

Palaeolithic archaeological potential of Pleistocene deposits in England: a geological mapping approach

Historic England Project 7732

Project Design

Keith Wilkinson

Department of Archaeology, Anthropology and
Geography



UNIVERSITY OF
WINCHESTER

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Author(s):	Keith Wilkinson Department of Archaeology, Anthropology and Geography University of Winchester Winchester SO22 4NR Keith.Wilkinson@winchester.ac.uk
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Front cover: Loess ('Brickearth') and palaeosol sequence containing in situ Middle Palaeolithic artefacts. The photograph (by Keith Wilkinson) is of a site at Sint Geertruid, near Maastricht, the Netherlands, but similar contexts exist in eastern England.

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Summary

The Palaeolithic archaeological potential of Pleistocene deposits in England: a geological mapping approach (PAPPDE) project will run in parallel with another Historic England sponsored project, namely Curating the Lower and Middle Palaeolithic. PAPPDE will result in England-wide online GIS tool for curators comprising superficial geology polygons with appended Palaeolithic archaeological potentials. Potentials be assigned on the basis of prior archaeological knowledge and geological context.

1. Introduction

- 1.1 This Project Design is for Historic England Project 7732 *Palaeolithic archaeological potential of Pleistocene deposits in England: a geological mapping approach* (henceforth 'the Project'). It is intended to enhance resources available to planning authorities in their consideration of the Palaeolithic within the National Planning Policy Framework (Department for Communities and Local Government 2012). Based on an approach pioneered in Hampshire (Wilkinson and Hennessy 2004), the Project seeks to provide, via the British Geological Survey's (BGS) LandFit portal, freely/easily accessible assessments of the archaeological potential of all Pleistocene geological strata in England¹. Assuming a 7 January 2019 start date, the first Project data would be made available at the same time as the launch of the Historic England guidance on the Middle and Lower Palaeolithic in January 2020 (Hosfield et al. 2017)².
- 1.2 This Project Design is organised as stipulated in the *Management of Research Projects in the Historic Environment [MoRPHE]: Project Managers' Guide* (Historic England 2015, 9-11 and 30-33) and *Heritage Protection Commissions Programme: Guidance for Grants Projects* (Historic England 2018a, 3-5 and 21-27). The document has benefitted from advice provided by Historic England on a Project Proposal (Wilkinson 2018), and face-to-face discussions with Dr Hannah Fluck, Jonathan Last, David Gander (all Historic England) and Katy Lee (BGS)³.

2. Background

- 2.1 Presentations made at a series of recent conferences, workshops, and in publications have highlighted the myriad of difficulties in managing the Palaeolithic resource within the planning process in England (Historic England 2017a)⁴. The common issue outlined by many presenters and authors is the geographic/institutional variability in response to planning applications that impact on Pleistocene strata. For example, some jurisdictions (i.e. curatorial archaeologists working on behalf of planning authorities) ask that all Pleistocene strata affected by a development are subject to archaeological evaluation. In other jurisdictions it is just those strata forming in alluvial depositional environments that are so investigated, while in the case of a few planning authorities, Pleistocene deposits are treated as 'the natural' and are not evaluated at all. If such variation in response was regionally determined [i.e. those planning authorities north of the Last Glacial Maximum (LGM) ice limits falling into the last category and those to the south into the former two (Figure 1)], it would be comprehensible, but this is not the case. The present state of play means that without suitable resources being

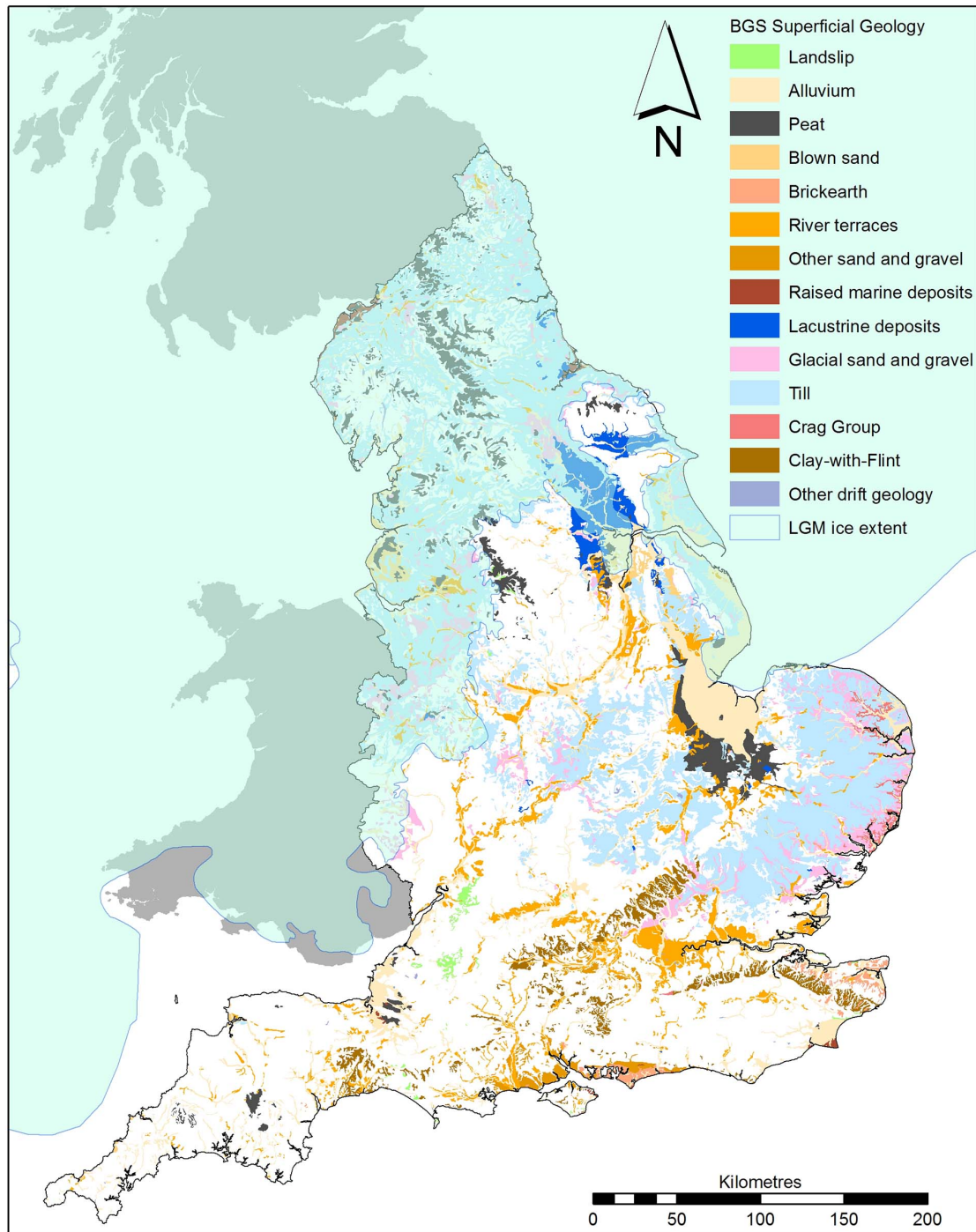
¹ Pleistocene - the geological epoch spanning 2.6 million (Ma) to 11.7 thousand (Ka) years ago

