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Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset

Geophysical Survey (Magnetic)

by Kyle Beaverstock and Rebecca Constable

Site Code: WQW13/200

(SY 7537 8998)

Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset

Geophysical Survey (Magnetic) Report

For Hills Quarry Products Ltd

by Kyle Beaverstock and Rebecca Constable

Thames Valley Archaeological Services Ltd

Site Code WQW 13/200

December 2015

Summary

Site name: Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset

Grid reference: SY 7537 8998

Site activity: Magnetometer survey

Date and duration of project: 16th - 23rd of November 2015

Project manager: Steve Ford

Site supervisor: Kyle Beaverstock

Site code: WQW13/200

Area of site: 8.7ha

Summary of results: The geophysical survey revealed a number of reasonably sized enclosures, and many isolated linear features that likely represent a continuation of the extensive complex of Late Iron Age, Roman and medieval deposits recorded to the south. In addition to the archaeological features, a number of areas of magnetic disturbance and ferromagnetic debris were observed; any underlying archaeology in these areas will have been obscured in the survey data. The ferrous spikes close to the north-west site boundary could very well have been caused by the presence of the drain running parallel to the site.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by:	Steve Ford✓ 15.12.15
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Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset
A Geophysical Survey (Magnetic)

by Kyle Beaverstock and Rebecca Constable

Report 15/200b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Woodsford Quarry, Woodsford, Dorset (SY 7537 8998) (Fig. 1). The work was commissioned by Nick Dunn, Land & Mineral Management Ltd, Bridge St, Frome, BA11 1BB on behalf of Hills Quarry Products Ltd, Woodsford Quarry, Woodsford, Dorchester, Dorset, DT2 8FR.

Planning permission is to be sought from Dorset County Council to develop the site as an area for the management of silt derived from the gravel and sand extraction in the adjacent quarry. This is in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF 2012) and the County's policies on archaeology. The field investigation was carried out to a specification approved by Steve Wallis, Dorset County Archaeologist. The fieldwork was undertaken by Kyle Beaverstock, Benedikt Tebbit, David Sanchez and Ellen McManus-Fry and the site code is WQW13/200.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located approximately 6km east of Dorchester and 930m south-west of the village of Woodsford. The site is a relatively flat and square parcel of land approximately 45.5m aOD, it is bounded by the road from Lewell Corner to West Woodsford to the north and hedges to the south and east. A bund which forms the boundary with the quarry compound area makes up the western boundary (Fig. 2). The land is currently being used for arable farming. The underlying geology is stated as being River Terrace Deposits (BGS 2000).

Site history and archaeological background

The archaeological background has been highlighted in the desk-based assessment (Tabor 2013). To summarise, the site lies in an area of rich prehistoric and Roman activity exemplified by the Mount Pleasant henge complex (Wainwright 1979). Excavations in adjacent fields to the south and west of the site which identified several field systems dating to the Roman and Medieval periods (Pine and Tabor, 2015).

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 20m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 1600 sampling points across a full 20m × 20m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution.. The grid was successfully laid out across the entirety of the site, excepting the western corner of the field; the presence of a large spoil bund prevented any access to this corner.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both English Heritage (2008) and the Chartered Institute *for* Archaeologists (2002, 2011, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using a dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometer. The instrument consists of two fluxgates mounted 1m vertically apart with a second set positioned at 1m horizontal distance. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high

response as will buried ferrous objects. More subtle anomalies such as pits and ditches, can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

A Trimble Geo7x handheld GPS system with sub-decimetre real-time accuracy was used to tie the site grid into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -0.80 to 1.20 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
Interpolate: *y* doubled	Increases the resolution of the readings in the *y* axis, enhancing the shape of anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 2, window size 5×5	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 4), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 5). Anomalies are shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 3) is prepared in EasyCAD v.7.58.00, producing a .FC7 file format, and printed as a .PDF for inclusion in the final report.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.10.1 Pisa and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

Results

A range of magnetic anomalies were recorded across the majority of the site with only a band across the centre appearing to be clear of positive magnetic readings. Positive magnetic anomalies represent cut or buried features of probable archaeological origin. In the north-west corner of the field are two small sub-circular positive magnetic readings that appear to be associated, representing two small cut or buried features **[Fig 5: 1]**.

