



Sling Road Bulford Camp

Gradiometer and Ground Penetrating
Radar Survey Report

Document Ref.: 325290.02
April 2026



© Wessex Archaeology Ltd 2026, all rights reserved

Suite 3
Minton House
London Road
Amesbury
SP4 7RT

www.wessexarch.co.uk

Wessex Archaeology Ltd is a company limited by guarantee registered in England, company number 1712772. It is also a Charity registered in England and Wales number 287786, and in Scotland, Scottish Charity number SC042630. Our registered office is at Portway House, Old Sarum Park, Salisbury, Wiltshire, SP4 6EB

Disclaimer

The material contained in this report was designed as an integral part of a report to an individual client and was prepared solely for the benefit of that client. The material contained in this report does not necessarily stand on its own and is not intended to nor should it be relied upon by any third party. To the fullest extent permitted by law Wessex Archaeology will not be liable by reason of breach of contract negligence or otherwise for any loss or damage (whether direct indirect or consequential) occasioned to any person acting or omitting to act or refraining from acting in reliance upon the material contained in this report arising from or connected with any error or omission in the material contained in the report. Loss or damage as referred to above shall be deemed to include, but is not limited to, any loss of profits or anticipated profits damage to reputation or goodwill loss of business or anticipated business damages costs expenses incurred or payable to any third party (in all cases whether direct indirect or consequential) or any other direct indirect or consequential loss or damage

Document Information

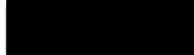
Document title Sling Road, Bulford Camp
Document subtitle Gradiometer and Ground Penetrating Radar Survey Report
Document reference 325290.02

Commissioned by WSP Environmental
Address Matrix House
 Basing View
 Basingstoke
 RG21 4FF

Site location Sling Road, Bulford Camp
County Wiltshire
National grid reference 418947 144344 (SU 18947 44344)

WA project name Sling Road, Bulford Camp
WA project code 325290
Date(s) of fieldwork 30 March – 2 April 2026
Fieldwork directed by Callum Jervis
Project management by Alison Langston
Document compiled by Filippo Carrozzo
Contributions from Max McShane
Graphics by Filippo Carrozzo

Quality Assurance

Issue	Date	Author	Approved by
1	23/04/2026	FC	AL 
2	27/04/2026	FC	AL 



Contents

Summary.....	ii
Acknowledgements.....	ii
1 INTRODUCTION	1
1.1 Project background	1
1.2 Scope of document	1
1.3 The site.....	1
2 ARCHAEOLOGICAL BACKGROUND	2
2.1 Introduction.....	2
2.2 Summary of the archaeological resource	2
3 METHODOLOGY	3
3.1 Introduction.....	3
3.2 Aims and objectives	3
3.3 Fieldwork methodology	4
3.4 Data processing	4
4 GRADIOMETER SURVEY RESULTS AND INTERPRETATION	6
4.1 Introduction.....	6
4.2 Survey results and interpretation.....	6
5 GPR SURVEY RESULTS AND INTERPRETATION	7
5.1 Introduction.....	7
5.2 GPR survey results and interpretation.....	7
6 DISCUSSION	8
6.1 Results	8
REFERENCES	9
APPENDICES.....	10
Appendix 1 Gradiometer Survey equipment and data processing	10
Appendix 2 Gradiometer Geophysical interpretation	12
Appendix 3 GPR Survey equipment and data processing.....	13
Appendix 4 GPR Geophysical interpretation	15
Appendix 5 OASIS form.....	17

List of Figures

- Figure 1** Site location and survey extent
Figure 2 Gradiometer survey results: greyscale plot
Figure 3 Gradiometer survey results: interpretation
Figure 4 Ground penetrating radar survey results: greyscale plot and traverses
Figure 5 Ground penetrating radar survey results: interpretation

List of Tables

- Table 1** Depth conversion based on a dielectric constant of 19.9 for the 400 MHz and 800 MHz antenna



Summary

A gradiometer survey and Ground Penetrating Radar (GPR) survey was conducted over land at Sling Road, Bulford Camp, Wiltshire (centred on NGR 418947 144344). The project was commissioned by WSP Environmental with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site into eight houses and associated garages.

The site comprises a grassed area located immediately north-east of Bulford Camp, covering 1.3 ha. The geophysical survey was undertaken on 30 March – 2 April 2026.

The gradiometer and GPR surveys have not detected anomalies of archaeological origin or related to the foundations of the military huts formerly on the site. The gradiometer and GPR results have detected mapped utilities.

The gradiometer results show the whole site has an increased magnetic response, which is likely linked to the demolition of the military accommodation present on the site to return it to a green space in the late 20th century. Any weaker anomalies on the site would have been masked due to the increased magnetic response.

The GPR results have detected mostly services across the site. Several of which are likely to relate to the military accommodation, as they appear to terminate at the locations where the barracks were located on historical mapping.

A ferrous platform possibly related to services was detected in the west of the site. Areas of high amplitude are likely related to areas of made ground, which were also detected along the edge of the site.

The modern road and chalk or limestone bedrock were detected across the site during the GPR survey.

Acknowledgements

Wessex Archaeology would like to thank WSP Environmental for commissioning the geophysical survey. The assistance of Orlando Prestidge is gratefully acknowledged in this regard.

The fieldwork was undertaken by Callum Jervis and David Butcher. Max McShane processed and interpreted the magnetometry data. Filippo Carrozzo processed and interpreted the ground-penetrating radar data. Filippo Carrozzo wrote the report with contributions from Max McShane. Filippo Carrozzo also prepared the illustrations. The geophysical work was quality controlled by Rok Plesnicar. The project was managed on behalf of Wessex Archaeology by Alison Langston.



Sling Road Bulford Camp, Wiltshire

Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology was commissioned by WSP Environmental to carry out a geophysical survey at Sling Road, Bulford Camp, Wiltshire (centred on NGR 418947 144344) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the development of the site into eight houses and associated garages.