² Remaining Project data would be on the LandFIT portal within three months of the publication of the guidance on the Middle and Lower Palaeolithic.

³ All of whom are thanked for their time and constructive approach to problem solving.

⁴ E.g. *Curating the Palaeolithic heritage: frameworks, challenges and (towards) solutions* [25/01/2016]; *Palaeolithic 2020: Strategies for the Protection and Transformation of the Palaeolithic Record in England* [19/05/2016]; *Revising Palaeolithic Specifications/WSIs Seminar* [11/11/2016]; The archaeology of Pleistocene hunter-gatherers and the Valletta Treaty. Time for a rewrite? Session at *EAA 2017*, Maastricht, The Netherlands [2/9/2017].

put in place, Palaeolithic sites might in the future be damaged by development with insufficient record being made beforehand in some parts of the country, while Pleistocene deposits that have no archaeological potential might also be needlessly investigated in others.



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 Glacial limits: <https://www.arcgis.com/home/item.html?id=90bed26927d84fe69479f995e26ad8cc>

Figure 1: Superficial geology of England as mapped by the British Geological Survey, cross-referenced with the limit of the Last Glacial Maximum glacier extent

2.2 Possible reasons for the problems set out above are provided in the results of a survey of curators, consultants, contractors and academics carried out as

part of Historic England's recently commissioned *Curating the Lower and Middle Palaeolithic* initiative (Historic England Project 7530)⁵. For the question 'which aspects of the British Lower and Middle Palaeolithic and its Pleistocene context would guidance be most helpful', the two most frequent responses (more than 70% of those surveyed in each case) were a. assessing potential [of deposits] for palaeoenvironmental and archaeological remains, and b. the types of deposit containing Palaeolithic remains (Hosfield et al. unpublished data). Furthermore the same survey revealed that the majority of respondents rated as 'Low' or 'Low to Moderate' their confidence in dealing with Lower and Middle Palaeolithic remains. In other words, curators and consultants frequently lack the necessary background knowledge to make decisions appropriate for the Palaeolithic resource, particularly in terms of geological context and palaeoenvironmental status.

- 2.3 Problems in curatorial response with regards the Palaeolithic were the subject of a seminar at the European Association of Archaeologists annual conference in Maastricht in September 2017 (Raczynski-Henk et al. 2017). The overwhelming view of participants (comprising both Palaeolithic and curatorial archaeologists from the UK, the Netherlands, France, Belgium and Denmark) was that education and the interests of the relevant curators is key in dealing with the Palaeolithic. It is worth noting in this respect that many of those studying for an Archaeology degree will learn very little about the Palaeolithic (a minimum of just three-four classes in the first year of an undergraduate programme in the case of most UK universities)⁶. Furthermore, the archaeology of the Palaeolithic is perceived by many archaeologists as being very different and somewhat removed from that of any other period, for example in terms of time depth, nature of the cultural record, methods of investigation and even the theoretical frameworks used in its interpretation (e.g. Bates and Pope 2016, Shaw and Scott 2016)⁷.
- 2.4 Various interest groups and statutory bodies, including Historic England and its forebear, English Heritage, have addressed the educational lacunae by issuing advice documents highlighting the value of the Palaeolithic (e.g. English Heritage 1998, Minerals and Historic Environment Forum 2008, Gamble et al. 2008) and seeking to provide information on how to assess the importance of Palaeolithic finds (English Heritage 1998). Indeed, the present Historic England *Curating the Lower and Middle Palaeolithic* initiative will lead to the production of new guidelines for managing the Palaeolithic archaeological resource that will replace those published in 1998 (Hosfield et al. 2017). These guidelines will be published in draft in early 2019 and in a final form in the first half of 2020.
- 2.5 Another approach to tackling limitations in the knowledge base has been the development of thematic research strategies, i.e. means by which key

⁵ The author would like to thank Dr Robert Hosfield and other members of the *Curating the Lower and Middle Palaeolithic* team for allowing access to the unpublished results of their survey of practitioners. NB: >50% of respondents to the survey were curators.

⁶ Although it is interesting to note that the survey of practitioners carried out as part of the *Curating the Lower and Middle Palaeolithic* initiative (see Section 2.3) revealed that more than 40% of respondents say that they did not learn about the Lower and Middle Palaeolithic while studying for an undergraduate degree (Hosfield et al. unpublished data)

⁷ For example, briefs for the evaluation of potential Palaeolithic sites will often require that the works are supervised/managed by an archaeologist with experience of Palaeolithic archaeology, but it is very rarely the case that knowledge of Neolithic or Roman archaeology would be a stated pre-requisite for managing a site of those periods.

questions specific to each archaeological period can be addressed in archaeological works carried out as part of the planning process. Developing such strategies has been achieved at a general level by national frameworks of the type set out in Section 2.4, but at a sub-national level through the development of regional research agenda, all of which include chapters on the Palaeolithic (e.g. Wenban-Smith et al. 2014)⁸. As a result, regional frameworks for Palaeolithic investigation are available for (most of) England.

