



Project Design for an Archaeological Evaluation



Co-authored by the Project Team



Project Design for an Archaeological Evaluation

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Purpose of document

This document has been prepared as a Project Design for the [REDACTED] Project Team, Historic England and other Stakeholders. The purpose of this document is to provide an outline of planned fieldwork, aims and objectives of the work, and methodology to be employed.

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Project summary

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Executive Summary

This document is submitted in support of an NPPF Emergency Funding Application for an Archaeological Evaluation at [REDACTED]. The application has been made in response to the recent discovery of a Palaeolithic hand-axe, found by two local enthusiasts, in close proximity to a well preserved megafaunal assemblage. This material was identified within a palaeochannel buried beneath the now extracted overlying gravels, which constitute the Northmoor Member of the Upper Thames Formation. The archaeological sequence potentially correlates with Latton, 2km to the east of [REDACTED] where the bones of a distinctive small form of mammoth (*Mammuthus cf. trogontherii*) and other palaeoenvironmental evidence dated to Marine Isotope Stage (MIS) 7 (~300–243 ka years BP) were recorded.

The evaluation will be undertaken over the course of 2019, as a collaboration between two Chartered Institute for Archaeologists (CIfA) Registered Organisations, DigVentures (RO 102) and ARCA, supported by a specialist team drawn from several public and independent research bodies including Anglia Ruskin University, Oxford University, University of Birmingham, University College London, University of Leicester, University of Gloucestershire, Royal Holloway, University of Southampton, Swansea University, Museum of Tromsø, and the Natural History Museum.

The goal of the work will be to define and characterise the physical extent of the site through a programme of non-intrusive and intrusive investigation, assessing the wider depositional context and taphonomic history of any recovered (and previously recovered) artefactual and palaeoenvironmental material. This will include high resolution photogrammetry survey, field walking, geoarchaeological boreholes, targeted evaluation test pits, artefact and palaeoenvironmental assessment, and a consideration of future conservation management and curation implications. The overarching aim of this fieldwork is to provide baseline information to contribute to the future management, research and presentation of the site. On this basis, a MORPHE/PRINCE2 compliant document has been produced, in association with a stand alone budget and GANNT chart document [REDACTED] outlining key archaeological research questions, roles, procedures, stages and outputs, focussing on the following work streams:

Remote Sensing

High resolution aerial photogrammetry survey followed by field walking to map the extent of the palaeochannel, recording potential spatial variations in surface artefacts or faunal remains

Geoarchaeological Boreholes

Desk-based assessment of existing geotechnical data and previously collected vertebrate and artefactual material, informing an adaptive strategy of 50 boreholes to map the extent of the palaeochannel, characterise infilling strata and inform test pit location

Targeted Excavation

Five targeted hand dug test pits, to sample the infilling strata for archaeological, palaeoenvironmental, lithostratigraphical and chronological purposes

Post-excavation Assessment

A multiproxy investigation of bulk and monolith samples, including biostratigraphy, geochronology (OSL), Coleoptera, pollen, Mollusca, waterlogged plant macrofossils and wood.



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1 INTRODUCTION

1.1 Project summary

- 1.1.1 This document provides a Project Design for delivery of an archaeological evaluation at [REDACTED] (hereafter 'the Site'), detailing the programme of geoarchaeological, archaeological and palaeoenvironmental work required to assess the significance of a potential Palaeolithic site (Figure 1). The project has been formulated in response to the recent discovery of a Palaeolithic hand-axe, found in close proximity to a well preserved megafaunal assemblage, identified within a palaeochannel buried beneath the now extracted overlying gravels. A programme of non-intrusive and intrusive investigation has been designed to assess the wider depositional context and taphonomic history of this and other associated material, contributing to the future management, research and presentation of the Site.
- 1.1.2 Subject to an application for NPPF Emergency Investigation Assistance (Project No. 7841) DigVentures has been invited to design and deliver this work by Historic England (HE). A collaborative team structure and methodology has been proposed, with fieldwork undertaken by two ClfA Registered Organisations, DigVentures (RO 102) and ARCA, bringing a wealth of recent experience of complex alluvial and Palaeolithic projects (Wilkins 2007; 2016; Wilkinson et al. 2018). On and off-site specialist support will be provided a team drawn from several public and independent research bodies including Anglia Ruskin University, Oxford University, University of Birmingham, University College London, University of Leicester, University of Gloucestershire, Royal Holloway, Swansea University, University of Sheffield, University of Southampton, Museum of Tromsø, and the Natural History Museum.
- 1.1.3 Historic England have offered provisional advice on the archaeological and conservation implications of the proposed evaluation (meeting with DigVentures, 30th June 2017) and issued comments on the NPPF Emergency Investigation Assistance Questionnaire (11th September 2018). Pursuant to these and wider specialist consultations, this document will define how the Project Team intends to deliver the project, and outlines how research aims and objectives will be met. The Project Design is presented in two parts; *Part 1: Description of the project* provides the project context, including a brief summary of proposed methodology, key sources and activities required to support the delivery of the proposal's outcomes. *Part 2: Resources and programming* identifies responsibilities of individual project staff members and outlines the tasks and programme.

1.2 Context of discovery

- 1.2.1 The Site was discovered in Spring 2017 by Neville and Sally Hollingworth, two local enthusiasts who voluntarily monitor the gravels as a hobby with the express permission of Hills Quarry Products Ltd (hereafter 'the Landowner'). Planning permission for mineral extraction at the Site was granted in 1988, pre-dating government planning policy guidance on archaeology contained in PPG16 (November 1990) and no archaeological conditions were attached to the original permission. In consequence, no formal evaluation or monitoring work other than a desk-based assessment (Ford 2004) was undertaken, and without the keen-eyed attention of the finders, this

discovery would have fallen through the usual mechanisms of statutory and planning-led protection.

- 1.2.2 Liaising through Dr Ben Garrod, Neville and Sally Hollingworth notified DigVentures (26th April 2017) that an assemblage of megafauna and a hand-axe had been discovered within a palaeochannel at the Site, in an area where workable gravel had been fully extracted. [REDACTED] and Historic England were made aware of the Site shortly after (email 5th May 2017) and a visit was organised with the landowner [REDACTED] and finders shortly after (24th May 2017). This was organised by Hannah Fluck (HE Head of Environmental Research), and attended by Mel Barge (HE Inspector), Hayley McParland (HE Regional Science Advisor), Steve Ford (Thames Valley Archaeological Services), Neville Hollingworth (University of Birmingham), [REDACTED] [REDACTED] Rob Hosfield (University of Reading) and Simon Lewis (University of London).
- 1.2.3 Those present observed several clusters of mammoth bone and other palaeoenvironmental material (particularly abundant mollusc shell) within what appeared to be a wide palaeochannel that had been sealed by the now extracted overlying gravels (email from Hannah Fluck, 24th May). No further artefactual evidence or modification of bone material (such as cut marks) was observed that could indicate behavioural as opposed to fluvial deposition, and the archaeological significance of the site could therefore not be determined. This raised two immediate concerns: firstly, the need to protect the Site (through hydrological stabilisation and inundation) and secondly, assessment of the Site's archaeological potential (to define and characterise the physical extent of the Site and taphonomic history of the faunal remains).
- 1.2.4 In response to the first concern, the Landowner modified their pumping regime to allow the water levels to rise in order to protect organic remains and stabilise the site. However, as the quarry will soon be reinstated in line with the adjacent [REDACTED] [REDACTED] it was recognised that this measure was not a long-term solution or management strategy. Addressing the second concern – the need to provide a baseline archaeological and palaeoenvironmental assessment as a basis on which to manage the Site – would require funding, and subsequent enquiries by Historic England indicated ineligibility for Research Council funding (such as NERC urgency funding).
- 1.2.5 DigVentures visited the site on 30th June, after which a meeting was held at Hills' offices with Mel Barge (HE Inspector) and Hayley McParland (HE Regional Science Advisor) to discuss potential funding options and strategies for an archaeological evaluation. Following this meeting, Mel Barge wrote to Andrew Liddle (Hills Divisional Director) to formally clarify HE's position in relation to the Site and the process necessary to secure NPPF Emergency Assistance Funding:

'Our engagement with this case is due to the potentially national and international importance of the archaeology, and the sensitivity of the remains. This is clearly an exciting site, with attributes which make it nationally and internationally important including the opportunity to assess the Upper Thames gravels and to

understand the environment during this period. There have, to date, been few opportunities to understand this relationship and the site offers the opportunity to make a substantial contribution to this.' Mel Barge, 13th July 2017.

- 1.2.6 As a result of this letter Hills commissioned DigVentures to act on their behalf and [REDACTED] agreed to complete the emergency funding questionnaire in accordance with guidance for NPPF Assistance cases (HE Guidance for Grants Projects, June 2017). The NPPF Application was submitted 31 May 2018 (see Section 1.3 below), and following further consultation, DigVentures was formally invited to develop a Project Design (25th October 2018, email from Barney Sloane), outlining the key requirements for the evaluation. This will be subject to expert advice from HE on appropriate personnel, techniques, sampling strategies and recording approaches, following which a joint public and private funding model will be agreed to share the costs and ensure appropriate quality and delivery monitoring.

'Should the potential of the site meet current expectations, we would then be able to move on to plan a formal recording stage, with subsequent px assessment, analysis, publication, and archiving stages as appropriate.' Barney Sloane, 8th October 2018.

1.3 Background to the NPPF Application

- 1.3.1 The following section has been reproduced from the [REDACTED] NPPF Application (Section 1, Planning Background). Initial planning permission for mineral extraction on the [REDACTED] site dates to 1988. The initial permission is earlier than government planning policy guidance on archaeology contained in PPG16 (November 1990) and no archaeological conditions were attached to the original permission. The site was subject to Periodic Review of Mining Sites from June 2004. A desk-based assessment (DBA) was produced by Thames Valley Archaeological Services (dated August 2004, see Appendix 1) as an appendix to the Environmental Impact Statement which accompanied the submission. This recorded an earlier find of a hand-axe from a quarry 450m to the northwest of [REDACTED] but, in line with then current thinking, indicated that the potential for in-situ deposits of Palaeolithic date was low (page 3). None was recorded at that time on the [REDACTED] Sites and Monuments Record in the search area. The DBA also reports on the results of geotechnical test pits and boreholes dug across the site, with no indication of significant deposits under the gravel being reported.

- 1.3.2 For reasons unknown the review was not further progressed until April 2009. Archaeological evaluation (geophysical survey and trial trenching) was recommended by the County Archaeologist's office but not carried out. The Review of Mineral Planning Permissions (ROMP) decision notice reference 04/5002/CWMRVW dated 19th April 2011 includes the following condition:

"23. The Mineral Operator will give the County Archaeologist not less than 21 days written notice prior to the commencement of soil / overburden stripping operations on site. The mineral operator shall afford at all reasonable times to any archaeologist

nominated by the Minerals Planning Authority and shall allow the archaeologist to observe the operations and record items of interests and finds.

Reason: To ensure that adequate archaeological investigation and recording is undertaken, in accordance with Policy NHE.6 of the [REDACTED] Structure Plan Second Review and Policy E8 of the [REDACTED] Minerals Local Plan."

- 1.3.3 The reason for the inclusion of an 'access' condition rather than the standard Model Condition 55 from App A Circular 11/95 was the Mineral Planning Authority's (MPA) concern over MPG14, para 174, which includes the following:

"...where MPAs determine conditions different from those submitted by the applicant; and the effect of those conditions, other than restoration or aftercare conditions, is to restrict working rights further than before the review, a liability for compensation will always arise." (As quoted, including highlighting, in email of 15/09/09 from Ben Gilpin, Principal Planning Officer to Charles Parry, Senior Archaeological Officer).

- 1.3.4 No archaeological work has subsequently been undertaken in the former fields where mammoth and other Palaeolithic material has recently been revealed under gravel deposits. Other planning applications have resulted in the archaeological excavation of features cut into the upper surface of the gravel nearby, the nearest being to the east of the former railway line that forms the boundary of the [REDACTED] site, but not on the site in question.

- 1.3.5 More recently, when asked for clarification of the extent to which the ROMP condition is enforceable, Kevin Phillips, Team Manager Development Management and Minerals and Waste Planning, [REDACTED] replied via email on 2nd June 2017:

"You are correct that the condition is observational only so there is no tie-in with either funding or compliance measures at the disposal of the Minerals Planning Authority".

When asked verbally, on 11th July 2017, whether the condition had been discharged Kevin Phillips replied that it had not been but that as an access condition they (the MPA) wouldn't expect to receive a formal application to discharge the condition. The MPA considers that the condition has been complied with as Hills (the Operator) notified the MPA when they started work and the MPA could then have nominated an archaeologist

Part 1: Description of the project

2 BACKGROUND

2.1 Research context

- 2.1.1 The Lower and Middle Palaeolithic of Gloucestershire is poorly understood. The archaeological record mostly comprises sporadic finds of uncertain provenance recovered from river terrace deposits of the Severn-Avon (Shaw et al 2015) and Thames River systems (Weston 2008). A major factor contributing to paucity of the archaeological record in the county is the notable lack of systematic archaeological research or planning-led investigations focusing on the Palaeolithic record, which has not greatly improved in recent years (Saville 2006, 239; Weston 2008, 42). Recent syntheses have identified only ten hand-axes from the catchment of the Severn-Avon Rivers in northern Gloucestershire (Shaw et al 2005, Table 2) and twenty-one from the entirety of Upper Thames in Gloucestershire and north Wiltshire (Weston 2008, Table 1), and it is unclear how these finds fit into the broader picture of human evolution and cultural development in Britain. The Thames River system is especially known for its rich Lower Palaeolithic and Middle Palaeolithic archaeological record (Aston 2017; Pettit & White 2012), and yet despite this there have been few sites recorded in the Upper Thames and head waters in
- 2.1.2 A further issue diminishing our understanding of the Palaeolithic archaeological record in Gloucestershire has been the lack of geological investigations in the region. Recent work has helped to clarify some issues relating to the age and formation of the Northmoor Member of the Upper Thames fluvial sequence, identifying a series of relatively well-dated deposits spanning the interval from Marine Isotope Stage (MIS) 7 to 2 (Lewis et al. 2001; 2006). Of particular relevance to the present investigation is the comprehensive work on deposits relating to the Churn-Thames confluence at Latton, Wiltshire [REDACTED] Here, Association A, comprising gravels and laminated sands, is dated based on biostratigraphical data (including a distinctive small form of mammoth *Mammuthus cf. trogontherii*) to MIS 7 (~300–243 ka years BP) and as currently hypothesised may be depositionally equivalent to the sequence at [REDACTED] (pers. comm. Hollingworth).
- 2.1.3 Despite Latton yielding a rich faunal assemblage, no cut-marked bone was identified and therefore no evidence for in situ human activity can be surmised. A small assemblage of eight hand-axes was recovered from Latton, although all of these artefacts were thought to be re-deposited, possibly during flooding, and related to several earlier episodes of human activity in the Upper Thames basin (Lewis et al. 2006, 196–7). The [REDACTED] assemblage may also indicate similar depositional processes, however, until further work to characterise the channel infill and edge sequence is completed, the presence or absence of in situ human activity cannot be reliably determined. Several published palaeochannel situations demonstrate the potential for analogous (near) in situ human activity – most notably Lynford Quarry (Schreve 2006; Boismier et al 2012). Though Lynford Quarry is dated to MIS 3 and significantly later than [REDACTED] (60 ka years BP) and geographically distant (East Anglia) both sites share many attributes, not least a dense suite of palaeontological remains associated

with handaxes. Against this backdrop, it is clear that the present lack of stratigraphic data hinders an absolute characterisation of the context of the [REDACTED] artefacts – and addressing this dearth in evidence is the salient point underlying this project’s evaluative aims and methodology.