Directly to the west are two short linear magnetic anomalies that are parallel to each other, with two very small circular anomalies to the south-east **[2]**. The readings are strong positive magnetic anomalies, and are of archaeological origin.

North-east of the two small circular anomalies is a weak positive linear anomaly **[3]**. The alignment of this anomaly is different to that of the previously mentioned, but also appears to be of archaeological origin.

In the northern corner of the field are a number of strong and weak positive anomalies that appear to be of archaeological origin. The easternmost of these is a linear anomaly with a small circular anomaly just above it **[4]**. The two anomalies appears to be similar in alignment and arrangement to the previous strong magnetic readings. As such, they are likely also of archaeological origin.

Just to the south is a magnetic reading formed of two linears creating a corner-shape **[5]**. It is difficult to tell if this anomaly is related to the surrounding readings, but it is of a strong reading of probable archaeological origin.

To the north-east are two very short linear magnetic anomalies **[6]**, presumably two parts of the same longer linear. Parallel to these is another, longer linear **[7].** It is very likely that the two readings are associated remnants of the same archaeological cut or buried feature.

Along the north-western boundary of the field are a number of weak magnetic anomalies, and one strong reading. Two of the weak anomalies **[8 and 9]** form a 'T' shape, seemingly unaligned with any previous readings. Although weak, these readings are likely of archaeological origin.

Diagonally below the 'T' shaped anomaly are three linear magnetic readings forming an inverted 'U' **[10]**. This anomaly appears as a strong magnetic reading and is of probable archaeological origin. It appears as though this probable cut or buried feature is on a very similar alignment to the above mentioned magnetic reading.

The last weak magnetic anomaly along the western boundary is formed of three separate short linears **[11]**. The topmost of these linears appears associated with the above anomaly, seemingly forming a rectangular enclosure. Below and to the east of this enclosure is a vertical linear, appearing to lengthen the eastern vertical

linear that forms the inverted 'U'. The final linear lies below the above mentioned, but is on a slightly different alignment, heading south-west to north-east. Although seemingly un-associated, these linear magnetic anomalies all appear to be of archaeological origin.

In the southernmost corner of the field there is a high concentration of positive magnetic anomalies. The abnormality farthest to the west is again formed of two linears forming a corner-shape, with another linear below, forming an incomplete square **[12]**. This anomaly is a strong magnetic reading and is very likely to be of archaeological origin.

Just to the east is a vertical linear with an associated small circular strong positive magnetic anomaly on its left side **[13]**. Directly south of this reading is what appears to be a rectangular enclosure, formed of three short linears **[14]**. Again south of this there appears to be a small corner of another enclosure, formed by two perpendicular linears **[16]**. It is probable that these anomalies are related remnants of the same large cut or buried archaeological feature.

Slightly west of this large feature, and possibly associated with it, are two linear magnetic anomalies **[15]**; the vertical linear is a strong magnetic reading and does not appear to be associated with the large feature mentioned above, whereas the horizontal linear is a weak reading, and cuts across the archaeological feature.

Seemingly associated with the eastern end of the weak horizontal linear, a largely weak magnetic reading appears as three linears **[17]**, forming a large rectangular enclosure of probable archaeological origin. This enclosure does not appear to be related to the previously mentioned cut feature.

To the centre of the southern corner there appears to be a strong magnetic anomaly of archaeological origin, formed by two slightly curved linears **[18]**. Beneath this, there appears to be a largely weak magnetic reading, again formed from two slightly curved linears **[22]**. Together, these anomalies form a reasonable large sub-rectangular enclosure of archaeological origin.

Heading south from the bottom left corner of the enclosure is a weak linear anomaly **[23]**. It is difficult to see if the linear is related to the enclosure, as any connecting linears appear to have been destroyed by two perpendicular weak linear magnetic readings to the east **[24]**. The linears, although weak, appear to be of an archaeological nature.

Heading east from the sub-rectangular enclosure is a linear strong magnetic reading [**20]**. The linear follows the same alignment as the enclosure, and as such is likely to be an associated cut or buried feature.

Slightly north of the sub rectangular feature appears a weak positive magnetic anomaly formed of two perpendicular linears **[19]**. These seem entirely un-associated with the enclosure itself, but are still likely to be cut or buried archaeological features.