1.2 Scope of document

- 1.2.1 This report presents a brief description of the methodology, followed by the detailed survey results and the archaeological interpretation of the geophysical data. In format and content, it conforms to current best practice, as well as to the guidance outlined in *Management of Research Projects in the Historic Environment* (MoRPHE, Historic England 2015), the Chartered Institute for Archaeologists' (CIfA) *Standards and guidance for archaeological geophysical survey* (CIfA 2020), Europae Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) and Historic England *Thesauri* (English Heritage 2014).
- 1.2.2 The survey was undertaken in adherence to a Project Design for Archaeological Geophysical Survey (WSP 2026a), which was prepared by WSP and approved by Neil Adam, Assistant County Archaeologist for Wiltshire Council, in March 2026.

1.3 The site

- 1.3.1 The site is located immediately north-east of the village of Bulford and 4.5 km north-east of Amesbury, in the county of Wiltshire.
- 1.3.2 The survey comprises 1.3 ha of grassed area with a road bisecting the site east to west. The site is bounded by a small housing estate to the north, green spaces and Sling Road to the east and wooded areas to the south and west.
- 1.3.3 The site is on a slight incline sloping from 88 m above Ordnance Datum (aOD) at the southern edge to approximately 95 m aOD at the eastern edge.
- 1.3.4 The solid geology comprises Seaford Chalk Formation, a sedimentary deposit consisting of Chalk formed during the Coniacian Age. There are no overlying superficial deposits recorded within the site (BGS 2026).
- 1.3.5 The soils underlying the site consist of free-draining, shallow lime-rich soils over chalk or limestone (LandIS 2026). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey (English Heritage 2008).



2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

- 2.1.1 An archaeological desk-based assessment (DBA) was prepared by WSP Environmental for the land at Sling Road, Bulford which examined the potential for the survival of buried archaeological remains within the development area and a 1 km study area (WSP 2026b). The following background is not exhaustive but is summarised below.

2.2 Summary of the archaeological resource

Previous archaeological work

- 2.2.1 There have been eight previous archaeological investigations within the study area. These comprise one geophysical survey, two watching briefs, three trial trench evaluations and two excavations of scheduled barrows (WSP 2026b).

Prehistoric

- 2.2.2 There are six scheduled round barrows located within the study area, with the closest recorded 30 m to the east of the site (HER ref: SU14SE630).
- 2.2.3 An area of archaeological investigation took place 50 m to the north-east of the site and comprises the excavation of scheduled barrows (HER ref: EWI2154; EWI2155; EWI2156), which was carried out between 1890 and 1900. It found both primary and secondary inhumations. Another partial excavation of scheduled barrows (HER ref: EWI9433) was completed between 2010 and 2012 with the closest barrow located 185 m to the north-east of the site. It is unknown what was found within the barrow closest to the site.
- 2.2.4 In 1914, a Bronze Age spearhead was discovered 400 m north-east of the site during the building of Bulford Camp (HER ref: SU14SE154).

Romano-British

- 2.2.5 An extensive complex of rectilinear earthwork banks, possibly representing a prehistoric or Roman field system, is visible as cropmarks on aerial photographs 215 m to the north of the site (HER ref: SU14SE765). The eastern part of the complex lies beneath, and on a slightly different alignment to, the footings of military buildings and roads associated with early twentieth century development at Bulford Camp.
- 2.2.6 The findspot of a Romano-British pottery fragment is recorded 245 m to the north-west of the site (Her ref: SU14SE302).
- 2.2.7 A projected Roman road which ran from Salisbury to Marlborough lies within the eastern extent of the site, on the same orientation and placement as Sling Road, along the eastern boundary.

Medieval

- 2.2.8 A burial was discovered within a scheduled bowl barrow located 50 m to the north-east of the site (NHLE ref. 1009968).

Post-medieval

- 2.2.9 The Map of Lands Subject to Tithes in the Parish of Bulford in the County of Wilts, dated to 1858, shows the site was located within an open grassland with one enclosed field within the centre and two roads running through the site.



- 2.2.10 An outfarm adjacent to Sling Plantation existed 200 m south of the site and was demolished in the 19th century. The site of Sheepbridge Barn, located 500 m north-west, was also demolished during the 19th century.

Modern

- 2.2.11 In the 20th century Bulford camp began expanding, with new buildings and roads constructed. Evidence of military training activity associated with the camp has been identified in the form of earthworks. These include practice trenches (HER ref: SU14SE527) located 235 m to the north and scattered across the northern section of the study area (HER ref: SU14SE537; MWI73423). Further slit trenches and practice trenches (HER ref: SU14SE532; SU14SE534; SU14SE538) are located throughout the southern and eastern areas of the study area with the closest discovered 5 m to the south of the site.

- 2.2.12 A series of single-story military accommodation and their associated residential access roads were constructed across the whole site in the 1920s. These huts were timber framed, covered in iron and asbestos lining. The accommodation remained within the site boundary until it was demolished and returned to a green space in the late 20th century, leaving only the unnamed road and Sling Road.

Undated

- 2.2.13 Within a gas trench an inhumation was found 550 m south-east of the site (HER ref: SU14SE554).

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 30 March – 2 April 2026. Field conditions were favourable for the survey throughout the period of the survey. An overall coverage of 1.3 ha was achieved. In the results, some gaps are present due to trees, felled branches and service boxes.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to the best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2020) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:

- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
- To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

- 3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:

- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
- To clarify the presence/absence of anomalies of archaeological potential; and



- Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

Gradiometer

- 3.3.1 The gradiometer survey was undertaken using four SenSys FGM650/3 magnetic gradiometers spaced at 1 m intervals and mounted on a non-magnetic hand-pushed cart. Data were collected at a rate of 100 Hz and interpolated to 0.1 m intervals along transects spaced 1 m apart, in accordance with European Archaeologiae Consilium recommendations (Schmidt et al. 2015).
- 3.3.2 The cart-based gradiometer system used a Carlson RTK GNSS instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey (OS). Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceed European Archaeologiae Consilium recommendations (Schmidt et al. 2015).
- 3.3.3 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

Ground penetrating radar

- 3.3.4 The GPR survey using a single channel dual frequency antenna Impulse Radar Crossover 4080 (400 MHz and 800 MHz). This provides data to a depth of 2 – 3 m for the 400 MHz antenna, whilst the 800 MHz offers higher resolution data to a depth of approximately 1.5 m. Due to survey conditions, the depth of the survey was limited to 1.2 m for both antennas. Data has been collected at intervals of 0.02 m with a 0.5 m traverse separation.
- 3.3.5 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 3**.

