AB HERITAGE
ARCHAEOLOGICAL CONSULTANCY

# Front Street Primary School, Whickham

# Geophysics and Ridge & Furrow Survey Report

Client: GALLIFORD TRY PLC

AB Heritage Project No: 10451

Date: 11/02/2015

# Front Street Primary School, Whickham

# Geophysical and Ridge & Furrow Survey

| | |
|---|---|
| **Client** | **Galliford Try** |
| **Project Number** | **10451** |
| **Prepared By** | **James Dunn** |
| **Illustrated By** | **Zoe Edwards** |
| **Approved By** | **Andy Buckley** |

| Rev Number | Description | Undertaken | Approved | Date |
|---|---|---|---|---|
| 1.0 | DRAFT | JD | AB | 11/02/2015 |
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# APPENDIX

# 1. INTRODUCTION

## 1.1 Project Background

1.1.1 AB Heritage have been asked to undertake a geophysical survey and a ridge & furrow survey on behalf of Galliford Try, at land near Front Street Primary School, Whickham, Gateshead, Tyne and Wear.

1.1.2 The purpose of these investigations are to identify any potential survival of archaeological remains.

## 1.2 Site Location & Description

1.2.1 The proposed development site is located c. 5km to the north east of Newcastle upon Tyne and 130m to the south west of Front Street Primary School. The site is situated within Whickham residential estate at centre point NGR NZ 20524 61413.

1.2.2 The north of the site is bounded by North View Road, while the east of the site is bounded by a wooden fence belonging to adjacent properties. Two footpaths enter the site from the southeast and southwest, with the footpath in the southeast and an iron fence forming the remaining site boundaries respectively.

## 1.3 Geology & Topography

1.3.1 The site is on a steep gradient that rises c. 10m from north of the site to a height of c.100m Above Ordnance Datum.

1.3.2 The overlying soils are known as Diamicton, which is a sand and gravel Devensian Till. The underlying geology is a mix of mudstone, sandstone and siltstone.

# 2. AIMS & METHODOLOGY

## 2.1 Aims of Survey Works

2.1.1 The overall aim of works is to identify any surviving archaeological features through non-intrusive means. Two forms of survey have been identified to offer the best possible picture of any surviving archaeological remains, with each area have their own specific aims.

Geophysical Survey

2.1.2 Geophysical survey is a programme of non-intrusive archaeological work. The aims of this geophysical survey were to:

- Identify any geophysical anomalies of possible archaeological origin within the specified survey area;
- Accurately locate these anomalies and present the findings in map form; and
- Provide recommendations for any further archaeological work(s) necessary to contribute to the mitigation of the impacts of proposed development on these potential features.

Ridge and Furrow Survey

2.1.3 A ridge and furrow survey was carried out using a GPS with a sub centimetre accuracy, the aims of this survey were to :

- Record the extent of the surviving ridge and furrow, above ground and within the boundaries of the site.
- Provide a detailed record of the surviving ridge and furrow.

## 2.2 Methodology of Survey Works

Site Specific Information

2.2.1 The magnetometry survey was undertaken covering an area of c.1.3ha hectares. A GPS survey was also undertaken to record above ground surviving ridge and furrow.

2.2.2 The AB Heritage staff members who undertook the works were Glenn Rose (Senior Project Archaeologist) and James Dunn (Archaeological Technician). The weather conditions for the work were mainly damp and sunny throughout the survey.

Equipment

2.2.3 The magnetic survey equipment used was one Bartington Grad-601 (fluxgate magnetometers). Please see Appendix 1, which contains a detailed methodology for the works undertaken; however, briefly, Table 1, below, shows site specific information on how the magnetometer was set up:

**Table 1: Setting Parameters of Magnetometer**

| Grid Size | 30x30 metres |
|---|---|
| Data Capture Distances | 1m x 0.25m |
| Sensors | 2 |
| Sensitivity | 0.1nT |

2.2.4 A GPS was used to setup the geophysical survey and also record the ridge and furrow within the site, a Trimble GeoXR has a sub-centimetre accuracy suitable for this survey.