- 2.1.4 Marine Isotope Stage 9-7 (~330-180 ka BP) is a critical time frame in Europe as it records the emergence of Neanderthals and shift to the widespread and persistent use of Levallois technology, often, although not always, accompanied with the disappearance of hand-axes (Ashton 2017; Pettit & White 2012; White et al. 2006). Archaeologically, this has been referred to as the ‘Early Middle Palaeolithic’, and for most of the 20th century this period of time had been compressed chronologically into the preceding Lower Palaeolithic (Scott 2010; Pettit & White 2012). Recent work has shown that this time frame is critical not only for understanding the shifts in stone tool technology, but also for changes in other hominin adaptive, social and cognitive structures (White and Ashton 2003; Gamble 1999). [REDACTED] with its combination of faunal and artefactual remains, and its attendant opportunities for the preservation of waterlogged material, provides a unique opportunity to investigate human-environment relations and concomitant impact of climate change. Furthermore, given its intermediary location at the headwaters of the River Thames, it provides potential for understanding connections and the movement of populations between well-known sites further downstream in the River Thames (e.g. Purfleet, Crayford, Stanton Harcourt) and sites at the northern extremities of occupation of Britain (e.g. Pontnewydd).
- 2.1.5 Methodologically, [REDACTED] presents a rare opportunity to investigate potentially in situ Palaeolithic activity at a waterlogged ‘open’ (as opposed to ‘cave’) site. Innovations in digital recording technology and portable instrumentation can facilitate real-time field-lab communication ‘at the trowel’s edge’ and ensure that sampling strategies remain adaptive to specialist concerns and multi-proxy analyses (Berggren et al. 2015; Westcott Wilkins 2014). Such work includes methodological innovations such as investigating the palaeoclimatic signal of preserved wood through isotopic analysis, and the extraction and analysis of ancient DNA from Middle and/or Upper Pleistocene sediments (see Appendix 1).
- 2.1.6 Recent work on lake sedaDNA suggests that continuously waterlogged conditions and high initial DNA content are far more important than age for DNA preservation; sedaDNA has been retrieved from MIS5e from Sochi in Finland (Tromsø Lab) and even older sedaDNA from cave deposits. The reported density of bone material and the presence of macroscopic plant material at Latton (Lewis et al. 2001; 2006) and at [REDACTED] (see Section 3) suggests that the sediment could have been high in DNA from the decomposition of the faunal and floral remains. If sequenced, this would be the oldest site yet with sedaDNA in the UK, and probably Europe as a whole. [REDACTED] exceptional burial conditions enable the implementation of methodologies at the vanguard of archaeological science, articulating contemporary concerns regarding the future climate evolution of our present interglacial by refining our understanding of the dynamic evolution of past interglacials.

2.2 Social context

- 2.2.1 With a rich ecological, archaeological and cultural heritage, the landscape in this area of Gloucestershire is characterised by farmland, important aquatic habitats and a number of exceptional prehistoric monuments and historic properties. The Site's immediate communities [REDACTED] are relatively affluent, falling within the top 30% of least deprived UK communities. Population trends towards older demographics, with accommodation and food services relating to tourism representing the largest segment of a mixed industry base (Source: Gloucestershire County Council Strategic Analysis Team). The [REDACTED] is home to two 'Special Areas of Conservation' and six 'Special Sites of Scientific Interest', designated on the basis of nationally important breeding populations that thrive in the lime rich waters and unimproved wildflower meadows that have been formed between gravel workings and established lakes.
- 2.2.2 The net consequence of these assets is a strong local focus on ecological conservation, building on the work of organisations such as the [REDACTED]. Initial consultation has been undertaken with Jill Bewley at [REDACTED] with agreement in principle to partner with their existing educational network and training infrastructure should suitable opportunities arise. The [REDACTED] project offers the potential to expand on [REDACTED] educational proposition, stimulating surrounding communities to become more involved with and enthused about the stewardship of their local landscape. More broadly, this also interfaces with the mission of several other national funding bodies to engage the wider public with scientific debate regarding human-environment relations in the face of imminent contemporary climate change.
- 2.2.3 Though occupying an easily accessible position off the B4696 Spine Road East, the site has hitherto escaped widespread attention of fossil collectors, and represents a rare opportunity to build a project with an extremely supportive landowner. There are, however, substantial heritage management issues with [REDACTED] quarry in the face of potential attritional threats, including theft, vandalism, weathering, scavenging and accidental damage. In particular, the bones and teeth of mammoths have a high market value in fossil shops and online, driving the potential loss of irrecoverable dating and contextual information. The Site was discovered by responsible collectors working with permission of the landowner and in dialogue with the specialist Quaternary community. This arrangement has thus far led to a relatively successful outcome, but there has been additional collecting and the find spot location has been compromised, and thus [REDACTED] is at significant risk of illicit fossil collecting activity.
- 2.2.4 The burial environment is clearly conducive to the survival of stratified artefactual and palaeoenvironmental remains, but further work to understand the significance of these deposits is urgently required in order to implement a coherent management strategy. The pumping regime at [REDACTED] has been modified to allow the water levels to rise, offering some protection and stabilisation to exposed and buried remains. However, reports of snorkelling have been received, and the quarry will soon be reinstated in line with the adjacent lakes and meadows, so this measure cannot be relied upon as a long term solution or management strategy. Historic England's South West team have long established protocols for alerting local police to heritage crime,

and have advised on mitigatory measures that should be implemented during fieldwork (see Table 6 – Risk Log).

2.3 Location, topography and geology

2.3.1 [REDACTED] is located in [REDACTED] and currently bounded to the north, south and west by lakes restored from former quarry workings (Figure 1). The focus of investigation will be palaeochannel deposits of Middle-Upper Pleistocene date currently exposed in the north-west corner of the quarry adjacent to [REDACTED]. The palaeochannel is cut into rocks of the Middle Jurassic Kellaways Sand Formation (manifested as grey mudstone overlain by light brown calcareous sandstone in the [REDACTED] Quarry) (Hollingworth and Hollingworth n.d.; Figure 3). A rapid assessment and initial survey (Figure 2) has estimated the palaeochannel to be approximately 200m in length and 60m in width, filled with organic muds and sands, and matrix-supported gravels. Now flooded to a depth of approximately 3m, the base of the quarry is characterised by an uneven and irregular topography as a consequence of the machine extraction of the overlying gravels.

2.3.2 The thickness of the palaeochannel has been estimated at 1-2m (Hollingworth and Hollingworth n.d.), though this has not been firmly established except through informal collecting. Surface investigation has confirmed that the channel sediments are highly fossiliferous, containing waterlogged plant macrofossils, mollusc shell and vertebrates. The latter are reported to be concentrated in localised depressions and are occasionally identified in an arrangement that suggests articulation (Hollingworth and Hollingworth n.d.). At least one hand-axe has been recovered from the palaeochannel fill (Plate 1.2) with a further hand-axe reported from the same quarry (though the precise location and circumstances of discovery remain unknown).

3 RESULTS OF PREVIOUS WORK

3.1 Artefact and vertebrate collection

3.1.1 Over the spring of 2017 a large collection of vertebrate remains was made at [REDACTED] by Neville and Sally Hollingworth, two local enthusiasts who regularly inspect adjacent quarry workings with the express permission of the Landowner (see Section 1.2). The material was collected as surface finds exposed at the base of the [REDACTED] pit during quarrying and drainage operations, and removed to a purpose-built storage facility at their family home. Through subsequent enquiries other material has come to light, including a further hand-axe (found by Mark O'Dell, exact find spot unknown) and two additional mammoth bones (recovered by Theo May and Ben Hinton) taking the total known assemblage from [REDACTED] to 111 items. A topographical laser scan has also been undertaken of the open quarry pit, providing an initial plan of scattered faunal remains on the surface of the palaeochannel deposits (Appendix 3).

3.1.2 Although no formal specialist identification of this material has yet been undertaken, or assessment of the material for indications of weathering, transport or hominin

interaction, Neville and Sally have produced a photographic catalogue of the material (see Appendix 3; and Figures 4 & 5), identifying faunal remains to genus and respective element where ever they were able. Specialists have however undertaken two separate site visits, confirming the context of discovery and surface scatters of faunal material exposed by quarry workings at the base of the gravel sequences (see Section 1.2). Mammoth bone is by far the most abundant faunal element at [REDACTED] and has tentatively been assigned to Steppe Mammoth (*Mammuthus trogontherii* – Pers. Comm. Adrian Lister). Other elements reportedly include horse bones, a partial jaw bone of a cave bear, hyena, bison and deer bone. These are distributed across the entire width of the palaeochannel, with concentrations of vertebrate material in specific areas (at least six mammoth tusks were identified in one particular five-square metre area, for instance) and other abundant palaeoenvironmental material such as mollusc shell and waterlogged wood also identifiable.

3.2 Stratigraphy and sedimentology

- 3.2.1 In addition to collecting faunal remains, Neville Hollingworth has also investigated the stratigraphy and sedimentology at [REDACTED] quarry, and the following description is based on his notes. Given that the site is currently flooded, no further specialist assessment is available to qualify these descriptions, other than the work proposed in Section 3.3 and elucidated further in the remainder of this Project Design.
- 3.2.2 The deposits at [REDACTED] consist mainly of medium to coarse limestone gravels with minor fine grained sand lenses that are of fluvial origin. Clast analysis indicate that, in addition to limestone derived ultimately from the Jurassic escarpment to the north of the site, there are also significant quantities of locally derived sandstone blocks and shelly fossils as well as large 50cm-1metre diameter septarian nodules. The sequence at [REDACTED] can be subdivided into two facies associations; these associations are separated by a sharp boundary which delineates the base of the overlying Northmoor terrace.
- 3.2.3 The palaeochannel forms a broad shallow concave up-bounding surface approximately 60 metres in lateral extent and about 200 metres in length. This is interpreted as a channel that has been controlled by small scale faulting within the underlying Kellaways beds and Oxford Clay. The lower contact of the channel with the Kellaways beds undulates and immediately above the contact there are large clasts of Kellaways rock and septarian nodules, some of which have been tilted to near vertical as a result of the topography at the base of the channel. Within these grey coloured silty gravels are pockets of lighter coloured sand and shell-rich silt that pass laterally into silty organic rich sand. The organic rich sand also forms pockets and depressions around and beneath large mammal bones and tusks. These organic rich silts yield abundant plant macrofossils, molluscs and gastropods. The disposition of the mammal remains is variable laterally and are concentrated into depressions at the base of the gravel sequences. In some places, large bones dip steeply into the gravels and may indicate post-depositional disturbance or trampling.

3.3 2019 Fieldwork proposals

- 3.3.1 The 2019 fieldwork proposed in this document has been designed to assess the nature, extent and character of the deposits, providing an outline dating framework to better understand the distribution of faunal remains and association of stone tools. A specialist Project Team has been assembled, drawn from public and independent research bodies with considerable range of experience in the undertaking and delivery of English Heritage/Historic England and other similar research projects.
- 3.3.2 Given the irregular and waterlogged topography of the Site, the north-east to south-west orientation of the palaeochannel, and the fact that adjacent fields are now flooded and inaccessible, geophysical survey will not be an effective means of realising the aims of the evaluation. The overlying gravels have been extracted up to the site boundary, exposing the lateral extent of the palaeochannel for investigation, similar in process to a topsoil strip exposing archaeological features on a dryland site where further remote sensing would be considered redundant. Should the proposed borehole strategy prove to be untenable (due to clastic obstructions or other unforeseen logistical constraints) low resolution electromagnetic induction will be utilised to map the conductivity contrast associated with the sediments of the palaeochannel to provide additional information to position targeted interventions (see Table 5, Risk Log).
- 3.3.3 The Site is also constrained by hydrological and social issues, including the negative impacts of dewatering the site and the subsequent potential for unregulated removal of archaeological material by fossil collectors. The proposed methodology will address this by combining fieldwork into a single stage, with rapid feedback on borehole results to ensure that targeted interventions can be programmed with minimum impact, and focussing on the following work streams:
- Desk-Based Study: assessing existing geotechnical borehole data, and faunal remains previously collected from the Site.
 - Remote Sensing: high resolution aerial photogrammetry survey will be undertaken, followed by field walking to map the extent of the palaeochannel, recording potential spatial variations in surface artefacts or faunal remains.
 - Geoarchaeological Boreholes: an adaptive strategy of 50 boreholes to further map the extent of the palaeochannel, both model and characterise infilling strata and inform test pit location.
 - Targeted Excavation: five targeted hand dug test pits, to sample the infilling strata for archaeological, palaeoenvironmental, lithostratigraphical and chronological purposes.
 - Palaeoenvironmental Assessment: a multiproxy investigation of bulk and monolith samples, including biostratigraphy, geochronology (OSL), Coleoptera, pollen, Mollusca, waterlogged plant macrofossils and waterlogged wood.

4 RESEARCH AIMS AND OBJECTIVES

4.1 Project model

- 4.1.1 The overarching aim of the archaeological excavation is to define and characterise the physical extent of the Site through a programme of non-intrusive investigations and intrusive excavation, obtaining baseline data that will facilitate its future management, research, presentation and enjoyment. This work has been designed according to the five principles of the 'Curating the Palaeolithic' project (forthcoming, and see Section 5.3 below). The project model is framed as overarching aims and key questions/objectives that provide a framework for the methods, stages, products and tasks set out in Part 2 of the Project Design below.

4.2 Aim 1 - Identify the physical extent and character of the [REDACTED] heritage asset in its environs

- 4.2.1 This aim will build on previous informal artefact collection and rapid assessment work, undertaking a programme of survey, field walking and geoarchaeological boreholes to define and establish the precise physical extent and condition of the Site. High resolution photogrammetry survey will be completed across the area, using low-level aerial photography to map the palaeochannel in its immediate surroundings. A desk-based assessment of extant geotechnical data will be undertaken, establishing a site-wide GIS and web-accessible database. This will be followed by geoarchaeological boreholes to determine the lateral and vertical extent of the palaeochannel, alongside a programme of field walking to indicate potential spatial variation in channel surface deposits. These low-impact tools will add further to our understanding of the monument by addressing the following questions:

- Q1. Can the physical extent of the palaeochannel and any associated subsurface archaeology be determined by remote sensing and refined by geoarchaeological boreholes?
- Q2. What is the extent (lateral and vertical) of the palaeochannel deposits and can this inform an appropriate evaluation and sampling strategy?
- Q3. Can we model the deposits infilling the palaeochannel, characterising areas of high archaeological and palaeoenvironmental potential, and how should this model be refined through further intervention?

4.3 Aim 2 - Understand the formation of the [REDACTED] palaeochannel within its palaeoenvironmental context

- 4.3.1 Informed by the results of work conducted under Aim 1, this aim will be achieved through small-scale targeted test pits. The purpose of the test pits will be to identify and investigate any archaeological strata containing archaeological materials, and obtain appropriate samples for archaeological, palaeoenvironmental, biostratigraphical and geochronological assessment.

- Q4. Can we reconstruct the depositional environment and sub-environments in which the channel sequence accumulated, as defined in Aim 1?
- Q5. Can we determine the position of artefacts within the depositional sequence, and determine their contextual relationship with biological remains (particularly vertebrates)?
- Q6. What are the typical and atypical features of the palaeochannel and can we infer its past micro-environment?