3.4 Data processing

Gradiometer

- 3.4.1 Data from the survey were subjected to minimal correction processes using in-house software. These comprise a remove overlap, median background, and Savgol smooth, applied to correct for any variation between the sensors and background magnetic data, as well as a gridding function for appropriate data visualisation.
- 3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

Ground penetrating radar

- 3.4.3 Data from the survey were subjected to common radar signal correction processes. These comprise amplitude and wobble correction of the radar profile to correct for variance in temperature and soil moisture content, background and bandpass filtering to remove noise in the data from the surrounding area, and XYZ mean line to correct for mosaic effects from variance in the day-to-day conditions during the survey. These steps were applied to all datasets collected across the Scheme.
- 3.4.1 The approximate depth conversion for the 400 MHz and 800 MHz antenna is in **Table 1**. These have been calculated on the assumption that the GPR pulse speed through the ground is 0.067 m/ns. It is possible to determine more precisely the average velocity of the GPR pulse through the ground if excavated features at a known depth can be identified in



the data. Radargrams were analysed for suitable hyperbolic reflections, which can be used to determine the velocity of the GPR pulse through the subsurface deposits.

- 3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 3**.



Table 1 Depth conversion based on a dielectric constant of 19.9 for the 400 MHz and 800 MHz antenna

Time Slice	Depth (m)	Time Slice	Depth (m)
1	0.0-0.2	12	1.1-1.3
2	0.1-0.3	13	1.2-1.4
3	0.2-0.4	14	1.3-1.5
4	0.3-0.5	15	1.4-1.6
5	0.4-0.6	16	1.5-1.7
6	0.5-0.7	17	1.6-1.8
7	0.6-0.8	18	1.7-1.9
8	0.7-0.9	19	1.8-2.0
9	0.8-1.0	20	1.9-2.1
10	0.9-1.1	21	2.0-2.2
11	1.0-1.2	22	2.1-2.3

4 GRADIOMETER SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

- 4.1.1 The gradiometer survey has identified magnetic anomalies across the site. Results are presented as a greyscale plot, and archaeological interpretation at a scale of 1:1500 (**Figs 2 and 3**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image.
- 4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends (**Figure 3**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.
- 4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.
- 4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.
- 4.1.5 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g., CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

4.2 Survey results and interpretation

- 4.2.1 Increased magnetic responses have been identified across the entirety of the site. These relate to the spread of magnetically enhanced material on the surface and are likely associated to previous development on the site.
- 4.2.2 In the eastern extent of the site, weak positive and dipolar linear anomalies have been detected. The morphology of the anomalies varies and, due to the increased magnetic response, cannot be confidently identified.
- 4.2.3 A series of strong positive and dipolar anomalies have been detected running adjacent to and north from Horne Road. The morphology and magnetic signature of these anomalies indicate modern services.



5 GPR SURVEY RESULTS AND INTERPRETATION

5.1 Introduction

- 5.1.1 The GPR survey was undertaken across the site (**Figure 1**). The 400 MHz and 800 MHz antennas used in this survey have the potential of detecting features to a depth of 2 – 3 m in optimal conditions and were successful at penetrating to these depths.
- 5.1.2 For ease of interpretation, the most representative timeslices have been selected for presentation with the interpretation image detailing the salient results from each relevant 0.2 m section. This is then followed by a graphical summary of all the timeslices to provide a summary and more complete understanding of how these features may relate to each other.
- 5.1.3 The GPR survey have identified several point reflectors, planar returns, and linear responses, along with anomalous areas of high in each area. Results are presented as a series of greyscale timeslices, and archaeological interpretations at a scale of 1:1500 (**Figs 4 and 5**). The greyscale plots display black representing high amplitude responses and white relating to low amplitude responses.
- 5.1.4 All features are described in terms of their geophysical character. It is important to stipulate that all the depths referred to in this report are approximate below the current ground level (bpgl). The interpretation of the GPR data highlights the presence of several services, geology, low and high amplitude responses (**Figure 5**).
- 5.1.5 Excessive disturbance can also impede the ability of geophysical techniques to detect archaeology. It may therefore be the case that more archaeological features are present than have been identified through the geophysical survey.
- 5.1.6 GPR may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g., CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

5.2 GPR survey results and interpretation

- 5.2.1 Across the site, linear high amplitude, point-source features have been detected in timeslices 2 to 7 (0.3 m to 0.6 m below present ground level (bpgl)) (**Figure 5**). These are typical of services; some of these align with those depicted on the utility map, however, many more have been detected. Several of these services are likely to relate to the military huts formerly on the site, as they appear to terminate at the locations of the former military huts shown on the map.
- 5.2.2 Running across the site from east to west, a high amplitude horizon has been detected and interpreted as being the modern road. It is detected in timeslice 1 (surface to 0.2 m bpgl) (**Figure 5**).
- 5.2.3 In the west part of the site, a ferrous platform has been detected in timeslices 2 to 6 (0.1 m to 0.5 m bpgl) (**Figure 5**). It appears to have services connected to it, so it has been interpreted as being a possible manhole cover or related to drainage. It is unlikely to be related to the foundations of the military huts formerly on the site, as it is isolated and does not correlate with the locations mapped for them.



- 5.2.4 Across the site, high amplitude horizons have been detected in timeslices 3 to 21 (0.4 m to 2 m bpgl) at **4000 – 4004 (Figure 5)**. The horizons are aligned with the site gradient and may correspond to the chalk or limestone bedrock of the underlying geology.
- 5.2.5 High amplitude anomalies have been detected in several areas along the edge of the site **4004 – 4006 (Figure 5)**. These are visible in timeslices 1 to 6 (surface to 0.5 m bpgl). These are likely to be areas of made ground. Some services have been observed, cutting this layer.

6 DISCUSSION

6.1 Results

- 6.1.1 The gradiometer and GPR surveys have not detected anomalies of archaeological origin or related to the foundations of the military huts formerly on the site.
- 6.1.2 The gradiometer and GPR results have detected the mapped utilities.
- 6.1.3 The gradiometer results show the whole site has an increased magnetic response. This is likely due to the demolition of the former military huts present on the site. Any weaker anomalies on the site it would have been masked due to the increased magnetic response.
- 6.1.4 The GPR results have detected mostly services across the site. Several of which are likely to relate to the military accommodation, as they appear to terminate at the locations where the barracks have been located on historical mapping.
- 6.1.5 A ferrous platform possibly related to services was detected in the west of the site.
- 6.1.6 Areas of high amplitude are likely related to areas of made ground, which were also detected along the edge of the site.
- 6.1.7 The modern road and chalk or limestone bedrock were detected across the site during the GPR survey.