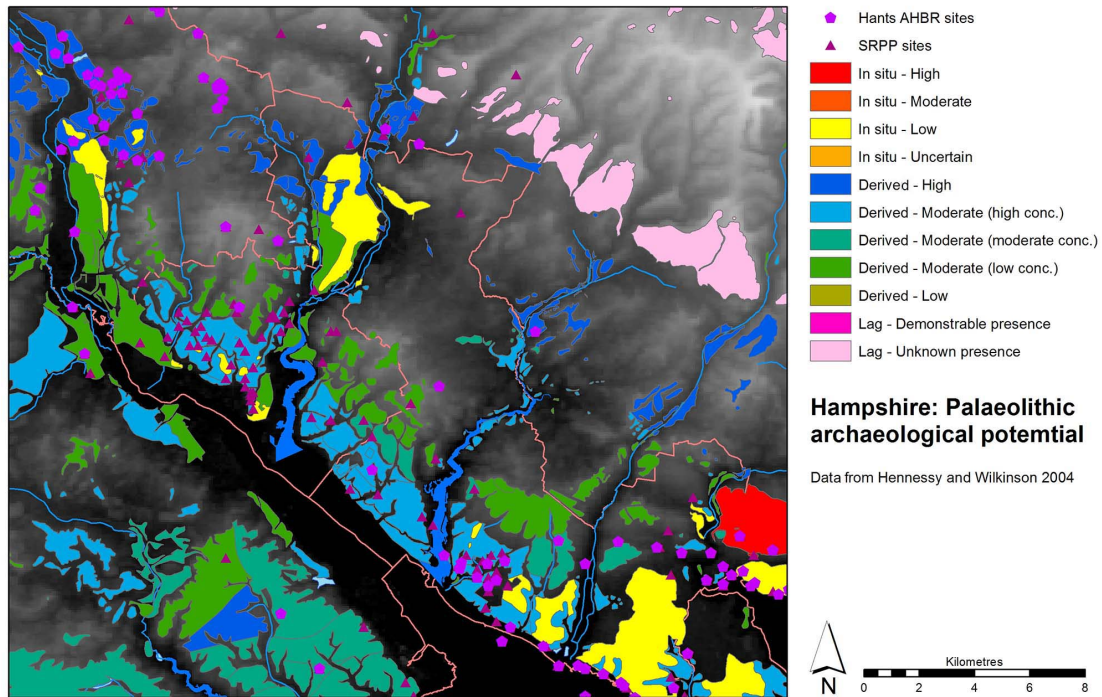


Figure 2: An example plot of Palaeolithic archaeological potential for the Solent estuary in the Southampton area (data from Wilkinson and Hennessy 2004).

2.6 Finally Historic England has sponsored Palaeolithic and Mesolithic-themed HER enhancement projects in Worcestershire, South Yorkshire, West Yorkshire, West Berkshire, Kent, Essex and Norfolk (Historic England 2017a)⁹. The purpose of these has been to provide better resources for curators in those areas, thereby enabling the development of more informed response strategies for planning applications that might affect the Palaeolithic. Of the six enhancement projects covering the entire Palaeolithic⁹, five focussed on incorporating the PastScape (NRHE), *Palaeolithic and Mesolithic Artefact* (PaMELA), *Portable Antiquity Scheme* (PAS, museum and unpublished excavation/survey archives) into the HER database, while two (Worcestershire and Essex) were deposit-based approaches similar to that intended for the present Project (Russell and Daffern 2014, O'Connor 2015). The success (or otherwise) of these projects has been reviewed (Historic England Project 7268), and 24 recommendations

⁸ Frameworks for some parts of the country, e.g. South-east England, have not been published and there are reported problems of visibility and access to others (Pye Tait Consulting's 2014, Historic England 2017c).

⁹ The West Berkshire project was of a subset of that unitary authority's territory in the Middle Kennet Valley and focussed on the Mesolithic and Late Upper Palaeolithic (Cattermole forthcoming).

made with regards future early prehistoric HER enhancement projects (Cattermole forthcoming).

- 2.7 While education is being tackled in the advice documents outlined above, it remains the case that curators in parts of the country where there have been no HER enhancement exercises are left to their own devices in deciding whether a given Pleistocene stratum has archaeological potential and how it is best investigated within the planning framework. The guidance documents provide a list of contacts for organisations who might offer advice, but the short turnaround times required in many planning applications often require an immediacy of response that cannot be addressed by wide consultation. The Project proposed here will mitigate the problems outlined above by providing a consistent body of evidence on which an initial response to a planning application could be made. This evidence base would comprise an assessment of Palaeolithic archaeological potential of the relevant Pleistocene stratum on the basis of its geological properties, associated archaeology and proxy palaeoenvironmental data, and chronology (e.g. Figure 2).

3. Aims and objectives

- 3.1 The overarching aim of the Project is ***to produce a GIS resource that will provide outline assessments of Palaeolithic archaeological potential (together with underpinning data) for all Pleistocene geological strata in England¹⁰.***
- 3.2 The subsidiary aim is ***to make the Palaeolithic archaeological potential resource freely available to curators via an online GIS¹¹.***
- 3.3 Objectives that enable the above aims to be met are:
1. To develop – through researching present and forthcoming guidance documents, the wider academic literature, and in consultation with Historic England officers, curators and Palaeolithic archaeological and Pleistocene geological experts [the latter via the *Palaeolithic and Pleistocene Environments Network UK* (PALNETUK@JISCMAIL.AC.UK) listserve¹²] – criteria that can be used to determine Palaeolithic archaeological potential of Pleistocene deposits;
 2. To obtain and then place the British Geological Survey (BGS) superficial geology polygons into a hierarchical GIS structure enabling attribute data of Palaeolithic archaeological relevance to be added;
 3. To utilise England-wide [i.e. the *Southern Rivers Palaeolithic Project (SRPP)*, *English Rivers Palaeolithic Survey (TERPS)* (Wymer 1999), the *Gazetteer of Upper Palaeolithic sites in England and Wales* (Wymer and

¹⁰ 'Archaeological potential' is here considered to be a product of the presence/absence and quantity of artefacts/human residues, and their association with palaeoenvironmental proxies and strata suitable for absolute and relative dating.