To the east lies an individual vertical linear reading, which appears as a weak magnetic anomaly **[21]**. This also seems unrelated to its surrounding features. It is likely of archaeological origin.

In the southernmost point of the field are two strong magnetic anomalies **[25 and 26]** forming a sideways 'T' shape. Although on a separate alignment to the anomalies surrounding them, these anomalies presumably represent cut or buried archaeological features.

An almost complete rectangular enclosure appears to be represented by three linear magnetic readings **[27]** to the east of anomalies 25 and 26. This apparent enclosure is likely of an archaeological nature.

Slightly above and to the east of the previously mentioned anomalies are four alternately strong and weak linear anomalies forming a rotated 'X' **[28]**. It appears as though this cluster of linears could be associated with either the large sub-rectangular enclosure, or the weaker readings forming two perpendicular lines just below the enclosure. Either way, these linears are likely archaeological in origin.

Directly east of the cluster of linears is a strong positive magnetic anomaly formed by three linears in an 'F' shape **[29]**. This is presumably an archaeological cut or buried feature that has been truncated by the site boundary.

Above the 'F' shaped feature is a weak positive magnetic reading that seems unrelated **[30]**. This reading is viewed as a short diagonal linear, heading north-east, and represents an archaeological feature.

The easternmost magnetic anomaly of archaeological origin is an interrupted weak vertical linear, possibly associated with the 'X" shaped cluster of linears, as they are similarly aligned. This reading could have been disrupted by the presence of scattered ferromagnetic debris to the south east **[34]**.

Another area of scattered ferromagnetic debris **[33]** can be seen in the possible rectangular enclosure formed by weak magnetic linears **[17]**. The presence of this ferromagnetic debris could explain why the linears only appear as weak magnetic readings.

A large, irregularly shaped area of scattered ferromagnetic debris can also be identified towards the north-west corner of the site **[32]**. This area of debris seems unrelated to any archaeological features, but could have obscured any weak readings in the immediate area surrounding it.

The northernmost corner of the site is largely covered by an area of magnetic disturbance, theoretically caused by the presence of a drain running parallel to the north-western boundary of the site. The survey data shows signs of subsoil disturbed so readings could obscured any other anomalies here.

A number of ferrous spikes can be seen lightly scattered across the site, with a slight concentration along the north-western site boundary. Ferrous spikes are caused by magnetic metallic objects discarded on the topsoil of the site. The spikes along the site boundary may be due to the presence of the drain running parallel to it.

Conclusion

The geophysical magnetic survey uncovered a number of enclosures and partial enclosures, along with numerous cut or buried archaeological features. There appear to be many un-associated archaeological features, which could reflect activity over various historical periods, and as such a staggered occupation of the site. Despite the high yield of archaeological features that can be seen from the geophysical data, there is a large band that runs horizontally across the middle of the site in which no features, archaeological or agricultural, can be seen. It can be assumed either that no archaeology is present in this area, or that it has been destroyed by subsequent agricultural processes. The latter, however, seems unlikely as no anomalies of agricultural origin were uncovered. Numerous ferrous spikes and areas of magnetic disturbance/scattered ferromagnetic debris are observed in the data, which could have obscured signs of underlying signals of archaeology origin.

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Appendix 1. **Survey and data information**

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Direction of 1st Traverse: 320.96 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions
Composite Size (readings): 1680 x 380
Survey Size (meters): 420 m x 380 m
Grid Size: 20 m x 20 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 96.56
Min: -100.00
Std Dev: 4.21
Mean: 1.13
Median: 1.51
Composite Area: 15.96 ha
Surveyed Area: 10.457 ha

