of the site of a proposed extension to the existing Whitemoor Haye Quarry at Alrewas, Staffordshire. The survey covered all accessible ground within two areas of land located to the south and east of Alrewas village, as indicated on the enclosed location plan (figure 1).

The survey was commissioned on behalf of Lafarge Aggregates Ltd by Phoenix Consulting Archaeology Ltd, and fieldwork was done in the second half of March 2012. The survey has detected magnetic features and activity from various sources, a small number of which may be of archaeological interest. The findings also include features identifiable as former field boundaries, as well as recent or non-archaeological ground disturbances.

#### **The Site**

A full account is given of the condition and topography of the site, as well as the archaeological background to the evaluation, in the Archaeological Desk Based Assessment (DBA) previously prepared by Phoenix Consulting [1]. The following summary is based in part on this document.

##### *Topography and geology*

The two areas of land currently under investigation are located at the northern and southern ends of the proposed extension site, which is centred at NGR SK 170130. (Intermediate fields were previously the subject of an archaeological field evaluation in the 1990s.) The extension site is located to the east of the A38, and west of the existing quarry. The proposed survey areas amount in total to c. 115ha, but the northern area includes wooded and overgrown ground, as well as a field planted with a tall and dense grass crop, and so could not be surveyed in full. The total survey coverage achieved across both areas was 95ha.

The geology of the site is described in the DBA as a gravel terrace bordering the western bank of the river Tame. The floodplain consists of spreads of alluvial deposits which overlie the gravel sub-surface, above a bedrock of Triassic Mercian Mudstone.

Variations in the depth and composition of alluvial deposits often give rise to characteristic broad and undulating magnetic anomalies, as is the case in parts of the present survey.

The presence of naturally magnetic stones in gravel can sometimes give rise to an increased

background noise level in a survey, as can also be seen in the survey, particularly in the northern part of the evaluation area. Background magnetic activity (as indicated by small magnetic anomalies outlined in light brown in the interpretation) has therefore been indicated on the interpreted survey plans (figures 2-5). The magnetic susceptibility readings taken during the survey (as plotted in figure 20) are sufficiently high (to about  $40 \times 10^{-5}$  SI) to suggest that conditions at the site should be reasonably favourable for the magnetic detection of archaeological features.

### *Archaeological Background*

A summary plan from the Desk Based Assessment is reproduced in figure 20. This shows the locations of nearby archaeological sites, as recorded in the County SMR. There has also been considerable archaeological work within the present quarry, where findings have included a Bronze Age barrow cemetery, together with a Roman and Iron Age farming landscape. The evaluation site is described in the DBA as lying within a wider landscape of prehistoric and ritual activity, centred at the confluence of the rivers Trent and Tame.

Most of the SMR sites within the evaluation area are cropmarks which may represent features including Bronze Age barrows, as well as other linear features and enclosures within both survey areas. Some of the cropmarks may be of prehistoric date, but others relate to former post-medieval field boundaries. Cropmarks as indicated in figure 20 have been traced approximately, and are shown (in grey) on the survey interpretation plans (figures 2-5) for comparison with the survey findings.

The 1990s evaluation of the central part of the extension area produced only limited findings, and monitoring of a soil strip in advance of the construction of the conveyor near to cropmarks [1] and [2] failed to identify any archaeological features. It is therefore concluded in the DBA that the archaeological potential of the evaluation area is 'moderate'. The survey evidence is broadly consistent with this conclusion.

### **Survey Procedure**

The site was investigated by means of a recorded magnetometer survey. Readings were collected along transects 1m apart using Bartington 1m fluxgate gradiometers, and are plotted at 25cm intervals along each transect. The results of the survey are presented at 1:2000 scale as grey scale plots (figures 6-11), and as graphical (x-y trace) plots in sections at 1:1500 (figures 12-19). Comparison of these alternative presentations allows the detected magnetic anomalies to be examined in plan and profile respectively. An interpretation of the findings is shown superimposed on figure 12-19 (which permits the interpreted outlines to be compared with the underlying data), and is reproduced separately to provide a summary of the findings (figures 2-5).

The graphical plot shows the magnetometer readings after minimal pre-processing which includes adjustment for irregularities in line spacing caused by variations in the instrument zero setting, and slight linear smoothing. Additional 2D low pass filtering has been applied to the grey scale plot to reduce background noise levels.