¹¹ As is described further below, Project data will be placed on BGS' LandFIT portal. This resource will be accessible free of charge by publicly-funded planning authorities.

¹² PalNetUK is an initiative of Dr Matthew Pope (UCL), Dr Robert Hosfield (University of Reading) and Dr Rebecca Scott (British Museum) as a follow up to the now defunct *National Ice Age Network* project. Most archaeologists (and indeed other natural scientists) with an interest in the British Palaeolithic, as well as many curators and consultants with expertise in later periods follow posts to PalNetUK

Bonsall 1977) and National Record of the Historic Environment (NRHE) archives] to assess artefact presence/absence and concentration in and palaeoenvironmental potential of each Pleistocene deposit;

4. To research in the academic literature and grey literature resulting from projects of the Aggregates Levy Sustainability Fund (ALSF) the chronology and palaeoenvironment of each Pleistocene geological unit;
5. To populate attribute tables attached to the superficial geology polygons with Palaeolithic archaeological potential assessments;
6. To produce guidance/help documentation to accompany the GIS polygon and point data files;
7. To transfer the GIS and guidance/help data to the BGS for implementation on their GIS server and via that to the LandFIT portal;
8. To test the GIS implementation of Project data within Historic England and also with select planning authorities;
9. To refine Project data and their implementation in light of feedback from the internal and external testing;

- 3.3 In addressing the above aims, the project is in accordance with Historic England's (2017d) *Heritage Access Information Strategy* in that a. research data/knowledge should be readily uploaded and accessed online (Principle 4), and b. data/knowledge should not be at risk of loss/fragmentation/obsolescence (both Historic England and the BGS will hold the digital dataset produced by the Project) (Principles 6 and 7).
- 3.4 As is discussed elsewhere the Project both complements and builds upon the current Historic England initiative to develop new guidance for the Palaeolithic (*Curating the Lower and Middle Palaeolithic*) (Hosfield et al. 2017). Furthermore the Project is a logical development from Historic England's funding of the HER enhancement exercises outlined in Section 2.6 (Historic England 2017a), its commissioning (via the ALSF) of site and regional-scale Palaeolithic studies (summarised in White et al. 2016) and its organisation of workshops on the Palaeolithic for archaeologists involved in the planning process [e.g. *Curating the Palaeolithic heritage: frameworks, challenges and (towards) solutions* in January 2016].
- 3.5 Even though the Project is not an HER enhancement initiative *per se*, it will nevertheless result in the augmentation of HERs. It is notable in this latter respect that the Project addresses the following recommendations of Historic England Project 7268: *A review of Historic Environment Record enhancement projects for the Palaeolithic and Mesolithic* (Cattermole forthcoming, 28-48):
 1. The scope of HER enhancement projects should be clearly defined, quantified and documented at the Project Design stage (i.e. this in the present document);
 2. Key sources should be identified and checked to ensure that they have been added in their entirety (*Southern Rivers Palaeolithic Project* and NRHE databases, and ALSF grey literature in the case of the present Project);
 5. A consistent approach to 'lumping' and 'splitting' of records is required to minimise partial enhancement of records (between the databases outlined above);
 10. The potential for the routine use of MIS date ranges in HERs, to complement existing periods, should be explored (MIS will be employed by the Project as the primary descriptor of chronology);
 16. Key sources of early prehistoric data should be more widely publicised among the HER community;

22. The content of deposit and predictive models needs to be both physically and intellectually accessible to a wide audience, and suitable for use by non-specialists.

It should also be pointed out that by making use of the *Southern Rivers Palaeolithic Project* database, the Project will be highlighting the importance of this resource to HERs. It is notable in this regard that Historic England Project 6637: the *Stour Basin Palaeolithic Project* found that a large number of records from the *Southern Rivers Palaeolithic Project* had not been added to Kent HER despite its publication in 1993 (Wenban-Smith and Cuming 2015).

3.6 Although the Project resource comes too late to feed into initial iterations of Historic England-sponsored Regional Research Agenda, it is still the case that fulfilling Project aims and objectives will help address many recommendations of those Agenda currently published, e.g. in the Thames-Solent document (Wenban-Smith et al. 2014, 54):

4.1.6 To put hominin presence and activity in its climatic, environmental and landscape context, as well as within a chrono-stratigraphic framework;

4.1.7 Predictive modelling for, and discovery and investigation of: (a) sites rich in faunal and other palaeoenvironmental remains; (b) undisturbed sites; and (c) ideally, both together;

4.1.8 Develop, compare and contrast regional and sub-regional sequences and distributions of settlement and cultural development;

4.2.1 Compiling and maintaining a database of sites with mammalian and other palaeoenvironmental evidence;

4.2.2 Developing a GIS model of the available Palaeolithic and Pleistocene evidence to provide an overall view of the palaeo-landscape as well as a predictive tool for potentially artefact- and fossil-rich deposits.

And in the revised East Anglia framework (Medlycott 2011, 8):

- HERS should include geological and palaeoenvironmental data to help ensure that threats to the resource can be met with an appropriate response;
- Development of deposit modelling, both as a research resource and a means of identifying areas of high potential.

It is also the case that Project data will be able to inform the updating of Regional Research Agenda.

3.7 The Project data together with the new Historic England Palaeolithic guidance will lead to better and more geographically consistent decision making with regards to Pleistocene deposits in England. Given that such strata outcrop over 48.3% (i.e. 63,041 km²) of the country, the impact of the proposed resource on the development of archaeological mitigation strategies is likely to be significant (Figure 1).

4. Business case

4.1 Assuming a January 2019 start date, the Project is well timed to both contribute to and take advantage of the current Historic England *Curating the Middle and Lower Palaeolithic* initiative and the guidelines that will result (Hosfield et al. 2017). As has been noted elsewhere in this document, the GIS resource that will be the primary product of the Project will be in the process of implementation on the BGS' LandFIT portal just as Historic England's Palaeolithic guidelines are published. The two resources would thus cross fertilise and thereby direct interested parties from one to the other.