Source Grids: 297
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242 Col:15 Row:14 grids\264.xgd
243 Col:15 Row:15 grids\265.xgd
244 Col:15 Row:16 grids\266.xgd
245 Col:15 Row:17 grids\267.xgd
246 Col:16 Row:0 grids\295.xgd
247 Col:16 Row:1 grids\296.xgd
248 Col:16 Row:2 grids\297.xgd
249 Col:16 Row:3 grids\298.xgd
250 Col:16 Row:4 grids\299.xgd
251 Col:16 Row:5 grids\300.xgd
252 Col:16 Row:6 grids\301.xgd
253 Col:16 Row:7 grids\302.xgd
254 Col:16 Row:8 grids\303.xgd
255 Col:16 Row:9 grids\304.xgd
256 Col:16 Row:10 grids\305.xgd
257 Col:16 Row:11 grids\306.xgd
258 Col:16 Row:12 grids\307.xgd
259 Col:16 Row:13 grids\308.xgd
260 Col:16 Row:14 grids\309.xgd
261 Col:16 Row:15 grids\310.xgd
262 Col:16 Row:16 grids\311.xgd
263 Col:17 Row:0 grids\312.xgd
264 Col:17 Row:1 grids\313.xgd
265 Col:17 Row:2 grids\314.xgd
266 Col:17 Row:3 grids\315.xgd
267 Col:17 Row:4 grids\316.xgd
268 Col:17 Row:5 grids\317.xgd
269 Col:17 Row:6 grids\318.xgd
270 Col:17 Row:7 grids\319.xgd
271 Col:17 Row:8 grids\320.xgd
272 Col:17 Row:9 grids\321.xgd
273 Col:17 Row:10 grids\322.xgd
274 Col:17 Row:11 grids\323.xgd

275 Col:17 Row:12 grids\324.xgd
276 Col:17 Row:13 grids\325.xgd
277 Col:18 Row:0 grids\268.xgd
278 Col:18 Row:1 grids\269.xgd
279 Col:18 Row:2 grids\270.xgd
280 Col:18 Row:3 grids\271.xgd
281 Col:18 Row:4 grids\272.xgd
282 Col:18 Row:5 grids\273.xgd
283 Col:18 Row:6 grids\274.xgd
284 Col:18 Row:7 grids\275.xgd
285 Col:18 Row:8 grids\276.xgd
286 Col:18 Row:9 grids\277.xgd
287 Col:18 Row:10 grids\278.xgd
288 Col:18 Row:11 grids\279.xgd
289 Col:19 Row:1 grids\280.xgd
290 Col:19 Row:2 grids\281.xgd
291 Col:19 Row:3 grids\282.xgd
292 Col:19 Row:4 grids\283.xgd
293 Col:19 Row:5 grids\284.xgd
294 Col:19 Row:6 grids\285.xgd
295 Col:19 Row:7 grids\286.xgd
296 Col:20 Row:2 grids\287.xgd
297 Col:20 Row:3 grids\288.xgd