REFERENCES

- British Geological Survey (2026) online viewer. Available at:
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (Accessed: 10 March 2026).
- Chartered Institute for Archaeologists [CIfA] 2020. Standards and guidance for archaeological geophysical survey. Reading, CIfA.
- English Heritage, (2008). Geophysical Survey in Archaeological Field Evaluation. English Heritage, Swindon. (now withdrawn, but used for evaluating sustainability of soil types)
- Google (2026) Google Earth. Available at: <http://earth.google.com> (Accessed: 10 March 2026).
- Heritage Gateway (2012) Heritage Gateway: Historic Environment Records. Available at:
<https://www.heritagegateway.org.uk/gateway/> (Accessed: 10 March 2026).
- Historic England (2015). Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide. Historic England Guidance
- WSP (2026a). Bulford Services Families Accommodation Site - Bulford Camp, Sling Road. Project Design for Archaeological Geophysical Survey.
- WSP (2026b). Defence Infrastructure Organisation: Bulford Service Families Accommodation Site – Bulford Camp, Sling Road. Historic Environment Desk-Based Assessment.
- LandIS (2026) Soilscales. Available at: <http://www.landis.org.uk/soilscales/> (Accessed: 10 March 2026).



APPENDICES

Appendix 1 Gradiometer Survey equipment and data processing

Survey methods and equipment

The magnetic data for this project were acquired using a non-magnetic cart fitted with four SenSys FGM650/3 magnetic gradiometers.

The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 0.6 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of $\pm 8 \mu\text{T}$ over $\pm 1000 \text{ nT}$ range. All of the data will be then relayed to a CS35 tablet, running the MONMX program, which is used to record the survey data from the array of FGM650/3 probes at a rate of 100 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Carlson BRX-7 RTK system. This receives corrections from a network of reference stations operated by the Ordnance Survey, allowing positions to be determined with a precision of 0.02 m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium (Schmidt *et al.* 2015).

Post-processing

The magnetic data collected during the detail survey are downloaded from the Sensys system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

The cart-based system generally requires a lesser amount of post-processing than the handheld instrument. This is largely because mounting the gradiometers on the cart reduces the occurrence of operator error, caused by inconsistent walking speeds and deviation in traverse position due to varying ground cover and topography.

Typical data and image processing steps may include:

- Destripe – Applying a zero-mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:



- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.
- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies. (XY trace plots are available on request)



Appendix 2 Gradiometer Geophysical interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.

Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



Appendix 3 GPR Survey equipment and data processing

The ground penetrating radar (GPR) data will be collected using a cart-mounted shielded antenna with central frequency suitable for the types of target being investigated. Lower frequency antennae are able to acquire data from deeper below the surface, whereas higher frequencies allow high resolution imaging of near-surface targets at the expense of deep penetration. The exact make and model of equipment varies.

The depth of penetration of GPR systems is determined by the central frequency of the antenna and the relative dielectric permittivity (RDP) of the material through which the GPR signal passes. In general, soils in floodplain settings may have a wide range of RDPs, although around 8 may be considered average, resulting in a maximum depth of penetration of approximately 2.5 m with the GPR signal having a velocity of approximately 0.1 m/ns.

The GPR beam is conical in shape, however, and whilst most of the energy is concentrated in the centre of the cone, the GPR signal illuminates a horizontal footprint, which becomes wider with increasing depth. At the maximum depth of the antenna, it becomes impossible to resolve any feature smaller than the horizontal footprint for the corresponding depth. The size of the footprint is dependent upon central frequency, and its size increases as the central frequency decreases.

The vertical resolution is similarly dependent upon the central frequency; for a 400 MHz antenna, features of the order of 0.05 m may be resolved vertically. Antennae with lower frequencies can therefore penetrate more deeply but are less resolute in both horizontal and vertical directions. Choice of antenna frequency is guided largely by the anticipated depth to the target and the required resolution.

GPR data for detailed surveys are collected along traverses of varying length separated by 0.5 m with cross lines collected running perpendicular to these traverses at wider separations. The data sampling resolution is governed by the data logger and a minimum separation of 0.05 m between traces is collected for all surveys, in accordance with European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).

Post-Processing

The radar data collected during the detail survey are downloaded from the GPR system for processing and analysis using commercial software (GPR Slice). This software allows for both the data and the images to be processed to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

Typical data and image processing steps may include:

- Gain – Amplifies GPR data based upon its position in the profile, which boosts the contrast between anomalies and background. A wobble correction is also applied during this step;
- Background Filter - is used to remove banding noises that are seen across the radargrams
- Bandpass – Removes GPR data lying outside a specified range, which removes high- and low-frequency noise.

Typical displays of the data used during processing and analysis:

- Timeslice – Presents the data as a series of successive plan views of the variation of reflector energy from the surface to the deepest recorded response. The variation in amplitude is



represented using a greyscale with black indicating high amplitude and white indicating low amplitude responses.

- Radargram – Presents each radar profile in a vertical view with distance along the profile expressed along the x axis and depth along the y axis. The amplitude variation is expressed using a greyscale.



Appendix 4 GPR Geophysical interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. The category is further sub-divided into groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend. These may be further separated into features following a certain character, such as linear, planar, or discrete depending on the requirement of the presentation of the data.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Service – used for responses considered relating to cables and pipes; most are composed of metallic/ceramic material although services made from non-metallic material can sometimes be observed.
- Road - used for responses considered relating to surface features

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Historic cultivation – such as ridge and furrow ploughing, and for broad and diffuse linear anomalies which are considered to indicate areas of land management.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of field drains that are visible in the data as a series of repeating high or low amplitude linear responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- High amplitude response – used for areas dominated by a high amplitude GPR response pertaining to indistinct anomalies which may have some archaeological potential, such as compact features.
- Low amplitude response – used for areas dominated by a low amplitude GPR response pertaining to indistinct anomalies which may have some archaeological potential, such as cut features.