Indeed, agreement was made with those leading *Curating the Middle and Lower Palaeolithic*, that enabled members of the present Project team to attend the *Curating the Middle and Lower Palaeolithic* workshops in October and November 2018 (in London, Bristol, Nottingham and Manchester). Although presentations on the present Project were not made at these meetings, it was possible to collect the views of curators and those with an expertise in the Palaeolithic on how Palaeolithic archaeological potential is best defined. Such 'piggy backing' has (informally) enabled the Project to advertise itself and work towards achieving its Objective 1 (Section 3.3) at a substantially reduced cost than were Project-specific participatory events to be organised.

4.2 Achieving the aims of the Project will allow curators working for planning authorities to make well informed, coherent and *consistent* (the latter on an England-wide basis) decisions on how to treat Pleistocene strata that are to be impacted by development. As such the Project addresses the following aims of the Historic England's corporate plan 2017-2020 (Historic England 2017c, 5):

- *Aim 2: Protecting through the listing and planning system:*
 - 8 Site specific planning advice;
 - 9 Planning advice – local plans, Conservation Areas and other historic places;
 - 10 Strategic planning advice – major projects and infrastructure;
- *Aim 4: Strengthening national capacity and sustaining heritage protection systems*
 - 19 Capacity building grants and initiatives to strengthen capability and effectiveness of heritage sector and community groups;
 - 20 Understanding the threats to historic environment and developing strategies to combat them from climate change to conservation deficits;
 - 21 Sustaining heritage protection policy and legislation and Historic Environment Records;
 - 22 Research filling national gaps in understanding, working with partners and in-house;
 - 23 Training and guidance for local authority staff and others, apprenticeships;
 - 24 Enhancing sector knowledge e.g. through specialist audience publications and webpages.

And is in accordance with the following Principals of Historic England's Heritage Information Access Strategy (HIAS) (Historic England 2018b):

- 3 Historic England, together with its partners, should continue to champion the development, maintenance and implementation of standards for the creation, management, sharing, re-use and storage of digital historic environment data.
- 4 Investigative research data or knowledge should be readily uploaded, validated and accessed online.
- 6 Such data or knowledge should not be at risk of loss, fragmentation, inundation (in data), or system obsolescence.
- 7 Historic England should, on behalf of the nation, ensure that a security copy of all such data exists in accordance with Principles 3 and 6.

4.3 Achieving the Project aims is also likely to result in long term resource savings for Historic England. Firstly, the provision of 'off the shelf' assessments of Palaeolithic potential together with a body of supporting evidence will reduce the time spent by Science Advisor and other Historic

England officers in providing advice to curators on the significance of particular Pleistocene strata (Section 2.7). Secondly, a better-informed consideration of the archaeological potential of Pleistocene deposits by curators is also desirable from the point of view of Historic England's finances. Given that Historic England is the funder of last resort and that investigation of Palaeolithic sites is a particularly expensive undertaking, the costs of the present project would represent a financial saving were just a single instance of an unexpected Palaeolithic site avoided during development.

- 4.4 It is also worth stressing that the Project represents a more efficient, cost effective and intellectually coherent approach than commissioning separate HER enhancements for the 43 counties that presently lack such studies (see Section 2.6).
- 4.5 A further reason for carrying out the Project at the present time is the recent agreement between Historic England and the BGS with regards data sharing for mutual benefit. The present Project would be the first Historic England sponsored project that falls under this framework. Thus the BGS 1/50,000 superficial deposit maps essential to the Project can be employed without Historic England incurring significant licencing costs (in excess of £130,000 for a single user licence in the present case)¹³.

5. Project scope

- 5.1 As set out in Section 3 above and 12 below, the Project is an assessment of the Palaeolithic archaeological potential of all Pleistocene deposits mapped by the BGS within England. However, the BGS do not specifically map Pleistocene strata, but rather they incorporate them within so-called 'superficial' deposits. These latter are in turn defined as having a Quaternary date of formation¹⁴. Thus the subset of superficial deposits outlined in Table 1 will be extracted from the superficial geology dataset and assessed for their Palaeolithic archaeological potential.
- 5.2 Assessment of Palaeolithic archaeological potential will be on the basis of the national datasets and publications outlined in Section 3 Objectives 3 and 4 above. HER data and non-ALSF grey literature will not be employed for reasons of compatibility/consistency and also to ensure that the Project is completed within a. time frames matching the *Curating the Lower and Middle Palaeolithic* initiative and b. for a sub-£100,000 budget. As such it should be noted that the archaeological data underpinning the Palaeolithic archaeological potential assessments reflect the knowledge-base of the late 1990s (i.e. the publication of the SRPP and TERPS archives) – albeit supplemented by subsequent *published* and ALSF data. The geological map data will be those current in the BGS GIS server in 2019-2020.
- 5.3 Although in theory the Palaeolithic archaeological potential assessments produced by the Project could be updated by future reviews, such an

¹³ Nevertheless, the BGS data need to reside on that organisation's server in order to make them publicly available without incurring licencing charges – hence the choice of the LandFIT portal as the means by which planning authorities will access Project data.

¹⁴ The geological period spanning 2.6 Ma to the present encompassing the Pleistocene (2.6 Ma – 11.7 Ka) and Holocene (after 11.7 Ka) epochs.

undertaking is not part of this proposal and is not envisaged over short to medium time scales. Rather the Project resource is intended as a common national baseline. Indeed it is hoped that curators/HERs at regional and local levels adapt the assessments to their particular circumstances.