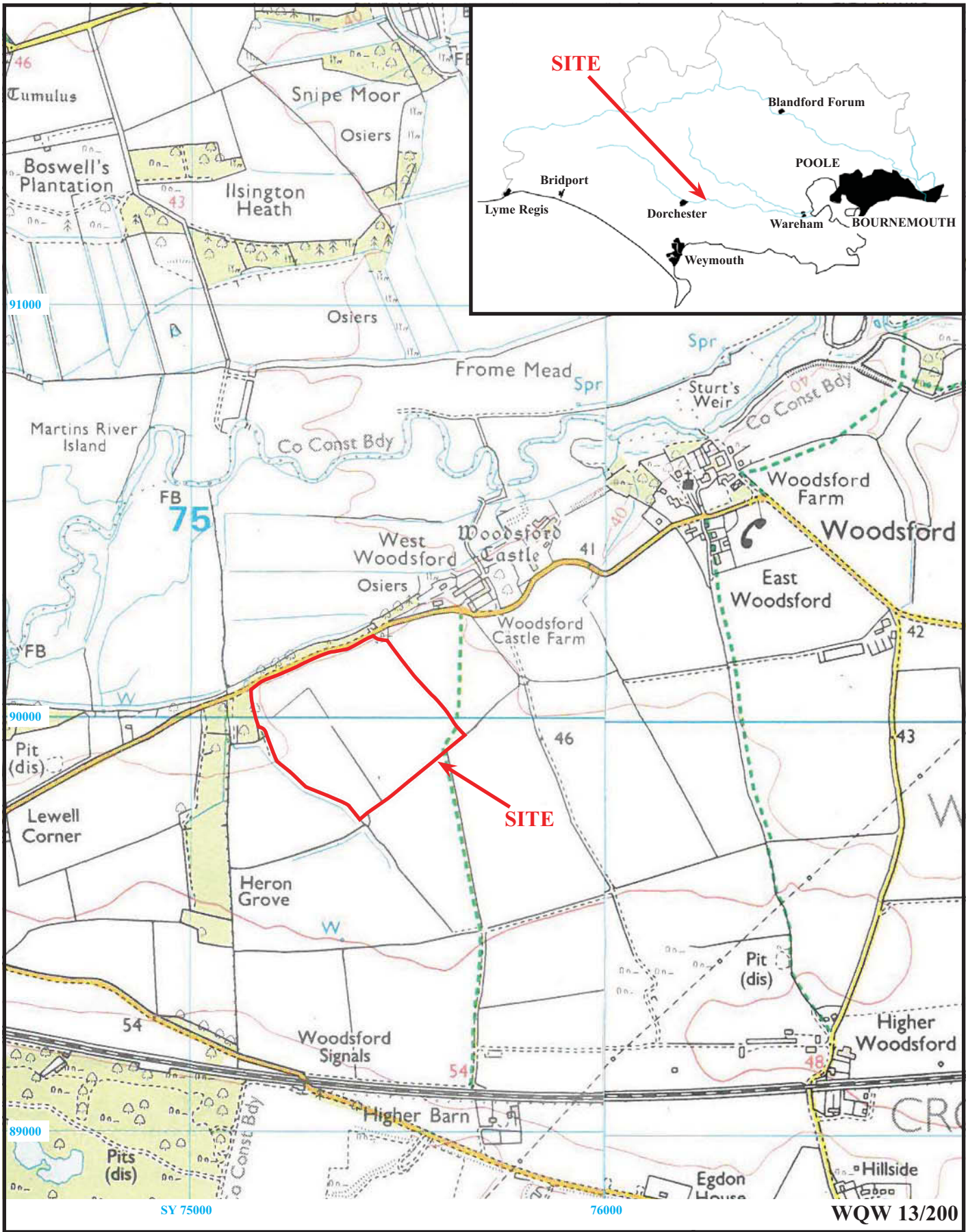
Processed data

Stats

Max:	1.20
Min:	-0.80
Std Dev:	0.51
Mean:	0.04
Median:	0.00
Composite Area:	15.96 ha
Surveyed Area:	10.457 ha

Processes: 6

1 Base Layer
2 DeStripe Median Traverse: Grids: All
3 De Stagger: Grids: 104.xgd 105.xgd Mode: Both By: -1 intervals
4 Despike Threshold: 2 Window size: 5x5
5 Interpolate: Y Doubled.
6 Clip from -0.80 to 1.20 nT



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Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset, 2015
Geophysical Survey (Magnetic)

Figure 1. Location of site within Woodsford and Dorset.

THAMES VALLEY ARCHAEOLOGICAL SERVICES SOUTH WEST

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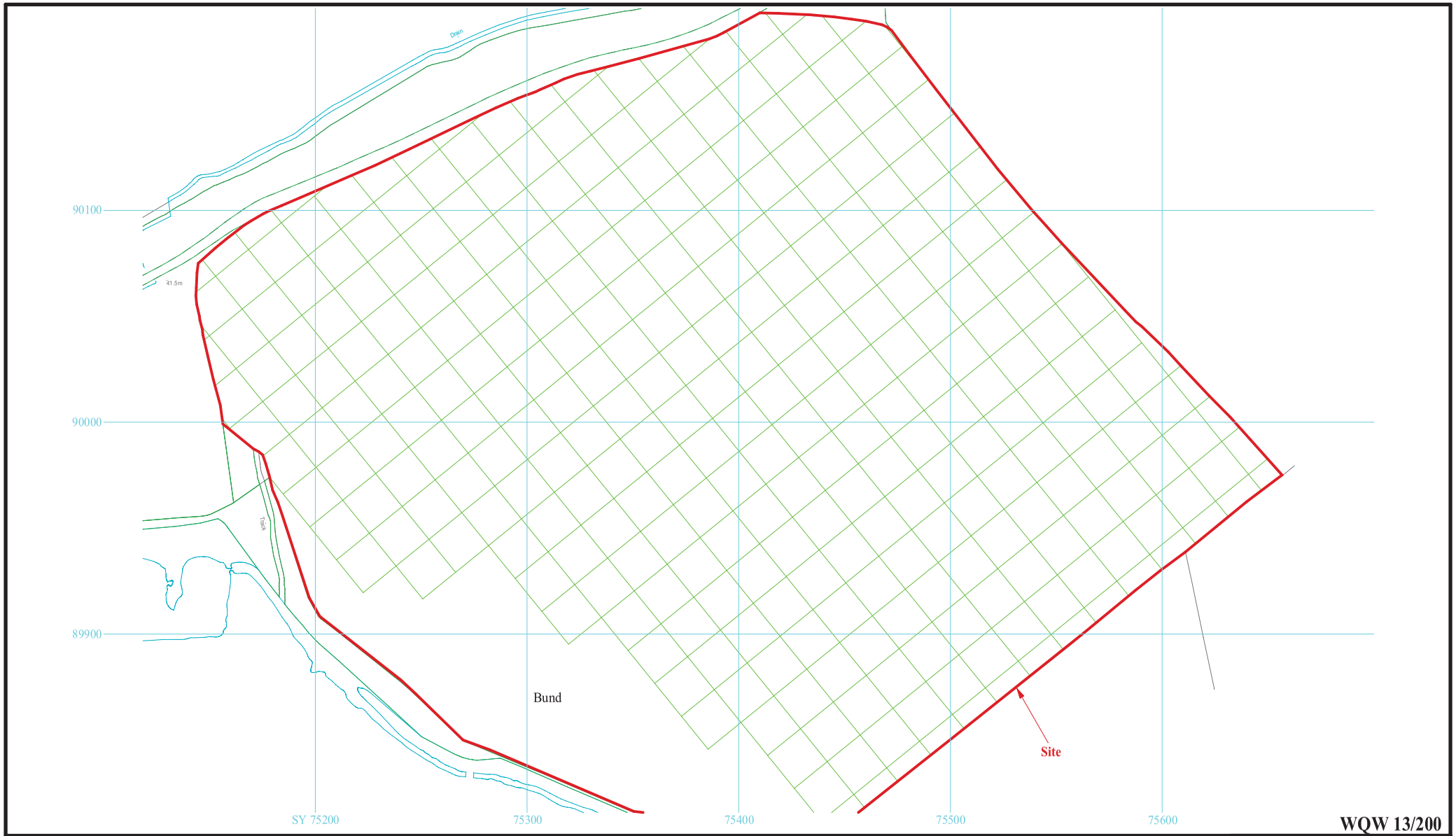
Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset, 2015 Geophysical Survey (Magnetic)

Figure 2. The location of the geophysical survey area in relation to previous excavations on the quarry site.