- Trend – used for low amplitude or indistinct linear anomalies



Appendix 5 OASIS form

OASIS Summary for wessexar1-542367

OASIS ID (UID)	wessexar1-542367
Project Name	Geophysical Survey at Sling Road Bulford Camp
Sitename	Sling Road Bulford Camp
Sitecode	325290
Project Identifier(s)	325290
Activity type	Geophysical Survey, MAGNETOMETRY SURVEY, GROUND PENETRATING RADAR SURVEY
Planning Id	
Reason For Investigation	Planning: Pre application
Organisation Responsible for work	Wessex Archaeology
Project Dates	30-Mar-2026 - 23-Apr-2026
Location	Sling Road Bulford Camp NGR : SU 18882 44409 LL : 51.198584765552624, -1.73113988343336 12 Fig : 418882,144409
Administrative Areas	Country : England County/Local Authority : Wiltshire Local Authority District : Wiltshire Parish : Bulford



Project Methodology	3METHODOLOGY 3.1Introduction 3.1.1The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 30 March – 2 April 2026. Field conditions were favourable for the survey throughout the period of the survey. An overall coverage of 1.3 ha was achieved. In the results, some gaps are present due to trees, felled branches and service boxes. 3.1.2The methods and standards employed throughout the geophysical survey conform to the best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2020) and European Archaeologiae Consilium (Schmidt et al. 2015). 3.2Aims and objectives 3.2.1The aims of the survey comprise the following: To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy. 3.2.2In order to achieve the above aims, the objectives of the geophysical survey are: To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions; To clarify the presence/absence of anomalies of archaeological potential; and Where possible, to determine the general nature of any anomalies of archaeological potential. 3.3Fieldwork methodology Gradiometer 3.3.1The gradiometer survey was undertaken using four SenSys FGM650/3 magnetic gradiometers spaced at 1 m intervals and mounted on a non-magnetic hand-pushed cart. Data were collected at a rate of 100 Hz and interpolated to 0.1 m intervals along transects spaced 1 m apart, in accordance with European Archaeologiae Consilium recommendations (Schmidt et al. 2015). 3.3.2The cart-based gradiometer system used a Carlson RTK GNSS instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey (OS). Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceed European Archaeologiae Consilium recommendations (Schmidt et al. 2015). 3.3.3Further details of the geophysical and survey equipment, methods and processing are described in Appendix 1. Ground penetrating radar 3.3.4The GPR survey using a single channel dual frequency antenna Impulse Radar Crossover 4080 (400 MHz and 800 MHz). This provides data to a depth of 2 – 3 m for the 400 MHz antenna, whilst the 800 MHz offers higher resolution data to a depth of approximately 1.5 m. Due to survey conditions, the depth of the survey was limited to 1.2 m for both antennas. Data has been collected at intervals of 0.02 m with a 0.5 m traverse separation. 3.3.5Further details of the geophysical and survey equipment, methods and processing are described in Appendix 3. 3.4Data processing Gradiometer 3.4.1Data from the survey were subjected to minimal correction processes using in-house software. These comprise a remove overlap, median background, and Savgol smooth, applied to correct for any variation between the sensors and background magnetic data, as well as a gridding function for appropriate data visualisation. 3.4.2Further details of the geophysical and survey equipment, methods and processing are described in Appendix 1. Ground penetrating radar 3.4.3Data from the survey were subjected to common radar signal correction processes. These comprise amplitude and wobble correction of the radar profile to correct for variance in temperature and soil moisture content, background and bandpass filtering to remove noise in
---------------------	--