## 2.3 Known Constraints

2.3.1 Known constraints which inhibit the geophysical survey within the site was metallic fencing, which runs along the southern edge of the site creating a magnetic disturbance from the fence of c.2m. Also the site is situated on a steep incline, which lead to some grids to contain a slight stagger within the data.

2.3.2 Known constraints likely to inhibit the ridge and furrow earthworks was the poor visibility of the surviving ridge and furrow,

# 3. RESULTS & INTERPRETATIONS

## 3.1 Survey Results

Geophysical Survey

3.1.1 Results of the geophysical survey have been drawn from the response within the raw (Figure 2) and processed geophysical data (Figure 3);

- In the north-east of the site there are a series of c. 5m spaced equidistant positive linear features [**AB 1**] running north east –south west.
- In the south and north of the site there are large areas of magnetic disturbance [**AB 2**], the larger of the two areas is situated within the northern end of the site.
- Di Polar anomalies [**AB 3**] are situated throughout the site in an amorphous pattern..

Ridge and Furrow Survey

3.1.2 Recording of the above ground ridge and furrow within the site has shown survival of ridge and furrow, mainly within the north eastern side of the site (Figure 5). The ridge and furrow runs in a north east to south west direction, with the majority of the surviving features recorded to a length of c.20-30m long.

3.1.3 The total identified surveying remains covers an area of approximately 0.1ha, which is equivalent to below 10% of the entire site.

3.1.4 Appendix 2 shows the elevations of the GPS points recorded during the ridge and furrow survey. The point names relate to the labels in Figure 5.

## 3.2 Survey Interpretation

Geophysical Survey

3.2.1 Interpretation of the results of geophysical survey is based on professional judgement as to the likely/probable cause of an anomaly or reading. For example, strong dipolar discrete anomalies of small size are often associated with ferrous debris or similarly magnetic debris. In addition, where a positive linear anomaly is recorded, which has a negative anomaly associated alongside either side of it, is often likely to relate to the line of a modern service.

**Table 2: Interpretation of Geophysical Anomalies**

| AB No | Appearance | Potential Cause |
|---|---|---|
| **AB 1** | Equidistant Positive Linear Features | Agricultural: Ridge and Furrow |
| **AB2** | Magnetic Disturbance | Ferrous objects and magnetic disturbance caused by debris laying at the bottom of the slope |
| **AB 3** | Di-polar Anomalies | Amorphous magnetic debris |

3.2.2 No clear archaeological features were identified during the geophysical survey. However, likely ridge and furrow [**AB 1**] remains were recorded in the north eastern limits of proposed development.

3.2.3 Features recorded in the northern limits of the site are mainly associated with magnetic disturbance [**AB 2**]. This is likely to be from a bank which rises from the northern end of the site to the south.

Ridge and furrow Survey

3.2.4 Interpretation of the surviving ridge and furrow is undertaken on site; with any surviving above ground earthworks recorded using a GPS.

3.2.5 The remaining ridge and furrow identified above ground by the GPS survey is not as extensive as the features identified within the geophysical survey, likely due to modern re-landscaping.

3.2.6 Aerial Imagery (Google earth, 2015) appears also to correspond more with the greater survival of earthworks identified in the geophysical data. This is likely due to the limitations of visibility on site and low lying ridge and furrow.

# 4. CONCLUSION

4.1.1 A geophysical and topographic survey were undertaken by AB Heritage Limited at Front Street Primary School, Whickham, Tyne & Wear.

4.1.2 The purpose of this work was to undertake a non-intrusive survey of any surviving archaeological remains. A GPS survey was used to identify above ground surviving ridge and furrow; and a magnetometer survey was used to identify the potential for any archaeological remains to survive undisturbed and, where possible, identify the form, function and extent of any potential remains.

4.1.3 The geophysical survey did not reveal any features that were concluded to be archaeological in nature, features identified are mostly magnetic disturbance likely associated with modern disturbances.

4.1.4 Likely ridge and furrow has been identified within the north eastern side of the site, these features have been identified within the geophysical survey (Figure 4 - **AB 1**) and GPS survey (Figure 5). The survival of the ridge and furrow within the site is poor with only below 10% survival of ridge and furrow across the entire site.