Colour coding has been used in the interpretation to distinguish different effects. The interpretation is intended to be schematic and illustrative, and not to reproduce the detail of the grey scale plots. A limited number of magnetic anomalies of potential archaeological interest are outlined in red. An attempt has been made to distinguish between these features and other linear disturbances which can be identified as field boundaries visible on the 1883 1<sup>st</sup> edition OS map (and other historic maps which are reproduced in the DBA). A copy of the 1883 map (figure 5 in DBA) is reproduced here as figure 20iii (with survey outlines superimposed). It is clear from this map that some of the survey findings (and cropmarks) relate to former boundaries, some of which remain visible in the 1972 OS map (figure 7 in DBA). Survey findings in this category are indicated on figures 2-5 by orange (rather than red) outlines and broken lines. Pipes, and features which appear to be land drains are marked in different shades of blue / purple. This leaves a reduced category of features which, by exclusion, might be of archaeological interest, and are indicated in red.

Background magnetic anomalies which appear to be of natural or non-archaeological origin are lightly outlined in brown, and stronger (perhaps recent) disturbances in a darker brown. Weak linear cultivation effects are in green, and some of the more conspicuous ferrous objects (identifiable as narrow spikes in the graphical plots) are in light blue. Magnetic anomalies which appear to be caused by alluvial deposition are in a light green.

The magnetometer survey was supplemented by a background magnetic susceptibility survey with readings taken using a Bartington MS2 meter and field sensor loop. Results are shown on a plot inset in figure 20. Susceptibility readings can provide a broad indication of previously occupied or disturbed areas in which burning associated with past human occupation has enhanced the magnetic susceptibility of the topsoil, although the readings may be affected by a number of non-archaeological factors, including geology and land use.

### *Survey location*

The survey grid was set out and tied to the OS grid using a differential GPS system. The plans are therefore geo-referenced, and OS co-ordinates of map locations can be read from the AutoCAD version of the plans, which can be supplied with this report.

## **Results**

Fields within the evaluation area have been numbered arbitrarily (from north to south) for reference in this report. Findings are described below by fields in this sequence.

### Northern Area

#### *Fields 1-4*

Only the northern end of field 1 could be surveyed because the rest is under a standing crop of tall grass. The area includes various cropmarks, but there is little evidence for them in the survey. Some very faint linear markings are visible in the grey scale plot (figure 6), and are indicated in the interpretation (figure 2) as possible cultivation effects.

The small triangular plot labelled as field 2 contains distinct ditch-like linear features (as at A, as labelled on figure 2). These cannot be identified with cropmarks or former boundaries but form a branching pattern, which is usually characteristic of drains.

Field 3, in common with other parts of the northern evaluation area, and particularly field 5, contains areas of dense magnetic background activity, which is probably of mainly geological origin. Glacial gravels often, as mentioned, contain magnetic stones of igneous origin which can give rise to strong narrow magnetic anomalies when they are exposed at the ground surface. Variations in the density of geological effects are indicated by the small background magnetic anomalies shown (in light brown) on the plans. This activity is particularly concentrated in the southern half of field 3 (where it corresponds to a distinct susceptibility anomaly as seen in the plot in figure 20), and also in fields 5 and part of 6.

It is difficult to identify specific findings against this disturbed background, other than possible strong recent disturbances (as outlined in dark brown). Some possible faint linear marks may be visible in the grey scale plot, and are indicated in figures 2-3 by red lines. The features around B (as labelled on figures 2-3) are very uncertain. They do not correspond directly to any of the cropmarks, but are in the same part of the site as various cropmarks. Other fragmentary polygonal patterns are perhaps visible in this part of the site in the grey scale plot. They are indistinct against the magnetically disturbed background, but such features may sometimes represent frost cracks in the exposed gravel surface.

A more distinct linear feature at C is parallel to a cropmark, but is not clearly identifiable as a former field boundary. Broad weak magnetic anomalies (outlined in light green) indicate an area of alluvial deposition in the SE corner of field 3 (and extending into fields 6 and 7).

Field 4 is a small separate paddock which was too overgrown to be surveyed.

#### *Fields 5-7*

The magnetic response in field 5 includes much strong geological background activity, and the field is also intersected by a large pipe (which continues through fields 6 and 7). It is difficult in these conditions to identify the possible cropmark enclosures, but one cropmark in field 5 aligns with a sequence of magnetic disturbances (D) in field 6. This suggests the cropmark could represent a former boundary or trackway.

Elsewhere in field 6 there are linear markings which could variously indicate former boundaries, cropmarks or drains. These various categories are indicated where possible by colour coding (as mentioned above), but are not always easy to distinguish. Land drains are typically represented by a sequence of small magnetic anomalies caused by sections of clay pipe, but some drains may have been laid in former boundary ditches.

Linear features at E align with and probably represent boundaries visible in the 1883 and 1901 OS maps. The double linear feature at F could be a former track, rather than a drain. It corresponds to a cropmark, and to a boundary visible on maps dated 1972 and earlier. The adjacent square enclosure G clearly corresponds to a cropmark, but at a slightly offset location. It is not identifiable in the DBA historic maps, and so a possibility remains that it could be of archaeological interest (although it terminates to the south at an old boundary (F)).