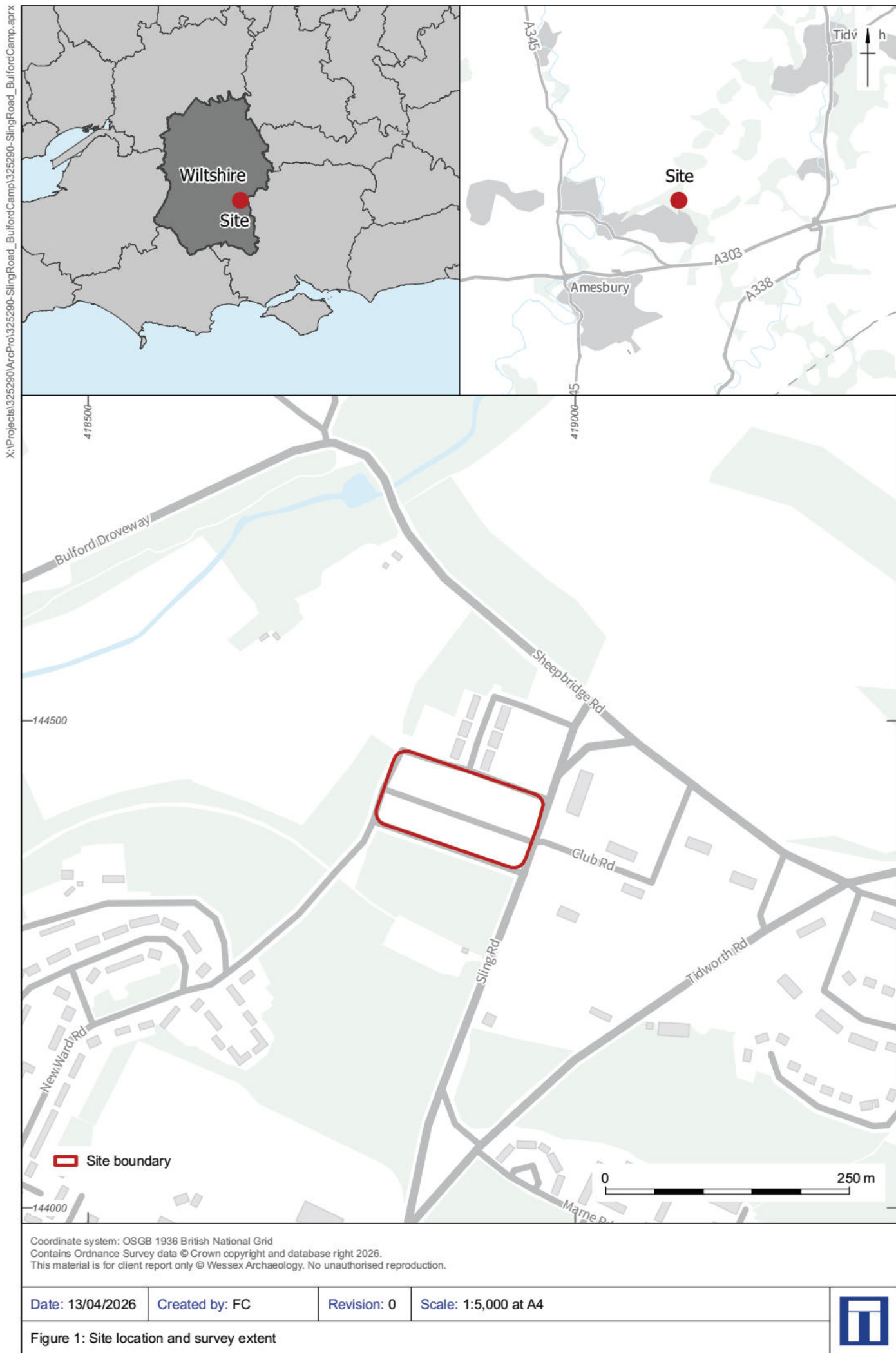


	the data from the surrounding area, and XYZ mean line to correct for mosaic effects from variance in the day-to-day conditions during the survey. These steps were applied to all datasets collected across the Scheme. 3.4.1 The approximate depth conversion for the 400 MHz and 800 MHz antenna is in Table 1. These have been calculated on the assumption that the GPR pulse speed through the ground is 0.067 m/ns. It is possible to determine more precisely the average velocity of the GPR pulse through the ground if excavated features at a known depth can be identified in the data. Radargrams were analysed for suitable hyperbolic reflections, which can be used to determine the velocity of the GPR pulse through the subsurface deposits. 3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in Appendix 3. Table 1 Depth conversion based on a dielectric constant of 19.9 for the 400 MHz and 800 MHz antenna <table><tr><th>Time Slice</th><th>Depth (m)</th><th>Time Slice</th><th>Depth (m)</th></tr><tr><td>10.0-0.21</td><td>1.1-1.3</td><td></td><td></td></tr><tr><td>20.1-0.31</td><td>1.2-1.4</td><td></td><td></td></tr><tr><td>30.2-0.41</td><td>1.3-1.5</td><td></td><td></td></tr><tr><td>40.3-0.51</td><td>1.4-1.6</td><td></td><td></td></tr><tr><td>50.4-0.61</td><td>1.5-1.7</td><td></td><td></td></tr><tr><td>60.5-0.71</td><td>1.6-1.8</td><td></td><td></td></tr><tr><td>70.6-0.81</td><td>1.7-1.9</td><td></td><td></td></tr><tr><td>80.7-0.91</td><td>1.8-2.0</td><td></td><td></td></tr><tr><td>90.8-1.02</td><td>1.9-2.1</td><td></td><td></td></tr><tr><td>100.9-1.12</td><td>2.0-2.2</td><td></td><td></td></tr><tr><td>111.0-1.22</td><td>2.1-2.3</td><td></td><td></td></tr></table>	Time Slice	Depth (m)	Time Slice	Depth (m)	10.0-0.21	1.1-1.3			20.1-0.31	1.2-1.4			30.2-0.41	1.3-1.5			40.3-0.51	1.4-1.6			50.4-0.61	1.5-1.7			60.5-0.71	1.6-1.8			70.6-0.81	1.7-1.9			80.7-0.91	1.8-2.0			90.8-1.02	1.9-2.1			100.9-1.12	2.0-2.2			111.0-1.22	2.1-2.3		
Time Slice	Depth (m)	Time Slice	Depth (m)																																														
10.0-0.21	1.1-1.3																																																
20.1-0.31	1.2-1.4																																																
30.2-0.41	1.3-1.5																																																
40.3-0.51	1.4-1.6																																																
50.4-0.61	1.5-1.7																																																
60.5-0.71	1.6-1.8																																																
70.6-0.81	1.7-1.9																																																
80.7-0.91	1.8-2.0																																																
90.8-1.02	1.9-2.1																																																
100.9-1.12	2.0-2.2																																																
111.0-1.22	2.1-2.3																																																
Project Results	A gradiometer survey and Ground Penetrating Radar (GPR) was conducted over land at Sling Road, Bulford Camp, Wiltshire (centred on NGR 418947 144344). The project was commissioned by WSP Environmental with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site into eight houses and associated garages. The site comprises a grassed area located immediately north-east of Bulford Camp, covering 1.3 ha. The geophysical survey was undertaken on 30 March to 2 April 2026. The gradiometer and GPR surveys have not detected anomalies of archaeological origin or related to the foundations of the military huts formerly on the site. The gradiometer and GPR results have detected mapped utilities. The gradiometer results show the whole site has an increased magnetic response, which is likely linked to the demolition of the military accommodation present on the site to return it to a green space in the late 20th century. Any weaker anomalies on the site would have been masked due to the increased magnetic response. The GPR results have detected mostly services across the site. Several of which are likely to relate to the military accommodation, as they appear to terminate at the locations where the barracks were located on historical mapping. A ferrous platform possibly related to services was detected in the west of the site. Areas of high amplitude are likely related to areas of made ground, which were also detected along the edge of the site. The modern road and chalk or limestone bedrock were detected across the site during the GPR survey.																																																
Keywords																																																	
Funder	Private or public corporation Organisation WSP Environmental																																																
HER																																																	