4.4 Aim 3 – Understand the Site’s archaeological and palaeoenvironmental conditions

4.4.1 This aim will be achieved with an assessment of the samples as defined and recovered in Aim 2, using appropriate palaeoenvironmental and archaeological techniques to establish the significance of the Site and nature of the burial environment.

- Q7. What is the current state of preservation of the archaeological and palaeoenvironmental material across the site?
- Q8: How well do artefacts and palaeoenvironmental remains survive (including carbon isotope and sedaDNA) and what is their significance?
- Q9. Can a dating framework for the palaeochannel be established, and how does this inform the palaeoenvironmental and functional context of the excavated material?
- Q10. What is the range and spatial patterning of artefacts recovered from the palaeochannel, and what can be inferred of the early hominin presence from this material?

4.5 Aim 4 – Making recommendations, assessment and publication

4.5.1 This aim will require all data from Aims 1-3 to be collated, with an integrated synthesis of the archaeological and palaeoenvironmental resource at the Site. Recommendations will be made to conserve, enhance and interpret the heritage significance of the Site, proposing either further fieldwork stages, and/or analysis, publication and final archiving.

- Q11: What can an integrated synthesis of the results of this work with previous studies of contemporary regional sites tell us about the Site and it’s setting?
- Q12: What recommendations can be made to protect, conserve and enhance the Site, in the light of the issues and opportunities identified under Aims 1 - 3?

5 BUSINESS CASE

5.1 Historic England Research Strategy

5.1.1 The project has been designed in accordance with priorities articulated in the Historic England Research Strategy (2017) and Historic England Corporate Plan (2018-21). The



Research Strategy defines nine broad themes that describe Historic England's research interests to ensure that any proposed work is aligned with HE's mission. The  project drivers can therefore be articulated within the fundamental theme to #understand (water, wetlands, and waterlogged; Archaeology of the deeper past) in addition to other research outcomes that will address other Historic England and sector priorities, delivering significant value added benefit. As a consequence of the innovative digital and multi-partner collaborative approach, there is a significant 'value added' dimension to this project, encompassing research themes including #adapt (climate change; heritage crime); #conserve (collections and archives; preserving archaeological remains); #inform (information systems and services); #skill (developing the workforce; working more effectively); #inspire (research media); #innovate (materials; human environment; dating and chronology; measuring and sensing).

5.2 Research frameworks

5.2.1 All work will be undertaken with regard to current resource assessments identified in Regional and National Research frameworks. This will pay particular heed to the draft Research Strategy for Prehistory (HE consultation draft 2010) and the research aims defined in the South West Archaeological Research Strategy (Grove and Croft 2012). These include:

5.2.2 Historic England's Draft Research Strategy for Prehistory (English Heritage 2010):

- Topic 1: Moving beyond the prehistoric site: developing landscape perspectives; Understanding human exploitation of different landscape zones.
- Topic 9: Reconstructing Pleistocene and Early Holocene landscapes; Understanding the chronology of human presence and absence; Understanding patterns of occupation – where are the campsites?

5.2.3 Research frameworks for the Palaeolithic and Mesolithic of Britain and Ireland (Gamble et al 1999):

- Research Theme: Human interaction with, and impact upon, faunal communities from the Middle Pleistocene to the Pleistocene-Holocene transition.
- Research Theme: How did caves and open sites fit into settlement patterns?

5.2.4 Research and Conservation framework for the British Palaeolithic (Pettit et al 2008):

- Primary Research Theme 2. Hominin Demographies: the Palaeoecology of Hominin Colonisation and settlement Processes: Research Question 1: How did Pleistocene faunal communities change over time, and what was the pattern of human interaction and impact on these?
- Primary Research Theme 3. How We Became Human: Social, Cultural and Economic Change: Research Question 4: How do we compare enclosed (cave and rockshelter) and open-site archaeology in terms of settlement systems?

5.2.5 South West Archaeological Research Framework (Grove and Croft 2012):

- Theme C: Environment and Dating – Landscape change and methodologies (Research Aims 16, 24 and 25)
- Theme H: Methodologies – Building blocks for research, developing new approaches and techniques

5.3 Curating the Palaeolithic

5.3.1 The 'Curating the Lower and Middle Palaeolithic' project is a joint initiative between Historic England and Reading University with two overarching goals: (1) evaluating current understanding and needs with regard to the curation of the Lower and Middle Palaeolithic in a development context; and (2) developing new guidelines and case studies in response to, and to help meet, those needs. Though the results of this work are not yet published, the 'Curating the Lower and Middle Palaeolithic' project team have shared five key principles of the new guidance. The table below describes how the [REDACTED] project has been designed to articulate with these principles, and the wider potential for the proposed work to inform the forthcoming 'Curating the Palaeolithic' guidelines as a live case study.

Five Principles	Description of how the project meets the 'Curating the Lower and Middle Palaeolithic' principles
<i>Principle 1: Where Palaeolithic archaeology is anticipated project designs and specifications should be prepared by someone with appropriate expertise and knowledge of Palaeolithic archaeology (including Pleistocene deposits).</i>	The project has been designed as a collaboration between two Chartered Institute for Archaeologists (CIfA) Registered Organisations who have recently delivered Palaeolithic projects – DigVentures (RO 102) and ARCA – and the core field team includes individuals with appropriate expertise and knowledge of both Palaeolithic archaeology and Pleistocene deposits. The field team is supported by a specialist team drawn from several public and independent research bodies including Anglia Ruskin University, Oxford University, University of Birmingham, University College London, University of Leicester, University of Gloucestershire, Royal Holloway, University of Southampton, Swansea University, Museum of Tromsø, and the Natural History Museum. All named specialists have contributed to the Project Design, which has been circulated for comment through the project's project management portal (RV2).
<i>Principle 2: That assessment of Palaeolithic sites and potential for Palaeolithic archaeology should take a deposit led approach.</i>	All project activity streams have been designed as a 'deposit led approach' – initially characterising the deposits (both vertically and spatially) in order to understand the infilling of the channel and therefore site formation processes, taphonomy and diagenesis. Only once this has been understood will excavation proceed, and then only to confirm/better understand the relationship between the archaeology, palaeontology and stratigraphy.

Five Principles	Description of how the project meets the 'Curating the Lower and Middle Palaeolithic' principles
<i>Principle 3: That there should be a clear link between the nature of the deposits, the range of question being asked and the methods used.</i>	Project methods have been linked to a series of iterative research questions, with the primary questions concerning the relationship of the archaeological and palaeontological remains to the stratigraphy. Once this relationship is established, the project team can establish how both were deposited and whether that was contemporaneous. This understanding will inform decisions regarding which strata to date by OSL and how to interpret the OSL data, leading finally to an understanding of the age of the channel fills.
<i>Principle 4: That any work should critically assess existing information on the Pleistocene deposits of the area (note that relevant deposits may be several km from the location that is being assessed), and on any existing Palaeolithic finds (e.g. artefacts, biological remains) that have previously been made.</i>	A review of existing information on the Pleistocene deposits and previously collected faunal and artefactual material has been incorporated in the project plan as a separate Stage 2a. In this particular case, such a review would not alter the investigative strategy for the initial works as the extent of the palaeochannel is already known, its fauna characterised in outline and something is known of its archaeology. Rather such background research would help interpret the data collected by the planned investigation by means of providing a context.
<i>Principle 5: That any investigation should seek to inform current and future understanding of the Palaeolithic archaeological potential of the deposits in that area. That to that end both positive and negative results can have value, and the most interesting/impactful aspects of a location may not necessarily be the archaeological artefacts themselves but might be the Pleistocene deposits instead.</i>	As per Historic England's research strategy (see Section 5.1 above) the key project outcomes and outputs are designed to achieve this result. The project will characterise the palaeochannel deposits in terms of their geological properties, archaeological and palaeontological inclusions and its chronology (and the relationships between all of the above).

Table 1: Curating the Lower and Middle Palaeolithic Principles

6 INTERFACES

6.1.1 This project will interface with a series of other projects, stakeholders, and initiatives, summarised in the table below:

Interfaces	Description
<i>Current Palaeolithic field and research projects</i>	The Project Team share specialist involvement with the Leverhulme Trust-funded 'Breckland Palaeolithic Project', led by Professor Simon Lewis at Queen Mary University London, and the Calleva Foundation-funded 'Pathways to Ancient Britain' (PAB) project, co-directed by Professor Chris Stringer at the Natural History Museum and Professor Nick Ashton at the British Museum. The  project aligns with several current field excavations of key sites (e.g. Barnham, Barnham Heath, Beeches Pit,

Interfaces	Description
	Broomhill Gravel Pit, Redhill, Santon Downham) investigating the nature of the colonisation of Britain following the Anglian glaciation, the subsequent emergence of Neanderthals, and the development of new technological and behavioural adaptations. Several members of the Project Team overlap with these projects and interact regularly through special interest groups, and will ensure that knowledge is transferred wherever possible.
<i>Palaeolithic Curatorial and Management Practices</i>	Several members of the Project Team have research interests in predictive deposit modelling for Palaeolithic archaeology and aggregate related archaeology, and have published widely on this topic (Wilkinson et al 2018; Brown 2009). The [REDACTED] project will be of direct relevance to the Historic England-funded 'Curating the Middle and Lower Palaeolithic' project, which will in turn lead to the production of guidelines for the Lower and Middle Palaeolithic in 2019-2020. Members of the Project Team have been consulted on this initiative, and will be able to contribute further insight as the fieldwork progresses.
<i>Evolutionary Biology in the Middle to Late Pleistocene</i>	Members of the Project Team (and the Natural History Museum) are investigating the complex transition from the Middle Pleistocene 'steppe mammoth' to the Late Pleistocene woolly mammoth (Lister and Joysey 1992; Lister and Sher 2015), and a well-stratified abundant sample of molars from the [REDACTED] site, especially if independent dating evidence can be obtained, may provide new (possibly important) evidence on this. The Project Team shares specialist involvement with correlating projects at
<i>Quaternary Science</i>	Linkages with the Palaeoenvironmental Laboratory at Southampton ensure project experience with organics from correlating Pleistocene gravels, including Latton (Scaife in Lewis et al. 2006) and more recently the analysis of MIS5e pollen from Chard Junction (Brown et al 2015). Sedimentary DNA expertise interfaces with several other Quaternary projects, from the Artic (Alsos et al 2015) to Norway (Clarke et al 2018) to the UK and Ireland (Sjorgren et al; Brown et al subm.). The link with Tromsø allows a full range of expertise to be available for the project, including Brown, Fonville, Pears at Southampton, supplemented by Alsos and Heintzmann at Tromsø, who collectively have more experience than any other team in metabarcoding and shotgun sequencing.
<i>Local Stakeholders</i>	The Project Team has met with [REDACTED] the charity which manages the [REDACTED]. Their remit includes estate management, biodiversity protection, conservation, wildlife protection, fundraising, promotion, school education programmes and public events. As such they will be key relationship for the project and will be kept informed of all developments, especially those which may have implications for the future. Consultation has also commenced with Bristol Museums, Galleries and Archives (See Appendix 4). As the receiving museum for future transfer of title of the assemblage and archival material, Bristol Museums, Galleries and Archives will be kept informed of project developments.

Table 2: Project interfaces

7 COMMUNICATIONS

7.1 Project team

- 7.1.1 The following section details specific staff responsibilities, drawing on terminology devised by Historic England for the MoRPHE project management framework. The Project Sponsor is Historic England, with funding allocated under the terms of the NPPF Emergency Investigation Assistance. Historic England have appointed a Project Assurance Officer (Jenni Butterworth) who will monitor compliance with relevant standards and guidelines on Historic England's behalf.
- 7.1.2 The core project team have all worked closely together over a number of research projects, including Leiston Abbey (2013-2016), Lindisfarne (a joint project with the University of Durham, 2016) and Barrowed Time (community investigation of a Bronze Age hoard site, 2016). Appropriate expertise and knowledge of Palaeolithic archaeology (including Pleistocene deposits) has been embedded in the project team, with a recognised Palaeolithic specialist from DigVentures (Dr Josh Hogue) and Pleistocene specialists from ARCA (Dr Nick Watson, Dr Monika Knul or Dr Paul Watson) on site for the duration of fieldwork – managed by individuals from both organisations with published experience of Palaeolithic (Dr Keith Wilkinson) and waterlogged palaeochannel sites (Brendon Wilkins).
- 7.1.3 The Expert team are all well known to each other, either through shared publications, project work or academic conference panels. Lisa Westcott Wilkins (Project Executive) will take overall responsibility for the project's outcome, supported by Brendon Wilkins (Project Manager) and Dr Ben Garrod (Expert and Project Support). The Expert team is drawn from various university departments and laboratories with a considerable range of experience in the undertaking and delivery of similar research projects. In addition to a web-accessible project management system (see below), DigVentures has developed a web-accessible digital recording system, ensuring that the Project and Expert Team will have continuous, real-time access to project data as it is created. In addition to scheduled site visits, Experts will be encouraged to comment and add to records during fieldwork, removing the usual logistical barriers that separate field from lab work.
- 7.1.4 An Advisory Board, comprising key stakeholders including the landowner, Project Sponsor, Project Executive and relevant Experts, will be formed to provide an extra layer of expertise to help advise as the project progresses. This board is not intended to be a logistically unwieldy process, but an informal group with established communication protocols to ensure that knowledge can be shared and insights harnessed as needed. This group includes senior colleagues (such as Nick Ashton and Tony Brown) able to offer advice to the team informally, visit the site as required, and offer mentorship to the core team as needed.

7.2 Project management

- 7.2.1 The Project Manager will produce Monthly Status Reports for the Project Executive and Project Team throughout this Execution Stage up to the review of the Assessment Report/UPD. This will present an overview of progress, list tasks completed or part completed, including any on-going work and issues affecting progress. The Project Manager will also be responsible for ensuring that the project runs to schedule, keeping track of key resources (notably staff time) on the basis of weekly Work Records. The Project Team will have a project meeting at each milestone described to ensure that all major tasks are briefed/debriefed as necessary. Provision will be made for the project in Basecamp, which is a web-based project communication package used by DigVentures, enabling project participants to generate and record notes, tasks, milestones and other project-related communication.
- 7.2.2 DigVentures operates a digital project management system. Projects are undertaken under the direction of the Project Manager, supported by Expert Team Leaders, who are responsible for the successful completion of all aspects of the project. All work is monitored and checked whilst in progress on a regular basis, and the Project Director/Managing Director checks all reports and other documents before being issued. A series of guideline documents and manuals form the basis for all work.
- 7.2.3 The Project Manager, Brendon Wilkins, is a full member of the Institute for Archaeologists (MCIfA). DigVentures is an ClfA Registered Organisation (No. 102), and fully endorses the *Code of Conduct*, the *Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology*, and the Standards and Guidance documents of the Institute for Archaeologists. All DigVentures staff are employed in line with the Institute's Codes and will usually be members of the Institute.