Table 1. BGS superficial deposits of Pleistocene age (taken from British Geological Survey 2018)

BGS Lithology	Notes
Beach Rock	Lithified raised marine deposits originally forming in warm climate stages
Boulder Clay	Fine-grained (silt and clay) poorly sorted deposits forming beneath glaciers
Brickearth	Aeolian deposits (including those reworked by alluvial processes) forming in cool climate stages
Clay-with-Flint	Lag strata forming as a result of deflation of Tertiary and Quaternary strata on Chalk bedrock
Cover Sand	Aeolian silts and sands forming in cool climate stages
Fluvioglacial Deposits	Outwash derived from glacier melt
Glaciofluvial Deposits	As Fluvioglacial deposits
Glaciolacustrine Deposits	Sediments accreting in pro-glacial lakes
Gravel	Used in recent maps with a type site prefix to describe former river beds and floodplains
Head	Poorly sorted sediments deposited by colluvial processes (including solifluction deposits)
Marine Beach Deposits	Raised beach sediments forming during warm climate stages
Plateau Gravel	As 'River Terrace' below, but referring to high level (and hence older) former river beds and floodplains
Raised Beach Deposits	As Marine Beach Deposits above
River Terrace Deposits	Used in conjunction with a number (e.g. 'River Terrace Deposits, 2') on older maps to indicate the presence of former river beds and floodplains
Sand and Gravel	Used to describe glacial outwash (where a 'Glacial' prefix is often used) or other coarse-grained alluvial or mixed solifluction/alluvial deposits (often with a type site prefix, e.g. 'Cheltenham Sand and Gravel')
Till	Poorly sorted deposits forming beneath a glacier

- 5.4 Given that production of the Project resource is intended to be a 'one off' activity there is no requirement for the BGS (or indeed the Historic England IT service) to maintain, manage or update the dataset at a level beyond that of any other online GIS resource.
- 5.5 The Project will be completed at the point the revised Palaeolithic archaeological potential assessment dataset is published (i.e. Table 3, Task 64). As such and given that time is needed thereafter for the resource to be adopted and employed by curators, it will not be possible to measure success or otherwise within the Project time scale. However, a simple online survey conducted one year following the publication date could provide a metric to judge the Project's success. The survey would be of curators through the

offices of ALGAO and of those working in Palaeolithic archaeology via PalNetUK. Project success would equate with >50% of planning authorities using the resource in dealing with planning applications and >50% of consultants/contractors citing the resource when writing Desk-based Assessments for sites on Pleistocene geologies¹⁵.

6. Interfaces

- 6.1 As has been noted above, the Project has already established links with the *Curating the Middle and Lower Palaeolithic* project team and has already taken part in consultative workshops organised as part of the latter (Hosfield et al. 2017). Also, as previously outlined, and assuming the present Project begins in January 2019, both projects will launch their products in the winter-spring of 2020.
- 6.2 As noted in Section 4.5, the Project will be the first Historic England-funded initiative carried out under a data sharing agreement with the BGS. The Project will therefore establish links between those two organisations and will be the first archaeological initiative to make data available via the BGS LandFIT portal. The latter is an online resource providing geological and hydrological data to planning authorities thereby enabling them to assess the hazards and impact of potential developments. The Palaeolithic archaeological potential data would be used in a similar way by curators working for planning authorities meaning that the Project resource is complementary to the BGS data on the portal. The LandFIT portal is currently under development and is due to be launched in March 2019. Once implemented LandFIT will be freely accessible by planning authorities (Lee, personal communication, 2018).
- 6.3 A message of introduction will be uploaded to the PalNetUK listserve (PALNETUK@JISCMAIL.AC.UK) and to ALGAO on Project initiation. Regular updates on the progress of the Project will also be added to these groups as and when appropriate.
- 6.4 The Project will directly contact curators in those local authorities who have carried out Historic England/English Heritage-funding HER enhancement exercises in respect of the Palaeolithic (see Section 2.6). The purpose of such consultation will be to discuss how deposit assessments made by the Project can best be integrated with prior data.
- 6.5 Although not formally part of the Project, training on the resulting datasets can be built into future Historic England seminars for stakeholders as well as workshops run by other organisations.

7. Communications

- 7.1 As is explained in Section 10, the Project Team consists of only three people, all of whom work in the same University of Winchester department. Therefore, informal communication will be on an at least weekly basis and in the form of face-to-face meetings and email discussions.

¹⁵ Note: costs for such a post-Project assessment of success are **not** included in the budget in Section 14 as they would post-date Project completion.

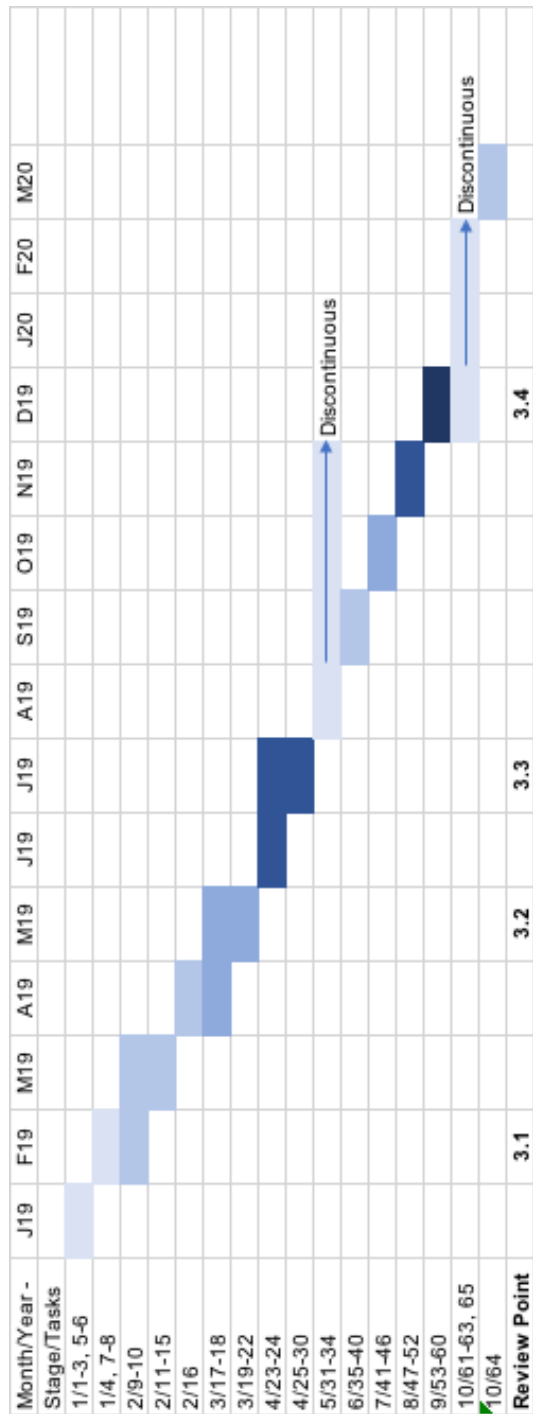


Figure 3. Project schedule (see Table 3 for explanation of Stages and Tasks)