4.1.5 Modern re-landscaping and disturbance are likely to be the cause of a poor survival for archaeological features, and any surviving ridge and furrow.

# 5. ARCHIVE

5.1.1 The Site Archive will contain the following, as a minimum:

**Table 3: Site Archive Data**

| Archive | Format |
|---|---|
| Raw Geophysical Data files and GPS | XYZ and Text |
| Processed geophysical data files | JPEG, BMAP |
| Archaeological Interpretation | Shape Files ARC GIS |
| Final Report | PDF |
| Final Images | PDF |

5.1.2 A physical and digital archive will be stored in a suitable format at AB Heritage Limited offices in Taunton, Somerset.

# 6. REFERENCES

BGS (British Geological Society) 2014.*Geology of Britain viewer.* http://mapapps.bgs.ac.uk/geologyofbritain/home.html.

Google Earth (2015), Front Street Primary School (image of site)

IFA, 2011.Standard and Guidance for archaeological geophysical survey.

Jones, D.M. 2008. Geophysical Survey in Archaeological Field Evaluation. English Heritage.

Schmidt, A. 2002. Geophysical Data in Archaeology*: a Guide to Good* Practice. Oxford. Oxbow.

# Appendix 1 Technical Information on Geophysical Survey

## FLUXAGTE MAGNETOMETRY SURVEY

The magnetic survey is carried out using a fluxgate gradiometer, which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field, whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

*Survey equipment*

The Bartington Grad 601-2 dual magnetic gradiometer is capable of surveying to an accuracy of 0.1 nanotesla (nT).

*Sample interval and depth of scan*

The magnetometer data is collected in 30mx30m grids at a resolution of 1m x 0.25m. This sample density is recommended for site evaluation (English Heritage, 2008). This equates to 3600 points per 30mx30m grid. The magnetometer has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects are buried within the site.

*Data capture and processing*

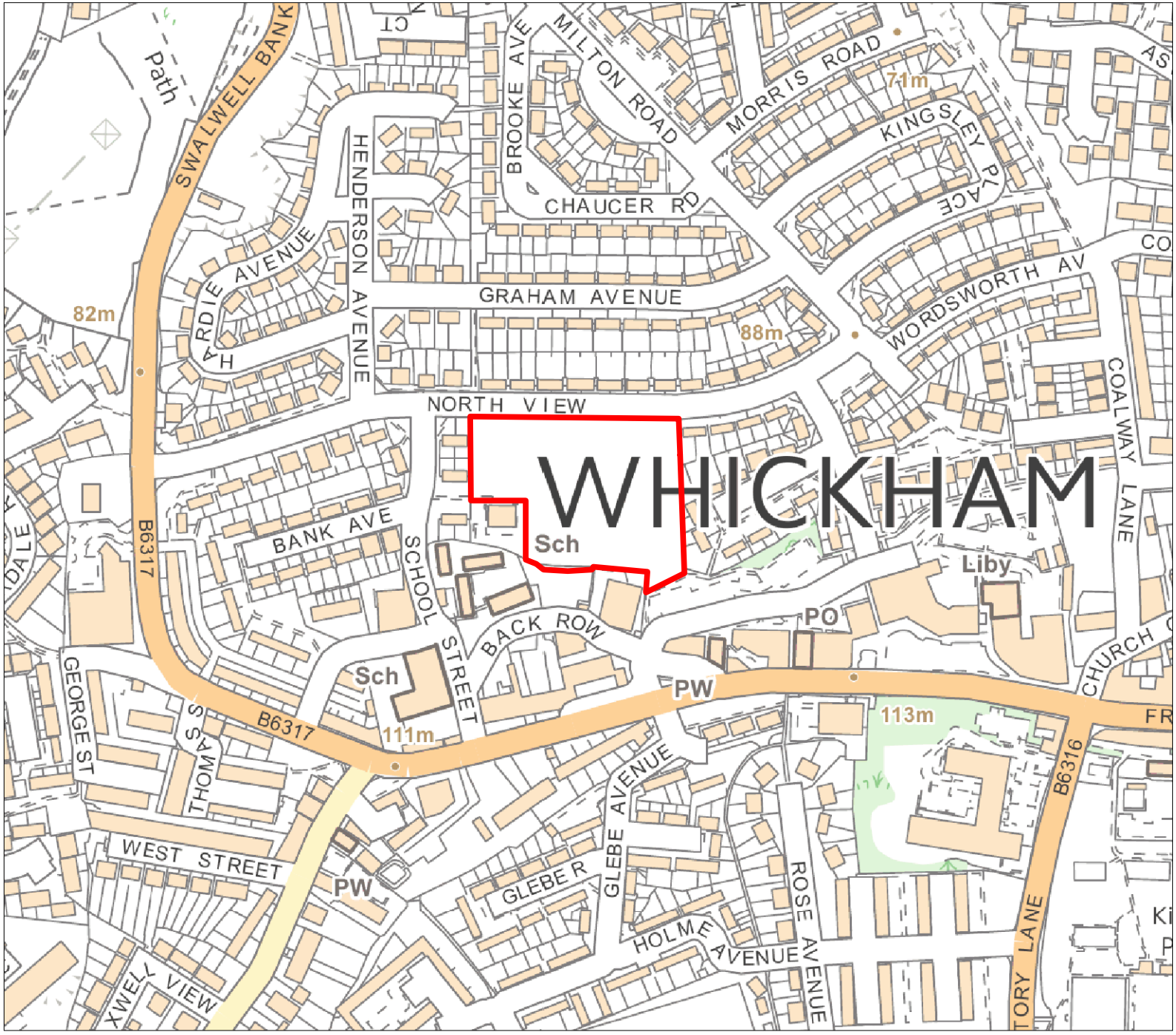
The readings are logged continually by the data logger during the survey, which is then downloaded on site to a site laptop. At the end of each job, data is transferred to the office PC's for processing and presentation.