7.3 Engagement and Public Communication

- 7.3.1 A collaborative approach will be taken for all public communication regarding the Project, to include DigVentures, [REDACTED] and Historic England. A Memorandum of Understanding outlining the terms will be developed following approval of this document, and agreed prior to fieldwork commencing. An equal share of voice for all parties will be preserved, and appropriate recognition for financial and value-in-kind support will be included.
- 7.3.2 Key messages, milestones and press materials will be jointly developed as per the signatories of the above-mentioned MOU. This will include protocols for sign off, a press release announcing the findings of the dig, any undesirable press during the dig, and a process for dealing with outstanding findings that are deemed to warrant immediate release. In this instance, once it's been decided what finds and discoveries will be announced and through what medium, coverage targets will be agreed and all comms representatives will contribute to final draft announcement with approval required from all parties before it goes public.
- 7.3.3 Information sharing and approval process. As we don't know what will be found during the excavation, regular and timely updates from the dig team will be provided to all partners' communications representatives. An open channel of communication will be

maintained between the site team and HE to ensure all parties are aware of developments and have sufficient time to respond.

7.3.4 Given the potential importance of the site, a documentary has been commissioned by BBC1, to be produced by Windfall Films and presented by Sir David Attenborough, for worldwide distribution. An exclusivity agreement restricting film production by other companies has been requested, however final terms have as yet not yet been presented. The proposed contract will be forwarded to HE and will not be agreed without their input regarding exclusivity. This agreement will be confined solely to television productions and will not restrict other press, social media or outreach activities.

7.3.5 As a core expertise of DigVentures and a stated priority for both the landowner and site finder, engagement and outreach are an important consideration for this project and will form a significant strand of work if it progresses through to a full Recording stage. In this case, the Updated Project Design for the Recording stage will include a full plan for outreach and engagement developed in consultation with Historic England and [REDACTED]

7.4 Dissemination and reporting

7.4.1 Rapid dissemination of the results to, and involvement of, stakeholders of the project is vital throughout. This will take place through multiple channels, addressing a multitude of established and new audiences. Dissemination outlined below will all be undertaken during 2019, and will include, but not be limited to:

- Dedicated digital archive of the excavation data.
- Wide circulation of the project assessment and the final report, and links to the OASIS record.
- Site publication in an appropriate local/national journal commensurate with the final results (analysis stage).
- Wide circulation of Assessment and Final Reports, Updated Project Design and links to the OASIS record.

7.5 Project archive

7.5.1 The project archive will be prepared in accordance with the Bristol Museums and Art Gallery Conditions of Acceptance (2012), and in line with DigVentures guidelines for Archive Preparation, following Appendix 1, P1 of MORPHE PPN 3 (English Heritage 2011), fulfilling the Guidelines for the preparation of excavation archives for long term storage (UKIC 1990). All reports produced by the project will be openly and freely disseminated through County Council Historic Environment Record, Archaeological Data Service, OASIS portal and Scribd website. Copyright on all reports submitted will reside with DigVentures, although a third party in-perpetuity licence will automatically be given for reproduction of the works by the originator, subject to agreement in writing with DigVentures. Historic England will be granted a third party licence in perpetuity for the [REDACTED] project materials.

- 7.5.2 The archive for the geoarchaeological component of the project will comprise hard copy records (test pit recording pro formas and borehole lithostratigraphic descriptions), digital records [dGPS] locations for test pits, a RockWorks database (in Microsoft Access format), GIS layers for borehole and test pit locations and stratigraphic thickness models (in ESRI Shape format) and the two reports (Adobe PDF). Storage will also be required for unprocessed bulk sedimentology and micromorphology samples as outlined in Section 11.5.2. The archive will be compiled in accordance with Archaeology Data Service (2011) guidelines.
- 7.5.3 A needs assessment has been undertaken of local repositories (including Corinium Museum) and agreement obtained in principle from Bristol Museums, Galleries & Archives to receive transfer of title of any excavated assemblages and related archival material not already in private hands (see Appendix 4).

8 PROJECT REVIEW

- 8.1.1 The project will be continually reviewed by the Project Executive and Project Manager, with a formal review undertaken at the end of each Stage. Stage 5 will culminate in a workshop where each Expert will present their results with view to developing proposals for further work and potential funding streams.

Stage	Description	Review Point	Completion Date
Initiation	Consideration of Project Proposal for NPPF Assistance and issue of brief by [REDACTED]	RV1 – Historic England and [REDACTED]	Completed – October 2018
Stage 1	Project Start-up, development of project design by DigVentures in consultation with wider specialist team	RV2 – Sign-off on MoRPHE Project Design, and liaison with stakeholders and landowners	December – March 2018
Stage 2a	Desk Based Assessment – previously collected faunal, artefactual and geotechnical data	RV3 – Review previously collected data to identify range of material expected during fieldwork	April 2019
Stage 2b	Photogrammetry Survey, Field walking, Geoarchaeological boreholes and deposit modelling	RV4 - Review deposit model and identify any constraints or implications for subsequent field investigation	April – May 2019
Stage 3	Field Investigation, to include five targeted test pits with the location of test pits informed by the results of the borehole survey	RV5 – Assemble site archive and distribute pertinent data to specialists	May – June 2019

Stage	Description	Review Point	Completion Date
Stage 4	Assessment Report and Updated Project Design	RV6 – Recommendations for further work, analysis and publication	December 2019
Stage 5	Closure, Analysis or continue with further fieldwork		December 2019

Table 3: Project review stages

9 HEALTH AND SAFETY

- 9.1.1 DigVentures will undertake the works in accordance with Health and Safety requirements and a Health and Safety Plan. This document will take account of any design information pertaining to above and below ground hazards. DigVentures will ensure that all work is carried out in accordance with its company Health and Safety Policy, to standards defined in *The Health and Safety at Work etc. Act 1974*, and *The Management of Health and Safety Regulations 1992*, and in accordance with the SCAUM (Standing Conference of Archaeological Unit Managers) health and safety manual *Health and Safety in Field Archaeology* (1996).

Part Two: Resources and Programming

10 PROJECT TEAM STRUCTURE

10.1 Team and responsibilities

10.1.1 The [REDACTED] core and expert team will be as follows (Table 3). The core team has been assembled to ensure that appropriate expertise and knowledge of Palaeolithic archaeology (including Pleistocene deposits) will be in attendance on site at all time. The core team will operate a flat rather than hierarchical organisational structure, with decision making (within the scope of the agreed MORPHE structure and Project Design) shared between on-site experts as appropriate. Communication between the core and expert team will be facilitated through the project's digital recording system, ensuring that the expert team has read/write access to the project archive in real time, providing technical support for an adaptive strategy. Password access to the database will be granted to stakeholders (such as HE) who will be able to observe a live stream of record production and provide oversight as necessary. A summary CV, setting out the skills and expertise of team members is set out in Appendix 3, including links to detailed online professional and publication profiles.

Name	Initials	Project Role	Key Responsibility
Lisa Westcott Wilkins	LWW	Project Executive	Overall project responsibility, budget responsibility and project assurance
Brendon Wilkins	BW	Project Manager, and Expert – Wetland and Waterlogged Archaeology	Archaeological co-direction (on and off-site), liaison with project team, partners and Stakeholders
Keith Wilkinson	KW	Team Leader, and Expert – Palaeolithic and Pleistocene Archaeologist	Archaeological co-direction (on and off-site), responsible for geoarchaeology team
Chris Casswell	CC	Team Leader, and Expert – Complex excavation strategy	Archaeological co-direction (on and off-site), reporting, liaison with project team, partners and Stakeholders
Joshua Hogue	JH	Expert – Palaeolithic Archaeologist	Archaeological co-direction (on and off-site), reporting, lithic analysis
Jenni Sherriff	JS	Expert – Geoarchaeology	Archaeological co-direction (on and off-site), reporting, geoarchaeology
Nick Watson	NW	Expert – Geoarchaeology	Archaeological co-direction (on and off-site), reporting, geoarchaeology

Name	Initials	Project Role	Key Responsibility
Monika Knul	MK	Expert – Geoarchaeology	Archaeological co-direction (on and off-site), reporting, geoarchaeology
Paul Watson	PW	Expert – Geoarchaeology	Expert – Geoarchaeology
Maggie Eno	ME	Site Assistant	On-site fieldwork and project support
Johanna Ungemach	JU	Site Assistant	On-site fieldwork and project support
Tony Brown	TB	Expert Advisor	Advisory board – Pleistocene and alluvial geoarchaeology
Nick Ashton	NA	Expert Advisor	Advisory board – Early Middle Palaeolithic
Sonia O’Conner	SO	Expert Advisor	Advisory board – Conservation
Ben Garrod	BG	Project Support	Academic Liaison and media communications
Mary Gagen	MG	Expert	On-site sampling, Waterlogged wood
Tom Hill	TH	Expert	On-site sampling, Pollen
Nigel Larkin	NL	Expert	On-site field-work, Conservation
Matthew Law	MW	Expert	On-site sampling, Mollusca
Adrian Lister	AL	Expert	On-site sampling, large fauna (mammoth)
Danielle Schreve	DS	Expert	On-site sampling, Microvertebrates
Kate Scott	KS	Expert	On-site sampling, large fauna
Marta Perez Fernandez	MP	Expert	On-site sampling, Plant macrofossils
David Smith	DAS	Expert	On-site sampling, Coleoptera
Adam Stanford	AS	Expert	Aerial Photography and Photogrammetry
Phil Toms	PT	Expert	OSL Dating

Table 4: Team and responsibilities

11 METHODOLOGY

11.1 Introduction

- 11.1.1 The methods reflect the project Stages set out above (Section 8), and a task list, with allocation of staff time and team members in Section 12 below, supported with a detailed GANNT chart, Task List and Project Budget supplied as a standalone file [REDACTED]. Detailed method statements relating the specific techniques or approaches summarised below can be found in Appendix 1 at the end of this document. ...page numbers for detailed method statements.

11.2 Stage 1 - Project Start-Up and Design

- 11.2.1 A Project Design (this document) has been prepared (Review Point 2).

11.3 Stage 2a and 2b - Desk Based Assessment, Survey, Field walking and Boreholes

- 11.3.1 Stage 2a (Desk Based Assessment) and Stage 2b (Fieldwork) will comprise the first execution stage required to meet Aims 1 and 2 (see Section 4 above). Stage 2a (scheduled from 1st April – 12th April) will require an assessment of previously collected faunal remains and artefacts, and a desk-based study of existing geotechnical data from [REDACTED] (Appendix 1, Page 44 and 46). Stage 2b (scheduled from 23rd April until 10th May) will include 3D photogrammetry survey, field walking, and geoarchaeological borehole survey (Appendix 1, Page 43).

- 11.3.2 This stage will aim to answer the following questions:

- Q1. Can the physical extent of the palaeochannel and any associated subsurface archaeology be determined by remote sensing and refined by geoarchaeological boreholes?
- Q2. What is the extent (lateral and vertical) of the palaeochannel deposits and can this inform an appropriate evaluation and sampling strategy?
- Q3. Can we model the deposits infilling the palaeochannel, characterising areas of high archaeological and palaeoenvironmental potential, and how should this model be refined through further intervention?

- 11.3.3 In advance of any proposed fieldwork, Stage 2a will commence with a desk based assessment of previously collected faunal and artefactual material, alongside an assessment of existing geotechnical data culminating in Review Point 3 (Appendix 1, page 38 and 40). Rather than inform the borehole strategy (which has been devised on a grid system based on the presumed position, extent and depth of the palaeochannel as determined from observations in the quarry before flooding) desk based task will provide an indication of the faunal and artefactual material likely to be encountered, and the type of deposits that infill the channel and through which the channel is cut. As such Stage 2a will culminate in a short Review Point 3 (15th – 18th April) as Stage 2a results will not materially impact proposed Stage 2b works or strategy.

- 11.3.4 This will be followed by Stage 2b field work (survey, field walking and boreholes). The borehole survey (Appendix 1, page 38) will be conducted using a machine-powered percussion auger driving gouge heads. Initially boreholes will be drilled at 15m intervals along nine transects perpendicular to the palaeochannel (Figure 2). Based on the findings in these 34 boreholes, a further 16 boreholes will be drilled elsewhere along the perpendicular transects to better resolve the distribution of the palaeochannel deposits. Strata retained in the gouge auger heads will be described on site and then discarded, while the lithostratigraphic data so recovered will be compiled within a database of the RockWorks geological utilities program.
- 11.3.5 A UAV mounted photogrammetry survey will be undertaken to provide a record of the channel margins, quarry sections, and provide a backdrop against which finds, test pits and boreholes could be plotted (Appendix 1, page 43). Field walking (Appendix 1, page 43) will be based on the same grid system as the boreholes, ensuring comprehensive coverage of each grid square with a 2m wide observation corridor between each field walker. Pro forma digital records will be made for each grid square, and any surface faunal or artefactual remains will be recorded by dGPS and a selective collection policy adopted.
- 11.3.6 To minimise the impact of dewatering and accessibility for potential looting, this stage will culminate with a short report (Review Point 4: 6th – 17th May) to finalise the location of Test Pits required for Stage 3. The report will provide a commentary on the stratigraphy of composite cross sections and the modelled extent/thickness of the palaeochannel deposits. The purpose of this first stage report will be to map the extent of the palaeochannel, broadly characterising infilling strata and propose test pit locations.

11.4 Stage 3 – Archaeological Test Pits

- 11.4.1 Directly following Review Point 4, Stage 3 (scheduled 20th May – 7th June) will continue to address Aims 1 and 2 with five hand dug test pits (varying between 1 x 1m and 2.4 x 2.4m depending on depth of channel sediments). Though an allowance of five test pits has been estimated, this will be contingent on the results of the borehole survey and the complexity of the deposits infilling the channel. If it transpires that there are a series of uniform channel fills and that these are found throughout the breadth and length of the channel, the number of test pits could be reduced to two or three. However, such simple infilling is unlikely given modern analogues, and it is proposed that five test pits are likely to be required to answer the following research questions:
- Q4. Can we reconstruct the depositional environment and sub-environments in which the channel sequence accumulated, as defined in Aim 1?
 - Q5. Can we determine the position of artefacts within the depositional sequence, and determine their contextual relationship with biological remains (particularly vertebrates)?
 - Q6. What are the typical and atypical features of the palaeochannel and can we infer its past micro-environment?
- 11.4.2 The purpose of the test pit investigation is to sample the infilling strata for archaeological, palaeoenvironmental and chronological purposes, as well as provide

an opportunity to record the lithostratigraphy in greater detail. Test pits will be positioned to collectively provide a record of all archaeologically and palaeoenvironmentally important deposits filling the palaeochannel, as well as sampling the deposits for archaeological, palaeoenvironmental and chronological purposes. Presuming sedimentary units of palaeoenvironmental potential will be encountered, a multiproxy sampling strategy will maximise the potential for spatial variation (lateral and horizontal). Continuous monolith sequences will be sampled from each test pit for pollen assessment and OSL dating, and associated 40lt samples for General Biological Assessment (microvertebrate; waterlogged plant remains; Mollusca; Coleoptera) collected in 0.1m spits from open faces adjacent to the monoliths (following Historic England 2011). Sampling will be overseen by respective palaeoenvironmental specialists, who will attend site during the excavation, to enable them to make an informed decision on which of the test pits samples would be the most appropriate to process and assess in Stage 4 (appendix 1, Page 40).

- 11.4.3 Investigations will also be carried out of the gravel strata overlying the palaeochannel during the test pit works (Appendix 1, Page 46). This Stage will culminate in Review Point 5, with the site archive assembled and pertinent samples/data distributed to specialists.

11.5 Stage 4 – Assessment Report and Updated Project Design

- 11.5.1 This Stage is the main reporting and recommendation stage of the project, culminating in Review Point 6 and focussing on the following research questions:

- Q7. What is the current state of preservation of the archaeological and palaeoenvironmental material across the site?
- Q8: How well do artefacts and palaeoenvironmental remains survive (including carbon isotope and sedaDNA) and what is their significance?
- Q9. Can a dating framework for the palaeochannel be established, and how does this inform the palaeoenvironmental and functional context of the excavated material?
- Q10. What is the range and spatial patterning of artefacts recovered from the palaeochannel, and what can be inferred of the early hominin presence from this material?

- 11.5.2 An adaptive processing selection strategy will be implemented, following specialist guidance on location and quantity of samples necessary to process in order to realise the aims of the evaluation received during Stage 3. Up to 10 samples will be processed and assessed per specialism, with the remaining samples stored until later project Stages.

- 11.5.3 The Updated Project Design will be produced following a specially convened workshop with the wider expert team, addressing Aim 4, culminating in Review Point 6 and focussing on the following research questions:

- Q11: What can an integrated synthesis of the results of this work with previous studies of contemporary regional sites tell us about the Site and its setting?

- Q12: What recommendations can be made to protect, conserve and enhance the Site, in the light of the issues and opportunities identified under Aims 1 - 3?

11.5.4 This work will be followed by Stage 5, where a decision to continue into analysis, further field work or closure will be made in consultation with HE.

12 STAGES, PRODUCTS AND TASKS

12.1 Methodological linkages

12.1.1 The project will be undertaken in five stages. These are set out in the table below and are set against the project aims and questions that will be met at each stage, the products that will be produced and the tasks undertaken.

Stage	Description	Project Aims/ Questions	Products	Task & ID Number
Stage 1	Project Start-up and Design	Aim 1-4 Q1-13	1. Finalised PD & Risk Log 2. Database Design 3. Digital Communication Plan 4. Risk Assessment & Health and Safety Plan	1.1 - Project Start up 1.2 – Project Team meetings 1.3 - Specialist and stakeholder liaison 1.4 - Specialists contributions to PD 1.5 - Project archive documentation 1.6 - First draft PD 1.7 - Illustrations PD 1.8 - Internal review 1.9 - Edit PD following comment 1.10 - Circulate to Project Team 1.11 - Edit PD following comment 1.12 - Submit PD to relevant parties 1.13 - Review Point 2
Stage 2a	Desk Based Assessment	Aim 1 Q1-3	5. Faunal Report 6. Artefact Report 7. Geotechnical Assessment	2.1 - Pre-site preparation 2.2 - Finalise the site programme 2.3 - RAMS circulation 2.4 - Set up Database and review existing borehole data

Stage	Description	Project Aims/ Questions	Products	Task & ID Number
				2.5 - Assess previously collected faunal material 2.6 - Assess previously collected artefactual material 2.7- Review Point 3
Stage 2b	Landscape Survey and Deposit Modelling	Aim 1 Q1-3	8. Field Walking Archive 9. Survey Archive 10. 3D Survey Archive 11. Interim Borehole Report	2.8 - DDT and Strategy Induction 2.9 - Photogrammetry 2.10 - GIS mapping 2.11 - Ground observation and survey 2.12 - Geoarchaeological boreholes 2.13 - Deposit modelling and Interim Report 2.14 - Propose test pit and sampling strategy 2.15 - Review Point 4
Stage 3	Targeted Field Investigation	Aim 1 Q1-3 Aim 2 Q4-6	12. Field Archive 13. Survey Archive 14. 3D Survey Archive	3.1 - Pre-site preparation & logistics 3.2 - Finalise the site programme 3.3 - RAMS circulation 3.4 - DDT and Strategy Induction 3.5 - GPS location of testpits 3.6 - Test Pit excavation & recording 3.7 - On-site processing 3.8 - Sampling for OSL dating 3.9 - Monolith and General Biological Assessment Sampling 3.10 - Site visits and meetings 3.11 - First Aid Conservation for Finds 3.12 - DDT records completed 3.13 – Review Point 5
Stage 4	Specialist Assessment and Updated Project Design	Aim 3 Q7-10 Aim 1-4 Q1-12	15. Stratigraphic & Specialist Assessment Report	4.1 - Stratigraphic assessment 4.2 – Lithostratigraphic assessment 4.3 - Circulate data 4.4 - Liaison with Specialists 4.5 - Multi-proxy assessment

Stage	Description	Project Aims/ Questions	Products	Task & ID Number
			16. Updated Project Design	4.6 - Artefact assessment 4.7 - Vertebrate assessment 4.8 - OSL dating 4.9 - Conservation assessment 4.10 - Project Team Meeting / workshop 4.11 - Review specialist contributions 4.12 - Integrate specialist contributions 4.13 - Report illustrations 4.14 - Integrated Assessment Report 4.14 - Circulate to Project Team 4.15 - Edit following comment 4.16 - Contributions to UPD 4.17 - Production of UPD 4.18 - Circulate PXA/UPD 4.19 - Edit following comment 4.20 - Circulate revised PXA/UPD 4.21 - Edit following comment 4.22 - Submit PXA/UPD 4.23 - Review Point 6
Stage 5	Closure or continue to next execution stage	Aim 1-4 Q1-12		5.1 - Update Oasis record and HER enhancements 5.2 - Prepare archive 5.3 - Deposit archive

Table 5: Methodological linkages

13 OWNERSHIP

13.1.1 The Copyright on all reports submitted will reside with DigVentures and the respective host institutions of each of the Expert team, and Historic England, although a third party in-perpetuity licence will automatically be given for reproduction of all products, subject to agreement with Historic England. The original copyright holder will retain copyright in pre-existing data, and Historic England will be granted a third party licence in perpetuity for project materials.

14 RISK LOG

Risk number	1	2	3	4
Description	Inclement weather - prolonged periods of rain	Exceptional weather (drying exposed archaeology)	Absence of core team member	Absence of specialist team member
Probability	Medium	Medium-low	Low	Low
Impact	Delay programme of work	Slow progress	Delay programme of work	Delay programme of work
Countermeasures	Provision of site hut, and planned indoor archiving tasks with flexible programme	Provision of water bowser + spray	Reallocate responsibilities or appointment of alternative	Reallocate responsibilities or appointment of alternative
Estimated time/cost	3 Days	None	Minimal if done by adjustment	Minimal if done by adjustment
Owner	Project Manager/Field Team Leader	Project Manager/Field Team Leader	Project Executive/Manager	Project Executive/Manager
Risk number	5	6	7	8
Description	Equipment theft/breakages	Serious site injury	Cost uplift due to unexpected archaeology requiring additional sampling	Delay in specialist contributions
Probability	Medium	Low	Medium	Medium
Impact	Delay programme of work	Delay programme of work	Reallocation or variation to agreed budget	Reallocate responsibilities or appointment of alternative
Countermeasures	Removal of finds material and digital equipment from site	Detailed H&S Risk Assessment + daily safety briefing	Comprehensive estimate of specialist costs undertaken at PD stage	Comprehensive estimate of specialist costs undertaken at PD stage
Estimated time/cost	3 days	3 days	Minimal if done by adjustment	Minimal if done by adjustment
Owner	Project Executive/Manager	Project Executive/Manager	Project Executive/Manager	Project Executive/Manager
Risk number	9	10	11	12



Description	Heritage Crime	Inclement weather impact on excavated remains (flooding)	Delay in provision of geotechnical data from adjacent quarry owners	Difficulty with executing borehole strategy due to subsurface obstruction
Probability	Medium	Medium	High	Med
Impact	Delay programme of work	Delay programme of work	No delay to programme of work	Delay to programme of work
Countermeasures	Notification of HE SW Heritage Crime Lead	Pumping regime (if possible) and plastic covers for any exposed archaeology	Incorporation into assessment report Stage 4	Alter proposed borehole pattern initially, followed by consideration of other remote sensing measures (such as electro magnetic induction)
Estimated time/cost	3 days	Variable – dependent on weather	No delay on field work	3 days
Owner	Project Executive/ Manager	Project Executive/ Manager	Project Executive/ Manager	Project Executive/ Manager/Expert Team Leader

Table 6: Risk log



1. Hand axe found in channel base 13th April 2017 by Sally Hollingworth



2. Hand axe found near channel base by Mark O'Dell in Spring/Summer 2017



3. Neville Hollingworth at [REDACTED] holding a mammoth tooth



4. Sally Hollingworth at [REDACTED] immediately after finding the hand axe



1. The [REDACTED] quarry site during extraction works. View is looking south from corner where BH1 is positioned



2. The [REDACTED] quarry site at present. [REDACTED]



3. One of the mammoth tusks visible on the ground surface at [REDACTED]



4. Items from Neville and Sally's collection from [REDACTED]. The catalogue lists 111 artefacts, including several not in their possession

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Appendices

16 APPENDIX 1 METHOD STATEMENTS

The methods for the proposed project will involve a combination of non-intrusive and intrusive investigation, including desk-based assessment of extant geotechnical data, GIS modelling, aerial photogrammetry survey, field walking, geoarchaeological boreholes, evaluation test pits, monolith and bulk sampling, specialist assessment and OSL dating. The methods are linked directly to the project aims and objectives (see Table 1) and detailed below.

Synthesis and Data integration	Multi-proxy Specialist Assessment	Artefact Assessment	OSL Dating	Monolith and Bulk Sampling	Archaeological Test Pit Excavation	Geoarchaeological Boreholes	Field Walking	Photogrammetry and Digital Terrain Modelling	Desk-base study of geotechnical sources and GIS Modelling	Key Questions and Objectives
						✓	✓	✓	✓	Q1
						✓	✓	✓	✓	Q2
						✓	✓	✓	✓	Q3
				✓	✓					Q4
				✓	✓					Q5
				✓	✓					Q6
				✓	✓					Q7
	✓	✓	✓							Q8
	✓	✓	✓							Q9
	✓	✓	✓							Q10
	✓	✓	✓							Q11
✓										Q12
✓										Q13

Table 7: Linking methods with objectives

Site survey and GIS modelling – Chris Casswell, DigVentures

All survey work will be carried out using a Trimble Real Time Differential GPS survey system. The Trimble VRS system is used in conjunction with a GPS Rover and/or Robotic Total Station unit, enabling accuracy to within 1cm. The survey data is exported from the data logger as a comma delimited file (csv) and managed within a GIS environment (QGIS), which will remain the principle conduit for all spatial data throughout the project.

Photogrammetry survey – Adam Stanford, Aerial-Cam

Photogrammetry survey will utilise AgiSoft PhotoScan 3D Modelling software to detect the feature points of the structure, and match these in different images to create a point cloud. The camera positions will be calculated automatically by the software and a dense reconstruction or geometric model will be built to create a DSM. The resulting DSM can be manipulated for viewing from any angle using a variety of artificial light and shading techniques to highlight certain features, or overlaid or draped with the original photographs for true colour representation.

Aerial Photogrammetry will be captured with a UAV/Drone, with grid flight plans flown over the survey area to capture vertical images from up to 50m in altitude. The resulting data images will then be processed to produce point cloud, mesh and textured 3D models and DEMs as Geotif files. The DEMs will then be geo-referenced to the National Grid via GPS positioned ground control points or by aircraft derived GPS coordinates. For ground-based photogrammetry, images will be captured perpendicular to the structure using telescopic mounted cameras, to deliver optimum results requiring little or no rectification. All images will be taken with a 16 megapixel Nikon D7000 digital camera with a variety of standard and other lenses and are captured in RAW format for later processing into high resolution JPG and TIF files, and downloaded directly on to the hard disk of the laptop.

Field walking – Dr Josh Hogue and Chris Casswell, DigVentures

Field walking will be based on a 15m grid system identical to the boreholes, ensuring maximum coverage of each grid square with a 2m wide observation corridor between each field walker. This will be undertaken in transects orientated NE-SW extending along the length of the exposed palaeochannel, with each grid square comprising a single collection unit. A dGPS system will be used to establish a survey baseline, in addition to defining collection points that will be marked with pegs and bamboo canes. Pro forma digital records will be made for each grid square, recording both the general surface conditions and an assessment of visibility (considering, for instance, the extent to which material may be weathering in contrast with previously walked grid squares). A rapid assessment of the site in 2016 (see Section 1.2) has established that faunal remains are distributed across the lateral extent of the palaeochannel, with bones dipping steeply below the exposed surface and therefore not recoverable without excavation. In consequence, any surface faunal or artefactual remains will be recorded by dGPS and a selective collection policy adopted. The strike/dip of any exposed faunal remains will be recorded with dGPS to establish if any taphonomic patterning can be determined. All human modified material will be collected, with faunal and palaeoenvironmental remains recorded and quantified where visible, but not disturbed or collected. Large faunal remains or concentrations of palaeoenvironmental material will be photographed in situ, and a detailed photogrammetry model made with ground control points surveyed with dGPS.

Geoarchaeological Boreholes – Dr Keith Wilkinson, ARCA

Geoarchaeological work will commence with a desk based assessment of extant geotechnical data available for the Site. A database will be set up within the RockWorks 17 geological utilities software package (RockWare 2018). Geotechnical borehole data for the Site and a 1km buffer around held in the British Geological Survey borehole database and by the quarry operator will be transferred to the RockWorks database. Borehole locations will be planned in an ArcGIS geodatabase. Coordinates from the geodatabase will be exported to a Trimble dGPS (see above) and that instrument used to both locate borehole positions in the field and record their position with respect to Ordnance Datum (OD).

The borehole survey will be conducted using a machine-powered percussion auger driving gouge heads. Initially boreholes will be drilled at 15m intervals along nine transects perpendicular to the palaeochannel (Figure 2). Based on the findings in these 34 samples, a further 16 boreholes will be drilled elsewhere along the perpendicular transects to better resolve the distribution of the palaeochannel deposits. Strata retained in the gouge auger heads will be described on site and then discarded, aside from one borehole that will be retained for XRF analysis. The lithostratigraphic data recovered will be compiled within a database of the RockWorks geological utilities program.

Mechanical boreholes will be drilled with an Atlas Cobra TT two stroke petrol-powered hammer driving 75-55mm diameter Eijkelkamp gouge augers. Strata recovered in the gouge augers will be photographed, described according to standard geological criteria and each layer so recognised will be assigned a unique 'Lithological Unit' designator (LU) (Jones et al. 1999, Munsell Color 2000, Tucker 2011). Each borehole will be drilled to bedrock and on completion the arisings will be used to backfill the borehole, i.e. samples will not be retained.

At the end of each day's work, lithological descriptions will be transcribed from the field notes and combined with positional information within a Microsoft Excel spreadsheet. The spreadsheet files will be stored both on the local hard drive of a laptop computer and on an internet cloud service. Once all boreholes have been drilled data held in Excel format will be migrated to a same RockWorks database that houses the existing geotechnical data. The latter software will be used to generate composite cross sections both along and across the palaeochannel, and also produce a deposit model showing the thickness and distribution of the channel sediments.

Gravel Terrace Recording – Dr Keith Wilkinson, ARCA

A photogrammetric and Total Station record will be made of sections through the (presumed) Northmoor Member gravels exposed in the quarry walls, while lithostratigraphic logs will also be compiled for representative sections. Strata will be recorded using the same descriptive approach as employed for the description of gouge auger and test pit wall records, while each Northmoor Member bed will be allocated a unique LU. Samples for biostratigraphic assessment and OSL dating (see below) will be taken from basal strata within the Northmoor Member on an opportunistic basis so as to provide a *terminus ante quem* age for the channel sediments.