Person Responsible for work	Alison Langston
HER Identifiers	
Archives	

Report generated on: 24 Apr 2026, 11:10





- Site boundary
- Detailed survey extent

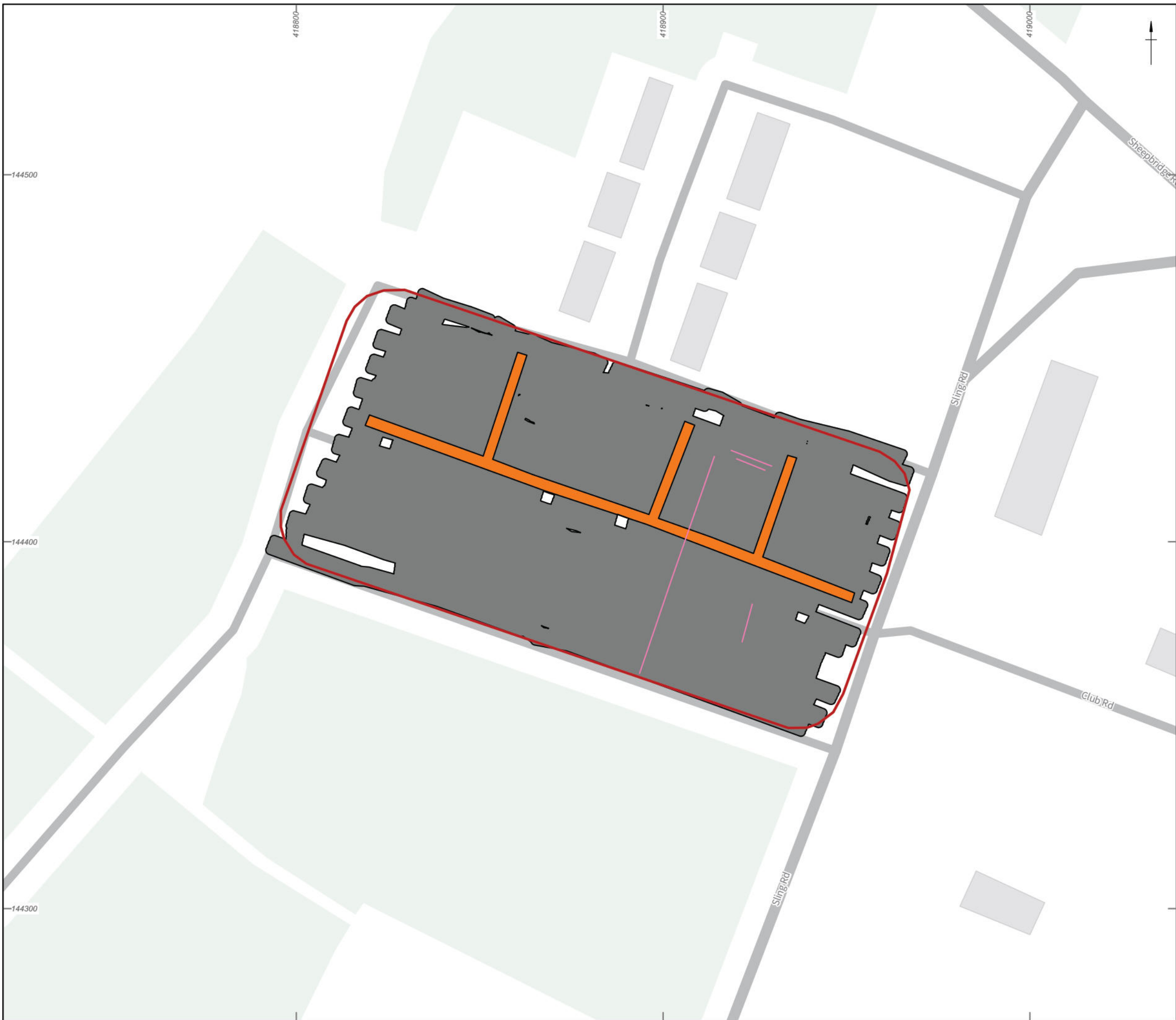
-2 nT 3 nT

0 50 m

Coordinate system: OSGB 1936 British National Grid
Contains Ordnance Survey data © Crown copyright and database right 2026.
This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date: 13/04/2026	Created by: FC	
Scale: 1:1,000 at A3	Revision: 0	

Figure 2: Gradiometer survey results: greyscale plot



- Site boundary
- Detailed survey extent
- Increased response
- Modern service
- Trend