This 'regular xy' data is then downloaded into specialist data processing software, at user defined sample intervals (in this case 1 m by 0.25 m). This is processed as standard magnetometer data.

## GPS METHODOLOGY

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to sub-cm accuracy, a far greater accuracy than a standard GPS unit. An RTK system uses a base station receiver and a number of mobile units (rovers). The base station takes measurements from satellites in view and then broadcasts them along with its known position to the rover receivers. The rover receiver also collects measurements from the satellites in view and processes them with the base station data. The rover then computes its location relative to the base.

During such a survey a Trimble GeoXR Differential Global Positioning System (dGPS), capable of Real Time Kinematic (RTK) is used to set out a nominal grid prior to the survey. This increases the accuracy and efficiency of the survey. The data is then downloaded from the unit on the day, using a USB stick.






Legend

Site Boundary


Figure 1: Site Location

Project: Front Street, Whickham

| Date: 09/02/15 | Job Number: 10451 |
|---|---|
| Drawn by: ZE | Approved by: AB |

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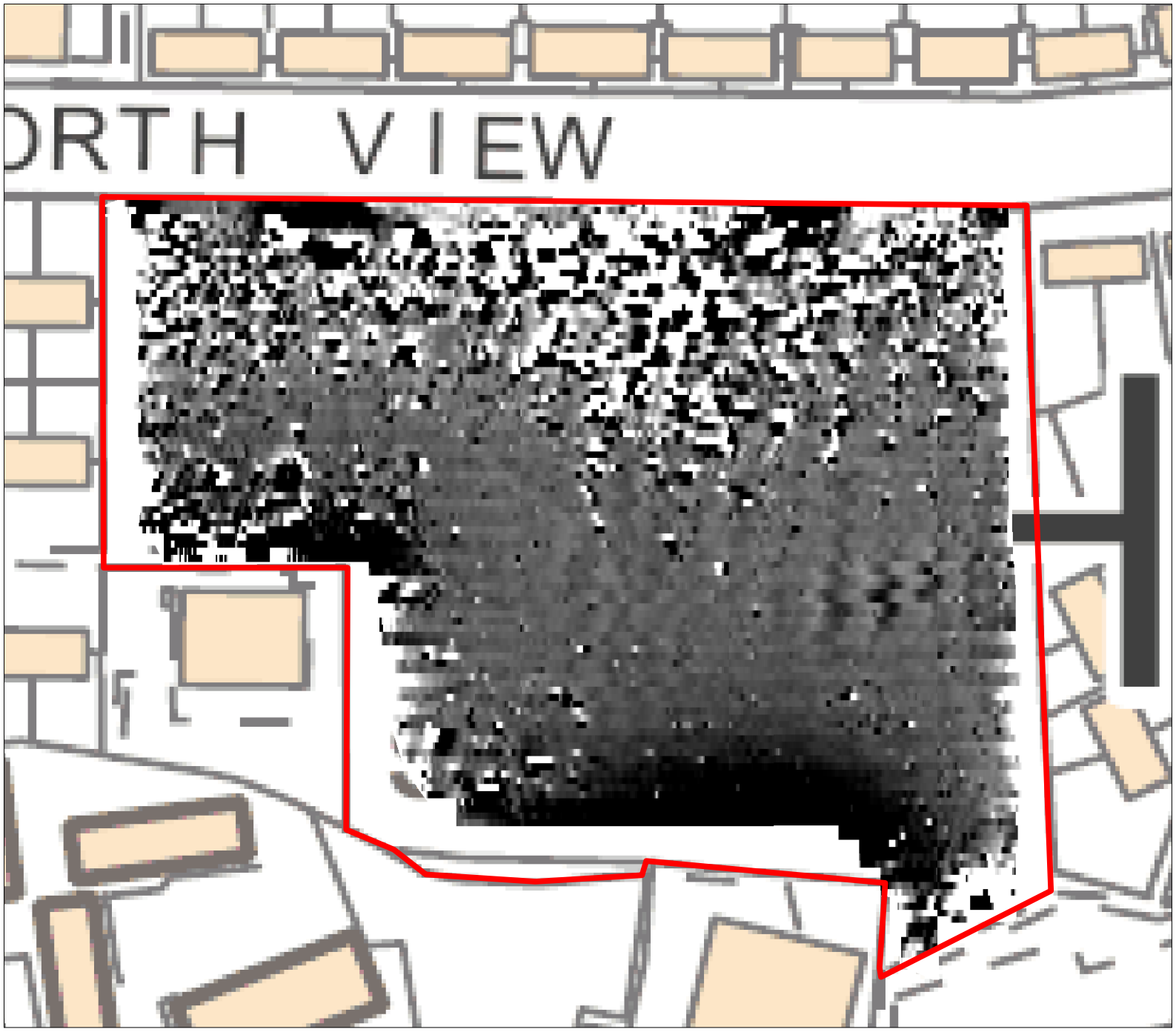


N

Legend

Site Boundary

+20

Plotting Perameters

-20



0 20 40 80 m

Figure 2: Raw Geophysical Data

Project: Front Street, Whickham

| Date: 11/02/15 | Job Number: 10451 |
|---|---|
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N

Legend

Site Boundary

+40

Plotting Perameters

-40



0 20 40 80 m

Figure 3: Processed Geophysical Data

Project: Front Street, Whickham

| Date: 11/02/15 | Job Number: 10451 |
|---|---|
| Drawn by: ZE | Approved by: AB |

