Swordfish Business Park, Hampshire

Written Scheme of Investigation
for an Archaeological Geophysical Survey

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wessexarchaeology



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Portway House
Old Sarum Park
Salisbury
Wiltshire
SP4 6EB

www.wessexarch.co.uk

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Address:	Vanbrugh House Grange Drive Hedge End Southampton SO30 2AF
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Address:	Civic Offices Civic Way Fareham Hampshire Post Code PO16 7AZ
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Project management by	Alastair Trace
Document compiled by	Filippo Carrozzo
Contributions from	Matt Lester
Graphics by	Filippo Carrozzo

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Swordfish Business Park, Hampshire

Written Scheme of Investigation for an Archaeological Geophysical Survey

1 INTRODUCTION

1.1 Project and planning background

1.1.1 Wessex Archaeology has been commissioned by Gleeds Cost Management Ltd, on behalf of Fareham Borough Council ('the client'), to produce a written scheme of investigation (WSI) for a proposed archaeological geophysical survey of a 17.2 ha parcel of land at Solent Airport, Gosport Road, Stubbington, PO14 2AE. The evaluation area is centred on NGR SU 55926 02262 (**Figure 1**).

1.1.2 The proposed development comprises infrastructure at Solent Airport (formerly Daedalus Airfield) on the west side of the airport in an area designated as Swordfish Business Park, which includes the relocation of an existing Taxiway on the airport.

1.1.3 The gradiometer survey will comprise 17.2 ha of land.

1.1.4 This survey forms part of an ongoing programme of archaeological works being undertaken in support of a hybrid planning application for phased development comprising:

(1) OUTLINE planning application (with all matters reserved except for the principal point of vehicular site access off Gosport Road) for: demolition of existing buildings and structures (including the "Bellman" aircraft hangars); decommissioning of aircraft taxiway; development of land for employment uses and buildings within use classes E(g)(ii), E(g)(iii), B2 and B8 (up to a maximum of 56,559sq.m.(GEA) / 54,035sq.m.(GIA)), and ancillary uses; works for changes to site levels; new access roads, parking and servicing areas; footways and cycleways; secondary points of site access; surface water and foul drainage infrastructure (including new pumping station/s); all other associated infrastructure works (including electrical and telecommunications installations, other essential services and utilities, and airside facilities); all other associated site works and development (including hard and soft landscaping, sustainable drainage, ecological enhancements including the phased provision of biodiversity net gain (BNG), fencing, lighting, and security); and

(2) FULL planning application for: alterations and improvements to the principal point of vehicular site access off Gosport Road; realignment of existing access road, and construction of first part of site spine road (including footpaths, cycleway and drainage); construction and installation of new drainage infrastructure (including new foul pumping station building, and sub-surface works); construction and installation of new electrical infrastructure (including sub-surface works); alterations and improvements to site perimeter landscaping (including new bunds, and fencing / screening); ecological enhancements; and all other associated works and development (including fencing, lighting and security).

1.2 Scope of document

1.2.1 This WSI sets out the aims of the geophysical survey, and the methods and standards that will be employed. 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 2014a), European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) and Historic England *Thesauri* (English Heritage 2014).

1.2.2 This document will be submitted to Hampshire County Archaeological services for approval, prior to the start of the geophysical survey.

1.3 Location, topography, and geology

1.3.1 The proposed geophysical survey area is to the west of Solent Airport in the town of Fareham, 8 km west of Portsmouth, in the county of Hampshire.

1.3.2 The survey comprises 17.2 ha of land, currently utilised as an airfield and ancillary infrastructure. The site is bounded by the Gosport Road to the north, residential land to the west and Solent Airport to the east and south.

1.3.3 The site is on a slight incline sloping from 8 m above Ordnance Datum (aOD) at the northern edge to approximately 6 m aOD at the southern edge.

1.3.4 The solid geology comprises Sand, Silt and Clay of the Earnley Sand Formation and Marsh Farm Formation with overlying superficial geological deposits of River Terrace Deposits (BGS 2026).

1.3.5 The soils underlying the site are likely to consist of freely draining slightly acid loamy soils (Soilscapes 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 AND HISTORICAL BACKGROUND

2.1 Introduction

2.1.1 The following historical and archaeological background has been compiled using resources from the Hampshire Historic Environment Record (HHER). It considers the recorded historic environment resource within a 1 km study area of the proposed development. The following archaeological background is not exhaustive but discusses known heritage assets relevant to the interpretation of the geophysical survey data.

2.2 Archaeological and historical context

Designated Heritage Assets

2.2.1 Designated heritage assets within the study area comprise seven Grade II Listed Buildings characterised by churches, cottages and farmhouses associated with the village of Stubbington dating from the medieval period and the 19th century.

Prehistoric

2.2.2 Evidence for prehistoric activity in the study area is limited to isolated findspots. These include a Lower Palaeolithic handaxe (HHER 1109171) 450 m south of LP_001_A, a Mesolithic tranchet axe (HHER 234466) 185 m south of LP_002_B, a Neolithic greenstone

(HHER 234376) found on the seashore 370 m south of LP_001_A, and a number of Late Bronze Age pottery sherds found 460 m east of the site during archaeological evaluation in 2014.

Medieval and post-medieval

2.2.3 Stubbington is mentioned in the Domesday Book as a small district belonging to the estates of Titchfield Estate, whilst the Market Town of Fareham is listed as having 90 households.

2.2.4 A series of possible former medieval field systems is noted at Seafield Park, 500 m west of the site.

2.2.5 Post-medieval drainage ditches are visible on aerial photographs to the south of Seafield Park 550 m west of the site.

Modern

2.2.6 Between 1917 and 1996 the site was part of RNAS Lee-on-Solent (HMS Daedalus), a Royal Naval Air Station that trained crews and engineers as part of the Royal Navy's Fleet Air Arm and earlier as part of the Royal Air Force and Royal Flying Corps. HMS Daedalus played a significant role during the Second World War. As a result, a number of military aviation assets survive within the surrounding landscape.

2.2.7 A group of aircraft hangars, known as Dunning, Swann and Overlord and dating to the 1930s or the Second World War, are located approximately 530 m south-east of LP_001_A.

2.2.8 The former dining rooms and cookhouse of HMS Daedalus, constructed in the early 1930s, are situated approximately 750 m south-east of LP_001_A.

2.2.9 In addition, a group of Second World War blister hangars is present within LP_004_A and LP_005_A, with further examples located between LP_006_E and LP_007. These surviving military structures reflect the former extent and operational infrastructure of HMS Daedalus and demonstrate the site's close association with the wartime airfield.

3 AIMS AND OBJECTIVES

3.1 Project aims

3.1.1 The aims (or purpose) of the geophysical survey, in compliance with the CIfA' *Standards and guidance for archaeological geophysical survey* (CIfA 2020), are:

- 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 Project objectives

3.2.1 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.

4 SURVEY METHODS

4.1 Introduction

4.1.1 All works will be undertaken in accordance with the detailed methods set out within this WSI. Any significant variations to these methods will be agreed in writing with the Hampshire County Archaeologist and the client, prior to being implemented.

4.2 Access

4.2.1 The client will make all access arrangements for the geophysical survey works, Wessex Archaeology will not deal directly with any landowners etc. unless instructed to do so by the client.

4.2.2 Any areas which are not accessible during the survey, or which are deemed by Wessex Archaeology staff to be unsafe to access, will not form a part of this survey work. Any such areas will be documented for future reference.

4.3 Service location and other constraints

4.3.1 The client will provide information regarding the presence of any below/above-ground services, and any ecological, environmental, or other constraints.

4.4 Survey specification

4.4.1 The cart-based gradiometer system uses a Carlson BRX-7 RTK GNSS instrument, which receives corrections from a network of reference stations operated by the OS. Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceeds Europae Archaeologiae Consilium recommendations (Schmidt et al. 2015).

4.4.2 Where GPS is not possible, for example due to tree cover, stakeout data will be prepared in OS National Grid coordinates prior to survey using ArcPro GIS, and survey data will be georeferenced accordingly. Individual survey grid nodes will be established where necessary using a Carlson Captivate RTK GNSS instrument, or equivalent. The full extent of the surveyed areas will be located using this system. This allows for the surveyed area to be independently relocated by a third party, if ever required.

4.4.3 All survey data will be recorded in OS National Grid coordinates and heights above OD (Newlyn), as defined by OSGM15 and OSTN15, with a horizontal precision of at least 50 mm.

4.4.4 The survey will be conducted with a 30 m buffer when the runways and taxiways are active. The survey within the 30 m buffer area will be conducted while the airdrome is not active.

4.4.5 Digital mapping and archaeological information gathered during any previous work by Wessex Archaeology on the site will be used to support the interpretation of the geophysical data.

4.4.6 An interpretation of the geophysical anomalies will be presented identifying likely and possible archaeological features, along with linear trends and areas of increased magnetic response.

4.4.7 Further details of the geophysical and survey equipment, methods, processing, and interpretation are described in **Appendix 1** and **2**.

5 INSTRUMENT SPECIFICATION

5.1 Gradiometer survey specification

5.1.1 The gradiometer survey will be conducted using hand pushed non-magnetic cart fitted with four, Sensys FGM650/03 gradiometers mounted at 1 m intervals with an effective sensitivity of 0.03 nT over a ±100 nT range.

5.1.2 Data will be 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). Data will be collected in the zigzag method.

5.1.3 Where necessary, data from the survey will be subject to minimal correction processes. The precise steps required will be determined after data collection but would typically comprise a zero-mean traverse function (±5 nT thresholds) to correct for variations in the calibration between the SenSYS sensors used and a de-step function to account for variations in traverse position due to varying ground cover and topography. The data will be processed using in-house software which allows greyscale and trace plots to be produced. Interpretation will be conducted within the latest version of ESRI ArcGIS Pro. All efforts will be made during data collection to limit required processing and no further filtering will be applied.

6 REPORTING

6.1 General

6.1.1 Following completion of the fieldwork and the processing and assessment of the data, a draft report will be submitted for approval to the client, for comment. Once approved, a digital (.pdf) final version will be submitted.

6.1.2 The report will include the following elements:

- A non-technical summary;
- Introductory statements including location and NGR of surveyed area, background to the project (and any references/event numbers as supplied by the client), site description with geology, and summarised archaeological background;
- Aims and objectives;
- Methods;
- Results;
- Conclusions in relation to the project aims and objectives;
- Archive preparation and deposition arrangements;
- Appendices;
- Plans and plots (including location plan); and
- References

6.1.3 The report will be prepared within three weeks of completion of all fieldwork, and submitted to the client for approval. If required interim reporting can be completed following fieldwork, subject to variation.

6.1.4 Digital copies of the raw data, report text, figures and electronic drawings will be made available upon request (subject to copyright).

6.2 OASIS

6.2.1 An OASIS online record (http://oasis.ac.uk/pages/wiki/Main) will be created, with key fields completed, and a .pdf version of the final report submitted. Subject to any contractual requirements on confidentiality, copies of the OASIS record will be integrated into the relevant local and national records and published through the Archaeology Data Service (ADS) ArchSearch catalogue.

7 ARCHIVE STORAGE AND CURATION

7.1 Preparation of archive

7.1.1 If provision is made in the contract, the complete project archive will be prepared in accordance with *A Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt *et al*. 2001) and ADS guidelines (ADS 2015), and any requirements of the relevant Historic Environment Record (HER).

7.1.2 A high quality geo-rectified TIFF will be produced from the processed data, with the raw data stored as ASCII files. The archive will usually be deposited within 6–12 months of the project's completion.

8 COPYRIGHT

8.1 Archive and report copyright

8.1.1 The full copyright of the written/illustrative/digital archive relating to the project will be retained by Wessex Archaeology under the *Copyright, Designs and Patents Act* 1988 with all rights reserved. The client will be licenced to use each report for the purposes that it was produced in relation to the project as described in the specification. The museum, however, will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use conforms to the *Copyright and Related Rights Regulations* 2003. In some instances, certain regional museums may require absolute transfer of copyright, rather than a licence; this should be dealt with on a case-by-case basis.

8.1.2 Information relating to the project will be deposited with the Historic Environment Record (HER) where it can be freely copied without reference to Wessex Archaeology for the purposes of archaeological research, or development control within the planning process.

8.2 Third party data copyright

8.2.1 This document, the evaluation report and the project archive may contain material that is non-Wessex Archaeology copyright (e.g., Ordnance Survey, British Geological Survey, Crown Copyright), or the intellectual property of third parties, which Wessex Archaeology are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Wessex Archaeology. Users remain bound by the conditions of the *Copyright, Designs and Patents Act* 1988 with regard to multiple copying and electronic dissemination of such material.

9 WESSEX ARCHAEOLOGY PROCEDURES

9.1 External quality standards

9.1.1 Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its *Code of conduct* (CIfA 2025a) and *Regulations for professional conduct* (CIfA 2025b). All staff directly employed or subcontracted by Wessex Archaeology will be of a standard approved by Wessex Archaeology, and archaeological staff will be employed in line with the CIfA codes of practice, and will normally be members of the CIfA.

9.2 Personnel

Project specific

9.2.1 The fieldwork will be directed and supervised by an experienced member of Wessex Archaeology's geophysics team. This will likely comprise geophysicists from our Amesbury Office, who will be on site at all times for the length of archaeological fieldwork as required. The overall responsibility for the conduct and management of the project will be held by one of Wessex Archaeology's project managers, who will visit the fieldwork as appropriate to monitor progress and to ensure that the scope of works is adhered to. Where required, monitoring visits may also be undertaken by Wessex Archaeology's Health and Safety manager. The appointed project manager and fieldwork director will be involved in all phases of the investigation through to its completion.

9.2.2 The following key staff are proposed:

- Project Manager Alastair Trace
- Fieldwork Director Callum Jerivs

9.2.3 Wessex Archaeology reserves the right, due to unforeseen circumstances (e.g., annual leave, sick leave, maternity, retirement etc) to replace nominated personnel with alternative members of staff of comparable expertise and experience.

Wessex Archaeology's geophysical capabilities

9.2.4 Wessex Archaeology has a unique track record in undertaking archaeological geophysics investigations in land, coastal and marine environments. Both in the UK and abroad, Wessex Archaeology delivers professional archaeological geophysical services. A practical and pragmatic approach to carrying out investigations is matched by a proven ability to place the results within their proper archaeological context.

9.2.5 Wessex Archaeology's expertise in geophysical surveys is fully integrated with its archaeological services, ensuring a seamless, professional approach with direct access to in-house computing, illustration, finds and environmental analysis, and scholarly and popular publication.

9.2.6 Wessex Archaeology's geophysics team comprises specialist staff at all grades from Geophysicist to Technical Manager, and is overseen by the Director of Geoservices. This team is supplemented by archaeologists with geomatics and geoarchaeological experience from Wessex Archaeology's wider staff and further experienced staff can be brought in on contract to meet project requirements.

9.2.7 In addition to its in-house expertise, Wessex Archaeology routinely employs the services of a range of eminent geoarchaeological, palaeoenvironmental, and finds specialists. The contribution of these specialists to specific projects is managed through a relevant technical

manager. Further details of external specialists employed by Wessex Archaeology can be provided on request.

9.3 Internal quality standards

9.3.1 Wessex Archaeology is an ISO 9001 accredited organisation (certificate number FS 606559), confirming the operation of a Quality Management System which complies with the requirements of ISO 9001:2015 – covering professional archaeological and heritage advice and services. The award of the ISO 9001 certificate, independently audited by the British Standards Institution (BSI), demonstrates Wessex Archaeology's commitment to providing quality heritage services to our clients. ISO (the International Organisation for Standardisation) is the most recognised standards body in the world, helping to drive excellence and continuous improvement within businesses.

9.3.2 Wessex Archaeology operates a computer-assisted project management system. Projects are assigned to individual project managers who are responsible for the successful completion of all aspects of the project. This includes monitoring project progress and quality; controlling the project budget from inception to completion; and all aspects of Health and Safety for the project. At all stages, the project manager will carefully assess and monitor performance of staff and adherence to objectives, timetables, and budgets, while the manager's performance is monitored in turn by the team leader or regional director.

9.3.3 All work is monitored and checked whilst in progress on a regular basis by the project manager, and all reports and other documents are checked (where applicable) by the team leader/technical manager, or regional director, before being issued. A series of guideline documents or manuals form the basis for all work. The technical managers in the Graphics, Finds & Analysis, GeoServices and IT sections provide additional assistance and advice.

9.3.4 All staff are responsible for following Wessex Archaeology's quality standards but the overall adherence to and setting of these standards is the responsibility of the senior management team in consultation with the team leaders/regional directors who also ensure projects are adequately programmed and resourced within Wessex Archaeology's portfolio of project commitments.

9.4 Health and Safety

9.4.1 Health and Safety considerations will be of paramount importance in conducting all fieldwork. Safe working practices will override archaeological considerations at all times. Wessex Archaeology will supply trained, competent, and suitably qualified staff to perform the tasks and operate the equipment used on site. All work will be carried out in accordance with the *Health and Safety at Work Act* 1974 and the *Management of Health and Safety at Work Regulations* 1999, and all other applicable Health and Safety legislation, regulations, and codes of practice in force at the time.

9.4.2 Wessex Archaeology will supply a copy of the company's Health and Safety Policy and a Risk Assessment to the client before the commencement of the evaluation. The Risk Assessment will have been read, understood, and signed by all staff attending the site before any fieldwork commences. Wessex Archaeology staff will comply with the Personal Protective Equipment (PPE) requirements for working on the site, and any other specific additional requirements of the principal contractor.

9.5 Insurance

9.5.1 Wessex Archaeology has both Public Liability (£15,000,000) and Professional Indemnity Insurance (£10,000,000).

REFERENCES

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Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A and Fassbinder, J. 2015 *Guidelines for the use of geophysics in archaeology: questions to ask and points to consider.* EAC Guidelines 2, Belgium: European Archaeological Council.

Soilscapes. 2026. Cranfield University. LandIS - Land Information System - Soilscapes soil types viewer (accessed August 2026)

APPENDICES

Appendix 1: Survey equipment and data processing

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 ±8 μT over ±1000 nT range. All of the data are then relayed to a CS35 tablet, running the MONMX program, which is used to record the survey data from the array of FMG650/3 probes at a rate of 20 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 Leica Captivate system with a rover and base station. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.01 m intervals along traverses spaced up to 0.25m apart.

Post-processing

The magnetic data collected during the survey is downloaded from the cart 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 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 Bartington Grad 601-2 fluxgate gradiometer 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:

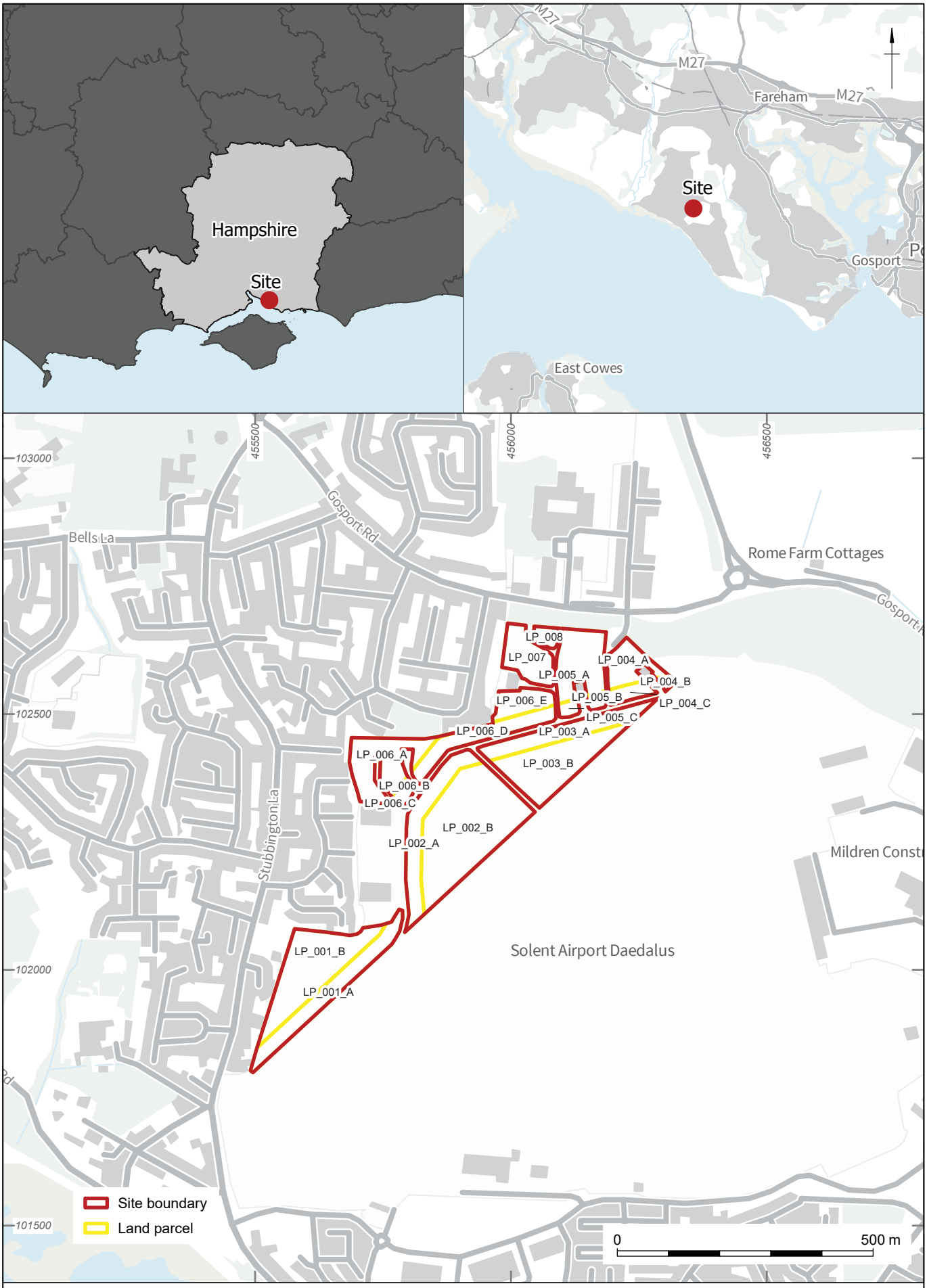
- GPS DeStripe – Determines the median of each transect and then subtracts that value from each datapoint in the transect within the defined window. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.
- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.
- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).

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 the 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 available on request).

X:\Projects\327891\ArcPro\327891 - Swordfish\327891 - Swordfish.aprx



Coordinate system: OSGB 1936 British National Grid
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Date: 10/08/2026	Created by: FC	Revision: 0	Scale: 1:10,000 at A4

Figure 1: Site location and survey extent



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

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