The linear feature at H may relate to a boundary visible on maps to 1901, but it also appears to link to a branching pattern of drains.

There are no identifiable features in field 7, other than alluvium and a pipe.

### Southern Area

#### *Fields 8-9*

The linear features indicated in field 8 are composed of intermittent magnetic anomalies, some of which are former boundaries, although others could be drains. Anomaly J aligns with a cropmark, which could be a boundary visible on maps until 1901, and K could have been a boundary until 1972. There is no evidence in the survey for the group of circular and other cropmark features to the north of K.

Another drain or boundary corresponds to a cropmark in the SW of the field at L. A large gas pipe follows the western boundary of fields 8 and 9.

#### *Fields 10-11*

A broad area of alluvial deposition (as indicated again by magnetic anomalies outlined in green) extends from field 8 into the northern part of field 10.

Cropmarks in the centre of field 10 have not been detected, but there are former boundaries at M and N. These are defined by irregular magnetic anomalies which perhaps represent disturbances along former hedge lines or ditches. A group of strong magnetic anomalies perhaps indicates a former field entrance at M. There are other recent disturbances near buildings and boundaries to the east of the field. There is a particularly clearly-defined ditch-like linear feature at P. This appears to terminate in a strongly disturbed area suggesting a large infilled pit at Q. This is identifiable as a former pond seen on maps until 1901.

### **Conclusions**

Findings from the survey are limited mainly to linear markings of variable quality, some of which can be identified with former boundaries and cropmarks. Various individual magnetic anomalies which could represent silted pits (as may be found at ancient occupation sites) have also been outlined (in red), but they are sparse and widely dispersed, with no identifiable clusters which might suggest the presence of a group of archaeological features. The survey has therefore detected a number of (probably insubstantial) traces of former hedge lines, but few other findings. Results from the fields with strong geological magnetic activity (3, 5, 6) must be interpreted with caution, but the evidence overall suggests that few dense concentrations of archaeological features are likely to be present.

Not all the cropmarks have been confirmed by the survey, but one clearly defined feature of possible archaeological interest is the square enclosure (G) next to a former track or

boundary (F) in field 6. These features closely resemble cropmarks recorded nearby.

The visibility of cropmark and other features in some of the northern area may be restricted because of the strong geological background magnetic activity. There is relatively little magnetic activity caused by magnetic gravel in the southern area, although extensive alluvial deposits were detected. Various former field boundaries, some of which may survive as drains, were detected, but the group of circular and other cropmarks towards the north of field 8 remains unconfirmed.

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**Reference**

- [1] Archaeological Desk Based Assessment; Whitemoor Haye Quarry, Alrewas South Proposed Extension, Alrewas, Staffordshire. Phoenix Consulting Archaeology Ltd. Report PC321a, 24 April 2011.

## Alrewas South Proposed Extension: Geophysical Survey Appendix : Inventory of Selected Findings

This list notes the more significant findings from the magnetometer survey of this site. The grading (1-4) given alongside each entry refers to the reliability of the geophysical evidence rather than the archaeological significance of the findings.

- Grade 1: Distinct magnetic anomalies of probable archaeological origin.
- Grade 2: Magnetic anomalies possibly including natural or recent disturbances, but which could in part be archaeologically significant.
- Grade 3: Weak or isolated features; not necessarily archaeologically significant.
- Grade 4: Magnetic anomalies of probably non-archaeological origin.

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This summary list includes only selected magnetic findings, particularly those which may be of potential archaeological interest. Magnetic disturbances which may be mentioned in the text or indicated on plans are not necessarily included if they appear to be of natural or non-archaeological origin.

<u>Feature</u>		<u>Grade</u>
A	Ditch-like linear features, but branching plan suggests drains.	2
B	Weak angular linear features near cropmarks: perhaps periglacial frost cracks ?	3
C	Linear feature parallel to cropmark: possible boundary (but not seen on 1883 OS map).	2
D	Magnetic anomalies align with cropmark and former boundary. Former trackway ?	1
E	Linear features correspond to 19 <sup>th</sup> C field boundaries.	1-2
F	Probable former trackway.	1
G	Square enclosure corresponds to cropmark, but is not fully defined by former field boundaries.	1
H	Linear features correspond to old field boundaries (but may link to drains).	1
J,K,L,M,N	Linear features identifiable as 19 <sup>th</sup> C field boundaries.	1
P	Distinct ditch-like feature terminating at Q.	1
Q	Disturbed area representing former pond.	1