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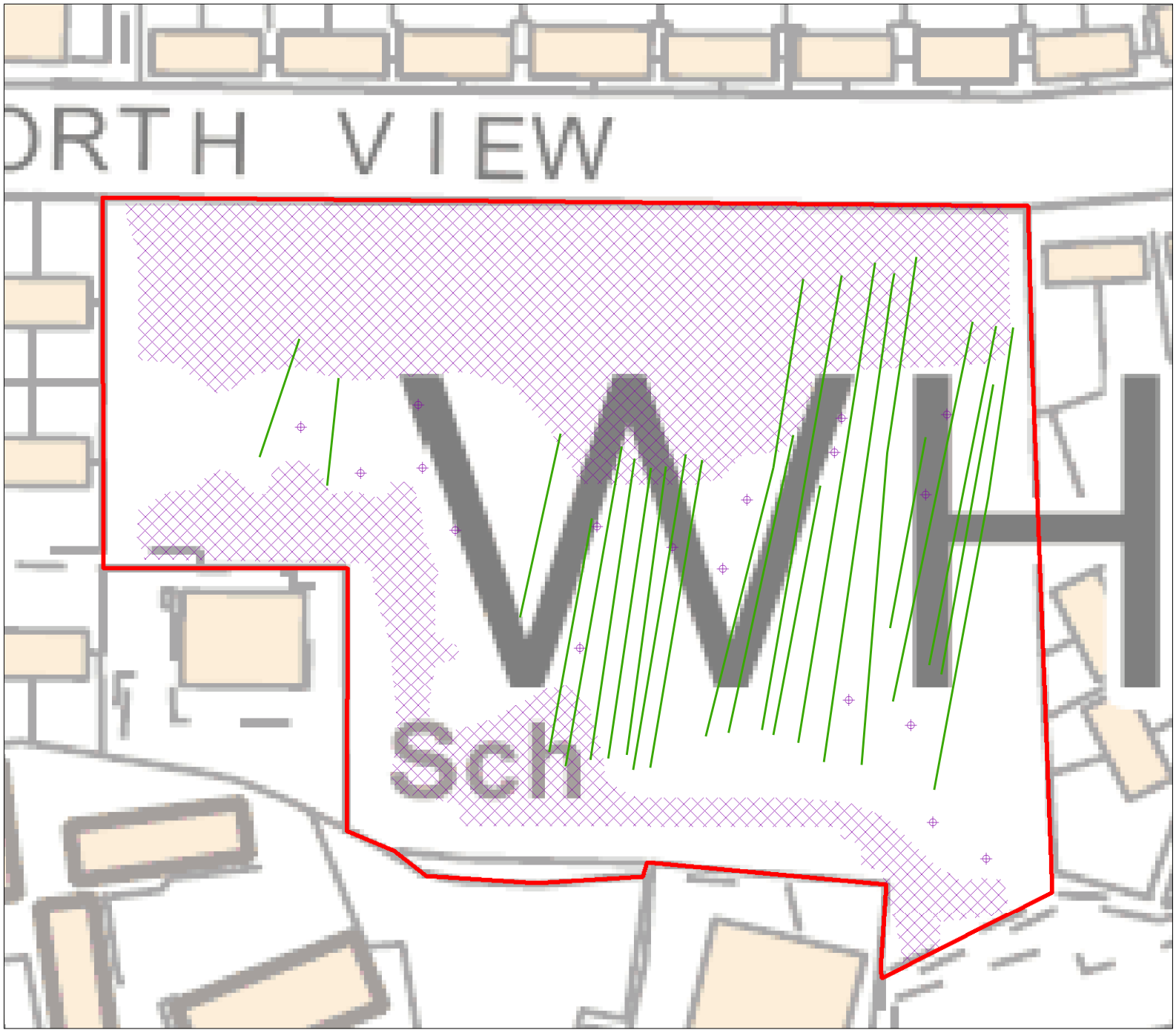


N

Legend

- Ridge and Furrow [AB1]
- Magnetic Disturbance [AB2]
- Di-Polar Anomalies
- Site Boundary



0 20 40 80 m

Figure 4: Interpretation of Geophysical Data

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| Date: 09/02/15 | Job Number: 10451 |
|---|---|
| Drawn by: ZE | Approved by: AB |