Evaluation Test Pits – Dr Keith Wilkinson, ARCA; Dr Josh Hogue and Chris Casswell, DigVentures

Five hand-dug test pits will be excavated under constant supervision of a Palaeolithic archaeologist (Josh Hogue) and/or a geoarchaeologist (from ARCA), supported on site by vertebrate and conservation specialists as required (see below). Given the waterlogged nature of the site, pumps will be utilised to ensure all working areas are accessible at all times. Test pit positions will be decided on the basis of data recovered by the borehole survey. Test pit locations will be plotted in ArcGIS, transferred to an RTK GPS and located on the site as described for boreholes above. Each test pit will each have a surface footprint of between 1 x 1m and 2.4 x 2.4m depending on depth of channel sediments. They will be excavated in 0.20m thick horizontal spits (or less where a new LU is encountered), with each spit being archaeologically (for artefacts and vertebrate remains) and geologically (for sedimentological properties including gravel size, shape and lithology) recorded before the next spit is dug. In addition to monolith and General Biological Assessment samples (see below) a 40l sub-sample will be sieved from each spit through an 8mm mesh.

Artefacts and faunal remains exposed in plan during the excavation of a spit will be both dGPS and photogrammetrically recorded (to provide an absolute three-dimensional position), allocated a unique 'find' code and manually removed before the next spit is excavated. The precise location, tilt and orientation of all lithic and faunal artefacts greater than 20mm will also be recorded. This will entail recording the x,y,z coordinates of the central point, orientation and slope for all finds greater than 20mm. Excavation and interim conservation of any large faunal remains will be overseen by Nigel Larkin. Artefacts and faunal remains will be recorded (type and quantity) with respect to LU on the test pit proforma, bagged by LU and spit, and transported to DigVentures/ARCA's laboratories for further study. Once recovered, Palaeolithic lithic finds will be examined (including classification – in terms of technology, typology and raw material, quantification, drawing and photography where relevant) by Josh Hogue while vertebrate faunal remains will be assessed by Adrian Lister, Danielle Schreve and Kate Scott. Photogrammetry will be undertaken for all artefacts deemed appropriate (such as

A geoarchaeologist will be constantly present and will describe the lithology of beds exposed in one or more of the test pit walls, allocating each stratum a unique LU identifier. Upon reaching a depth of 1.2m BGL and if bedrock has not been reached, the test pit will be stepped in by 1m and will be continued to 2m depth or the bedrock, whichever is the lesser. On completion of each test pit, its walls and the base will be recorded photogrammetrically, while the former will also be recorded by means of a total station-produced drawing. Lithological descriptions will be made according to the same standard geological criteria used in the borehole survey (Jones et al. 1999, Munsell Color 2000, Tucker 2011). These data and other parameters concerning each test pit will be recorded on a proforma. Descriptions on the proforma will be organised by LU designator, while finds (artefactual and faunal) will be labelled with and grouped by the appropriate LU. The geoarchaeologist will also digitally photograph the test pit walls that are described against an appropriate scale (i.e. a surveyor's staff).

Lithostratigraphic data collected during the test pit study will be transferred to the RockWorks database holding the borehole and geotechnical data, and revised composite cross sections and deposit models produced. A full geoarchaeological and archaeological report will be produced on completion of the test pit sampling exercise. It will then be updated following

the completion of archaeology and biostratigraphic assessment, and OSL dating. OSL age determinations will be returned for the top, middle and bottom of the processed test pit sequence (see below).

Test Pit Sampling Strategy

The palaeoenvironmental sampling strategy is designed to recover samples of wet-preserved sediment from all five of the test pits excavated in the wetland area, with a sub-set of these (10 per specialism) selected for processing in order to realise the aims and objectives of the evaluation. The remaining samples will be stored pending later stages of the project (analysis or further field work). Sampling will be overseen by respective palaeoenvironmental specialists, who will attend site during the excavation, to enable them to make an informed decision on which of the test pits samples would be the most appropriate to process and assess, given the evaluative aims of the project and the proposed budget of 10 assessed samples per specialist.

Continuous monolith sequences will be sampled from each test pit for pollen assessment and OSL dating, and associated 40l samples for General Biological Assessment (microfauna; waterlogged plant remains; Mollusca; Coleoptera) collected in 0.1m spits from open faces adjacent to the monoliths. General Biological Assessment samples will be transported off site, with individual specialists advising on the quantity of samples requiring processing in order to meet the aims of the evaluation (see below). For instance, priority should be given to finer-grained sediments (sands, silts, clays), especially those that are visibly shelly. Optimal recovery will also be determined by the location of the test pit in relation to the palaeochannel profile (such as at the dryland margin or within the deeper central channel). Samples will be stored in lidded plastic boxes and should be labelled with the site, context, sample number and depth, both inside and outside. To ensure an adaptive sampling strategy can be implemented, a budget allowance of 10 samples per specialist has been estimated (see associated budget sheet 

Samples will be weighed before processing to allow evaluation of the relative richness of the individual samples in terms of weight of biological material per kilogramme of sediment. In order to ensure effective processing of the samples, the nature of the deposits and the clay fraction within the sediments will be evaluated beforehand. It may be necessary either to air-dry the samples on trays (to weaken the hydrophilic bond of the clay particles) or to pre-soak the samples for a minimum of 24 hours in a solution of 10% sodium hexametaphosphate. Samples should be washed gently through a 500-micron mesh sieve until all the sediment has been removed. The clean residues will then be dried (either air-dried or with a gentle source of heat, avoiding prolonged exposure to temperatures over 60 degrees C), labelled and bagged in resealable bags for analysis. Processed samples will be weighed (in order to note percentage loss of sediment) and then graded into different size fractions (>4mm, 2-4mm, 1-2mm, <1mm, to facilitate sorting and extraction of remains.

Faunal Remains – Prof. Adrian Lister (Mammoth), Dr Kate Scott (Large Vertebrate) and Prof. Danielle Schreve (Microvertebrate)

Faunal remains study will begin with an assessment of material previously collected from  Mammoth molars and bones will be measured according to standard protocols (see Lister & Joysey 1992 and Lister & Sher 2015 Supplement). Measurements will be plotted

against Lister's extensive database on UK and continental European Middle to Late Pleistocene mammoths to compare them with samples from various MIS 7, MIS 6 and last-glacial sites in particular, for biostratigraphic and evolutionary interpretation. Other large vertebrates will be assessed for species identification, age structure, quantification and human interaction (such as cut marks) drawing on correlating assemblages assessed by the project team at Latton and Stanton Harcourt (Scott in Lewis et al. 2006).

20L samples will be processed for microvertebrate assessment and divided into fractions (see above). The largest fractions will be scanned by eye, whereas the smaller fractions will be scanned under a low-power microscope. All microvertebrate remains will be extracted using foil tweezers and placed in labelled test-tubes, together with any mollusc shells, plant or other remains, or micro-debitage. Microvertebrate remains will be weighed (to assess sample richness and evaluate any change through the sequence) and then split into fish, reptiles and amphibians, birds and small mammals. Non-mammalian remains will be passed to other specialists, as required, while all mammalian remains will be identified to species level (or to genus, Family or higher level as appropriate). Identification of small mammals will focus on dental remains, since these are most diagnostic to species level. Quantification of numbers of identified specimens and minimum numbers of individuals will be provided, together with a preliminary statement of taphonomic factors relating to the assemblage, palaeoenvironmental reconstruction and biostratigraphic (age) inference.

Lithics – Dr Josh Hogue, freelance (DigVentures core project team)

Recording of the lithic assemblage follows the methods outlined elsewhere for the recording of artefacts from British Early Middle Palaeolithic (EMP) sites (Scott 2006, 2010). The chosen method is typo-technologically focused allowing for a greater understanding of the taphonomic history of the assemblage and its recovery context, the technological strategies adopted at the site, and allows comparisons with existing work, placing the assemblage into its broader chronological and geographical context. If possible, refitting of the assemblage will be undertaken to better understand the development of the site, helping to establish if the site is definitely in situ, and relate artefacts to specific reduction episodes to human activity. Stoneham's Pit, Crayford (Cook 1986; Scott 2006, 2010) has until recently been the only EMP occurrence with refits and this has recently been potentially added to with work at Harnham (Bates et al. 2014).

Coleoptera – Dr David Smith, University of Birmingham

Samples will be processed using the standard method of paraffin flotation as outlined in Kenward et al. (1980) and will be stored in ethanol. The system for 'scanning' faunas, as outlined by Kenward et al. (1985) will followed in this assessment in order to identify preservation, quantity and interpretative value of any insect fauna recovered. If necessary insect identifications will be confirmed with reference to the Gorham and Girling Insect Collections housed in the Department of Classics, Ancient History and Archaeology and the Coope and Osborne collection of dried Pleistocene fossils housed in the Lapworth Museum, University of Birmingham.

Pollen – Dr Thomas Hill, Natural History Museum

The specific strategy will be dependent on the thickness of the unit(s) in question, but the strategy developed will utilise a systematic sampling approach (2, 4, 8, 16cm sample intervals), with a sample size of c. 1cm³ (or 10g) desirable. Additional samples will be taken for archiving for further analysis if initial assessments prove the sequence to be of high palaeoenvironmental potential. Pollen preparation will follow standard techniques which will be modified based on the type of sediments encountered during excavations (whether they be organic, minerogenic or CaCO₃-rich). Such techniques may include potassium hydroxide (KOH) digestion, hydrofluoric acid (HF) treatment and acetylation (Moore et al., 1991). A count of at least 100 total land pollen grains (TLP) excluding aquatics and spores will be attempted for each sample during the initial assessment.

Mollusca – Dr Matthew Law, L-P Archaeology

Samples for molluscan analysis will be air-dried and a standard weight of sediment (likely 1kg) processed using a 250µm mesh sieve (see above). The resultant residue will be air dried and scanned under a low power binocular microscope and molluscs identified to species level using a reference collection. Ecological interpretation will be carried out with reference to standard sources (Evans 1972; Kerney and Cameron 1979; Davies 2008). Nomenclature will follow Anderson (2008).

Plant macrofossils – Dr Marta Perez, Department of Geography, Royal Holloway University

General biological analysis (GBA) samples of 1 litre in volume are processed for the recovery of waterlogged plant macrofossils following the techniques outlined in Kenward et al (1980, and see above). Samples will be assessed in accordance with Historic England guidelines for environmental archaeology assessments (English Heritage 2011). A preliminary assessment of the samples is made by scanning using a stereo-binocular microscope (x10 - x65) and recording the abundance of the main classes of material present. The research potential and significance of the assemblage is assessed with recommendations made for further analysis.

Samples selected for analysis are fully sorted using a low power binocular reflected light microscope (x10 – x 65). Identification of plant macrofossils and wood charcoal is carried out to as high a taxonomic level as possible by comparison with modern reference material in the Department of Geography, Royal Holloway University and various reference works (e.g. Cappers et al 2006; Schweingruber 1990; Hather 2000). Waterlogged plant material will be stored in 70% dilute ethanol and distilled water in airtight glass jars and kept refrigerated, in accordance with Historic England guidelines for the curation of waterlogged macroscopic and invertebrate remains (Historic England 2008).

On-site conservation and assessment – Nigel Larkin, Natural History Conservation

Artefacts will be recovered as a matter of routine during the excavation. When retrieved from the ground finds will be kept in a finds tray or appropriate bags in accordance with First Aid for Finds (Walker 2001; with additional reference to Historic England 2018, Waterlogged Organic Artefacts). All finds will be stored in optimum conditions in accordance with First Aid for Finds and Guidelines for the Preparation of Excavation Archives for Long-Term Storage (Walker, 1990; Brown 2007). The conservation assessment report will include statements on

condition, stability and potential for further investigation (with conservation costs) for all material groups. The conservation report will be included in the updated project design prepared for the analysis stage of the project.

The excavation and removal of large faunal remains will be undertaken under the guidance of a conservator. Once removed from the ground, they will immediately be placed into an appropriate receptacle i.e. a large polypropylene tray or crate lined with Plastazote foam, and transported on a purpose-built stretcher. Exceptions to this are: large, long limb bones that have cracks in them; any bones that appear to be broken already in situ; and mammoth tusks. All such items will be excavated carefully, then covered in acid-free tissue followed by foil and then plaster of paris with hessian strips. Larger items will also need wooden splints to make sure the jackets are rigid. Once jacketed appropriately, the specimens can be lifted, turned over, and carried away in these field jackets. This will ensure that the pieces of the specimens are kept in place in association with one another, and that specimens will dry out more slowly as the jackets provide a buffering to the elements. Additionally, field jackets will provide protection to specimens whilst being transported.

If specimens in situ are fragile, friable and/or in pieces the conservator will advise on consolidation measures required prior to lifting, including adhering pieces. Only reversible polymers will be used in the field, such as Paraloid B72 in acetone. Such products can be dissolved and removed if necessary in the cleaning and conservation phase and the material cleaned before any further consolidation and repairs required. If vulnerable specimens in the field are wet but need to be lifted a process called 'solvent drying' can be used: applying small amounts of acetone to the specimen aids in the evaporation of water, removing water from the pore spaces and making room for the consolidant to be applied.

A thorough photographic record will be kept of all faunal remains, comprising photographs of in situ material as found, with labels including unique identifying numbers; and, in-process excavation photos of the specimen, including close-up shots of the find as well as contextual information. Additionally, we will be recording locations as detailed in the second paragraph of the test pit methodology, Appendix 1, page 39: 5D, with a further clarification included: x,y,z coordinates of the central point, orientation and slope) will be recorded for all finds greater than 20mm. Any bone that extends beyond a test pit margin would need to be left in situ (within reason of course). Otherwise bone would be recorded (by total station measurement – one point at either end for pieces of >5cm length – and photography) and removed/retained (by lithological unit).

Most material should be lifted without any treatment required, placed on or within appropriately sturdy receptacles, supported underneath and from the sides with appropriate materials. Exceptions could be mammoth tusks, and possibly large long thin bones such as limb bones, whose mechanical integrity have been compromised due to intervention by early humans (smashing bones for access to marrow for instance) or trampling by other mammoths: taphonomic evidence that needs to be preserved as well as bones that have specific mechanical integrity issues. Such bones or tusks, which are would clearly fall apart if lifted as found, will be carefully excavated and sturdily jacketed using the appropriate techniques described previously.

There should be no need to immediately clean the specimens after excavation, and these will be cleaned only if they need to be identified further. Should this be necessary, cleaning and conservation should consist of the gentlest and least invasive of methods and materials: i.e. small soft dry brushes and small wooden hand tools for cleaning; reversible adhesive and consolidants for repairs and consolidant etc. (such as Paraloid B72 in acetone). Appropriate PPE should be worn (disposable gloves and dustmasks). The bones and tusk material should not be wet cleaned (wetting and drying cycles are deleterious to the bones). Material should therefore only be dry cleaned using small artists' brushes and small wooden hand tools to remove sediment, ensuring that the bone surfaces are not scratched.

If removing sediment would make the specimen vulnerable to collapse, consolidating the sediment and leaving it in place should be considered. All sediment removed from bones will be bagged and labelled appropriately. Specimens should be allowed to dry out slowly, or splitting and cracking will take place. Freshly excavated material will not be stored in areas with central heating where temperatures are too high and the relative humidity (RH) too low (such as in offices where people work). However, neither will they be stored in an environment where RH and temperature fluctuate greatly (i.e. not outside, and certainly not in direct sunlight). Ideally the relative humidity should not exceed 60% nor fall below 45% but the most important requirement is to avoid fluctuations, especially rapid and extreme fluctuations.

Friable areas that are vulnerable to damage by handling should be consolidated by Paraloid B72 in acetone at 5%, and any breaks that need to be repaired should be adhered with Paraloid B72 adhesive after appropriate consolidation. Specimens should be stored on clean, fresh, archival products that support their weight adequately, e.g. in nests of shaped acid-free tissue on archival foam in polypropylene boxes or crates. At the end of the cleaning process photographs will be taken of each side of each specimen, including their unique find number in shot. A consistent written record will be kept of the cleaning and conservation of each find, describing the processes and materials used and any weaknesses or other issues noted.

Optical Dating – Prof Phil Toms, University of Gloucestershire

Given the location and known efficacy of Optical Dating methodologies in this region, OSL has been selected as the most appropriate dating strategy to realise the aims of the evaluation (supplanting the need to undertake AAR at this stage).

Optical age estimates of sedimentation are premised upon the reduction of the minerogenic time dependent signal (Optically Stimulated Luminescence, OSL) to zero through exposure to sunlight and, once buried, signal reformulation by absorption of litho- and cosmogenic radiation. The signal accumulated post-burial acts as a dosimeter recording total dose absorption, converting to a chronometer if the rate of dose absorption is quantified through the assay of radioactivity in the surrounding lithology and streaming from the cosmos.

Conventional (matrix-supported) sediment samples will be obtained in daylight from sediments within boreholes and/or exposed in section. Samples will be retrieved by opening the core under controlled conditions or by means of opaque plastic tubing (50 x 200 mm) forced into each section. Gamma (γ) spectra will then be measured in situ for each sample or, where precluded by borehole depth/diameter, by means of interval sampling; this process aims to accommodate any heterogeneity in the surrounding γ field and improve the accuracy

of γ dose rate assessment. An additional 100 g of sediment from each sample location will be collected for laboratory analysis by high precision Ge gamma spectrometry. The sampled section will be recorded, noting in particular the thickness of overburden for each sample, geographical location, the thickness and composition of stratigraphic units and the location of any independent chronological controls.

Age is defined by the quotient of equivalent dose (D_e) and dose rate (D_r) values. Given the anticipated antiquity of the deposits (Mid-Pleistocene), D_e values for each sample will be derived from paired measurements, of both quartz and K-feldspar sands (Murray and Olley, 2002; Li et al., 2014). Post-excavation assessment is two-fold. Firstly, in discussion with the client, samples will be identified that by their relative stratigraphic position have the greatest potential to address the archaeological questions. Secondly, the availability of sufficient datable material will be determined. In the laboratory, under filtered red light, fine sand sized quartz and K-feldspar will be isolated from each sample by means of dry sieving, alkali (H_2O_2) and acid (HCl) digestion, density separation and, for quartz only, a further acid (HF) digestion. The timescale for this initial assessment will vary with the number of samples commissioned, but this element is normally completed within 3-4 weeks. A minimum of 95 mg of fine sand quartz or K-feldspar provides sufficient datable material.

The accumulated OSL signal will be calibrated using known laboratory doses to yield a measure of D_e (Murray and Wintle, 2000; 2003; Li et al., 2014) facilitated by a Risø TL-DA-15 irradiation-stimulation-detection system (Markey et al., 1997; Bøtter-Jensen et al., 1999). Lithogenic D_r values will be defined through measurement of U, Th and K concentrations from the in situ NaI gamma spectrometry (for γ contributions) and by Ge gamma spectrometry (for β and, if sampled from a borehole, γ contributions). High precision Ge gamma spectrometry will be conducted to provide direct assessment of current U disequilibrium. Estimates of concentration will be converted into D_r values (Adamiec and Aitken 1998), accounting for D_r modulation forced by grain size (Mejdahl, 1979) and moisture content (Zimmerman, 1971). Cosmogenic D_r values will be calculated on the basis of sample depth, geographical position and matrix density (Prescott and Hutton, 1994).

The standard error on luminescence age estimates will be quoted at 1σ confidence and based upon the propagation of both systematic and experimental (1σ) standard errors associated with each parameter contributing to the calculation of D_e and D_r values. A report, structurally aligned with Historic England's research reports, will be produced. The interval between commencing measurements and reporting will depend on the number of samples. For a Mid-Pleistocene, paired Luminescence measurement, the processing time is c. 2-3 weeks per sample. A budget allowance for six OSL determinations has been made (see associated budget sheet .

Waterlogged wood and Dendroclimatology Pilot Study – Prof. Mary Gagen, Swansea University

The assessment of waterlogged wood will be led by Professor Mary Gagen, Swansea University, who is an expert in dendrochronology and dendroclimatology with a specialism in stable isotope methods. As we expect to need to identify potentially degraded subfossil wood samples from the site, Swansea's wider network of contacts from within the UK dendro community will be consulted as necessary. The planned methodology is to carry out field ID as possible and take samples for full identification under laboratory conditions. Wood slices

(in the order of 20 μm thickness) will be taken using microtome, to produce thin section for wood anatomical identification as necessary.

Additional consultants for this process will be:

Dr Martin Bridge, Institute of Archaeology, UCL. <http://www.martinbridge.co.uk/> . Dr Bridge is a specialist in dating historic growth timbers and the dating of medieval and post-medieval buildings and artefacts.

Dr Dan Miles runs the Oxford-Dendro laboratory <http://www.oxford-dendrolab.com/>. Oxford-Dendro is an independent tree-ring dating lab with close links for training with the Research Laboratory for Archaeology and the History of Art, Oxford University, as well as the Scientific Dating Section, English Heritage.

Assuming the dating range of the site falls, conservatively, in a warm stage period from MIS 3 to 7 (potentially an age range of 27,000 to 245,000 years BP) there is potentially much to be gained from an examination of the water and carbon isotope variability in trunk wood fragments from the site. Water isotope ratios in UK wood samples (analysed using stable isotope dendroclimatology) will potentially reveal information about past atmospheric temperatures, whilst carbon isotope ratios can contain information about past temperature and hydroclimate. Whilst traditional, ring width based, dendrochronology methods are unlikely to be suitable given the age of the site, and the likely number of rings within trunk wood samples being small, we will use isotope methodologies to explore the palaeoclimatic signal.

Depending on the quality of preservation, species can be identified by their wood anatomy and, where possible, isotopic ratios in individual tree rings analysed to explore their range over a floating time window. This can potentially give windows of paleoclimate information within the broader stratigraphy, as indicated below, giving insight into the climatic conditions relevant to the faunal and human finds. There are few examples of the use of dendroclimatology back into the Pleistocene and fewer still of using stable isotope methods to explore the potential of Pleistocene dendroclimatology. This site, depending on the preservation quality of the wood samples, provides a possibility to develop and test the palaeoclimatic potential of tree ring analysis back into the Middle Pleistocene.

Professor Tony Brown

Professor of Physical Geography, Research Group Leader, Research Director of GeoData, PLUS Research Group Leader

Visiting Professor, Department of Natural History, University Museum Tromsø, Norway

<https://www.southampton.ac.uk/geography/about/staff/ab1e06.page>

Tony is a geoarchaeologist and palaeoecologist with long-standing interests in alluvial geoarchaeology, climate and vegetation change, and has published nearly 200 academic papers and 9 books. Since his PhD at Southampton he has been a staff member in the Departments of Geography and Archaeology at both the Universities of Leicester and Exeter in the UK. He has supervised nearly 30 postgraduate students and undertaken several major geoarchaeological projects in Britain, Ireland, Scotland, Italy, East Africa and Norway. His current major projects are Flood and Flow: Place Names and the Changing Hydrology of English and Welsh Rivers (funded by the Leverhulme Trust); Celtic Connections and Crannogs: A new Study of Lake Settlements Across the Irish Sea (funded by AHRC), ECOGEN (funded by the Norwegian Science Council), and Jomon Wetland Archaeology: A New Palaeo-nutritional Approach (funded by Leverhulme). His recent archaeological publications include Brown et al. 2016 The Environmental Context and Function of Burnt-Mounds: Palaeoenvironmental Studies of Irish Fulacht Fiadh. Proceedings of the Prehistoric Society 82, 259-290 and Brown, et al. 2017. Eels, beavers and horses: Human niche construction in the European Late Upper Palaeolithic. Proceedings of the Prehistoric Society 87.

Professor Mary Gagen

Swansea University

Professor, Geography

<https://www.swansea.ac.uk/staff/science/geography/m.h.gagen/>

A broadly trained physical geographer with a research specialism in high-resolution palaeoclimatology. Mary is interested in developing reconstructions of past climates, primarily from the information stored in tree rings, is developing dendroclimatology based palaeocloud reconstructions in the northern Boreal forest and in Sabah, Malaysian Borneo. Mary's research focuses on the use of stable isotope dendroclimatology in 'non-traditional' environments and in the development of palaeoclimatic reconstructions from broad networks of traditional and novel tree ring proxies.

Dr Ben Garrod

Anglia Ruskin University

<https://www.anglia.ac.uk/people/ben-garrod>

Ben is an evolutionary biologist, author and broadcaster. With a degree in Animal Behaviour, Masters in Wild Animal Biology and a NERC-funded PhD entitled 'Primates of the Caribbean', he has worked across the world with a range of species, with a focus on great apes and other primates. Ben is an award-winning BBC science broadcaster, presenting, among other things, 'Secrets of Bones', 'The Day the Dinosaurs Died' and 'Attenborough and the Giant Dinosaur'. Ben's institutional affiliations include being a Trustee for the UK Jane Goodall Institute; Ambassador for the Norfolk Wildlife Trust; Ambassador for Bristol Museum and Art Gallery;



Patron of the Natural Sciences Collections Association (NatSCA); Ambassador for the Marine Conservation Society; and Fellow of the Linnean Society.

Dr Tom Hill

Natural History Museum

Head of the Economic and Environmental Earth Sciences (EEES) Division; Micropalaeontology Sector Leader, Earth Sciences Department

<http://www.nhm.ac.uk/our-science/departments-and-staff/staff-directory/tom-hill.html>

Tom is a micropalaeontologist specialising in the analysis of Quaternary sedimentary archives in order to reconstruct past environmental conditions. Specialisms include: Biostratigraphy, Diatom Analysis, Geoarchaeology, Holocene Sea-Level Change, LGIT, Micropalaeontology, Pollen Analysis, Quaternary Palaeoenvironments.

Dr Joshua Hogue

DigVentures – Palaeolithic Specialist

Josh is currently involved with fieldwork projects re-investigating key Lower and Middle Palaeolithic sites in Britain as part of the project 'Pathways to Ancient Britain' based at the British Museum and Natural History Museum, London, and the 'Breckland Palaeolithic Project' based out of Queen Mary University of London. His on-site work includes archaeological and geoarchaeological investigations at Barnham Heath, Beeches Pit, Redhill, Broomhill Gravel Pit, Santon Downham, Maidcross Hill, East Farm. He is currently undertaking experimental archaeological work to help interpret evidence of fire from the British Lower Palaeolithic. He gained his doctorate on the Leverhulme-funded 'Cemeteries and Sedentism in the Epipalaeolithic of North Africa' based at the University of Oxford. He is currently the Treasurer and Membership Secretary of the Lithic Studies Society, sits on the bursary sub-committee, and co-organises the annual conference. He has recently been made a Visiting Research at the University of Lincoln.

Nigel Larkin

Freelance Consultant, Natural History Conservation

<http://www.natural-history-conservation.com/biog.htm>

<http://cambridge.academia.edu/NigellLarkin>

Nigel is a conservator of natural history specimens specialising in the excavation, preparation, conservation, curation, storage and display of geological, palaeontological, archaeological and osteological material. Previously the Project Manager of the West Runton Elephant Conservation Project and Curator of Geology for Norfolk Museums and Archaeology Service, he has worked as an excavator and site conservator on internationally important excavations in Swanscombe, Happisburgh, Pakefield, Norton Subcourse, and Lynford. He is a Fellow of the Royal Geographical Society, committee member of the Geological Society of Norfolk, Committee member of the Geological Curators Group and a member of the Natural Sciences Collections Association Conservation Committee, and an Associate Member of the Ancient Human Occupation of Britain (AHOB) Project, member of; the Natural Sciences Collections Association, Society for the Preservation of Natural History Collections, Geological Curators Group, Shropshire Geological Society, the British Artist Blacksmiths Association, Museums Association and the Institute of Conservation.



Dr Matt Law

Senior Lecturer, Environmental Change and Sustainability, Bath Spa University

Environmental Archaeology Specialist, L-P Archaeology

<https://www.bathspa.ac.uk/our-people/matthew-law/>

Matt is a specialist in marine, freshwater and terrestrial mollusc shells, as well as other invertebrate remains such as parasite eggs, foraminifera and bryozoans. In his current role at L-P Archaeology, Matt designs fieldwork sampling strategies, on site geoarchaeological analyses and co-ordinates post-excavation analysis of biological remains. He works concurrently as a part time Senior Lecturer in Environmental Change and Sustainability at Bath Spa University. He previously worked as a freelance environmental archaeologist, analysing assemblages from the UK, Albania, Nigeria and Turkey for clients including The British Museum, University of Nottingham, Cornwall Council and numerous contract archaeology units.

Professor Adrian Lister

Research Leader in Palaeontology, Natural History Museum

Honorary Professor, University College London, Genetics, Evolution and Environment

<http://www.nhm.ac.uk/our-science/departments-and-staff/staff-directory/adrian-lister.html>

Adrian is a palaeobiologist interested in patterns and processes of species-level evolution, adaptation and extinction. His research focusses mainly on Quaternary to recent large mammals, with special expertise in deer and elephants (including mammoths). The main ongoing projects in his group are: (1) the origin and dwarfing of endemic mammal species (especially elephants and deer) on Mediterranean islands in the Quaternary; (2) the timing and causes of extinction of large mammals ('megafauna') in the Late Quaternary, by mapping the shifting ranges of mammal species in relation to vegetation and people; (3) patterns of speciation and adaptation in fossil elephants and other mammals, with a particular interest in the role of behaviour in initiating adaptive change.

Dr Marta Perez

Palaeoecologist, Royal Holloway University

Marta is a colleague and Project collaborator of Professor Danielle Schreve in the Department of Geography at Royal Holloway University. She was awarded a PhD in the Faculty of Sciences and Technology at Plymouth University for researching the use of high resolution pollen analysis to reconstruct past landscapes, soil geochemistry and GIS. Her current work is focussed on early Quaternary sediments, assisting students and staff with macrofossils, and she has previous experience in commercial archaeology, specifically archaeobotany, sampling, processing and analysing plant macrofossils.

Dr David Smith

Senior Lecturer in Environmental Archaeology. Department for Archaeological Studies. The University of Birmingham



David has considerable experience gained over the last 25 years in site-based archaeoentomology using the remains of both beetles and flies to address issues concerning the reconstruction of the past human landscape, living conditions, hygiene and craft and manufacture. He has worked on both a wide range of geological and archaeological material; working in co-operation with a range of field units and other environmental specialists, including the English Heritage Midlands Regional Team.

Adam Stanford

Remote Pilot Qualification (RPQ-s), Civil Aviation Authority Permission for Commercial Operation

<http://www.aerial-cam.co.uk/>

Adam is Director of Aerial-Cam Ltd. and a Member of the Chartered Institute for Archaeologists, a Life Member of the Council for British Archaeology and Hon. Research Fellow at the School of Archaeology, Cardiff University. Adam is a specialist in aerial photography and photogrammetry, using Remotely Piloted Aircraft (RPAS, UAVs, Drones), Telescopic Masts and manned Aircraft for aerial photography, photogrammetry and video recording. Adam has worked on high profile archaeology and heritage sites across the world, including Orkney, Stonehenge, and Easter Island.