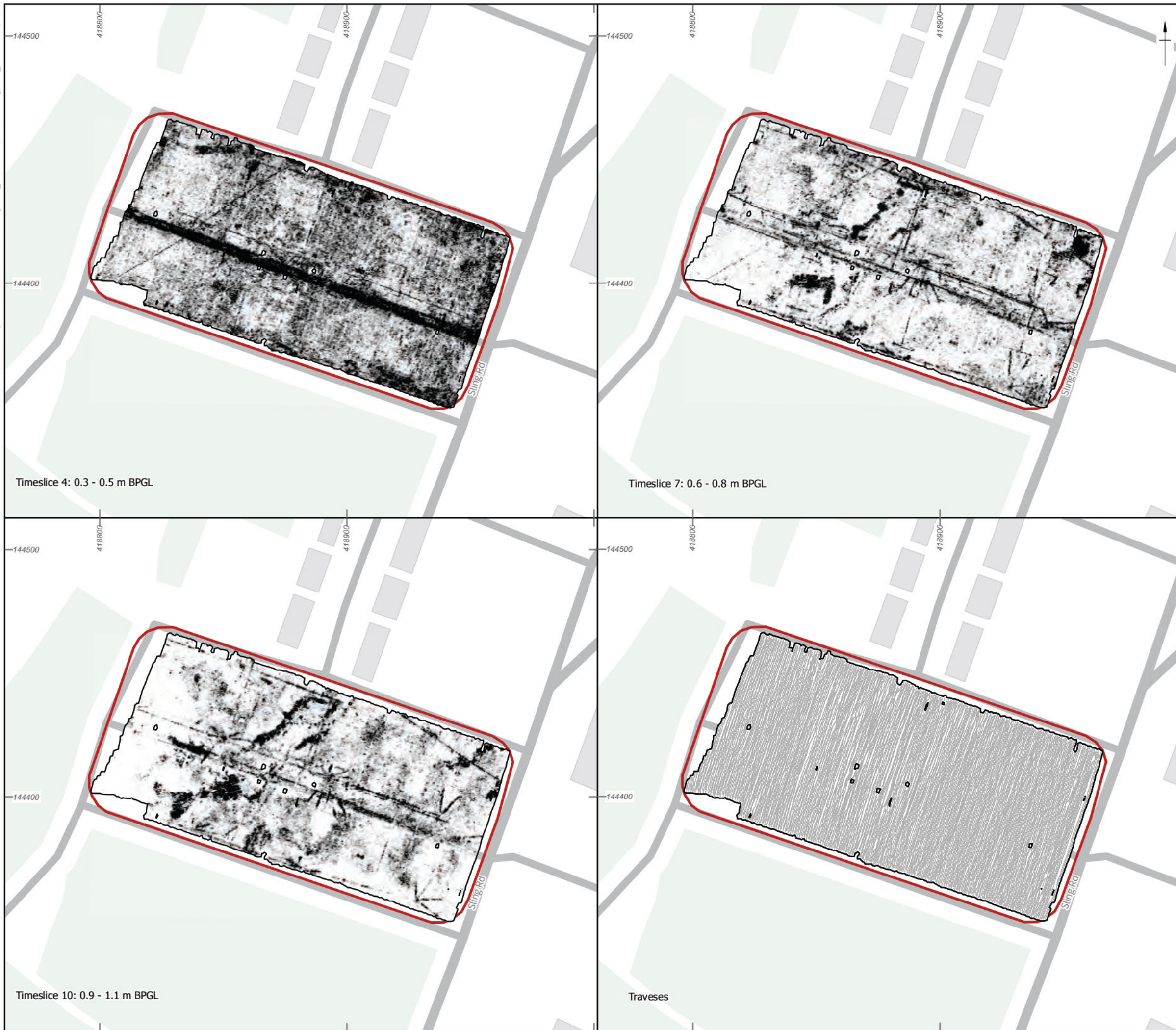
0 50 m

Coordinate system: OSGB 1936 British National Grid
Contains Ordnance Survey data © Crown copyright and database right 2026.
This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

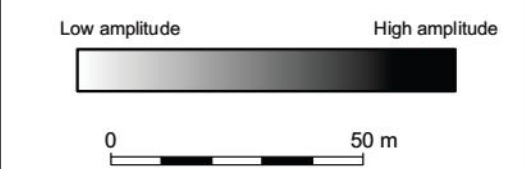
Date: 13/04/2026	Created by: FC	
Scale: 1:1,000 at A3	Revision: 0	

Figure 3: Gradiometer survey results: interpretation

X:\Projects\325290\ArcPro\325290-SlingRoad_BulfordCamp_SlingRoad_BulfordCamp.aprx



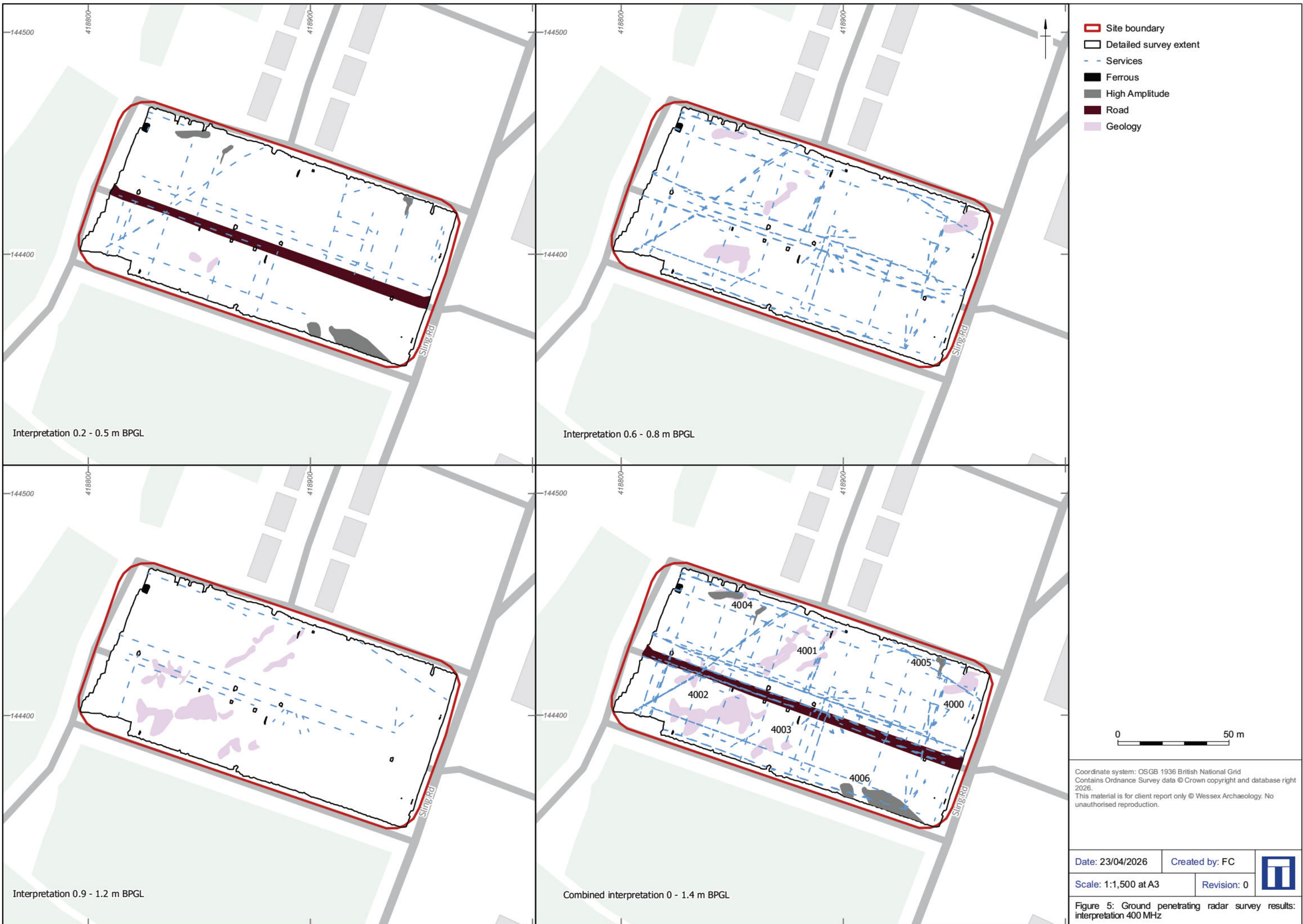
- Site boundary
- Detailed survey extent
- GPR traverses



Coordinate system: OSGB 1936 British National Grid
Contains Ordnance Survey data © Crown copyright and database right 2026.
This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date: 20/04/2026	Created by: FC	
Scale: 1:1,500 at A3	Revision: 0	

Figure 4: Ground penetrating radar survey results: greyscale plot and traveses 400 MHz





Wessex Archaeology Ltd registered office Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk