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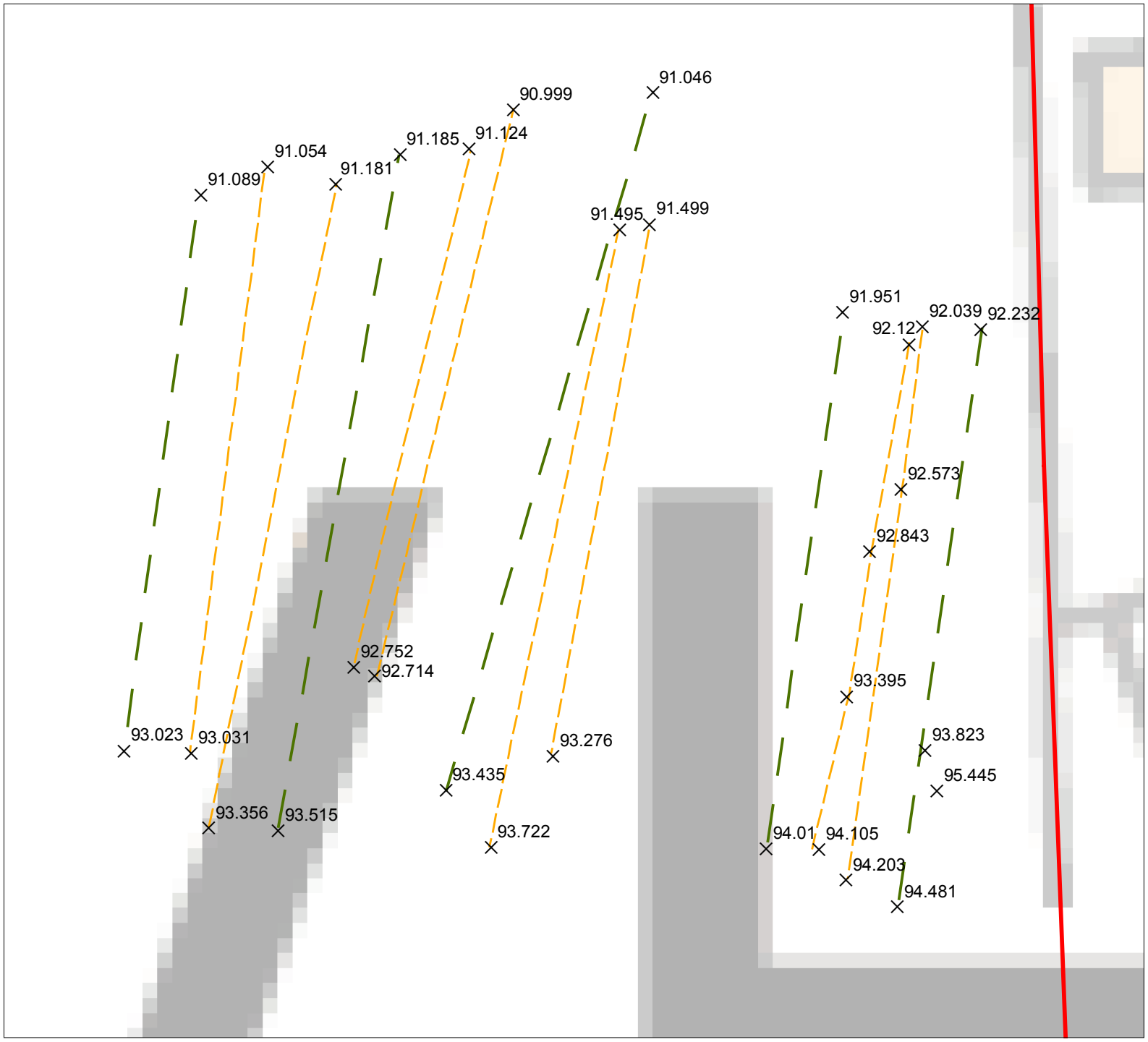
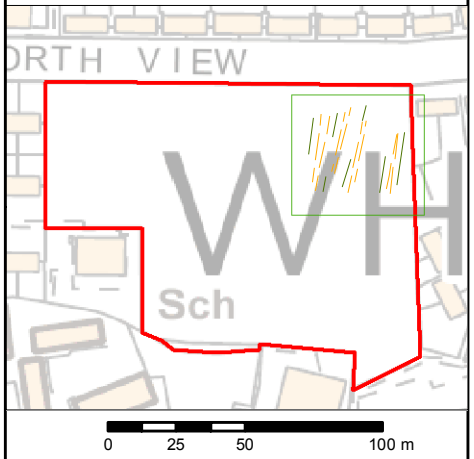





Legend

- Ridge Top
- Ridge Bottom
- Site Boundary

Location




The numbers shown are the elevation (m above OD) at the location of the X

Figure 5: Ridge and Furrow

Project: Front Street, Whickham

| Date: 11/02/15 | Job Number: 10451 |
|---|---|
| Drawn by: ZE | Approved by: AB |

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