Acoustic fence on Bund (1.5m)

Localised heightening of Acoustic fence on Bund (2m)

Note: Bund to be 1.5m before acoustic fence added

Legend:

- 1.8m Closeboard fence
- 1.8m Screen Wall
- Low Stone Wall
- 0.9m Private Path
- 1.2m Private Path M4(3)
- Private Parking Space (52)
- Visitor Parking Space (>)
- Bin Collection Points
- Proposed Hedge
- Proposed Trees

NOTE: Please refer to detailed landscape design for full landscape proposals

proj: 19-026 drg: 0030 date: 14/12/22 rev: F

ORIGIN3
Tyndall House
17 Whiteladies Road, Clifton
Bristol, BS8 1PB

N

1:500 @ A0 / 1:1000 @ A2

m 10 20 30 40 50

Snow Capel, Matson

Proposed Site Plan

Bromford & EWH

W:\PLANNING\19-026 Snow Capel, Matson\Urban Design\2 Graphics\1 In Progress\CAD\19-026 Snow Capel_0300 - Proposed Site Plan.dwg

19-026 Snow Capel, Matson 09.12.22

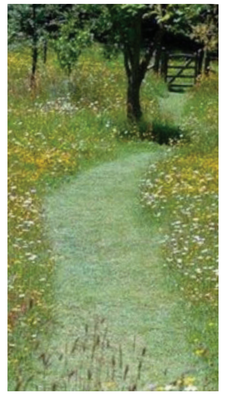
Bromford & EWH 0030 - Proposed Site Plan

Original HT	No.	Beds	Storey	sq.m	sq.ft	Total sq.m	Total sq.ft
1Bed Flat (540) (Aprt A,B,E)	16	1	F	50	540	803	8640
1Bed Flat (701) (Aprt C,D)	6	1	F	65	701	391	4206
M4(3) Flat (701) (Aprt C,D)	4	1	F	65	701	260	2804
1bed Maisonette (625)	3	1	2	58	625	174	1875
2B3P (774)	11	2	2	72	775	792	8524
2B4P (855)	42	2	2	79	855	3335	35896
3B5P (886)	10	3	2	82	886	823	8859
3B5P (1010)	9	3	2	94	1010	844	9087
3B5P V1 (864)	4	3	2	80	864	321	3457
3B5P V1 (1019)	20	3	2	95	1018	1892	20370
3B5P V2 (1019)	15	3	2	95	1018	1419	15277
3B5P (1014)	18	3	2	94	1014	1696	18251
3B - M4(3) (1367)	1	3	2	127	1367	127	1367
4B7P (1109)	3	4	2	103	1109	309	3327
4B7P (1253)	4	4	2	116	1253	466	5012
4B8P V2 (1448)	6	4	2	135	1448	807	8687
4B7P (1316)	11	4	3	122	1316	1345	14481
4B8P (1357)	7	4	2	126	1357	883	9501
Total	190					16687	179621

Net Area (ha/acre)- North	1.05	2.59
Net Area (ha/acre) - South	3.39	8.38
Net Area (ha/acre) - Total	4.44	10.97
Coverage	16372	sq.ft/acre
Density	43	dph

Masterplan

PROPOSED LANDSCAPE AREAS



TREE PALETTE

Native Focal Trees such as Acer campestre, Betula pendula and Carpinus betulus.

Betula pendula

Street Trees such as Acer campestre "Streetwise" and Carpinus betulus "Frans Fontaine"

Acer campestre "Streetwise"

Ornamental Trees such as Pyrus calleryana "Chanticleer" and Prunus "Amanogawa"

Pyrus calleryana "Chanticleer"

KEY TO MASTERPLAN

Soft Landscape

- Existing Vegetation
- Proposed Ornamental Shrub Planting
- Proposed Ground Cover Planting
- Proposed Ornamental Hedge Planting
- Proposed Native Buffer Planting
- Proposed Native Hedge Planting
- Amenity Grass to Public Open Space Areas
- Back Garden Grass
- Plot Frontage Grass
- Mown Path
- Wildflower Meadow Grassland
- Proposed Planted Acoustic Bund
- Area of Retained Vegetation
- SuDS - Sustaiable urban Drainage System

Hard Landscape

- Tarmac Paths
- Proposed Road and Parking Space Tarmac Surfacing
- Proposed Block Paving to Shared Surfaces and Private Drives
- Timber Post and Split Rail Fencing
- Slab Paving
- 3m High Accoustic Fence

Streetscape Items

- Picnic Table
- Heritage Interpretation Board
- Finger Post
- Naturalistic Play Items

Rev.	Date	Initials	Comments
C	16.12.2022	AJW	Ammended to latest layout
B	13.05.2022	CR	Ammended to client comments
A	10.05.2022	CR	Ammended to client comments

Site
Snow Capel, Matson, Gloucester

Drg Number
JBA 21/169- SK01

Client
Edward Ware Homes

Drawn by	Date	Scale	Rev
HNG	APRIL 2022	1:1000@A1	C

[redacted]

JAMES BLAKE ASSOCIATES

Snow Capel, Matson, Gloucester

December 22

Environmental Statement, Volume 1 – Main Report - Addendum

Snow Capel, Matson, Gloucester

Prepared by Black Box Planning
on behalf of *Bromford Housing*

Table of Contents

1.	Introduction	3
2.	Scope and Methodology	6
3.	Site and Surrounding Area	7
4.	Proposed Development	8
5.	Planning Policy Context	11
6.	Ecology and Biodiversity (see separate document)	12
7.	Cultural Heritage (see separate document)	13

Volume 2: Technical Appendices

Appendix 4.5 – Proposed Site Plan – 19-026 – 0030 – Rev F

Appendix 4.6 – Accommodation Schedule – 09/12/2022

Appendix 4.7 – Landscape Masterplan – JBA 21/169-SK01 Rev C

This report has been prepared in accordance with the quality assurance procedures operated by Black Box Planning Ltd	
Created by:	[redacted]
Signature:	
Checked by:	
Signature:	

1. Introduction

Introduction and Purpose

1.1. An Environmental Impact Assessment (EIA) was undertaken in May 2022 on behalf of Bromford Housing ('the Applicant') in support of a full planning application ('the planning application' ref: 22/00519/FUL) made to Gloucester City Council ('the Local Planning Authority') on 9th June 2022 in respect of residential development at Snow Capel, Matson, Gloucester ('the site') with the following description of development:

> *"Residential development of 190 no. dwellings (Class C3); vehicular, pedestrian and cycle access from Winnycroft Lane; public open space and landscaping; drainage attenuation and other associated works"* (the 'proposed development').

1.2. The site is land at Snow Capel Farm, Matson, Gloucester and is detailed further within Chapter 3 of the main ES report.

1.3. The proposal for the Snow Capel site covered by the planning application is detailed within Chapter 4 of the main ES report. The changes made to the proposal are discussed in this ES addendum. The revised proposal is thereafter referred to as 'the proposed development' within this ES addendum. Refer to Appendix 4.5 for the Proposed Site Plan

1.4. This Environmental Statement (ES) addendum has been compiled by Black Box Planning (BBP) with the assessments of each environmental matter undertaken by a team of specialists summarised within Table 1.1 below. The purpose of this ES addendum is to present the findings of the EIA and identify the likely significant environmental effects of the proposed development during both the construction and operational phases.

Environmental Impact Assessment

1.5. This ES addendum has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, specifically Regulation 25 which covers further information and evidence respecting environmental statements.

1.6. As part of the ES process, there is the requirement to assess the likely significant effects of the proposed development. The relevant updated plans are provided at Appendix 4.5 through 4.7.

1.7. The planning application was provided in full detail and therefore represents the maximum parameters of the proposed development. The application remains in full detail following the submission of revised plans. As such the EIA is considered to represent a robust assessment of the likely significant effects of the proposed development.

The EIA Team

1.8. This ES addendum has been prepared by the following project team, summarised in Table 1.1 below.

Table 1.1: The Applicant's EIA Team

Name and Title	Organisation	EIA Role	Qualifications and Experience
[redacted]			

Structure of the Environmental Statement

1.9. The ES is structured as follows:

- **Volume 1 – Main Report:**

- Chapter 1: Introduction, purpose and structure of the ES
- Chapter 2: Scope and Methodology
- Chapter 3: Site and Surrounding Area
- Chapter 4: Proposed Development, Need and Alternatives
- Chapter 5: Planning Policy Context
- Chapter 6: Ecology and Biodiversity
- Chapter 7: Cultural Heritage
- Chapter 8: Summary of Findings

- **Volume 1 – Main Report – Addendum**
- **Volume 2 – Figures and Technical Appendices**
- **Non-Technical Summary**

Consultation on the Environmental Statement

1.10. This ES addendum will be consulted on alongside the submission of revised information. During this period, the ES documents, including this report, should be made available by Gloucester City Council for public viewing during normal hours. The details of where it can be viewed will be available from the development management team who can be contacted by:

Telephone: 01452 396396

E-mail: development.control@gloucester.gov.uk

1.11. All of the planning application documents, including the ES, can be accessed on Gloucester City Council's website at the following page:

Website: www.gloucester.gov.uk/planning-development/planning-applications/view-planning-applications-online

1.12. Any consultation comments on the ES documents should be directed to Gloucester City Council at the following email address clearly stating 'Snow Capel: ES Addendum Consultation' in the subject line:

Address: Gloucester City Council PO Box 3252, Gloucester, GL1 9FW.

2. Scope and Methodology

2.1. This ES addendum has been prepared in accordance with Regulation 25(1) which states that:

"If a relevant planning authority, the Secretary of State or an inspector is dealing with an application or appeal, as the case may be, in relation to which the applicant or appellant has submitted an environmental statement, and are of the opinion that, in order to satisfy the requirements of regulation 18(2) and (3), it is necessary for the statement to be supplemented with additional information which is directly relevant to reaching a reasoned conclusion on the likely significant effects of the development described in the application in order to be an environmental statement, the relevant planning authority, Secretary of State or inspector as the case may be must notify the applicant or appellant in writing accordingly, and the applicant or appellant must provide that additional information: and such information provided by the applicant or appellant is referred to in these Regulations as "further information".

2.2. A set of revised detailed plans of the proposed development have been submitted (refer to Appendix 4.5 through Appendix 4.7) which have been assessed as part of the ES addendum. Collectively these updated plans control the parameters and defining aspects of the proposed development capable of having significant environmental effects. These include:

- **Appendix 4.5** - Proposed Site Plan – 19-026 – 0030 - Rev F
- **Appendix 4.6** – Detailed Accommodation Schedule – 09/12/2022
- **Appendix 4.7** – Landscape Masterplan – JBA 21/169-SK01 Rev C

2.3. Please refer to Chapter 2 of the main ES report for more information.

3. Site and Surrounding Area

Site Description

3.1. The ES incorrectly stated that the public right of way (PROW) across the site forms part of the Glevum Way, a local long distance circular route around the outskirts of Gloucester, however it has since been confirmed by Gloucestershire Ramblers, that this route instead exists to the north of the site.

4. Proposed Development

4.1. Bromford Housing have submitted a full planning application (ref: 22/00519/FUL) on 9th June 2022 to the local planning authority, Gloucester City Council, in respect of residential development at Snow Capel, Matson, Gloucester with the following description of development:

> *"Residential development of 190 no. dwellings (Class C3); vehicular, pedestrian and cycle access from Winnycroft Lane; public open space and landscaping; drainage attenuation and other associated works"* (the 'proposed development').

4.2. Additional plans and drawings have now been submitted in order to amend the proposed development. The description of the development remains the same but should be read in conjunction with the re-submitted plans and drawings. The revised Proposed Site Plan is provided at Appendix 4.5. A revised detailed accommodation schedule is provided at Appendix 4.6. A revised landscape masterplan is provided at Appendix 4.7.

4.3. The application is made in full and therefore establishes the definitive parameters within which the development of the site will be delivered. These have underpinned the environmental assessment.

Description of the Development

Built Land Uses

4.4. The proposed development comprises the construction of 190 no. residential dwellings (Class C3).

4.5. The proposal provides for a mix of different house types with a variety of number of bedrooms, comprising 29 no. 1 bedroom flats or maisonettes, 53 no. 2 bedroom houses; 77 no. 3 bedroom houses and 31 no. 4 bedroom houses. All of the proposed buildings are either 2 or 2.5 storeys in height.

4.6. The proposed dwellings meet Nationally Described Space Standards (NDSS) are between the following ranges in floorspace area:

- 1 bedroom flats – 50.17 and 65.12 sqm;
- 2 bedroom houses – 72 sqm and 79.4 sqm;
- 3 bedroom houses – 82.3 sqm and 127 sqm;
- 4 bedroom houses – 103.03 sqm and 134.5 sqm.

4.7. A detailed accommodation schedule is provided at Appendix 4.6.

4.8. A landscaped earth bund with fence on top will provided along the south-east boundary of the site to provide noise mitigation from the M5 motorway.

Building Design and Materials

4.9. A mix of housing typologies are proposed. The dwellings are proposed to mainly consist of terraces, semi-detached and detached houses between 2 and 2.5 storeys in height. All dwellings are set back from the street and have back gardens to the rear, all private, aside from the apartment blocks which will have access to a communal space.

4.10. The apartment buildings will be of a similar typology to the houses. They will be arranged over two storeys.

4.11. Primary building materials that are to be used are wood, brick, glass and metal frames. Stone finishes will also be used in key areas to reflect local vernacular.

Movement and Access

4.12. The proposed development remains to be accessed from Winnycroft Lane from the west by the construction of a new priority access vehicular junction. The location of the new junction is adjacent to the rear of property Yew Trees on Matson Lane.

4.13. The new junction will also provide pedestrian and cycle accessibility with new footpath provision to be provided along Winnycroft Lane to the north.

4.14. Emergency vehicular access is provided further south along Winnycroft Lane adjacent to the southernmost area of Sneedham's Green.

4.15. Internally, the dwellings will be accessed by a primary vehicular route with footpath on either side. The route will be interspersed with changes in surfacing to denote key areas and calm traffic. The primary route has been designed to allow the future use of buses.

4.16. The secondary streets will be shared surface spaces and will provide plot by plot access. Each dwelling will have allocated parking spaces either on or adjacent to the property curtilage.

4.17. A key feature of the proposal is the integration of a pedestrian and cycle network into the wider area. The public right of way (PROW) entering the site from the north will be continued and directed towards the central green, with a new circular route around the space. A further route is provided along the site frontage providing connections from the north to the south of the proposal.

Landscape and Public Realm

4.18. The placemaking aspiration for the proposal is informed by the respectful treatment of the moat and its setting, by creating a central green landscape space intended to retain a generous setting and provide public accessibility to and engagement with the asset.

4.19. The openness of the proposal towards Sneeham's Green will provide opportunity to facilitate views towards the wider historical setting. Well placed interpretation boards on walking routes will also highlight this link between Sneedham's Green and the moat. The existing PROW will be facilitated into the central green to enable an attractive recreational route and point of interest.

4.20. The non-built areas of the site will comprise landscaped, public open space areas providing multi-functional benefits of facilitating pedestrian and cycle connections, together with heritage conservation and management, drainage, biodiversity gains and amenity space. The proposed public realm and green infrastructure features are shown on the plan at Appendix 4.7.

Flood Risk and Drainage

4.21. All of the site lies within Flood Zone 1 indicating the lowest probability risk of flooding. The surface water drainage strategy for the proposal is comprised on a series of underground drainage pipes and attenuation cellular storage tanks. The revised drainage strategy seeks to incorporate some above ground swales. The proposal will have two surface water outfalls, one will be as overland flow indirectly into the moat following transition through a filtering spillway. The second will be to the north into an existing highway ditch.

5. Planning Policy Context

Emerging Policy

5.1. The Gloucester City Plan 2011-2031 has undergone examination and main modifications have been recommended by the examiner. Following the submission of the planning application and the ES main report, the main modifications were consulted upon from May 2022 to July 2022. The plan is therefore at an advanced stage and moderate weight should be given to its policies. In the context of the proposed development, and with reference to the status of the emerging plan, it is noted that a series of concerns have been raised by the Applicant regarding the soundness of the plan, which have been provided separately through ongoing representations to the emerging plan.

5.2. When adopted, the City Plan will replace the saved policies of the Gloucester City Plan 1983, and the material consideration of the Saved Policies from the 2002 Second Stage Deposit Plan, in their entirety.

6. Ecology and Biodiversity

Introduction

6.1. Please refer to the Ecology Addendum

7. Cultural Heritage

Introduction

7.1. Please refer to the Heritage Addendum

the environmental dimension partnership

LANDSCAPE
ECOLOGY
HERITAGE
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www.edp-uk.co.uk

29 November 2022 Our Ref: **L**/edp3746/RSk/cro

David Millinship
Planning Services
Gloucester City Council
Shire Hall
Westgate Street
Gloucester
GL1 2TG

Dear David,

This letter is written in response to a Gloucester City Council (GCC) Consultation Memorandum issued on 22 November 2022 by Andrew Armstrong, City Archaeologist, in respect of planning application 22/00519/FUL.

As a very brief summary, the City Archaeologist's opinion is that the planning application should be refused for the following reasons:

- That the application failed to provide a convincing justification for development in the setting of the scheduled monument: Moated Site at Sneedham's: Green (Mon No. 32357, NHLE No.1019399), with "*no evidence of a design process that considers heritage or that seeks to protect or enhance the setting of the monument*";

- That there are no public benefits to heritage from the proposals;

- That the proposals are "*contrary to the requirements of the NPPF, the JCS and the Gloucester City Plan*" such that, in respect of paragraph 206 of NPPF the proposal "*does not make a positive contribution nor does it conserve and enhance the setting of the heritage asset*;.

- And that, if granted, the scheme would "*fundamentally damage the significance of the monument*' and '*entirely remove its setting*"; and

- And, that the scheme will take a monument that is in good and sustainable condition and leave it requiring ongoing management and protection.

His conclusion is that "*There are no aspects of this scheme which can be considered positive from a heritage point of view nor does the scheme include elements intended to protect or enhance the heritage of the city*".

Earlier in the response it is articulated that the harm to the monument's significance due to change within its setting would be at the high end of 'less than substantial' (as per NPPF paragraph 202).

This letter sets out how this assessment is flawed: (1) through its misrepresentation of the proposals themselves; (2) through its failure to fully consider the new evidence that has been produced for the scheduled monument or the modern aspects of its setting; (3) through its unrealistic assessment of the harm which would be caused to this designated heritage asset; and (4) through its refusal to acknowledge the benefits of the proposal, specifically its accompanying Heritage Management Plan (HMP).

It is apparent that there are fundamental misconceptions of the scheme which underlie and therefore undermine the veracity of the City Archaeologist's opinion. It references an evidence base of reports submitted in support of the application but importantly does not include in this list the Heritage Management Plan (EDP, 2022, edp3746_r011) that was also submitted. This is an important and disappointing omission because the HMP contains key information on the treatment of the scheduled monument within the development, including proposals in respect of its interpretation and presentation to the public.

By ignoring this document, its contents and some key elements of the design that are illustrated on the Masterplan (James Blake Associates, 2022, JBA 21-169-SK01 Rev A), the City Archaeologist's response to the submission of the planning application does not consider the whole scheme, which was submitted to the Council and thus is only partial and lacks objectivity, as it is not based on a full and comprehensive understanding and assessment of the submitted documents. Where relevant, the HMP is referenced in respect of the City Archaeologist's comments below.

The City Archaeologist presents a brief description of the scheduled monument and its setting based on the evidence considered. A key flaw in this description is that the monument is confidently and repeatedly referred to as a 'medieval moated site'. Whilst it is undoubtably a moated site, the evidence in the geoarchaeological borehole survey (ARCA 2022) only identified a date of the late 17th century AD at the earliest for the deposits present in the moat and thus does not give any clear indication that the moat was medieval, adding a high degree of uncertainty to the traditional interpretation of this asset.

In a similar vein, there are several other baseless assumptions of a medieval date applied to the stream on the west of the site, Winneycroft Lane and field boundaries to the north of the site, whereby these elements of the landscape are stated as 'medieval' without any explanation as to why this is thought to be the case. This point is highlighted as it illustrates how the City Archaeologist does not fully consider the most up to date archaeological evidence in his assessment, or fully evidence some aspects of his conclusions. This partial and unevidenced approach is also notable in the lack of

consideration for the full breadth of the proposals and, in the assessment of the monument's setting and the impact of development on it.

The City Archaeologist's assessment of the setting and what elements of it contribute to the significance of the monument is in marked contrast with EDP's own assessment (as per Chapter 1 *Cultural Heritage* of the Environmental Statement). In this regard, the EDP assessment is comprehensive and balanced, considering all aspects of the monument's modern setting including how it will change following the neighbouring consented development (Land South of Winneycroft Farm, part of the Strategic Allocation A6 – Winneycroft in the JCS). Conversely, the City Archaeologist's assessment only references the few remaining historic features in the asset's wider setting. Given that the definition of 'setting' in NPPF is 'The surroundings in which a heritage asset is experienced' this partial approach does not present a proper illustration of how the asset is experienced and how other, non-historical aspects of its setting contribute to an appreciation and understanding of the monument. This is an important consideration for a heritage asset that is located in an urban-edge context within a field which had its present appearance defined in the 20th century (through the deposition of a thick layer of spoil across it when the M5 was constructed) and that is adjacent to the M5 motorway, the sound of which is present throughout the site.

The City Archaeologist's statement as to the development's impacts on this setting contain some inaccuracies. For example, the masterplan (James Blake Associates, 2022, JBA 21-169-SK01 Rev A) and the HMP and other documents which describe the proposed development (such as the ES Chapter) clearly indicate that a historic hedgerow is proposed as being reinstated along the course of the former field boundary that once incorporated the moat's lost southern arm. This deliberate design feature is intended to mark the southern edge of the monument so as to make its extent, and historic form, legible in the landscape, whereby they are not at present.

Although stated as such in the City Archaeologist's opinion, the scheduled monument will clearly not be left "*as an island*", the proposal is for it to be retained within an area of open space that has been left open to improved views to and from the west so as to maintain the monument's historic link with Sneedham's Green. This link would be presented to and interpreted for the public via an interpretation board that would be positioned at a point where the moat can be overlooked with Sneedham's Green in the background. This design intention is fully described in the HMP and ES Chapter.

Consequently, rather than being "*cut off from what survives of its historic setting*", it would in fact have its link with the element of its historic setting that does survive (Sneedham's Green) become a clear focus for the monument's treatment in the masterplan and the proposed public interpretation of the asset.

You would therefore think that this design intention would find favour with the City Archaeologist, whose own assessment clearly identifies the Sneedham's Green settlement as a feature of the historic landscape that he holds in high regard and especially in terms of the setting and significance of the scheduled monument. Yet strangely this aspect of the development proposals is entirely ignored in his response.

These considerations in the masterplan and HMP, particularly those in relation to the monument's interpretation, are entirely ignored in the City Archaeologist's commentary to the point that, in the 'Recommendations' section several non-factual statements are made. For example, there is quite clearly evidence of a "*design process that considers heritage*". The masterplan gives due consideration to the elements of the monument's setting that contribute positively to its significance and offers interpretation of the monument to the public, which does not presently exist.

In this regard, it is considered that, contrary to the City Archaeologist's opinion, a public benefit to heritage is offered, as the monument would be presented to the public, interpreted and the links with the wider historic landscape to its significance highlighted in the information provided. In that regard, to an archaeologist with knowledge of the City's archaeological resources the monument may be interpretable as a visible earthwork that, as stated by the City Archaeologist, is an "*interesting and visible part of Gloucester's history*". However, to a ley person passing the monument on the public right of way (PROW) that runs through the field, it appears as little more than a fenced off pond in a field adjacent to the M5 motorway. The existing fencing does not even correlate to the extent of the scheduled monument, a delineation which would be re-instated as part of the proposal as a result of the planting of the historic hedge line along the southern edge. The assessment made and conclusions drawn in the consultation response, in this regard, are extremely superficial.

From a wider assessment perspective, the proposed development aims to deliver a range of benefits by providing interpretation of the monument to the public that includes consideration of the historic elements of its setting and allowing a greater number of people to access, experience and appreciate its significance.

With reference to Historic England guidance 'The Setting of Heritage Assets' (GPA 3, 2017), it is considered that the proposed development does offer some 'enhancements' to the setting of the scheduled monument by:

"*Introducing new views (including glimpses or better framed views) that add to the public experience of the asset*" – i.e. the intention to provide a viewpoint whereby the monument can be overlooked with Sneedham's Green in the background with information provided at this point (HMP, paragraphs 5.30–5.33)

And by:

"*Improving public access to, or interpretation of, the asset including its setting*" -whereby managed and controlled public access is proposed, as well as interpretation of the monument including from the Glevum way walking route.

EDP's setting assessment, as presented in the ES Chapter, concurs with the City Archaeologist's assessment, in that it does assess that the change in character to the field in which the asset lies would result in a degree of harm to the asset's significance. However, a key point of difference is that EDP considers this to be low and that it is reduced to a negligible degree by the implementation of the interpretative enhancement measures, noted above and set out in detail in the HMP submitted with

the planning application. Thus overall harm is assessed at the very lower end of 'less than substantial harm'.

EDP's identification of harm at the 'very low end' of the less than substantial harm 'spectrum' is in marked contrast with the assessment of the City Archaeologist, who assesses rather an impact at the 'higher' end of less than substantial harm. However, it is our contention that harm from change within an asset's setting should, unless the asset has a setting that is especially relevant to its significance over and above its actual fabric, only ever be of a relatively low scale. This is because, in line with NPPF, it is only the significance that the asset derives from its setting that is affected, not any of that which is contained in its actual fabric. Typically speaking, the majority of an asset's significance is bound up in the asset itself and so its wider setting in the landscape contributes only a minor proportion.

This position has been confirmed by the Secretary of State for Levelling Up, Housing and Communities regarding a planning application at Edith Summerskill House, Clem Atlee Court, London on 04 July 2022 (Ref. APP/H5390/V/21/3277137). In their report the Planning Inspector made the same statement, that:

"*In cases where the impact is on the setting of a designated heritage asset, it is only the significance that asset derives from its setting that is affected. All the significance embodied in the asset itself would remain intact. In such a case, unless the asset concerned derives a major proportion of its significance from its setting, it is very difficult to see how an impact on its setting can advance a long way along the scale towards substantial harm to significance*."

This statement was endorsed by the Secretary of State in paragraphs 11 to 15 of the Decision Letter (Ref. APP/H5390/V/21/3277137 – 04 July 2022) who agreed with the Inspector's reasoning that, where the majority of a heritage asset's significance is bound up in its physical form and fabric, the harm which would be caused to that asset by development proposals that affect only its wider setting (and leave that physical form and fabric unchanged) are likely to be towards the lower end of the spectrum of less than substantial harm as a consequence.

In that case, the asset in question was a listed building, which is admittedly a different type of designated heritage asset. However, it is arguable that as setting in respect of scheduled monuments is a policy matter and not a matter controlled under the 1979 Ancient Monuments and Archaeological Areas Act, that, in lacking legislative protection, the desire to preserve setting is less onerous and so the Inspector's point should be even more relevant.

In the current situation this is surely the case as, in respect of the setting assessment presented in the Archaeological and Heritage Assessment and ES Chapter, the majority of the setting of the moated site is of poor quality and includes modernised elements such as the M5 motorway and the field in which the monument lies, which has been reformed and levelled out when the motorway was built. To reiterate, the key element of the monument's setting that retains a historical, functional relationship to it; i.e. Sneedham's Green; is respected in the proposals with views to it retained, emphasised and indeed, celebrated through interpretation in the design.

An assessment of harm at the high end of 'less than substantial harm', as reached by the City Archaeologist, is only one step below 'substantial harm'. The threshold between substantial and less than substantial harm has been clarified in the Courts. Paragraphs 24 and 25 of Bedford BC v Secretary of State for Communities and Local Government [2013] EWHC 2847 are of relevance here in the way they outline the assessment of 'harm' for heritage assets:

"*What the inspector was saying was that for harm to be substantial, the impact on significance was required to be serious such that very much, if not all, of the significance was drained away.*

Plainly in the context of physical harm, this would apply in the case of demolition or destruction, being a case of total loss. It would also apply to a case of serious damage to the structure of the building. In the context of non-physical or indirect harm, the yardstick was effectively the same. One was looking for an impact which would have such a serious impact on the significance of the asset that its significance was either vitiated altogether [i.e. destroyed] or very much reduced."

In other words, for the 'harm' to be 'substantial', the proposal would need to result in the asset's significance either being "*vitiated altogether or very much reduced*."

With a comprehensive consideration given for the scheduled monument's setting and its contribution to its significance, and, with full regard given to the nature of the proposals, it is clearly apparent that the monument does not derive a large proportion of its significance from its setting. As such, change (especially change which includes, as proposed, consideration for the remaining historic link with Sneedham's Green), could not objectively result in such a high level of impact such that the monument would be one step from having all or most of its significance destroyed, which is what the City Archaeologist is suggesting.

The assessment of 'heritage benefits' from public interpretation of a heritage asset, even in the face of an impact from change to its setting by development, is also reflected in recent appeal decisions. On 23 April 2020 the Secretary of State allowed a housing-led appeal in the green belt (where a high level of policy protection operates) at the Wheatley Campus of Oxford Brookes University (APP/Q3115/W/19/3230827), which included a scheduled monument, which was described as being "*forlorn, neglected and uninspiring*" (paragraph 13.51) and that it "*goes largely unnoticed and unappreciated by the public at large*". In that case the inspector and the Secretary of State balanced the harm that would arise to the setting of the scheduled monument with the public benefits (as the NPPF states). The benefits included a 'scheduled monument improvement scheme' to be secured by condition. The inspector explained that the improvement scheme would include the:

"*…maintenance and the provision of features such as public seating, an information board and research into the SM's origins. Given the current state of the SM, I consider this to be a significant heritage benefit which would enable the general public to appreciate and understand the asset in a way that is far removed from today's underwhelming experience*."

In another case, on 03 March 2021, the Secretary of State granted planning permission for a mixed-use development in Burley-in-Wharfdale (APP/W4705/V/18/3208020) whereby an archaeological asset, considered on par with a scheduled monument in terms of its significance, was subject to a mix of positive and negative effects, with the positive effect arising from long-term management and public interpretation. In that case, the Secretary of State concluded that incorporating the asset within the development in an appropriate manner and utilising it as an educational resource, represented a heritage benefit of significant value, which outweighed any associated harm to the significance of this asset.

Whilst the present case must be judged on its own circumstances, the parallels with these cases cannot be dismissed and thus, the benefits associated with the proposed HMP inclusive of those related to interpretation and the future management of the scheduled monument should be seen as bringing some benefit to the significance of the monument, and certainly not ignored as the City Archaeologist has done in providing his opinion.

It is excessively negative that the City Archaeologist appraises the inclusion of the monument within the scheme as only resulting in negative consequence and that its future management is itself a negative consequence. Whilst it is true that there is a need to strike a balance between increased access to a heritage asset and its management, it is feasible that the monument can be successfully managed and the methodology of doing so, including controlling direct access, is set out in the HMP.

Whilst its future management could be seen by some as burdensome, at the same time the monument's inclusion at the heart of the scheme allows for an opportunity to interpret and present it to the public. By bringing the presence of the monument to the fore and presenting information about its provenance, and the history of this part of the City, to the public who access it will hopefully encourage the local community to take pride in its presence within their lived landscape, a feature that will bring heritage interest to the locality. This is considered to be a much more optimistic outlook for the monument's future than that preferred by the City Archaeologist whereby the monument remains an anonymous pond in a field seen only by passers-by and understood by only those with a pre-existing knowledge of local history.

The concept of development-led regeneration of heritage assets is in no way an unusual or uncommon approach. The incorporation of heritage features within developments to connect the present with the past is a key aspect of placemaking. Indeed, this desirability is reflected in paragraph 197 of NPPF in that in determining applications local authorities should take account of "*the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality*' and '*the desirability of new development making a positive contribution to local character and distinctiveness*." The response fails to consider relevant policy, read as a whole, which undermines the balanced approach it should take in drawing conclusions.

In conclusion, the City Archaeologist has misrepresented the proposed development by not regarding aspects of its design and its intentions in his opinion. This fundamental lack of consideration for the nature of the proposals brings into question the reliability of the City Archaeologist's conclusions, particularly in respect of the overstated assessment of harm to the scheduled monument in the site

from change within its setting and the lack of regard for the heritage related public benefits of the scheme.

In accordance with paragraph 202 of NPPF, the overall harm which is assessed, residually as negligible and thus is at the very low end of the scale of less than substantial harm, should be weighed against the public benefits that the proposed development would bring forward and deliver, where these include enhancements to the scheduled moat in addition to the more typical benefits arising from the provision of market and affordable housing etc. In doing so, the consultation response is seemingly denying the planning officer the objective analysis and appropriate application of policy to then feed in to the balancing exercise at NPPF 202 (the heritage balance) before then going on to consider the 'planning balance'.

Unfortunately, the failure to address and consider, the scheme as presented, the supporting information (including the HMP), the appreciation of the correct policy tests and lack of objective assessment has undermined the extent to which it can be considered reflective of the issues in informing the decision-making process.

Yours sincerely

Land at Snow Capel Farm, Matson, Gloucester

Heritage Addendum

Prepared by:
The Environmental Dimension Partnership Ltd

On behalf of:
Edward Ware Homes and Bromford Developments Ltd

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DISCLAIMER TEXT

Contents

Section 1 Introduction 4
Section 2 Updated Baseline 5
Section 3 Revised Impact Assessment 9
Section 4 Conclusion 12
Section 5 References 14

APPENDICES

Appendix EDP 1 Masterplan

Appendix EDP 2 Geoarchaeological Report - ARCA

Section 1
Introduction

1.1 This Heritage Addendum has been written in support of a revised planning application for Land at Snow Capel Farm, Matson, Gloucester. It presents an assessment of the effects of post-submission revisions to the proposed development on the historic environment. It also updates the historic environment baseline following the receipt of new information. In this regard, it represents an addendum to the following documents:

- Chapter One, Cultural Heritage of the Environmental Statement (ES) - Land at Snow Capel Farm, Matson, Gloucester; and
- Land at Snow Capel Farm, Matson, Gloucester, Archaeological and Heritage Assessment (EDP, 2021).

1.2 The masterplan illustrating the revised development is at **Appendix EDP 1**. In this regard, the following changes to the previously submitted scheme are proposed which are pertinent to the heritage assessment:

- The layout has been modified to create an increased off-set between the Scheduled Monument and the footpath to the south of 4.0m in width. This has been implemented in response to comments received from Gloucester City Council in response to the planning submission;
- House types have been changed to Bromford's new range. This is detailed in the Design and Access Statement (DAS) Addendum. As per Chapter Four of the ES, a Tier 1 house type is still proposed for the houses that face inwards towards the Scheduled Monument as is detailed in the DAS Addendum; and
- Two swales are proposed situated along the edge of the proposed development adjacent to the open space around the Scheduled Monument. These features will be 600mm deep, and 4.8m in width, appearing as shallow grassed ditches alongside proposed footpaths.

1.3 Regarding additional historic environment information, this Addendum presents the results of a Geoarchaeological Study (ARCA, 2022) completed at the Scheduled Monument in the autumn of 2022 and consideration of how they affect the baseline assessment of the site set out in the documents above. The Geoarchaeological report is at **Appendix EDP 2**.

Section 2
Updated Baseline

GEOARCHAEOLOGICAL SURVEY

2.1 The Geoarchaeological survey (referenced as ARCA, 2022) is only of relevance to a single heritage asset, the scheduled monument *Moated site at Sneedham's Green, 220m north-east of Green Farm* (National Heritage List Entry - 1019399).

2.2 The survey was commissioned following consultation with the Gloucester City Archaeologist and Historic England (HE) in October and November 2021. This resulted in a request for further information on the archaeological deposits associated with the scheduled moat with a borehole survey, assessing the deposits through paleoenvironmental analysis in order to provide further information on their significance.

2.3 A Written Scheme of Investigation (WSI) for the completion of the investigative works and was agreed with the Gloucester City Archaeologist on 4 February 2022 It was appended to Chapter One of the ES.

2.4 The survey comprised the following work:

- The drilling of 20 boreholes along three transects across the Scheduled Monument's moat; two across water-filled parts of the moat and a third across an infilled part where the moat was formerly located;
- Taking photographs and making written descriptions of the sedimentary sequence within each of the gouge auger boreholes;
- On the basis of the stratigraphy revealed in the gouge augers, samples were then taken for laboratory assessment with one sample taken from each transect at the point of thickest sediment. These used a closed chamber Russian auger for the waterlogged areas and a mechanical hammer driven gouge auger for dry ground; and
- Off-site laboratory analysis involving paleoenvironmental and palynological analysis, as well as radiocarbon dating.

2.5 The geoarchaeological report, which was prepared by ARCA following the completion of the work described above, reaches the following conclusions:

- The moat fills are derived from weathering of the bedrock in the moat sides, decomposition of aquatic and marginal plants in the moat, transport of flora from beyond the moat and deliberate human deposition which either comprised small scale dumping into the moat antiquity or large scale redeposition of bedrock during modern engineering (i.e. the construction of the nearby M5 motorway);
- It is highly likely that the lower fills of the western and northern moat arms have been permanently submerged by water since their deposition and it is possible that the

upper fills have also. However, iron stains in the eastern moat arm demonstrate that there has been fluctuation of the water table;

- The C14 dates indicate that the lower deposits in the western arm of the moat are of modern origin, with a post 1950s date indicating that the material in this part is almost certainly contaminated by spoil dumped when they built the M5 motorway;

- A radiocarbon date from the lower deposits in the northern arm produced a C14 date of the post-medieval period but with a balance of probability (see 6.2.3 in the report at **Appendix EDP 2**) leaning towards a 19th or early 20th century date (26% chance of an AD 1680-1730 cal. range with a 69.4% chance of an AD 1800 – 1930 cal. range). There is no positive data to indicate that the deposit sampled is medieval;

- Sub-fossil concentrations are low in all parts of the moat with better pollen preservation in the dry, infilled, eastern part of the moat;

- Consequently, the strata have a low potential for paleoenvironmental reconstruction beyond providing outline information on the environment at the time that the lower moat fills were accumulating;

- Due to the generally low pollen concentrations and limited diversity of taxa observed in the assessments, the sequences preserved in the exposed arms of the moat are assessed as having a low paleoenvironmental potential;

- In terms of the preservation of organic archaeological remains, the plant macrofossil data do suggest that degradation has occurred but that limited organic preservation does nonetheless occur - even in the 'dry' part of the moat. It is likely that organic artefacts could survive - if they were ever present. However, no evidence for organic artefacts was found in any of the boreholes; and

- In conclusion, the geoarchaeological work does not completely negate the possibility of significant archaeological remains and deposits occurring within the moat deposits, although it does suggest that the potential for medieval material is very low and indicates a low potential for deposits of paleoenvironmental significance.

REVISED ASSESSMENT

2.6 The geoarchaeological survey has implication for the assessment of the significance of the Scheduled Monument. Presently, this is presented in the Archaeological and Heritage Assessment (EDP, 2021) at Paragraph 4.12 and Chapter One of the ES at Paragraph 1.69.

2.7 The geoarchaeological survey (ARCA 2022) suggests that the below ground deposits within the moat (both within its extant part and infilled former part) have only a limited degree of archaeological interest in comparison to other elements of the monument.

2.8 The work suggests that the moat is unlikely to contain deposits that date from the medieval period. The moat may pre-date the oldest radiocarbon date of 17th century at the earliest, as there is a thin deposit of 30cm in depth at the bottom of the sediment sequence that

could not be dated, but it is considered to be very unlikely this represents *in situ* preserved medieval material if the deposit immediately overlying it is not.

2.9 It is also speculated that the moat could be medieval in origin and has been regularly and thoroughly dredged, and thus the present deposits only formed after the moat went out of use. This is feasible but seems unlikely as it is not a structure which had a strategic military purpose (being overlooked by adjacent hills), and thus it seems unnecessary for it to have been consistently dredged. Furthermore, it is unlikely that dredging would have been absolutely thorough, and you would expect some older material to remain within the moat's lower deposits, which was not identified by the borehole survey.

2.10 Either way, the dates indicate that the deposit sampled at the base of the northern arm of the moat is of no earlier than 17th century date and that the submerged deposits partly consist of 20th century material deposited during the construction of the M5 motorway. Regarding the potential for well-preserved organic materials being present in the moat, whilst there is still a low possibility for such materials to be preserved, they would be most likely, at most, of the same date as the deposits, i.e. of no earlier than 17th century date; and potentially disturbed and damaged by modern deposition of spoil into the moat and thus of limited archaeological interest or significance.

2.11 Also, the report identifies a low potential for paleoenvironmental data for the deposits that were sampled, thus indicating that they do not possess a great wealth of information on the nature of the past landscape in which they were formed. As such, this aspect does not indicate anything more than a low degree of archaeological interest.

2.12 As such, the geoarchaeological assessment suggests that the deposits within the moat only contribute to the monument's archaeological interest to a limited degree. The assessment of the monument's archaeological interest, as an aspect of its significance, is now understood to primarily comprise the interest contained in any archaeological remains located within the enclosed area of the moat, which may relate to the building that was once enclosed by it. Also, the structure of the moat itself and the buried remains that indicate its previous form, layout and use contain a degree of interest even if the deposits within the moat itself are probably only of a low degree of significance.

2.13 In this regard, with reference to the previous assessment, the monument's historic interest is possibly greater than its archaeological interest in respect of making up the totality of the monument's heritage significance. This interest is in how the monument illustrates the nature and appearance of the medieval landscape in the locality and its association with the history of the De Sneedham family, the history of settlement at Sneedham and with the general history of the medieval aristocracy of Gloucester.

2.14 Overall, the geoarchaeological survey does therefore provide evidence that the balance of heritage value within the monument's overall national significance, is more focused on its historical interest rather that its remaining archaeological interest. In this regard, the proposed development will unequivocally preserve those aspects of the monument that retain its heritage significance. In the unlikely event that the surrounding development would result in changes to the moat's water supply mechanism, then the only aspect of the monument's archaeology that might be affected, the submerged deposits in the moat, are

demonstrably of limited significance and thus the monument's overall significance is not especially sensitive to this form of impact.

Section 3
Revised Impact Assessment

3.1 This section presents a revised impact assessment based on the new evidence derived from the geoarchaeological survey and the revised development proposals.

3.2 In respect of the assessment of direct impacts upon the Scheduled Monument *Moated site at Sneedham's Green, 220m north-east of Green Farm,* the proposed development includes the same surface water attenuation system set out in the ES.

3.3 As such, the assessment set out in Paragraphs 1.111 – 1.112 in Chapter One of the ES is still relevant, robust and accurate in that it reaches the same conclusion, regardless of the indication that the submerged moat deposits are of limited archaeological interest; i.e. the proposed development would result in no risk of submerged deposits being dried out as the moat's water level will be maintained, and no direct impact will occur from this aspect of the proposed development.

SETTINGS ASSESSMENT

3.4 The revised masterplan shows development set back 4.0m from the southern edge of the Scheduled Monument. This is a wider/bigger buffer than was previously proposed and thus the extent of open space provided around the monument will be slightly increased.

3.5 The proposed swales are shallow grassed linear ditches located up against the edge of the development, with both running parallel with part of the footpath that is proposed around the inside edge of the open space. Neither swale is within the scheduled area and will not result in any direct impact upon the Scheduled Monument.

3.6 Situated up against the proposed path, and parallel to it, the swales will be clearly defined as modern features and thus will not give the impression of being historical ditches that might confuse the interpretation of the moated site to an observer. Furthermore, as narrow linear features they will not mimic the form of the moat itself.

3.7 As shallow ground-level features, the swales will not be prominent in views across the open space such as that from the information board proposed to the north-east of the Scheduled Monument and will not screen or distract from the appreciation of the moat from the adjacent open areas. Additionally, the southern swale would be separated from the Scheduled Monument by the proposed hedge that would run along the monument's southern edge, indicating its extent and the position of the former southern part of the moat. The hedge would serve to screen the swale in views from the east including from the Scheduled Monument.

3.8 As noted above, the frontage of the development facing inwards onto the open space that is proposed around the Scheduled Monument is to remain as Tier 1 housing.

3.9 As such, the following statement detailed in Paragraphs 1.116 and 1.117 of the ES Chapter will still apply:

"A Tier 1 house type is proposed for those fronting the open space which will possess a more refined architecture that other houses that will not be visible across the open space. Due to their prominence in views across the open space, the Tier 1 houses will utilise a material pallet that will reflect the colouration of the wider Cotswold vernacular utilising imitation stone with a buff finish on their front elevations, as well as dark weatherboarding and buff render. Roofs will be finished in grey materials with prominent chimneys.

The DAS illustrates a high-quality frontage onto the open space with the following characteristics:

- *Creation of a 'pedestrian priority environment' with a footpath around the edge of the open space rather than a road and with parking for the houses adjacent to the open space to their rear. As such, cars will not be parked around the edge of the open space;*
- *Landscaping features such as trees and shrubs will be integrated with the houses so as to break up the frontage and create variety;*
- *Local stone walling will be used as a front boundary treatment for the Tier 1 houses; and*
- *The Tier 1 housing will comprise a mix of wide fronted cottages with paired dwellings with gables so as to create variety in the streetscape."*

3.10 In respect of the impact upon the significance of the Scheduled Monument, the assessment presented between Paragraphs 1.122 and 1.140 in Chapter One of the ES is predominantly unchanged as all of the provisions it assesses are still included in the proposals.

3.11 The loss of openness around the Scheduled Monument would be slightly less than previously stated and assessed. Considering the small size of the additional area, this 'retained' openness is not such that the overall assessment of the 'indirect' impact of development on this designated asset would change markedly.

3.12 Likewise, the two proposed swales would be part of the wider change to the setting of the Scheduled Monument, that will come forwards with the proposed development. However, as discussed above, they would not be of such a scale so as to result in an incremental change to the level of impact from the development as assessed in Chapter One of the ES.

3.13 The final assessment as set out in Chapter One of the ES at Paragraphs 1.135 and 1.140 would still apply, that a Low magnitude of effect would apply from change within the monument's setting, but that this is mitigated through the proposed conservation and interpretation measures to a Negligible adverse impact. Paragraph (1.140) sums this up:

"*Overall, given the provisions regarding conservation, the interpretation of the monument and its wider historic landscape context to a public audience, and consideration for the asset's setting in terms of the character of its surroundings and their openness, the impact of the development on the monument's value is mitigated to a degree and a Negligible*

Magnitude of Change is assessed. A Negligible magnitude of change to an asset of High Sensitivity would result in a Negligible effect which would not be a significant effect."

3.14 As such, in summary, the changes to the heritage baseline and the revision of the proposed development will not result in any material diversion from the assessment as previously set out in Chapter One of the ES. In this regard, the summary of effects as set out in Table 1.4 of the chapter will still apply.

Section 4
Conclusion

4.1 The Addendum provides an update to the existing, submitted Archaeological and Heritage Assessment for the site (EDP 2021) and *Chapter One: Cultural Heritage* of the ES.

4.2 In this regard, it updates the baseline position in terms of the Scheduled Monument *Moated site at Sneedham's Green, 220m north-east of Green Farm* by considering new information arising from a geoarchaeological borehole survey (ARCA, 2022).

4.3 The Addendum concludes that the archaeological interest of the monument is very slightly less than previously assessed, as the borehole data suggests that the moat's submerged deposits are of limited paleoenvironmental or archaeological significance.

4.4 However, in this regard, the additional information from the boreholes highlights that the national significance of the monument stems from other aspects of the monument's archaeology such as its interior, where buried remains related to a medieval manor may be present, its morphology as a moated site and, the monument's high degree of historical interest rather than the archaeological interest possessed by the submerged deposits in its ditches.

4.5 The Addendum also presents a revised assessment based on the new geoarchaeological information and on changes anticipated within the setting of the Scheduled Monument as a result of alterations to the masterplan.

4.6 Hence, it is concluded that the limited archaeological interest of the submerged deposits in the moat would, due to the proposed surface water attenuation plan, not be affected by the proposed development as water levels and water quality would be maintained. As such, the assessment of 'direct' impacts presented in Chapter One of the ES would still apply and the proposed development would give rise to only the direct Negligible affect assessed in the ES resulting from postholes for replacement fencing.

4.7 In terms of the Scheduled Monument's wider setting, alterations to the masterplan would result in a slight reduction in the loss of openness in comparison with the scheme assessed in the ES chapter. However, this would not be to such a degree as to result in an incremental change in the assessment and instead that would remain as described in Chapter One of the ES; comprising a Low magnitude of change that is reduced through the implementation of conservation and interpretation (as set out in the Heritage Management Plan that accompanies the application) to an overall Negligible adverse residual effect which would not be a significant effect.

4.8 In terms of National Planning Policy Framework (NPPF), this harm would be at the lower end of the spectrum of 'less than substantial harm' and, in accordance with Paragraph 202 of NPPF, should be "*weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use*." Public benefit is defined in the NPPF's Planning Practice Guidance whereby they could be anything that delivers economic, social or environmental objectives and can include heritage benefits, such as provision for the interpretation of a heritage asset to the public.

4.9 In terms of local planning policy, the assessment of impact is overall negligible adverse and thus does not fully conserve the significance of the designated heritage asset. However, the proposals as set out in the ES and in the Heritage Management Plan that accompanies it, in accordance with Policy D1 of the Gloucester City Plan, do indicate the conservation of features that contribute positively to the significance of the Scheduled Monument, notably its physical fabric and historically associated elements of its setting such as Sneedham's Green, to which views are opened up. Also, through the provision of a Heritage Management Plan that includes the interpretation of the monument to the public, the approval and implementation of the proposed development would sustain the asset's significance and better reveal it to future users and occupiers of the site.

4.10 In conclusion, the Addendum has set out changes to the heritage baseline at the site and modification to the proposed development and its masterplan. However, it has not assessed any changes to the conclusions that were reached in Chapter One of the ES, as previously submitted and thus the summary of effects as set out in Table 1.4 of the chapter will still apply as will the concluding statements in the chapter.

Section 5
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Appendix EDP 1
Masterplan

Tier 1 Housing

Tier 2 Housing

Acoustic fence on Bund (1.5m)

Localised heightening of Acoustic fence on Bund (2m)

Note: Bund to be 1.5m before acoustic fence added

Legend:

- 1.8m Closeboard fence
- 1.8m Screen Wall
- Low Stone Wall
- 0.9m Private Path
- 1.2m Private Path M4(3)
- Private Parking Space (52)
- Visitor Parking Space (>)
- Bin Collection Points
- Proposed Hedge
- Proposed Trees

NOTE: Please refer to detailed landscape design for full landscape proposals

proj: 19-026 drg: 0030 date: 14/12/22 rev: F

ORIGIN3
Tyndall House
17 Whiteladies Road, Clifton
Bristol, BS8 1PB
[redacted]

N

1:500 @ A0 / 1:1000 @ A2

m 10 20 30 40 50

Snow Capel, Matson

Proposed Site Plan

Bromford & EWH

W:\PLANNING\19-026 Snow Capel, Matson\Urban Design\2 Graphics\1 In Progress\CAD\19-026 Snow Capel_0300 - Proposed Site Plan.dwg

Appendix EDP 2
Geoarchaeological Report - ARCA

Geoarchaeology

ARCA

September 2022 (updated October 2022)

Report Number: 2223-1

SNEEDHAM'S GREEN MOATED SITE, MATSON, GLOUCESTERSHIRE: GEOARCHAEOLOGICAL STUDY

Prepared on behalf of The Environmental Dimension Partnership for Bromford Developments Ltd

[redacted]

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CONTENTS

Contents 2
Figures 2
Tables 2
Summary 4
1. Introduction 5
2. Methodology 8
2.1 Fieldwork 8
2.2 Laboratory core description and sub-sampling 8
2.3 ^{14}C dating 9
2.4 Palynology 10
2.5 Archive 10
3. Lithostratigraphy 12
3.1 Blue Lias and Charmouth Mudstone Formations 13
3.2 Moat fills 13
3.3 Reed mat 16
4. Chronostratigraphy 17
5. Biostratigraphy 18
5.1 Palynology 18
5.2 Plant macrofossils 18
6. Assessment 21
6.1 Properties of the moat fills 21
6.2 Mode of formation and age of the moat fills 21
6.3 Biological preservation in the moat fills 22
6.4 Palaeoenvironmental potential 23
7. Acknowledgments 24
8 References 25
Appendix 1: Borehole locations 27
Appendix 2: Borehole lithostratigraphy 28

FIGURES

Figure 1. Location of study area within (A) southern England and (B) southern Gloucester, and (C) the Sneedham's moated site and location of boreholes 6
Figure 4. East–west composite cross section along borehole Transect 1 12
Figure 5. South–north composite cross section along borehole Transect 2 14
Figure 6. West–east composite cross section along borehole Transect 3 15

TABLES

Table 1. Sub-samples collected from the Sneedham's Green moated site boreholes 9

Table 2. Material archive, location and discard policy 10

Table 3. ^{14}C dating results of samples from Sneedham's Green moated site, Matson 17

Table 4. Pollen identified in sub-samples from ARCA BH08, ARCA BH14 and ARCA BH18 19

Table 5. Macrofossils identified in sub-samples from ARCA BH08 and ARCA BH1820

SUMMARY

A geoarchaeological borehole study was undertaken of the Sneedham's Green moated site Scheduled Monument at Matson, Gloucestershire in May to September 2022. The purpose of the work was to determine the thickness, nature, biological preservation and hence palaeoenvironment potential of strata infilling the moat.

Sixteen geoarchaeological boreholes were manually drilled with gouge and Russian augers along two transects across the west and north sides of the water-filled moat. An Atlas Cobra TT petrol-powered hammer driving gouge auger heads and core samplers was used to drill a third transect of five boreholes through the infilled east side of the moat. Strata in the gouge (manual and mechanical) auger heads were described in the field, while cores (from the Russian auger and mechanically driven core samples) were described and sub-sampled in the laboratory for ^{14}C dating, and palynological and plant macrofossil assessment.

*The moat fills in the western arm of the Sneedham's enclosure are up to 1.55m thick, entirely sub-crop beneath water infilling the moat and are comprised largely of dark grey minerogenic silt/clays. These latter contain moderate to low quantities of plant macroremains. A ^{14}C date on the lower moat fills in the western arm produced an age post-dating AD 1950, which given the nature of the sample and sampled material is not considered to be the result of contamination. The infills of the northern arm of the moat have similar properties to the west, albeit that they are less than 1.20m thick and mostly post-date the AD 1680–1930 time range according to a single ^{14}C date. The eastern arm of the moat exists as a narrow topographic feature that is unfilled (at the time of sampling) by water, but contains up to 2.45m of infilling deposits. These latter are mainly of dark grey minerogenic silt/clays and containing fewer visible plant remains than in the western and northern arms. However, gravel is present in several of the beds (*contra *the western and northern arms of the moat), this including ceramic and bone artefacts. The cross-sectional profile through the infills of the eastern arm suggests that the moat extends at least 6m eastwards of the easternmost borehole (ARCA BH18) and beyond the fenced area presently demarcating the site. Further, characteristics of both the cross-sectional morphology and the macroscopic properties of the deposits present in the boreholes of the eastern boreholes suggest that some fills are the result of deliberate deposition, this almost certainly took place during construction of the adjacent M5 motorway.*

Assessment of samples collected for palynological and plant macrofossil study demonstrates poor sub-fossil preservation, low concentration and low floral diversity. These data, combined with the recent age of the deposits, mean that the moat fills have a low palaeoenvironment potential. Even so, the very fact that botanical macrofossils were found, indicates that organic objects will survive within the moat fills.

1. INTRODUCTION

1.1 This document reports the results of a geoarchaeological study undertaken at the Sneedham's Green moated site[1], Matson, Gloucestershire (henceforth 'the site' and 'study area'). The work was carried out as set out in a written scheme of investigation (Wilkinson 2021), and in accordance with Historic England's (2015) guidance on geoarchaeology, environmental archaeology (Campbell et al. 2011) and the Chartered Institute for Archaeologist's (CIfA) (2014) *Standards and guidance for archaeological field evaluation*. ARCA carried out the project on behalf of the Environmental Dimension Partnership Ltd and their client, Bromford Developments Ltd. The latter organisation has proposed to develop the site for residential purposes.

1.2 Sneedham's Green is centred on NGR 385088 214218, and lies 1 km south of Matson House and 160m north-west of the M5 motorway (Figure 1B). The moated area measures approximately 80m on an east to west axis and 40m north to south (Figure 1C). An area of approximately 66 by 42m is partially enclosed (the enclosure is open on the southern side) (Williams 2021). The moat edge lies at c. +56.4m OD and the area within rises to +56.7m OD, cf a maximum elevation of +198m OD on Robins Wood Hill 1.3 km to the north-west and +239m OD on Cud Hill 1.8 km to the south-east (Figure 1B). The British Geological Survey (BGS) map the bedrock geology of the study area as undifferentiated Blue Lias and Charmouth Mudstone Formation, and are Early Jurassic sub-units of the Lias Group dating from 199 to 183 million years ago (British Geological Survey 2021a, 2021b).

1.3 Sneedham's Green is a Scheduled Monument (1019399) under the Ancient Monuments and Archaeological Areas Act 1979 (Historic England 2021) and was first included on the Schedule of Ancient Monuments on 17 January 1951. As a Scheduled Monument, Sneedham's Green is by definition a heritage asset of national significance.

1.4 Despite being a Scheduled Monument since 1951, an aerial photograph taken in 1970 suggests that disturbance occurred during the construction of the M5 motorway and resulted in the capping of at least some of the site with overburden (EPD 2017, Williams 2021). Indeed, geotechnical boreholes on the site suggest that up to 3.1m of motorway-derived Made ground exists south of the moat and 1.6m of the same to the north-east, The same boreholes indicate that rockhead occurs at +54.6m OD north, +55.0m OD west and +57.5m OD south and east of the moat (Williams 2021).

1.5 The present geoarchaeological investigation concerns the fills of the Sneedham's Green moat. Although the proposed development does not overlap the bounds of the Scheduled Monument or the moat itself[2], a Tier 2 water environment assessment has indicated that construction *could* result in lowering of the water level and thus oxidation of any organic deposits that might survive in the moat (this author's italics) (Williams 2021). Further, the Tier 2 water environment assessment implies that the previously described M5-derived Made ground has had an impact on ground water and suggests that a perched water table exists within that stratum north and south of the site (Williams 2021, figure 3, 13). Dipper measurements of the moat made during fieldwork for that assessment suggested that its base lies at a maximum of +55.34m OD (Williams 2021). However, whether the moat is infilled by sediment and the character of potential fills could not be determined. Water levels within the moat were measured at between +56.166 and +55.970m OD in January to April 2021, while ground water

[1] The site is also known as Snow Capel.
[2] As Figure 1 indicates, the western moat arm is not entirely encompassed within the area of the Scheduled Monument.

level in five window sample boreholes south of the moated area varied between +58.76 and +55.59m OD in January and February 2021 (Williams 2021). Ground water north and west of the moat varied between +56.04 and +54.45m OD during the same interval.

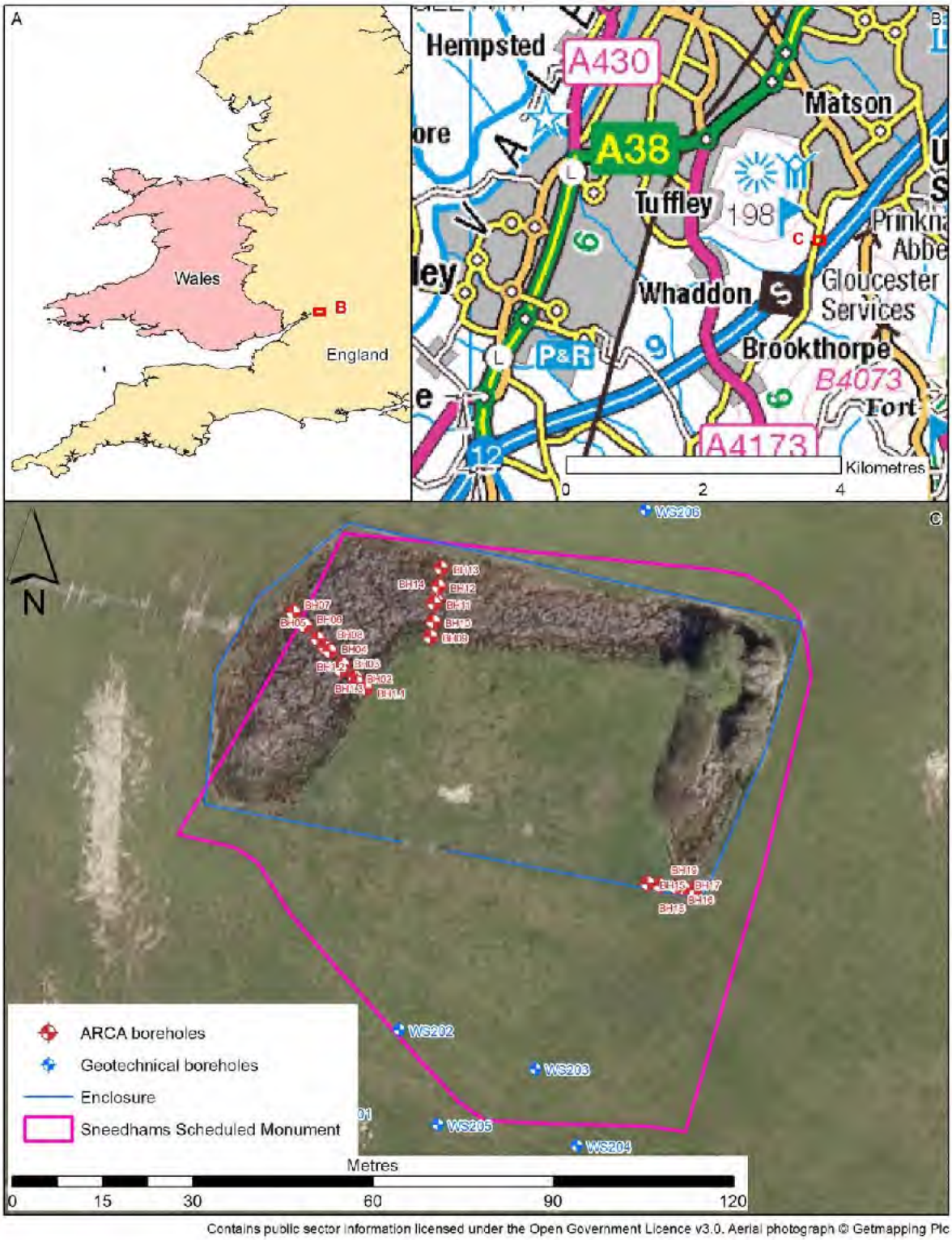

Figure 1. Location of study area within (A) southern England and (B) southern Gloucester, and (C) the Sneedham's moated site and location of boreholes

1.6 The risk of a lowered water table as a result of construction is addressed in the development proposals by a sustainable drainage system that will top up the moat water using filtered surface run off[3]. However, the present study has been commissioned to provide further information to aid consideration of the planning application. Its aims are to (Wilkinson 2021, 3)

1.6.1 Characterise the lithostratigraphy of the moat infills (thickness, properties and variation);

1.6.2 Determine the mode of formation of the infilling strata;

1.6.3 Provide a chronology for the infilling strata;

1.6.4 Assess the preservation of biological remains within the moat fills;

And by resolving the Aims 1.6.1–1.6.4 to:

1.6.5 Assess the palaeoenvironmental potential of the moat fills

1.7 The next section of this report sets out the methodologies by which the geoarchaeological study at Sneedham's Green moated site was carried out. The strata revealed in the boreholes are then described and interpreted (Aims 1.6.2–1.6.3) after which the results of bioarchaeological assessment and ^{14}C dating are discussed (Aims 1.6.3–1.6.4). Finally, the Assessment section considers the palaeoenvironmental potential of the moat fills (Aim 1.6.5).

[3] Further details are submitted with the current planning application

2. METHODOLOGY

2.1 Fieldwork

2.1.1 The methodology employed in the field and subsequently was that described in the written scheme of investigation (Wilkinson 2021).

2.1.2 A total of 20 boreholes were drilled along three transects in the locations shown on Figure 1C. Transects 1 (west) and 2 (north) were across water-filled parts of the moat. Individual boreholes of these transects were advanced by wading into the moat and employing a 25mm diameter x1000mm length gouge auger to manually drill holes at 3m intervals. Each hole was marked with a cane between successive drives and on completion (so that it could be found for the next drive and then surveyed), while sediment retained in the auger head was photographed and described using standard geological criteria in the field (Appendix 2) (Jones *et al*. 1999, Munsell Color 2000, Tucker 2011) before being discarded. On the basis of stratigraphy revealed in the gouge auger boreholes of each transect (ARCA BH01.1–07 for Transect 1 and ARCA BH09–13 for Transect 2), decisions were then made on where to sample for laboratory assessment. Thus, a single borehole was manually drilled at the point of greatest sediment thickness in each transect using a closed chamber, 50mm diameter and 500mm length Russian auger (ARCA BH08 in Transect 1 and ARCA BH14 in Transect 2). At each closed-chamber auger sample location two separate boreholes were drilled and overlapping cores (e.g. 0.00–0.50m in the first borehole, 0.30–0.80m in the second) collected to sample disturbed zones resulting from the 50mm-long head of the Russian auger. Sediment collected in each Russian auger drive was transferred to labelled (site code, borehole number, depth increment and top/base) plastic guttering and wrapped in plastic film for transport to the laboratory. Russian auger boreholes were also marked with canes between each drive and on completion of drilling.

2.1.3 Transect 3 was across the eastern side of the moat and which did not contain water. Individual boreholes (ARCA BH15–19) were drilled at 1–4m intervals along the transect using an Atlas Cobra TT petrol-powered hammer driving 75–65mm diameter gouge augers. Sediment sampled in each gouge auger head was photographed and described as outlined in Section 2.1.2 above and then used to refill the borehole. The basal (2–3m below ground level [bgl]) meter of ARCA BH18 (the borehole sampling the thickest part of the moat sequence), was, however, drilled using the Atlas Cobra TT hammer, but driving a 54mm diameter by 1000mm long core sampler. This core was labelled and sealed, and then transported to ARCA's Winchester laboratory for detailed study. Part of ARCA BH18 was backfilled with inert bentonite pellets.

2.1.4 All borehole positions (as marked by canes in the case of Transect 1 and 2) were surveyed using a Leica GS16 RTK GPS (accuracy ±10mm). In addition, the margins of the water-filled part of the moat and the corners of the fenced area containing the moated area were surveyed with the same GPS (Figure 1C).

2.1.5 Upon completion of fieldwork, lithological (i.e. field descriptions of strata sampled in the gouge auger heads) and positional (downloaded from the Leica GS16) data were transferred into a RockWorks 17 database.

2.2 Laboratory core description and sub-sampling

2.2.1 In ARCA's Winchester laboratory, the outer surface of the plastic guttering (ARCA BH08 and ARCA BH14) and single tube (ARCA BH18) containing the cores were cleaned. The plastic sleeve containing the same core was next cut open with a hooked knife blade. A c. 1mm-thick sliver of the sediment in all cores was then removed with

a scalpel to expose a fresh surface, and the cores photographed and described using the same geological criteria as employed in the field (Jones *et al*. 1999, Munsell Color 2000, Tucker 2011).

Table 1. Sub-samples collected from the Sneedham's Green moated site boreholes

Bore	Top[1]	Base[1]	Purpose	Measured/assessed?
ARCA BH08	1.04	1.05	Pollen	
ARCA BH08	1.13	1.14	Pollen	Assessed
ARCA BH08	1.20	1.21	Pollen	
ARCA BH08	1.28	1.29	Pollen	
ARCA BH08	1.30	1.35	Plant macrofossils	Assessed
ARCA BH08	1.40	1.41	Pollen	Assessed
ARCA BH08	1.62	1.63	Pollen	
ARCA BH08	1.70	1.71	Pollen	
ARCA BH08	1.75	1.80	Plant macrofossils	Assessed
ARCA BH08	1.83	1.84	Pollen	Assessed
ARCA BH08	1.92	1.97	Plant macrofossils	Assessed
ARCA BH08	1.96	1.97	Pollen	
ARCA BH08	1.96	1.98	^{14}C	Measured
ARCA BH08	2.09	2.10	Pollen	Assessed
ARCA BH08	2.15	2.20	Plant macrofossils	Assessed
ARCA BH08	2.29	2.30	Pollen	Assessed
ARCA BH14	0.80	0.81	Pollen	
ARCA BH14	1.10	1.11	Pollen	
ARCA BH14	1.25	1.26	^{14}C	Measured
ARCA BH14	1.30	1.31	Pollen	Assessed
ARCA BH18	2.16	2.17	Pollen	
ARCA BH18	2.25	2.26	Pollen	Assessed
ARCA BH18	2.40	2.45	Plant macrofossils	Assessed
ARCA BH18	2.56	2.57	Pollen	Assessed

[1] m bgl

2.2.2 Two sub-samples comprising plant macrofossil remains were collected opportunistically from cores of ARCA BH08 (fibres) and ARCA BH14 (twig) for AMS ^{14}C measurement (Table 1). Seventeen samples were also opportunistically collected using a 3ml volumetric sampler from ARCA BH08, ARCA BH14 and ARCA BH18 for palynological assessment, of which eight were assessed (Table 1). Five samples from ARCA BH08 and ARCA BH18 were taken as 0.05m thickness blocks for plant macrofossil assessment (Table 1).

2.3 ^{14}C dating

2.3.1 The two samples described in Section 2.2.2 were sent to the Scottish Universities Environmental Research Centre for accelerator mass spectrometry (AMS) ^{14}C measurement (Table 1). Full details of methodologies and quality assurance measures applied by the laboratory are available on the SUERC website.

2.4 Palynology

2.4.1 Samples for palynological assessment were examined in the laboratories of Quaternary Scientific (Quest), University of Reading. The pollen was extracted as follows: (1) sampling a standard volume of sediment (1ml); (2) deflocculation of the sample in 1% Sodium pyrophosphate; (3) sieving of the sample to remove coarse mineral and organic fractions (>125µm); (4) acetolysis; (5) removal of finer minerogenic fraction using Sodium polytungstate (specific gravity of 2.0g/cm^3); (6) mounting of the sample in glycerol jelly. Each stage of the procedure was preceded and followed by thorough sample cleaning in filtered distilled water. Quality control is maintained by periodic checking of residues, and assembling sample batches from various depths to test for systematic laboratory effects. Pollen grains and spores were identified using the University of Reading pollen type collection and the following sources of keys and photographs: Moore *et al* (1991); Reille (1992). The assessment procedure consisted of scanning the prepared slides, and recording the concentration and preservation of pollen grains and spores, and the principal taxa on four transects (10% of the slide) or up to 100 total land pollen (Table 4).

2.4.2 The five samples indicated in Table 1 were processed for the recovery of macrofossil remains, including waterlogged plant macrofossils, wood, insects, and Mollusca. The extraction process involved the following procedures: (1) measuring the sample volume by water displacement, and (2) processing the sample by wet sieving using 300µm and 1mm mesh sizes. Each sample was scanned under a stereozoom microscope at x7-45 magnifications and sorted into the different macrofossil classes. The concentration and preservation of remains was estimated for each class of macrofossil.

2.5 Archive

Table 2. Material archive, location and discard policy

Type	Number	Location	Discard policy[2]
50mm x 1000mm diameter cores from ARCA BH03, ARCA BH06, ARCA BH09, ARCA BH12 and ARCA BH14	1	University of Winchester	Will be disposed of on 6 June 2023
Unprocessed pollen samples	9	University of Winchester	Will be disposed of on 6 June 2023
Slides prepared from processed pollen samples	8	University of Reading	
Residues resulting from the processing of plant macrofossil assessment	5	University of Reading	

Unless requested otherwise (a retention fee will apply)

2.6.1 As noted in Sections 2.1.2–2.1.3 above, sediment recovered in the gouge auger heads was discarded in the field and, in the case of ARCA BH15–17 and ARCA BH19, used to refill the void left by the borehole. The material archive therefore comprises (i) the cores, (ii) unprocessed pollen samples and (iii) the sample slides (palynology) and residues (plant macrofossils).

2.6.2 The digital archive comprises a RockWorks 17 (SQLite) database housing the positional and stratigraphic data, photographs of the borehole cores as image files (compressed TIF format) and Excel spreadsheets holding the palynological and plant

macrofossil assessment data. These data will be held in perpetuity at the University of Winchester (RockWorks, images) and University of Reading (Excel), while exported versions of the data are included in this report as Table 4 and Table 5 and Appendices 1–2).

3. LITHOSTRATIGRAPHY

3.0.1 Deposits revealed in the boreholes are plotted as single composite cross sections for each transect (Figure 2, Figure 3, Figure 4), while the detailed lithostratigraphic descriptions are provided in Appendix 2. The following text synthesises the depositional sequence in reverse stratigraphic order (earliest to latest).

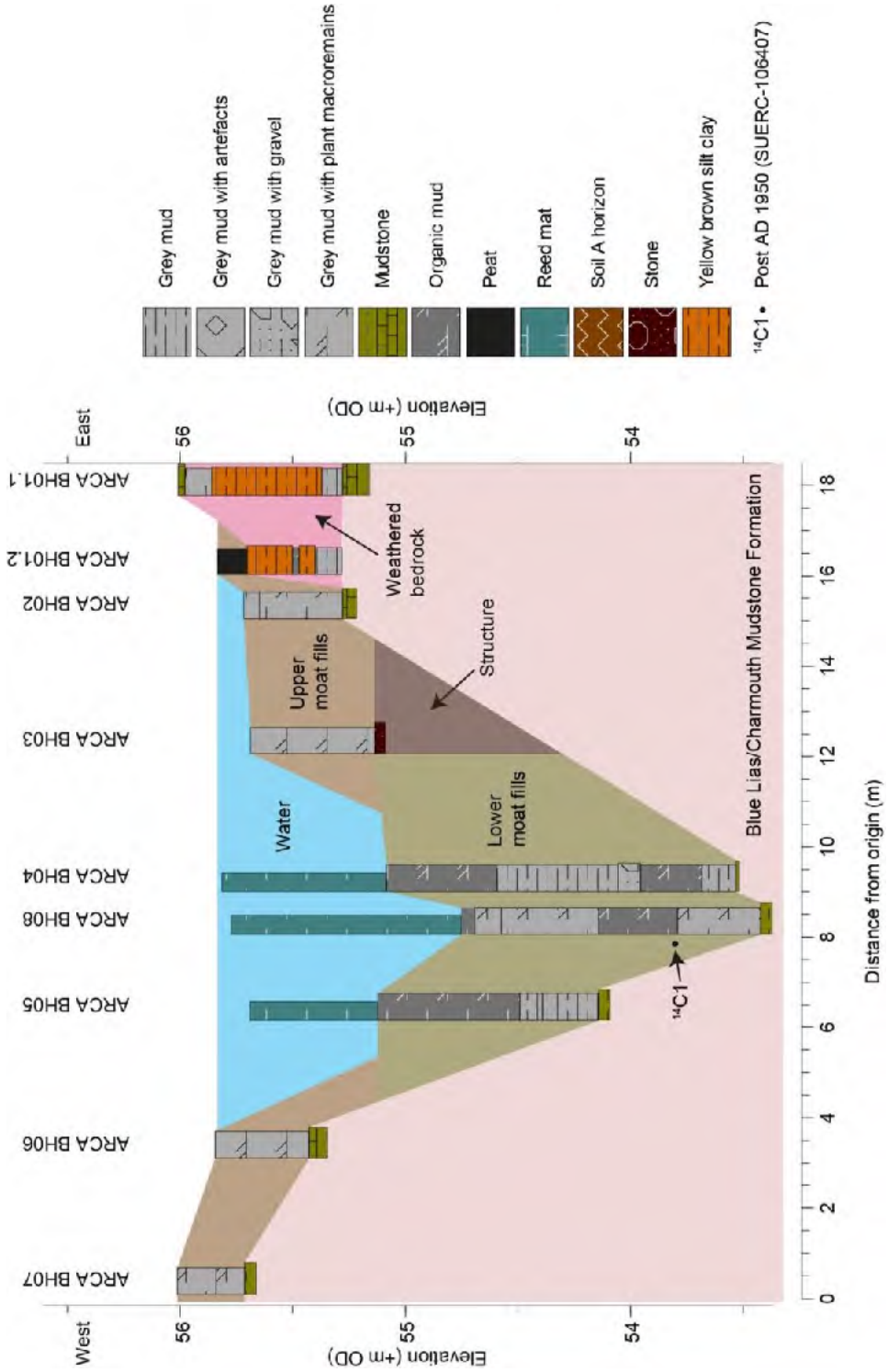

Figure 2. East–west composite cross section along borehole Transect 1

3.1 Blue Lias and Charmouth Mudstone Formations

3.1.1 Dark grey (Munsell 5 Y 4/1) silt/clay was observed subcropping in all boreholes below 0.23m (in ARCA BH15) to 2.35m below surface level (in ARCA BH08) - equating with +56.70–+53.42m OD. These highly compact deposits were eventually (after c. 1m [in ARCA BH15 and ARCA BH16] further drilling) impenetrable by the mechanical auger, while the stratum could not be penetrated with manual gouge or Russian auger heads.

3.1.2 The silt/clays are the undifferentiated Blue Lias and Chamouth Mudstone Formation, which as described in Section 1.3 is of Jurassic age and the bedrock geology of the study area. It is notable that in boreholes where moat fills were not encountered (ARCA BH01.1, ARCA BH01.2, ARCA BH09, ARCA BH13 and ARCA BH15), deposits sampled in the gouge augers are either dark grey (2.5 Y 4/2) compact silt/clay or dark yellowish brown (10 YR 4/4) compact silt/clays. These latter strata are most likely weathered deposits of the Blue Lias and Charmouth Mudstone Formation (indicated as 'weathered bedrock' in Figure 2 and Figure 3).

3.1.3 In all three transects, the surface topography of the Blue Lias and Charmouth Mudstone Formation indicates the cross sectional profile of the Sneedham's moat. In the case of the western arm (Transect 1), the full width of the moat is 17m and is 2.5m deep (Figure 2), the northern arm (Transect 2) is 11m wide and 2.2m deep (Figure 3), while the eastern arm (Transect 3) is over 9m wide and 2.5m deep (Figure 4). The full profile of the moat has been demonstrated in the case of the northern and western side, but as Figure 4 demonstrates, the eastern moat extends beyond the borehole transect. The implications of the latter are further considered in Section 6.1.1 below.

3.2 Moat fills

3.2.1 Deposits accumulating in the Sneedham's moat were found in all boreholes except ARCA BH01.1, ARCA BH13 and ARCA BH15 and at variable thicknesses. The greatest infill thickness *may* occur in the eastern arm in which up to 2.45m of moat fill and Made ground (see 3.2.4 below) were present in ARCA BH17 (Figure 4). In the western arm of the moat a maximum of 1.55m of infilling deposits was encountered in ARCA BH04 (Figure 2), while in the northern arm, 1.20m of fills were present in ARCA BH11 (Figure 3).

3.2.2 In the case of the present water-filled part of the moat (Transects 1 and 2, ARCA BH1–14), the fills can be divided into those subcropping below +55.1m OD (ARCA BH04, ARCA BH05, ARCA BH08, ARCA BH11 and ARCA BH14) and those lying above this datum (the remaining boreholes of Transects 1 and 2) (Figure 2 and Figure 3). The lower fills are largely of dark grey (5 Y 4/1) silt/clays containing occasional to moderate (mainly fibrous) waterlogged plant macroremains of <4mm size, and beds of very dark grey organic mud containing similar plant macroremains. However, grey (5 Y 5/1) silt/clays lacking plant macroremains also subcrop in ARCA BH04, ARCA BH05 and ARCA BH11, while gravel-sized particles (including a single piece of ceramic building material) were found at the base of ARCA BH08. The lower moat fills most likely formed from weathering of the moat sides, in wash (via overland flow) of sediment from the wider catchment and *in situ* decomposition of plants growing in and adjacent to the moat. In the case of the first two categories, ultimate sediment origin is likely to be from the Blue Lias and Charmouth Mudstone Formation bedrock.

3.2.3 The 'upper' moat fills sub-cropping in ARCA BH01.2, ARCA BH02, ARCA BH03, ARCA BH06, ARCA BH07, ARCA BH09, ARCA BH10 and ARCA BH12 are up to 0.57m thick. These deposits are almost entirely of very dark grey (5 Y 4/1) silt/clay and contain plant macroremains as described in Section 3.2.2 above. It should be noted that the 'upper'

designation does not mean that deposits in ARCA BH02, ARCA BH03, ARCA BH06, ARCA BH07, ARCA BH09. ARCA BH10 and ARCA BH12 post-date the 'lower' fills described in Section 3.2.2, but rather that they formed at a higher elevation and at the moat margin. The upper fills are likely to have accreted by the same mechanisms and from the same sources as the lower fills described in Section 3.2.2.

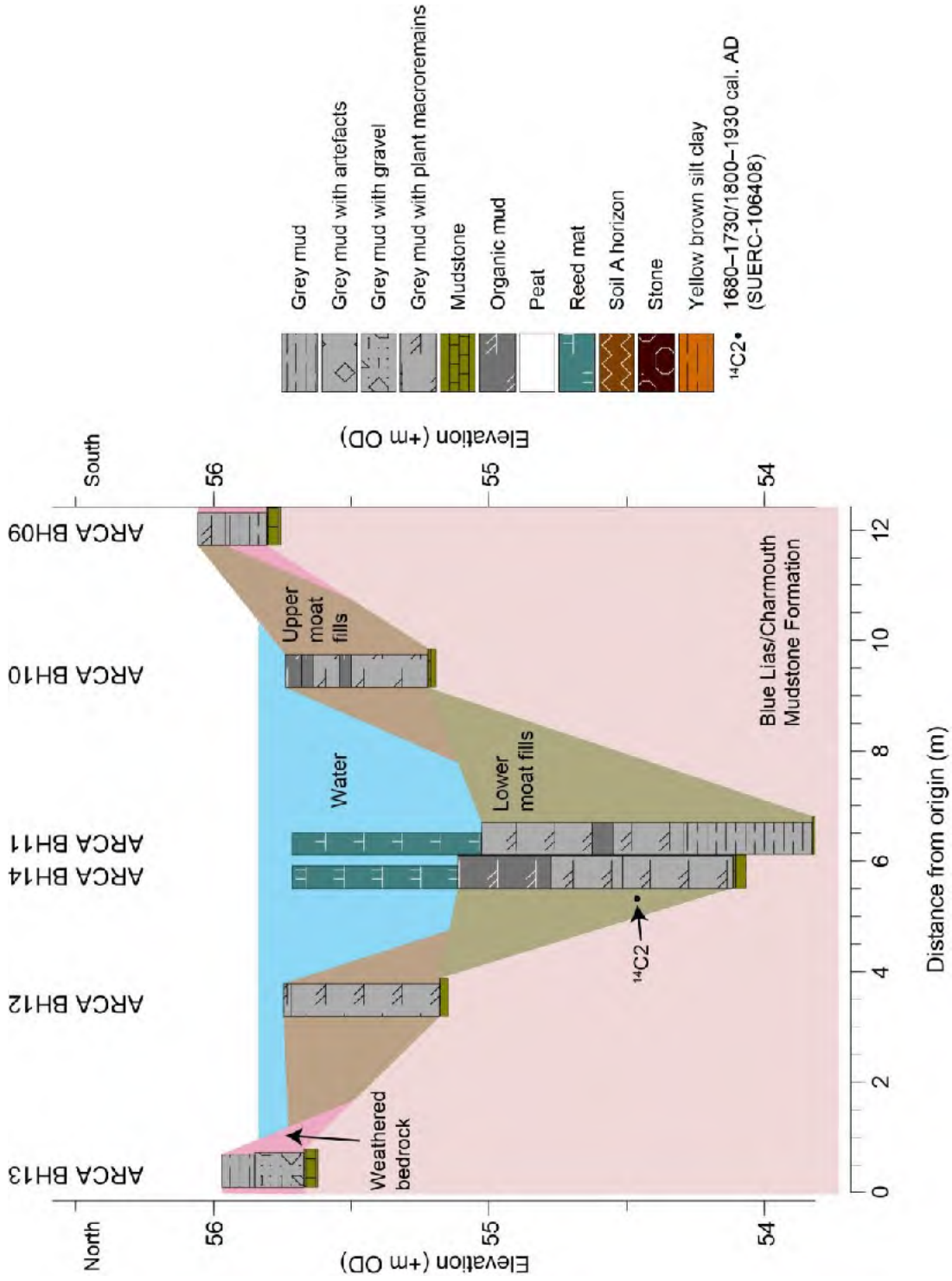

Figure 3. South–north composite cross section along borehole Transect 2

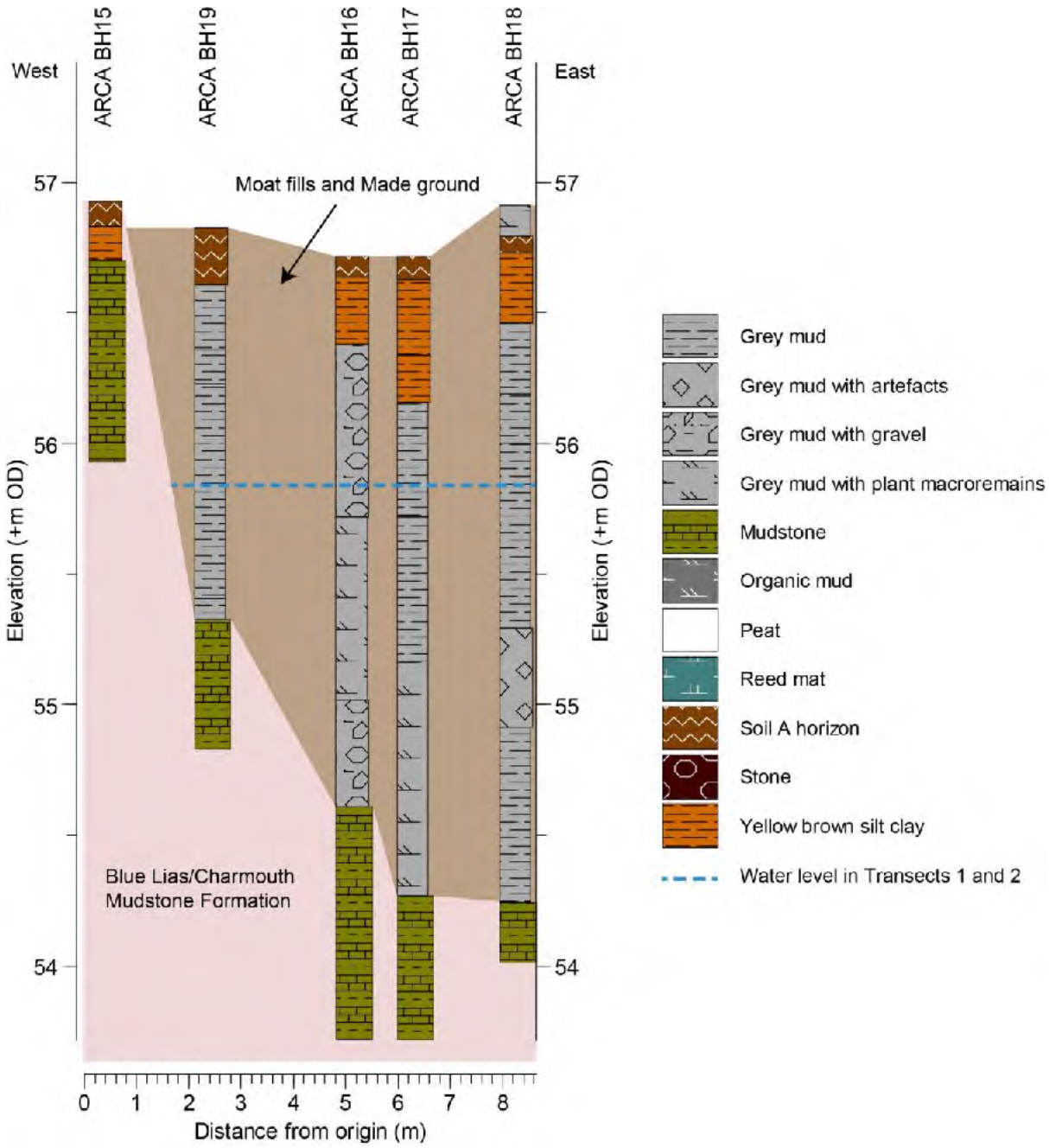

Figure 4. West–east composite cross section along borehole Transect 3

3.2.4 Fills of the completely infilled and water-free eastern moat arm (Transect 3) are of a more heterogeneous nature than those of the western and northern arms, while it is also likely that they include Made ground in their upper parts (Figure 4). Nevertheless, there are some similarities with the moat infills in the western and northern arms, e.g. the main infilling deposits are dark grey (5 Y 4/1), greyish brown (2.5 Y 5/2) and olive grey (5 Y 4/2) silt/clays. However, there are fewer visible plant macroremains than in the western and northern arms, but also a more frequent and coarser gravel content. Indeed, in the case of ARCA BH18, the latter includes ceramic fragments and bone. Furthermore, iron stains (effectively rust) present within the eastern arm moat fills suggest – unlike the western and northern arms – that the water table has fluctuated within the sediment sequence. The eastern arm moat fills are likely to have accumulated in a similar fashion to those in the water-filled western and northern arms and from similar sediment sources. However, the lesser plant macroremain content

would appear to suggest that *in situ* plant growth was a less important source, while the more frequent occurrence of gravel-sized particles is suggestive of higher energy transport of material into the moat (e.g. intense weathering of the moat side and wider eastern catchment) or – perhaps more likely – deliberate deposition by people. Indeed, given that the silt/clay strata in the upper part of the eastern moat subcrop have very similar compositional properties to the Blue Lias and Charmouth Mudstone Formation bedrock, it is highly likely that part of the sequence is derived from redeposition of the latter. This redepositional process is most likely associated with construction of the adjacent cutting for the M5 motorway. However, the latter interpretation is made cautiously as Made ground deposits derived from the bedrock cannot be separated from the moat fills originating from the same sediment source in the narrow window of a borehole.

3.2.5 A boulder-sized rock was encountered beneath moat strata in the eastern part of the western moat arm at 0.55m bgl (ARCH BH03) (Figure 2)[4]. As clasts of this size do not occur elsewhere in the moat stratigraphy or indeed in the bedrock as sampled on the site, it is highly likely that the object was deliberately placed and possible that it might be part of a structure.

3.3 Reed mat

3.3.1 A dense mat, up to 1.02m thick, of plant material sub-crops in the central portions of the water-filled moat in its western and northern arms (Figure 2 and Figure 3). This mat is formed of both growing and recently dead aquatic plants.

3.3.2 The water level at the time of fieldwork (31 May–2 June 2022) was a maximum of 0.13m above the reed mat. If the latter is excluded[5], water depth reached a maximum of 1.10m bgl (at ARCA BH08) (Figure 2).

[4] Three attempts were made to drill BH03 at locations within a 0.2m radius, but the edge of the rock could not be found.
[5] The mat rapidly deteriorated as a result of passage during fieldwork.

4. CHRONOSTRATIGRAPHY

4.1 Results of ^{14}C dating are presented in Table 3.

Table 3. ^{14}C dating results of samples from Sneedham's Green moated site, Matson

Lab. Code	Borehole/depth	^{14}C age[1]	Calendar age (2σ, 95.4%)[2]	$\delta^{13}C$
SUERC-106407	ARCA BH08 1.96–1.98m (plant fibres)	1.0859±0.0028[3]	Post AD 1950	-29.8‰
SUERC-106408	ARCA BH14 1.25–1.26m (twig)	90±29 BP	cal. AD 1680–1730 (26.0%) cal. AD 1800–1930 (69.4%)	-28.4‰

[1] Radiocarbon age in years before present, where 'present' is AD 1950
[2] Calendar age at two standard deviations (2σ) and 95.4% probability, following calibration using the IntCal20 curve (Reimer et al. 2020) and OxCal 4.4 (ORAU 2022), and rounded to the nearest 10 years.
[3] Modern fraction – a fraction modern value above 1 indicates that the sample was formed in the nuclear era (post AD 1950).

4.2 Even allowing for the possibility that SUERC-106407 might date intrusive roots, the ^{14}C dates indicate that the lower moat fills were accumulating in the post-medieval and possibly modern periods.

5. BIOSTRATIGRAPHY

Mike Simmonds, Quest, University of Reading

5.1 Palynology

5.1.1 The results of the pollen assessment are shown in Table 4. There was a low concentration and poor preservation of remains in most of the waterlogged samples (excluding ARCA BH08 2.09-2.10), and low concentration but slightly better preservation in the two samples from ARCA BH18.

5.1.2 Within the waterlogged part of the moat (ARCA BH08 and ARCA BH14), the majority of the samples have a very low concentration and very poor preservation of pollen. This has led to relatively high numbers of 'obscured/broken/degraded' grains and which were also taxonomically unidentifiable. The five samples from the waterlogged part of the moat all have frequent or abundant concentrations of microcharcoal, and it may be that burning has led to the degradation of the pollen in these levels. Given the limited identifiable palynomorphs, it is difficult to ascertain anything about the environment at the time of deposition from these five samples. One sample (BH08 2.09-2.10m) from within the waterlogged part of the moat had much lower charcoal concentrations, with higher concentrations and preservation levels of pollen. The pollen from this level was dominated by herbaceous taxa, particularly grasses (Poaceae), but also with the presence of pollen of the daisy family (Asteraceae), the dandelion family (Lactuceae), buttercup (*Ranunculus*) and ribwort plantain (*Plantago lanceolata*). Ivy (*Hedera helix*), willow (*Salix*) and beech (*Fagus*) were identified in very low quantities. This pollen spectra indicates an open environment at the time of deposition, as also indicated by light requiring taxa such as the dandelion family and buttercup. The presence of ribwort plantain suggests that agriculture may have been occurring locally, as it is a weed of arable field margins and pastures.

5.1.3 The samples from the dry part of the moat (ARCA BH18) appear to contain better preserved pollen than most of the samples from the waterlogged parts. The pollen spectra from these former samples is not dissimilar from the ARCA BH08 2.09-2.10m sample, with a range of herbaceous taxa including grasses (Poaceae), the daisy family (Asteraceae), the dandelion family (Lactuceae) and the carrot family (Apiaceae). Again, this combination indicates an open ground environment surrounding the moat at the time of deposition. The presence of pine (*Pinus*) and elm (*Ulmus*) in both samples of the dry moat suggests a woodland presence, although the nature and location of this woodland relative to the site is difficult to ascertain. Charcoal values remain high within the dry part of the moat, and although preservation was poor in the two relevant samples, it was not as poor as the samples from ARCA BH08.

5.2 Plant macrofossils

5.2.1 The results of plant macrofossil assessment are shown in Table 5. Limited quantities of waterlogged wood and seed remains were found in three of the samples (ARCA BH08 1.30-1.35m, 1.75-1.80m and 2.15-2.20m). In these samples the assemblage is likely to be too small to attempt a full environmental interpretation. The sample from ARCA BH08 1.92-1.97 had a higher quantity of both seeds and wood and may be suitable for a full analysis. The sample from ARCA BH18, the dry part of the moat, had no seed remains, very limited wood remains, and appeared more minerogenic when compared to the samples from ARCA BH08. No charred wood, bone or Mollusca were recorded in this sequence.

Table 4. Pollen identified in sub-samples from ARCA BH08, ARCA BH14 and ARCA BH18

		ARCA BH08					BH14	BH18	
	Context			**Waterlogged**				**Dry**	
	Depth (m OD)	**1.13-1.14**	**1.40-1.41**	**1.83-1.84**	**2.09-2.10**	**2.29-2.30**	**1.30-1.31**	**2.25-2.26**	**2.56-2.57**
Latin name	**Common name**								
Trees									
Pinus	pine			1				1	
Quercus	oak			1					
Ulmus	elm			1				1	2
Fagus	beech			1	1				
Shrubs									
Hedera helix	ivy				3				
Salix	willow				1				
Herbs									
Apiaceae	carrot family								1
Poaceae	grass family			1	15			1	3
Asteraceae	daisy family		1		3				1
Lactuceae	dandelion family			1	2			5	2
Ranunculus	buttercup				3				
Plantago lanceolata	Ribwort plantain				3				
Spores									
Filicales	ferns							1	
Polypodium	rockcap fern			1			4	1	2
Other									
Unknown		1		1	2				
Obscured/Broken		5	25	21	14	24	7	3	7
Charcoal		61	100	177	16	142	120	121	92
Lycopodium		24	39	30	19	36	26	15	10
Total Land Pollen (grains counted)		0	1	6	31	0	0	8	9
Concentration*		0	1	1	5	0	0	2	2
Preservation**		0	1	1	1	0	3	2	2
Microcharcoal Concentration***		4	5	5	2	5	5	5	4
Suitable for further analysis		**NO**	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**

*Key: *Concentration: 0 = 0 grains; 1 =1-75 grains, 2 = 76-150 grains, 3 =151-225 grains, 4 = 226-300, 5 =300+ grains per slide; **Preservation: 0 = absent; 1 = very poor; 2 = poor; 3 = moderate; 4 = good; 5 = excellent; ***Microcharcoal Concentration: 0 = none, 1= negligible, 2 = occasional, 3 = moderate, 4 = frequent, 5 = abundant*

Table 5. Macrofossils identified in sub-samples from ARCA BH08 and ARCA BH18

					Charred					Waterlogged			Mollusca		Bone			
Depth (m OD)	**Sequence**	**Unit**	**Volume processed (ml)**	**Fraction**	**Charcoal (>4mm)**	**Charcoal (2-4mm)**	**Charcoal (<2mm)**	**Seeds**	**Chaff**	**Wood**	**Seeds**	**Sedge remains (e.g. stems/roots)**	**Whole**	**Fragments**	**Large**	**Small**	**Fragments**	**Insects**
1.30 - 1.35	BH08	Waterlogged	0.5	>300µm	-	-	-	-	-	1	1	5	-	-	-	-	-	-
1.30 - 1.35	BH08			>1 mm	-	-	-	-	-	1	1	-	-	-	-	-	-	-
1.75 - 1.80	BH08		0.5	>300µm	-	-	-	-	-	1	1	5	-	-	-	-	-	-
1.75 - 1.80	BH08			>1 mm	-	-	-	-	-	1	1	-	-	-	-	-	-	-
1.92 - 1.97	BH08		0.4	>300µm	-	-	-	-	-	1	3	5	-	-	-	-	-	-
1.92 - 1.97	BH08			>1 mm	-	-	-	-	-	2	3	5	-	-	-	-	-	-
2.15 - 2.20	BH08		0.4	>300µm	-	-	-	-	-	1	-	5	-	-	-	-	-	-
2.15 - 2.20	BH08			>1 mm	-	-	-	-	-	1	1	1	-	-	-	-	-	-
2.40 - 2.45	BH18	Dry	0.5	>300µm	-	-	-	-	-	1	-	3	-	-	-	-	-	-
2.40 - 2.45	BH18			>1 mm	-	-	-	-	-	-	-	-	-	-	-	-	-	-

6. ASSESSMENT

6.01 In this section, the results of the field and laboratory investigations are assessed in relation to the aims of the project as set out in Section 1.6.

6.1 Properties of the moat fills

6.1.1 The moat fills sit within a clear topographically and vegetationally defined feature in the case of the northern and western arms (Figure 1c). However, as Figure 4 makes clear, the depression that *appears* to mark the eastern arm does not include the full width of the moat. Rather it would seem that the centre of the moat at this location coincides with ARCA BH17 and/or ARCA BH18, meaning that if the feature has a symmetrical cross section, it would extend at least 6m east of ARCA BH18. If such is the case, the moat would project beyond the fenced area that presently encloses the site (Figure 1A).

6.1.2 Despite the fact that fills of the moat have varying relationships with the present water table, their properties are broadly similar. They are largely composed of dark and very dark grey silt/clays, interbedded in the presently water-filled part of the moat, with organic muds. Gravel sized particles, including ceramics (and bone in the eastern arm) are only found at the very base of moat fills in the western arm, not at all in the northern arm, but at a moderate level in the eastern arm. Other than the organic muds, which are made up largely of finely-divided plant remains, there are no organic-rich strata (i.e. 'peats') within the moat.

6.2 Mode of formation and age of the moat fills

6.2.1 As has been described in Sections 3.2.2–3.2.4, the moat strata are likely to have formed as a result of i) weathering of the Blue Lias and Charmouth Mudstone Formation bedrock, this either in the moat sides or beyond the moat margin; ii) *in situ* decomposition of aquatic and marginal plants living within the moat; iii) transport into the moat (e.g. by overland flow or airborne movement) of plant material derived from flora growing beyond the moat, and iv) deliberate human deposition into the moat. In respect of the last, anthropogenic activity can be divided into small scale (e.g. deposition of artefacts, bones and gravel particles in antiquity) activities and the products of mid-late 20th century engineering (i.e. redeposition of bedrock-derived mudstone as a result of construction of the M5 motorway). The sediment units found in the three arms of the moat reflect the operation of different combinations of these four processes. In the western and northern arms weathering of the bedrock, *in situ* decay of plant materials and local transport of botanical remains predominated, the first largely forming the dark grey silt/clays and the latter two the organic muds. However, in the eastern arm bedrock weathering and deliberate human deposition are the predominant formational processes. Indeed, in the case of the latter, discard in antiquity, as manifested by ceramics and bone found within ARCA BH18, and recent earth-moving activities are both the most likely causes of infill.

6.2.2 It is highly likely that the lower fills of the western and northern moat arms have been permanently submerged by water since their deposition, while it possible that the upper fills at the margin of the moat in the same locations have similarly been permanently waterlogged. However, iron stains in the strata of the eastern moat arm demonstrate fluctuation of the water table within the moat fills since original deposition.

6.2.3 The ^{14}C dates on the lower moat fills in ARCA BH08 and ARCA BH14 indicate that the infilling deposits are of post-medieval, and perhaps even modern age. While it is possible that the post-AD 1950 age of SUERC-106407 (BH08 1.96–1.98m bgl) is a

result of contamination by roots from plants inhabiting the moat in the last 70 years, such an explanation is considered improbable as (i) the dated plant fibres do not correspond to the present vegetation, and (ii) the ^{14}C dated sample was collected from a depth below present rooting. Further, it is very unlikely that the sample was contaminated following collection given that it was taken in a closed-chamber Russian auger, immediately sealed with plastic film on site and was thereafter extracted in a controlled laboratory environment. Rather it is probable that much of the lower fill of the western part of the moat is of modern age and may even have been deposited during engineering works for the M5 motorway as described for the eastern segment above. The lower fills of the northern segment of moat in ARCA BH14 were ^{14}C dated to the post-medieval period (SUERC-106408), but the balance of probability is that they are of 19th or early 20th century age (26.0% chance of a cal. AD 1680–1730 cal. range, but 69.4% likelihood of an AD 1800–1930 age). Even so, the latter age range pre-dates construction of the M5, suggesting that infilling was underway before that event.

6.2.4 Despite the discussion in Section 6.2.3 above, it should be noted that 0.37m of moat infill underlies the sample dated for SUERC-106407 in ARCA BH08 and 0.34m of similar sediment is beneath the twig dated for SUERC-106408, i.e. there is a possibility of deposition preceding the late 17th century. It is also important to emphasise that the age of the deposits infilling the moat provides only a *terminus ante quem* for construction and use of the moated site. It is possible that sediment began to accumulate in the moat only following abandonment and that prior to this 'event' any sediment deposited in the moat was removed and the area kept clear of vegetation. Were such a scenario the correct explanation of events, it would suggest only that the site fell into disuse before AD 1680–1930. Nevertheless, it is unlikely that the Sneedham's Green moat was constructed for defensive purposes given its probable shallow depth and the fact that it overlooked by both Robins Wood and Cud Hills (Figure 1B). Such choices might indicate that the site was constructed during peaceful times and that it is of post-medieval date.

6.3 Biological preservation in the moat fills

6.3.1 Pollen and plant macrofossil assessment of the sequences show that sub-fossil concentration and preservation was low in samples from all three of the boreholes that were examined (ARCA BH08, ARCA BH14 and ARCA BH18). Further, comparison of the degree of preservation between samples in the wet and dry parts of the moat indicates that there is little difference in this respect between the two moat areas. Indeed, in many instances the pollen preservation is better in the dry part of the moat than in the wet (excluding the ARCA BH08 2.09–2.10m sample). On the other hand, the results of plant macrofossil assessment highlights better preservation of macrofossils in the water-filled than the dry part of the moat, although given that only a single sample from the latter was examined it is hard to be definitive. Taken collectively, these data suggest that sub-fossil preservation is not solely a factor of the degree and permanency of waterlogging, but rather that other factors (e.g. water and sediment chemistry) might play a significant role. Investigation of the latter is, however, beyond the scope of the present study.

6.3.2 Preservation of plant macrofossils, albeit only examined in five samples, might provide an indication of how well organic artefacts and structural remains could survive. As stated in Section 6.3.1, preservation of the former was poor, but the key point to make is that there *was* survival. It is therefore likely that such artefacts and structures would still exist in the moat had they originally been placed/discarded there. However, the stratigraphic data reviewed in Section 6.1.2 above and the results of plant macrofossil assessment, suggest that the concentration of organic material is low in the infilling

deposits (this because the predominant depositional process is by transport of weathered bedrock), while of course organic artefacts were not found in any borehole, and structural remains are a possibility in only one.

6.4 Palaeoenvironmental potential

6.4.1 Given the low concentration of pollen and plant macroremains in the stratigraphy, the moat strata have a low potential for palaeoenvironmental reconstruction. Nevertheless, the pollen spectra from ARCA BH08 and ARCA BH18 provide outline information on the environment at the time that the lower moat fills were accumulating. The landscape appears to have been open and characterised by herbaceous vegetation, and was likely used for arable purposes. Trees were, however, present at low density, these comprising willow, elm, beech and pine.

6.4.2 Due to the generally low pollen concentrations, the limited diversity of taxa observed in the palynological study and the recent age of the infilling deposits, the moat sequences are assessed as having a low palaeoenvironmental potential.

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APPENDIX 1: BOREHOLE LOCATIONS

Bore	Easting	Northing	Height[a]
ARCA BH01.1	385059.553	214210.156	56.009
ARCA BH01.2	385058.083	214211.119	55.832
ARCA BH02	385057.759	214212.056	55.716
ARCA BH03	385055.660	214214.180	55.686
ARCA BH04	385053.577	214216.406	55.815
ARCA BH05	385051.561	214218.418	55.691
ARCA BH06	385049.450	214220.627	55.845
ARCA BH07	385047.451	214222.871	56.012
ARCA BH08	385052.859	214217.015	55.772
ARCA BH09	385070.340	214218.762	56.057
ARCA BH10	385070.826	214221.287	55.741
ARCA BH11	385070.986	214224.326	55.716
ARCA BH12	385071.654	214227.148	55.748
ARCA BH13	385072.152	214230.200	55.971
ARCA BH14	385071.264	214224.862	55.715
ARCA BH15	385106.534	214177.733	56.929
ARCA BH16	385111.214	214177.125	56.718
ARCA BH17	385112.382	214177.033	56.716
ARCA BH18	385114.322	214176.729	56.911
ARCA BH19	385108.528	214177.445	56.827

[a] Ordnance Datum elevation of borehole collar.

APPENDIX 2: BOREHOLE LITHOSTRATIGRAPHY

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH01.1	0.00	0.03	Peat	10 YR 2/1 Black moderately humified peat with moderate fibrous plant remains. Diffuse boundary to:
	0.03	0.15	Grey mud with plant macrofossils	10 YR 3/2 Very dark greyish brown silt/clay with moderate fine fibrous plant remains and finely divided organic matter. Sharp boundary to
	0.15	0.64	Yellow brown silt clay	10 YR 6/6 Brownish yellow compact silt/clay with moderate fine vertical channels of 10 YR 5/2 Greyish brown silt/clay (oxidised roots). Sharp boundary to:
	0.64	0.73	Grey mud	10 YR 4/2 Dark greyish brown compact silt/clay with frequent medium root-sized vertical iron stains. Diffuse boundary to:
	0.73	0.85	Mudstone	5 Y 3/1 Very dark grey compact silt/clay. Well sorted.
ARCA BH01.2	0.00	0.13	Peat	10 YR 2/1 Black moderately humified peat with moderate fibrous plant remains. Diffuse boundary to:
	0.13	0.33	Yellow brown silt clay	10 YR 6/6 Brownish yellow compact silt/clay with moderate fine vertical channels of 10 YR 5/2 Greyish brown silt/clay (oxidised roots). Sharp boundary to:
	0.33	0.36	Organic mud	10 YR 4/1 Dark grey highly humified peat/organic mud with frequent fibrous plant remains.
	0.36	0.43	Yellow brown silt clay	10 YR 6/6 Brownish yellow compact silt/clay with moderate fine vertical channels of 10 YR 5/2 Greyish brown silt/clay (oxidised roots). Diffuse boundary to:
	0.43	0.53	Grey mud	10 YR 4/2 Dark greyish brown compact silt/clay with frequent medium root-sized vertical iron stains. Diffuse boundary to:
	0.53	0.55	Grey mud	5 Y 3/1 Very dark grey compact silt/clay. Well sorted.

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH02	0.00	0.07	Grey mud with plant macroremains	5 Y 4/2 Olive grey silt/clay with frequent pebble–cobble-sized plant macroremains. Well sorted. Diffuse boundary to:
	0.07	0.44	Grey mud with plant macroremains	5 Y 3/1 Very dark grey silt/clay with frequent fibrous plant remains. Occasional pebble-sized wood/reed macrofossils. Well sorted.
	0.44	0.50	Mudstone	Impenetrable with gouge auger
ARCA BH03	0.00	0.55	Grey mud with plant macroremains	5 Y 3/1 Very dark grey silt/clay with frequent fibrous plant remains. Occasional pebble-sized wood/reed macrofossils. Well sorted.
	0.55	0.60	Stone	Impenetrable rock/stone encountered at
ARCA BH04	0.00	0.73	Reed mat	No recovery, but dense mat of reeds noted
	0.73	1.22	Organic mud	5 Y 3/1 Very dark grey organic silt/clay with frequent finely divided plant remains. Very soft. Sharp boundary to:
	1.22	1.76	Grey mud	5 Y 5/2 Olive grey silt/clay. Occasional vertical iron stains. Moderately compact. Sharp boundary to:
	1.76	1.86	Grey mud with gravel	5 Y 4/1 Dark grey silt/clay with moderate sub-angular limestone and mudstone pebbles. Sharp boundary to:
	1.86	2.13	Organic mud	5 Y 2.5/1 Black organic silt/clay with frequent fibrous plant remains. Plant macrofossils to granular size. Diffuse boundary to:
	2.13	2.28	Grey mud	5 Y 3/1 Very dark grey silt/clay. Well sorted.
	2.28	2.30	Mudstone	Impenetrable with gouge auger
ARCA BH05	0.00	0.57	Reed mat	No recovery, but dense mat of reeds noted
	0.57	1.20	Organic mud	5 Y 3/1 Very dark grey organic silt/clay with frequent finely divided plant remains. Very soft. Sharp boundary to:
	1.20	1.30	Grey mud	5 Y 5/2 Olive grey silt/clay. Occasional vertical iron stains. Moderately compact. Sharp boundary to:
	1.30	1.55	Grey mud	5 Y 3/1 Very dark grey silt/clay. Well sorted.
	1.55	1.60	Mudstone	Impenetrable with gouge auger

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH06	0.00	0.42	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with moderate fibrous plant remains. Well sorted.
	0.42	0.50	Mudstone	Impenetrable with gouge auger
ARCA BH07	0.00	0.17	Grey mud with plant macroremains	2.5 Y 4/3 Olive brown silt/clay with frequent vertical fine root-sized iron stains. Occasional fine roots. Well sorted. Diffuse boundary to:
	0.17	0.30	Grey mud with plant macroremains	5 Y 4/2 Olive grey silt/clay with moderate fine roots and and moderate fine root-sized iron stains. Well sorted.
	0.30	0.35	Mudstone	Impenetrable with gouge auger
ARCA BH08	0.00	1.02	Reed mat	Poor recovery
	1.02	1.08	Organic mud	5 Y 2.5/1 Black organic mud. Very soft. Mostly comprised of decomposed plant matter. Sharp boundary to:
	1.08	1.20	Grey mud with plant macroremains	5 Y 5/1 Grey silt/clay with occasional fine pebble-sized plant macroremain fragments. Well sorted. Diffuse boundary to:
	1.20	1.63	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with fine, wavy, discontinuous, parallel laminae of 5 Y 3/1 Very dark grey organic silt/clay. Moderate pebble and granular-sized plant macroremains. Diffuse boundary to:
	1.63	1.98		5 Y 5/2 Olive grey silt/clay with fine beds of 5 Y 2.5/1 Black organic mud at 1.64–1.66, 1.82–1.86, 1.91–1.92 and 1.96–1.98m. Occasional fine pebble-sized sub-angular and sub-rounded clasts, including CBM at 1.72–1.73m. Moderately sorted. Diffuse boundary to:
	1.98	2.35		5 Y 3/1 Very dark grey silt/clay with frequent coarse sand-sized plant macrofossiils, decreasing downwards. Well sorted.
	2.35	2.40	Mudstone	No recovery
ARCA BH09	0.00	0.10	Grey mud with plant macroremains	2.5 Y 4/3 Olive brown silt/clay with moderate fibrous plant remains and roots. Diffuse boundary to:
	0.10	0.25	Grey mud	2.5 Y 5/3 Light olive silt/clay. Firm. Well sorted. Occasional coarse sand-sized iron stains.
	0.25	0.30	Mudstone	Impenetrable with gouge auger

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH10	0.00	0.06	Organic mud	5 Y 4/1 Dark grey silt/clay with frequent fibrous plant remains. Well sorted. Diffuse boundary to:
	0.06	0.10	Organic mud	5 Y 2.5/1 Black fibrous root mat. Sharp boundary to:
	0.10	0.20	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with moderate fibrous plant remains. Well sorted. Sharp boundary to:
	0.20	0.24	Organic mud	5 Y 2.5/1 Black organic mud with frequent fibrous plant remains. Sharp boundary to:
	0.24	0.52	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with moderate fibrous plant remains. Well sorted.
	0.52	0.55	Mudstone	Impenetrable with gouge auger
ARCA BH11	0.00	0.69	Reed mat	No recovery, but dense mat of reeds noted
	0.69	1.09	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with moderate fibrous plant remains. Well sorted. Sharp boundary to:
	1.09	1.17	Organic mud	5 Y 3/1 Very dark grey organic mud with frequent fibrous plant remains. Sharp boundary to:
	1.17	1.42	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with moderate fibrous plant remains. Diffuse boundary to:
	1.42	1.89	Grey mud	5 Y 5/1 Grey silt/clay with moderate, vertical, linear iron stains. Well sorted.
	1.89	1.90	Mudstone	Impenetrable with gouge auger
ARCA BH12	0.00	0.03	Grey mud with plant macroremains	2.5 Y 5/2 Greyish brown silt/clay with frequent fine roots and frequent fine root-sized iron stains. Diffuse boundary to:
	0.03	0.57	Grey mud with plant macroremains	5 Y 5/1 Grey silt/clay with occasional granular-sized plant macro remains and moderate fine roots. Firm and becoming more compact with depth.
	0.57	0.60	Mudstone	No recovery, but dense mat of reeds noted
ARCA BH13	0.00	0.12	Grey mud	2.5 Y 4/2 Dark greyish brown silt/clay with frequent fibrous plant remains. Well sorted. Diffuse boundary to:

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH13	0.12	0.30	Grey mud with gravel	2.5 Y 5/2 Greyish brown silt/clay with rare sub-rounded fine pebble-sized limestone clasts. Moderate iron stains to granular size. Compact.
	0.30	0.35	Mudstone	Impenetrable with gouge auger
ARCA BH14	0.00	0.60	Reed mat	Poor recovery
	0.60	0.94	Organic mud	5 Y 2.5/1 Black organic mud with frequent fibrous plant remains, particularly below 0.80m. Sharp boundary to:
	0.94	1.20	Grey mud with plant macrofossils	5 Y 4/1 Dark grey silt/clay with thin, discontinuous layers of 2.5 Y 3/1 Very dark grey organic mud. Moderate coarse sand-sized plant macroremains. Well sorted. Diffuse boundary to:
	1.20	1.60	Grey mud with plant macrofossils	5 Y 5/1 Grey silt/clay silt/clay with occasional fine pebble and coarse sand-sized plant macroremains. Iron staining as thin discontinuous beds. Well sorted.
	1.60	1.65	Mudstone	No recovery, but dense mat of reeds noted
ARCA BH15	0.00	0.10	Soil A horizon	10 YR 3/3 Dark brown humic silt/clay/fine sand with frequent fine roots. Granular to coarse sand-sized aggregates. Well sorted. Diffuse boundary to:
	0.10	0.23	Yellow brown silt clay	10 YR 4/4 Dark yellowish brown silt/clay/fine sand with occasional sub-rounded fine pebble-sized limestone. Well sorted. Diffuse boundary to:
	0.23	1.00	Mudstone	2.5 Y 4/2 Dark greyish brown firm becoming compact silt/clay with occasional sub-angular mudstone granules and fine pebbles. Oxidising to 10 YR 5/6 Yellowish brown above 0.45m
ARCA BH16	0.00	0.08	Soil A horizon	10 YR 3/3 Dark brown humic silt/clay/fine sand with frequent fine roots. Granular to coarse sand-sized aggregates. Well sorted. Diffuse boundary to:
	0.08	0.34	Yellow brown silt clay	10 YR 4/2 Dark greyish brown firm silt/clay oxidising to 10 YR 5/4 Yellowish brown. Occasional granular size iron stains. Occasional sub-angular mudstone pebbles. Moderately sorted. Diffuse boundary to:
	0.34	1.00	Grey mud with gravel	2.5 Y 5/2 Greyish brown silt/clay with moderate granular-sized iron stains. Occasional fine pebble-sized sub-rounded mudstone clasts. Occasional fine plant roots. Moderately sorted. Sharp boundary to:

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH16	1.00	1.70	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with occasional granular-sized iron stains. Band of sub-rounded mudstone pebbles at 1.36–1.38m and band of medium plant macroremains at 1.25–1.35m. Diffuse boundary to:
	1.70	2.11	Grey mud with gravel	5 Y 4/1 Dark grey silt/clay with occasional granular-sized iron stains. Moderate sub-angular/sub-rounded limestone clasts. Poorly sorted. Diffuse boundary to:
	2.11	3.00	Mudstone	2.5 Y 4/1 Dark grey silt/clay oxidising to 10 YR 6/4 Light yellowish brown from 2.11–2.30m. Compact, becoming stiff.
ARCA BH17	0.00	0.09	Soil A horizon	10 YR 3/3 Dark brown humic silt/clay/fine sand with frequent fine roots. Granular to coarse sand-sized aggregates. Well sorted. Diffuse boundary to:
	0.09	0.38	Yellow brown silt clay	10 YR 4/2 Dark greyish brown firm silt/clay oxidising to 10 YR 5/4 Yellowish brown. Occasional granular size iron stains. Occasional sub-angular mudstone pebbles. Moderately sorted. Diffuse boundary to:
	0.38	0.56	Yellow brown silt clay	2.5 Y 4/2 Dark yellowish brown silt/clay, oxidising to 10 YR 5/3 Brown. Well sorted. Diffuse boundary to:
	0.56	1.00	Grey mud	2.5 Y 5/2 Greyish brown silt/clay with moderate granular-sized iron stains. Occasional fine plant roots. Moderately sorted. Sharp boundary to:
	1.00	1.55	Grey mud	5 Y 4/2 Olive grey silt/clay with occasional medium-sized roots. Well sorted. Diffuse boundary to:
	1.55	2.45	Grey mud with plant macroremains	5 Y 4/1 Dark grey silt/clay with occasional granular-sized iron stains. Moderate granular sized oxidising plant macroremains. Diffuse boundary to:
	2.45	3.00	Mudstone	2.5 Y 4/1 Dark grey silt/clay oxidising to 10 YR 6/4 Light yellowish brown. Compact, becoming stiff.
ARCA BH18	0.00	0.12	Grey mud with plant macroremains	2.5 Y 5/1 Grey oxidising to 10 YR 5/6 Yellowish brown silt/clay with frequent fine plant roots. Well sorted. Sharp boundary to:
	0.12	0.18	Soil A horizon	10 YR 3/3 Dark brown humic silt/clay/fine sand with frequent fine roots. Granular to coarse sand-sized aggregates. Well sorted. Diffuse boundary to:
	0.18	0.45	Yellow brown silt clay	10 YR 4/2 Dark greyish brown firm silt/clay oxidising to 10 YR 5/4 Yellowish brown. Occasional granular size iron stains. Occasional sub-angular mudstone pebbles. Moderately sorted. Diffuse boundary to:

Bore	Top (m)	Base (m)	Lithology	Descriptions
ARCA BH18	0.45	0.72	Grey mud	2.5 Y 4/1 Dark grey oxidising to 10 YR 6/4 light yellowish brown silt/clay with occasional granular sub-angular mudstone clasts. Moderately sorted. Diffuse boundary to:
	0.72	0.91	Grey mud	2.5 Y 4/1 Dark greyish brown oxidising to 10 YR 5/4 Yellowish brown silt/clay with frequent granular size iron stains, some as coarse, wavy, non-parallel fine layers. Well sorted. Diffuse boundary to:
	0.91	1.62	Grey mud	5 Y 4/1 Dark grey compact silt/clay with occasional vertical iron stains. Moderate granular-sized iron stains. Well sorted. Sharp boundary to:
	1.62	2.00	Grey mud with artefacts	5 Y 4/1 Dark grey silt/clay with occasional granular-sized iron stains. Rare granular-sized ceramic fragments, glazed pottery and bone.
	2.00	2.67	Grey mud	5 Y 4/1 Dark grey silt/clay silt/clay with moderate granular and coarse sand-sized iron stains below 2.33m. Well sorted. Diffuse boundary to:
	2.67	2.90	Mudstone	5 Y 4/1 Dark grey with thin layers of 10 YR 5/2 Greyish brown silt/clay. Well sorted.
ARCA BH19	0.00	0.22	Soil A horizon	10 YR 3/3 Dark brown humic silt/clay/fine sand with frequent fine roots. Granular to coarse sand-sized aggregates. Well sorted. Sharp boundary to:
	0.22	0.47	Grey mud	10 YR 5/2 Greyish brown silt/clay as pebble-sized sub-angular aggregates with occasional sub-rounded oolite pebbles. Frequent fine roots. Poorly sorted. Chaotically bedded. Sharp boundary to:
	0.47	0.60	Grey mud	2.5 Y 4/2 Dark greyish brown silt/clay with fine pebble–granular size iron stains. Moderately sorted. Diffuse boundary to:
	0.60	1.42	Grey mud	2.5 Y 5/2 Greyish brown silt/clay with moderate granular-sized iron stains. Occasional fine plant roots. Moderately sorted. Sharp boundary to:
	1.42	1.50	Grey mud	5 Y 4/1 Dark grey silt/clay with occasional granular-sized iron stains. Sharp boundary to:
	1.50	2.00	Mudstone	2.5 Y 4/2 Dark greyish brown firm becoming compact silt/clay with occasional sub-angular mudstone granules and fine pebbles. Oxidising to 10 YR 5/6 Yellowish brown.

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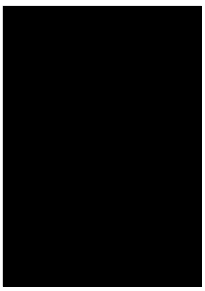

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