Professor Philip Toms

Academic Subject Leader in Environmental Sciences
University of Gloucestershire

<https://orcid.org/0000-0003-2149-046X>

Phillip's research and consultancy focuses on the development and application of luminescence dating. Of late, his research has focused on the past environments of South Africa and instances of hominin occupation in East Africa and Australia.

Dr Keith Wilkinson

Founder and Director, ARCA Geoarchaeology
Reader, Environmental Archaeology, University of Winchester

<http://www.arcauk.com/kwilkinson-staff.html>

Keith has been involved in commercial geoarchaeological and GIS projects for over 25 years, has directed such projects since 1998 and has published extensively on the earth sciences in archaeology (including a textbook on environmental archaeology in 2003, together with Chris Stevens). Keith's research interests outside UK geoarchaeology include the role of humans in Quaternary evolution of Mediterranean and Near-Eastern landscapes, the geoarchaeology of Palaeolithic sites in the Transcaucasus, and the use of GIS in archaeological survey. To this end and as well as his work in the UK, Keith has undertaken geoarchaeological research in Armenia, Bulgaria, France (mainland and Corsica), Georgia, Greece (mainland and Crete), Libya, the Netherlands, Spain and Syria. ARCA is the only specialist geoarchaeological contractor in the UK to be awarded CIfA Registered Organisation status. Keith will be assisted by Dr Nick Watson, Dr Monika Knul, Dr Paul Watson, and Dr Jenni Sherriff from ARCA:

<https://www.winchester.ac.uk/about-us/leadership-and-governance/staff-directory/staff-profiles/sherriff.php>

<http://www.arcauk.com/home.html>





Lisa Westcott Wilkins

MANAGING DIRECTOR

BA MA MCIFA FRSA
LISA@DIGVENTURES.COM
@LISAWILKINS

Lisa has extensive experience delivering high-profile projects in the heritage and culture sectors, having held leadership posts in several organisations including LOCOG, *Current Archaeology* and the Palaeontological Research Institution. An accredited coach and facilitator, Lisa is skilled in brokering and developing partnerships and building communities. She has a track record of implementation for profile-building activities, evaluation, interpretation and events, and is a sector innovator in engagement with digital technology and consumer trends in a heritage context. She is a Clore Fellow and Fellow of the Royal Society of Arts.



EXPERIENCE

MANAGING DIRECTOR | 11.2011 - PRESENT
DIGVENTURES

PROJECT MANAGER | 2011 - 2012
LONDON ORGANISING COMMITTEE FOR THE OLYMPIC
GAMES (CULTURAL OLYMPIAD, EVALUATION)

EDITOR | 2007- 2011
CURRENT ARCHAEOLOGY

FREELANCE | 2010 - 2015
CHARTERED INSTITUTE FOR ARCHAEOLOGISTS,
GLOBAL HERITAGE FUND UK, ITV (SHIVER)



KEY COMPETENCIES

- Heritage sector project design and delivery
- Digital techniques and workflows for heritage activities
- Crowdfunding campaign design, execution and consultancy
- Strategic and business planning for cultural programmes
- Stakeholder relationship management
- Community-focussed archaeological fieldwork and skills training
- Historic research (Desk Based Assessment)
- Writing and editing for digital and print publication



EDUCATION AND AFFILIATIONS

MEMBER | 2014

CHARTERED INSTITUTE FOR ARCHAEOLOGISTS

CIfA is the leading professional body representing archaeologists working in the UK and overseas.

FELLOW | 2011

ROYAL SOCIETY OF ARTS

The RSA's mission is to create the conditions for the enlightened thinking and collaborative action needed to address today's most pressing social challenges.

FELLOW | 2010

CLORE LEADERSHIP PROGRAMME

The Clore Leadership Programme was set up to develop outstanding cultural leaders in the UK.

MENTOR: Sandy Nairne, Director, National Portrait Gallery (former)

MA ARCHAEOLOGY (DISTINCTION) | 2002

UNIVERSITY COLLEGE LONDON

BA CORPORATE COMMUNICATIONS | 1993

ITHACA COLLEGE, ITHACA NY USA



SELECTED PUBLICATIONS AND PAPERS

'DIGGING THE CROWD: THE FUTURE OF ARCHAEOLOGICAL RESEARCH IN THE DIGITAL AND COLLABORATIVE ECONOMY'

European Association of Archaeologists, Glasgow, September 2015

'CROWDFUNDING AND THE HERITAGE SECTOR'

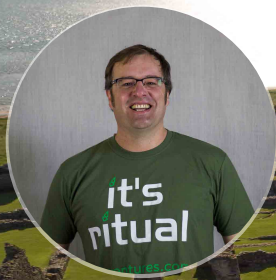
New Philanthropy Capital leadership roundtable, June 2015.

THE 'REAL TIME' TEAM: THE FUTURE OF FIELDWORK

Current Archaeology, May 2015, p36-40.

'THE THINGS WE THINK AND DO NOT SAY - THE FUTURE OF OUR BUSINESS'

Institute for Archaeologists, 2014



Brendon Wilkins

PROJECTS DIRECTOR

BA MA MCIFA MIAI
BRENDON@DIGVENTURES.COM
@DIGGINGTHEDIRT

Brendon is an award-winning field archaeologist and researcher, with over fifteen years of experience directing and managing large, complex sites in advance of major construction projects. He has held senior posts in two of the largest commercial contractors in the EU. Brendon has a consistent publications record, and has lectured internationally on digital archaeology, wetland archaeology, mortuary archaeology and quality assurance on large-scale archaeology projects. He is currently pursuing a PhD at the University of Leicester, entitled: 'Digging the Crowd: the future of archaeology in the digital and collaborative economies'.



EXPERIENCE

PROJECTS DIRECTOR | 11.2011 - PRESENT
DIGVENTURES

OPERATIONS DIRECTOR | 2012 - 2013
RUBICON HERITAGE SERVICES LTD (LONDON)

SENIOR PROJECT MANAGER | 2011- 2012
WESSEX ARCHAEOLOGY

FIELD ARCHAEOLOGIST | 2002 - 2011
VARIOUS ROLES AND LEVELS OF RESPONSIBILITY
INCLUDING LICENSED SITE DIRECTOR (IRELAND)



KEY COMPETENCIES

- Design and management of archaeological works
- MORPHE project design and Scheduled Monument Consent
- Fieldwork and survey management
- Strategic and business planning for cultural programmes
- Digital techniques and workflows for heritage activities
- Historic research (Desk Based Assessment)
- Stakeholder relationship management
- Digital techniques and workflows for heritage activities
- Community-focussed archaeological fieldwork and skills training



EDUCATION AND AFFILIATIONS

COUNCIL MEMBER | 2013

MEMBER | 2004

CHARTERED INSTITUTE FOR ARCHAEOLOGISTS

CIFA is the leading professional body representing archaeologists working in the UK and overseas.

MEMBER | 2004

INSTITUTE OF ARCHAEOLOGISTS OF IRELAND

The IAI is the representative organisation for professional archaeologists working in Ireland and Northern Ireland.

IRISH LICENSE ELIGIBILITY | 2004

DEPARTMENT OF ARTS, HERITAGE, REGIONAL, RURAL
AND GAELTACHT AFFAIRS

The National Monuments Act requires that excavations for archaeological purposes be carried out by archaeologists acting under an excavation licence, granted based on assessment of competency.

MA ARCHAEOLOGY (DISTINCTION) | 2008
UNIVERSITY OF BRADFORD

BSC ARCHAEOLOGY | 1999
UNIVERSITY OF BRADFORD



SELECTED PUBLICATIONS AND PAPERS

'DIGGING THE CROWD: THE FUTURE OF ARCHAEOLOGICAL RESEARCH IN THE DIGITAL AND COLLABORATIVE ECONOMY'

European Association of Archaeologists, Glasgow, September 2015
Digital Pasts, Llandudno, 2014

'THE THINGS WE THINK AND DO NOT SAY – THE FUTURE OF OUR BUSINESS'

Institute for Archaeologists, 2014

KNOWLEDGE, VALUE AND THE CELTIC TIGER

In Aitchison, K., Jameson, J. and Eogan, J. (eds.) Archaeologists of the world: globalizing archaeological practice. Springer



Manda Forster

PROGRAMME MANAGER

BSc PhD MCIFA FSA Scot
MANDA@DIGVENTURES.COM
@MANDA_FORSTER

Manda's diverse archaeological career stretches across research, education, not-for-profit and commercial environments. Having held senior management roles in several organisations, she is particularly adept at post-excavation management, mentoring staff and developing learning materials. Manda also has a track record delivering membership and audience development programmes for professional bodies and heritage organisations. She is research-active, with academic interests in standards development for the archaeological sector and the trade of steatite goods in the North Atlantic region during the Viking and Early Medieval period.



EXPERIENCE

PROGRAMME MANAGER | 2016 - PRESENT
DIGVENTURES

STANDARDS PROMOTION MANAGER | 2011 - 2015
CHARTERED INSTITUTE FOR ARCHAEOLOGISTS

RESEARCH FELLOW | 2011-2011
INSTITUTE FOR ARCHAEOLOGY AND ANTIQUITY,
BIRMINGHAM UNIVERSITY

POST-EXCAVATION MANAGER | 2004 - 2011
BIRMINGHAM ARCHAEOLOGY



KEY COMPETENCIES

- Heritage sector project design and delivery
- Designing and delivering vocational training
- Research and university-based teaching, including programme design (campus & distance learning)
- Archaeological post-excavation programme management
- Volunteer, staff and stakeholder management and engagement
- Strategic and business planning for cultural programmes
- Community-focussed archaeological fieldwork and skills training
- Writing and editing for academic and technical publications



EDUCATION AND AFFILIATIONS

MEMBER | 2004

CHARTERED INSTITUTE FOR ARCHAEOLOGISTS

CIFA is the leading professional body representing archaeologists working in the UK and overseas.

TREASURER AND TRUSTEE | 2011

BIRMINGHAM AND WARWICKSHIRE ARCHAEOLOGICAL SOCIETY

Founded in 1870, the Society aims to support and raise the profile of the region's archaeological heritage.

DOCTOR OF PHILOSOPHY | 2004

UNIVERSITY OF BRADFORD

DISSERTATION: *SHETLAND AND THE TRADE OF STEATITE GOODS IN THE NORTH ATLANTIC REGION DURING THE VIKING AND EARLY MEDIEVAL PERIOD*

BSC ARCHAEOLOGY (FIRST CLASS HONOURS) | 1998
UNIVERSITY OF BRADFORD



SELECTED PUBLICATIONS AND PAPERS

FROM HOMELAND TO HOME; USING SOAPSTONE TO MAP MIGRATION AND SETTLEMENT IN THE NORTH ATLANTIC

Forster, A K and R E Jones, in Gitte Hansen and Per Storemyr (eds) *From Prehistoric Vessels to Medieval Cathedrals*, Universitetsforlaget i Bergens arkeologiske serier UBAS. FORTHCOMING.

'DRIVING MEMBERSHIP ENGAGEMENT THROUGH TARGETED MARKETING COMMUNICATIONS'

Membership Excellence, London, 2015

'A CHARTERED PROFESSION: CIFA AND THE NEXT GENERATION'

Theoretical Archaeology Group Conference, Manchester, 2014

CIFA CLIENT GUIDE

Chartered Institute for Archaeologists, 2014



Christopher Casswell

HEAD OF FIELDWORK

BA MCIFA

CHRIS@DIGVENTURES.COM

@CASSWELLARCH

Chris is a professional field archaeologist with over a decade of experience on complex, large-scale investigations and academic fieldwork projects. He specialises in excavation and recording methodology and has used his skills to deliver first class results at the World Heritage Sites of Stonehenge, the Alhambra, and across a variety of scheduled monuments throughout the UK. Chris is also a key initiator for innovative use of Geographic Information Systems (GIS), Structure from Motion (SfM) photogrammetry and digital survey techniques in fieldwork, and has a strong track record in public outreach as well as practical skills and knowledge transfer.



EXPERIENCE

HEAD OF FIELDWORK | 2017 - PRESENT
DIGVENTURES

SENIOR PROJECT OFFICER | 2014- 2017
ALLEN ARCHAEOLOGY

SUPERVISOR/PROJECT OFFICER | 2008 - 2013
NETWORK ARCHAEOLOGY

SUPERVISOR | 2004 - PRESENT
STONES OF STONGEHENGE AND STONEHENGE
RIVERSIDE PROJECTS



KEY COMPETENCIES

- Directing complex excavations in all environments and conditions
- Geographic Information Systems (GIS)
- Photographic and 3D recording of sites and artefacts
- Digital techniques and workflows for heritage activities
- Commercial and research-focussed archaeological fieldwork and skills training
- Writing and editing for technical publications
- Extensive knowledge of British archaeology
- Strategic and business planning for cultural programmes
- On site Health and Safety



EDUCATION AND AFFILIATIONS

MEMBER | 2017

CHARTERED INSTITUTE FOR ARCHAEOLOGISTS

CIfA is the leading professional body representing archaeologists working in the UK and overseas.

MEMBER | 2017

LANDSCAPE SURVEY GROUP

LSG provides a voice for the exchange of ideas and information relating to archaeological landscape survey.

BA ARCHAEOLOGY | 2006

UNIVERSITY OF SHEFFIELD



SELECTED PUBLICATIONS AND PAPERS

**INTERNATIONAL Bomber Command Centre;
BEFORE THE Bomber County**

The Archaeologist, CIfA, 2015

STONE WAS THE ONE CROP THAT NEVER FAILED

Casswell, C. and Daniel P., 2011, Excavations between Pannal and Nether Kellet 2006-2007. BAR Brit. Ser. 526

NORTH KILLINGHOLME: ARCHAEOLOGICAL INVESTIGATIONS

Allen Archaeology Field Reports, 2017

TICKENCOTE LODGE FARM: COSMIC ASSESSMENT

Allen Archaeology Field Reports, 2017





culture
team

21 November 2018

Lisa Westcott Wilkins
Managing Director
DigVentures Ltd
34 Newgate
Barnard Castle
County Durham
DL12 8NG

Dear Lisa Westcott Wilkins,

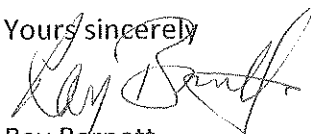
Re: 

I understand that as the landowner's appointed archaeological consultant, Historic England have asked DigVentures to form a project team to design and deliver an archaeological evaluation over the course of 2019 at a site in . This site was located by the recent discovery of a Palaeolithic handaxe, found in close association with a well preserved megafaunal assemblage (including Mammoth, Horse, Bear and Hyena) within a palaeochannel buried beneath the now extracted overlying gravels.

The goal of the work will be to define and characterise the physical extent of the site through a programme of non-intrusive investigations and intrusive excavation, assessing the wider depositional context and taphonomic history of any recovered material. This will include geophysics, geoarchaeological boreholes, targeted evaluation trenches, artefact and ecofact assessment, and a consideration of future conservation management and curation implications.

I can confirm that Bristol Museums, Galleries & Archives (part of the Bristol Culture team) are willing in principle to agree to receiving for transfer of title any excavated assemblages and related archival material not already in private hands. This will of course be subject to further discussion as to exactly what may be involved.

Yours sincerely



Ray Barnett

Head of Collections & Archives