0 500m

THAMES VALLEY ARCHAEOLOGICAL SERVICES SOUTH WEST



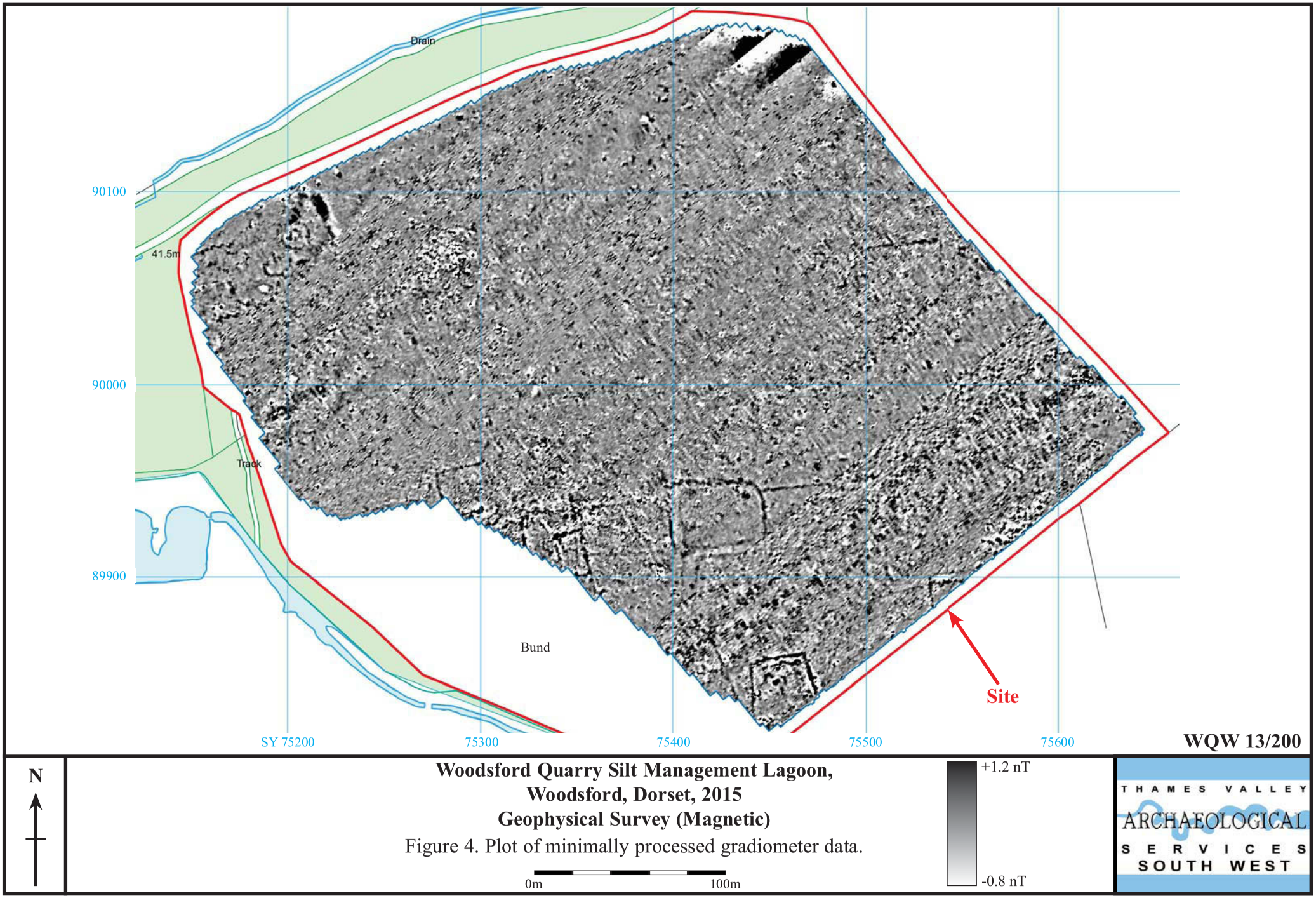
N

Woodsford Quarry Silt Management Lagoon, Woodsford, Dorset, 2015 Geophysical Survey (Magnetic)

Figure 3. Survey grid layout.