- 7.2 Formal Project communication will take the form of monthly face-to-face meetings of the Project team [i.e. the Project Manager/Executive and Project Officer(s)]. A Highlight Report will be produced by the Project Officer(s) in advance of each such meeting and in the form of a word-processed file containing the information required for such a report as set out in the *MoRPHE Project Managers' Guide* (Historic England 2015, 34).
- 7.3 Formal communication with Historic England will be via monitoring meetings at each Review Point (R3) (see Section 8 and 12.2). Such meetings will also

be face-to-face and held either in Winchester or Fort Cumberland. Highlight Reports for the period between each Review Point will be provided to the Historic England officer acting as Project Assurance Officer (PAO).

- 7.4 As has been noted in Sections 4.1 and 6.2, the Project first interacted with stakeholders during the autumn 2018 consultation meetings of the *Curating the Lower and Middle Palaeolithic* project. It will further consult with such stakeholders via messages to the PalNetUK listserv and to relevant ALGAO groups in January 2019. Subsequent communication during the course of the Project (i.e. updates) will also be through posts to PalNetUK and tweets (with links) including the ALGAO_UK hash tag. During the final Project stages articles will be written explaining the Project and its products for *The Archaeologist* and the *QRA Newsletter*, while a dedicated web page will be developed that explains the Project and how Project data should be used (Section 12.2).

8. Project review

- 8.1 The Project schedule is set out by means of a GANTT chart in Figure 3. Review Points (R3) are incorporated as final elements of Project Stages 1, 2, 4 and 9 (see Section 12.2). Assuming a Project start date in January 2019 therefore, Review Points will be in February 2019 (R3.1), May 2019 (R3.2), July 2019 (R3.3) and December 2019 (R3.4). As outlined in Section 7.3, Review Points will be associated with monitoring meetings attended by the Project Manager/Executive, Project Officer(s) and Historic England's appointed PAO.
- 8.2 In addition to formal Review Points, Project review will be continuous and both informal (i.e. considered in weekly meetings) and formal [by means of Highlight Reports considered at monthly Project meetings attended by the Project Manager/Executive and Project Officer(s) (see Section 7.2)]. As is made clear in the *MoRPHE Project Managers' Guide*, a key inclusion in each Highlight Report is an account of 'schedule status' (Historic England 2015, 34). Therefore, potential problems with regards the Project timetable will be identified within a month of them occurring. The Project Manager/Director will have the authority to approve necessary alterations to the schedule to address slippages (or the opposite) of four weeks or less revealed by the Highlight Reports submitted monthly Project meetings.
- 8.3 Approval from Historic England (via the PAO) would be sought for remedial action should delays of more than four weeks affect the Project or were the Project to run more than four weeks ahead of schedule. Such approval would be sought at monitoring meetings where the schedule allows or separately via telephone and email conversation where it does not.

9. Health and safety

- 9.1 Implementing the Project is an entirely desk-based exercise. The majority of data collection and analysis will be undertaken at the University of Winchester, although visits will need to be made by members of the Project Team to archives of other organisations and to attend meetings. Health and Safety protocols to be followed by the Project Team are therefore those of the University of Winchester (2013).

10. Project Team structure

10.1 The Project Team is small, but ideally suited to undertaking the Project. It comprises:

- Dr Keith Wilkinson (Keith.Wilkinson@winchester.ac.uk, homepage: <https://www.winchester.ac.uk/about-us/leadership-and-governance/staff-directory/staff-profiles/wilkinson.php>, Project Director/Manager) is a geoaarchaeologist who has worked on the Palaeolithic – in England and elsewhere in the Old World - since the mid-1990s and who has published widely on the geological and palaeoenvironmental setting of Palaeolithic sites (e.g. Bates et al. 2000, Wilkinson and Pope 2003, Pinhasi et al. 2011, Adler et al. 2014). Wilkinson (together with Hampshire's County Archaeologist, David Hopkins) developed the approach for assessing Palaeolithic archaeological potential on the basis of geological property that would be used by the Project (Wilkinson and Hennessy 2004) and has also written on other aspects of the Palaeolithic in the planning system (e.g. Wilkinson 2002, Wilkinson et al. 2018). Wilkinson has worked with and taught GIS since 1994 and has been using ArcGIS and its forebears since 1999.
- Dr Monika Knul (Monika.Knul@winchester.ac.uk, Project Officer) obtained a PhD from Bournemouth University in November 2018 for *Faunal and human biogeography, and climate change in terminal ice age Europe*. Her Masters dissertation (Leiden) was on artefacts from the Happisburgh site (Knul 2012), while she has worked on Palaeolithic sites in the UK, Germany, Russia, Armenia and Georgia. Knul's expertise in GIS and computer modeling, combined with her knowledge of Palaeolithic archaeology in North-west Europe and its geological context, will be essential in combining archaeological, geochronological and palaeoenvironmental information with geological polygons. Despite being an Early Career Researcher, Knul has published widely, including in high impact journals (e.g. van Kolfschoten et al. 2012, Miller et al. 2015, Slon et al. 2017).
- Dr Jenni Sherriff (Jenni.Sherriff@winchester.ac.uk, homepage: <https://www.winchester.ac.uk/about-us/leadership-and-governance/staff-directory/staff-profiles/sherriff.php>, Project Officer) is a physical geographer with expertise in Pleistocene sedimentology and isotope geochemistry, geomorphological mapping and GIS. She obtained an MSc Quaternary Science (2010) and a PhD (2016) from the Department of Geography, Royal Holloway, University of London, the latter titled *The palaeoenvironmental context of Lower Palaeolithic occupation in southern Britain during Marine Oxygen Isotope Stage 11*. Sherriff has worked as Research Assistant on the *Ancient Human Occupation of Britain* (AHOB) 3 project and is presently a Post-doctoral Research Fellow on the Leverhulme Trust-funded *Pleistocene Archaeology, Geochronology and Environment of the Southern Caucasus* (PAGES) project (University of Winchester 2018). She has published on several important Marine Isotope Stage 11 sites in the UK, e.g. Swanscombe and Marks Tey (Candy et al. 2014a, 2014b; Sherriff et al. 2014; Tye et al. 2016). Sherriff's geological and palaeoenvironment knowledge complements that of Knul and will be employed in the examination of the Southern, Thames and Anglia Project Zones.