0 100m

THAMES VALLEY ARCHAEOLOGICAL SERVICES SOUTH WEST


Drain
41.5m
Track
Bund
Site
90100
90000
89900
SY 75200
75300
75400
75500
75600
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N
Woodsford Quarry Silt Management Lagoon,
Woodsford, Dorset, 2015
Geophysical Survey (Magnetic)
Figure 4. Plot of minimally processed gradiometer data.
0m
100m
+1.2 nT
-0.8 nT
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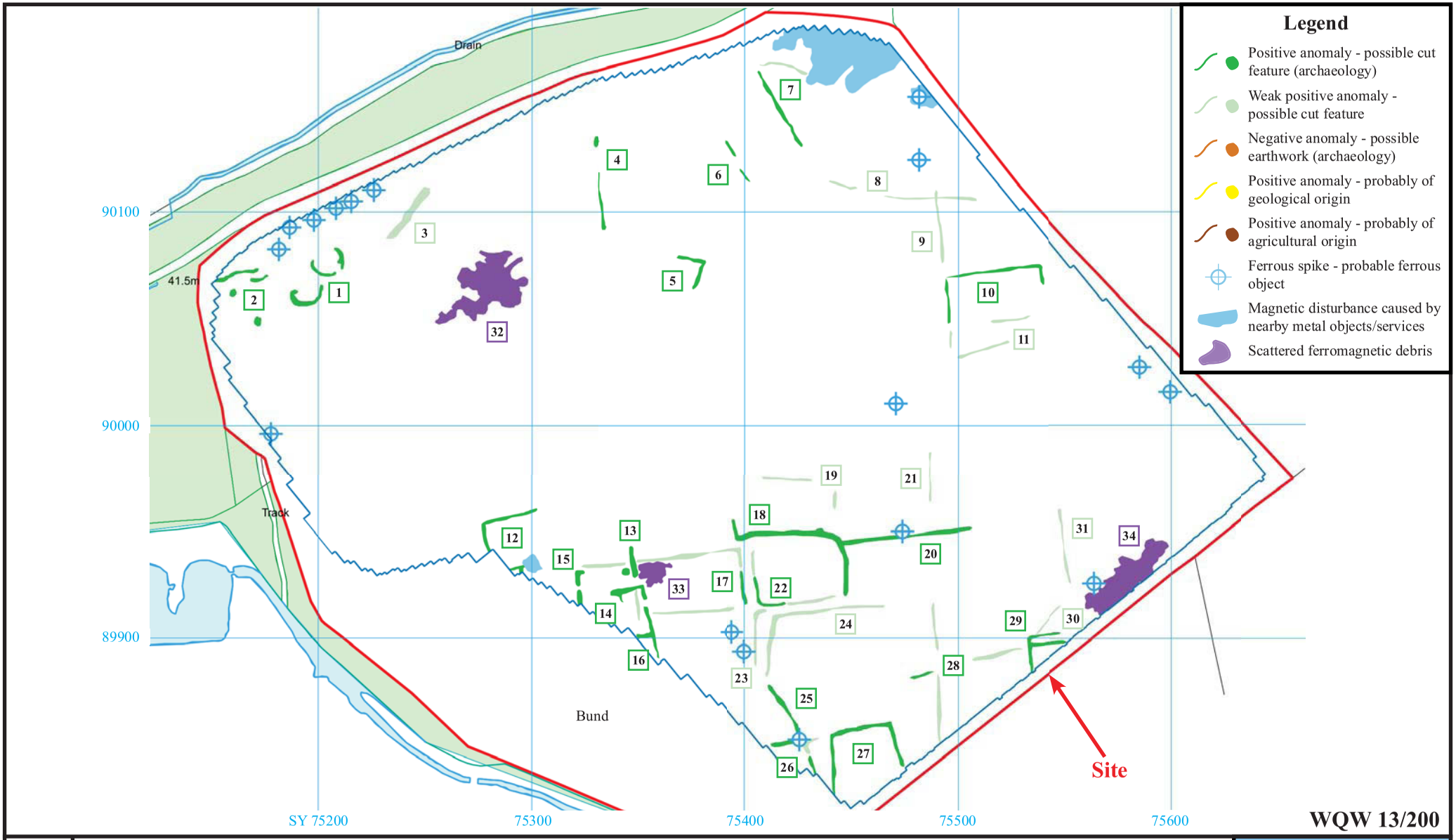
SOUTH WEST



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Geophysical Survey (Magnetic)

Figure 5. Interpretation plot.

0m 100m

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Plate 1. The survey area, looking north from the southern corner.

Plate 2. The survey area, looking north-west from the southern corner.

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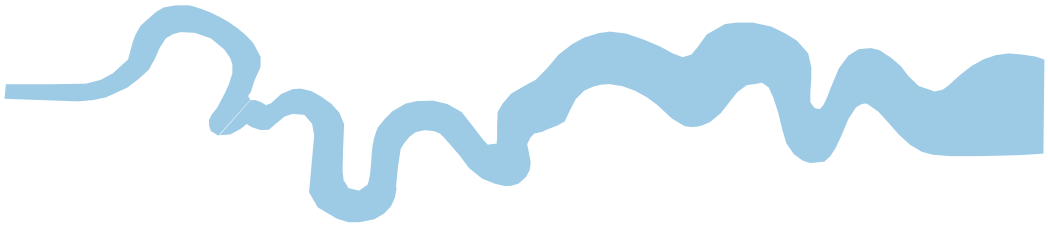
Geophysical Survey (Magnetic)
Plates 1 - 2.

THAMES VALLEY
ARCHAEOLOGICAL
SERVICES

TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC



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