11. Methods statement

- 11.1 The methodology used by the Project will be that developed for Hampshire in 1999-2004¹⁶ and then used for Development Control purposes in that county ever since (e.g. Figure 2) (Wilkinson and Hennessy 2004). As noted above, the approach is also similar to that employed in the HER enhancement exercise carried out in Essex (O'Connor 2015). The stages by which the Project will be implemented and the associated methodologies are both set out in Section 12.2, and summarised below. As is made clear, the methodology is entirely in accordance with HIAS principals (English Heritage 2018b) and the Archaeology Data Service (2018) *Guides to Good Practice*.
- 11.2 As outlined in Section 3, data sources to be used by the project will comprise national datasets [BGS 1/50,000 superficial geology polygons, the SRPP and TERPS (Wymer 1999), the *Gazetteer of Upper Palaeolithic sites in England and Wales* (Wymer and Bonsall 1977) and NRHE archives]; published accounts of the Pleistocene geology, palaeoenvironment, chronology and archaeology of key sites, and grey literature resulting from Palaeolithic/Pleistocene-related projects carried out as part of the ALSF. The national data will be collected on project initiation from the BGS, Historic England and the Archaeology Data Service, and stored on a server at the University of Winchester¹⁷. The 1/50,000 superficial geology polygons are organised into tiles that correspond to the paper maps produced by the BGS. The tiles will therefore be read into ArcGIS 10.4, combined as a single file and then cookie-cut into files using polygons corresponding to the Environment Agency's River Basin Districts (RBD) (Figure 4). These latter are the geographic zones used by the Project as a basis for analysis. SRPP, TERPS and NRHE data will be read into an Access database, weeded (to remove duplicates) and manipulated to produce separate, but related tables containing information on site details (name, location, bibliographic details), artefacts (type and quantity), environment (presence and relative quantity of key flora and fauna), and chronology (where absolute dates have been obtained or as indicated by biostratigraphy). The Access database will be added to the ArcGIS 10.4 project.
- 11.3 Consultation on the criteria to be used for assessing the Palaeolithic archaeological potential of a given geological unit has been via feedback received at the four meetings of the *Curating the Lower and Middle Palaeolithic* project (Section 4.1), and will be via a SurveyMonkey survey completed by those subscribing to PalNetUK listserve, members of ALGAO, and officers of Historic England. In developing criteria, note will also be taken of published frameworks (i.e. English Heritage 1998, Gamble et al. 2008) and academic research on the chronology of hominin presence in Britain (e.g. Sutcliffe 1995, Hosfield 1999, White and Schreve 2000, Currant and Jacobi 2001, Schreve 2001, Ashton and Lewis 2002, Pettitt and White 2012). It is envisaged that a 'traffic light' categorisation similar to that used by Wilkinson and Hennessy (2004) for Hampshire will be adopted by the Project (Table 2).

¹⁶ The Hampshire study was jointly funded by Hampshire County Council and King Alfred's College, Winchester (the latter a former name for the present University of Winchester).

¹⁷ Data on this server are stored both locally and on a second duplicate server in Germany. Backup from one to the other is on a daily basis.

Table 2. Categories of Palaeolithic archaeological significance used by Wilkinson and Hennessy (2004, 46-47) for Hampshire

Potential/Density	Category	Description
High	<i>In situ</i>	Well mapped geological units that are likely to contain <i>in situ</i> Palaeolithic remains by virtue of comparison with similarly dated units elsewhere
Moderate	<i>In situ</i>	Geological units that <i>may</i> contain <i>in situ</i> Palaeolithic remains or less well constrained geological units which are likely to contain such remains
Low	<i>In situ</i>	Geological units which are suitable for the preservation of <i>in situ</i> Palaeolithic remains, but which on the basis of current views of hominid occupation of Britain and available chronological evidence are unlikely to contain Palaeolithic remains. Also raised beach deposits which are represented only by marine gravels
Uncertain	<i>In situ</i>	Geological units which are suitable for the preservation of <i>in situ</i> Palaeolithic remains, but which are undated
High	Lag	Deposits which have been demonstrated to contain Palaeolithic remains
Moderate	Lag	Deposits which may contain Palaeolithic remains on account of their topography, but where artefact find spots are absent
Low	Lag	Deposits which because of their topographic position are unlikely to contain Palaeolithic artefacts and for which no records exist
High	Derived	Gravel terraces where prior research suggests enhanced quantities of derived artefacts
Moderate Many	Derived	Well constrained geological units where high concentrations of Palaeolithic artefacts can be expected. This is on the basis of comparison with the existing database and current theory as to the timing of hominid occupation of Britain)
Medium		Poorly constrained geological units where high concentrations of Palaeolithic artefacts occur or well mapped geological units likely to contain lower quantities of artefacts
Few		Poorly constrained geological units where low quantities of Palaeolithic artefacts are expected
Low	Derived	Geological units forming when current theory suggests that hominids were absent from Britain, but which contain derived artefact assemblages or units from which no artefacts are known

- 11.4 Assignment of Palaeolithic archaeological potential for geological units in each Project zone (RBD) will thereafter proceed as follows:
1. Research is carried out in the academic (via Scopus and Google Scholar queries using appropriate geographically-based key terms to find journal papers and of ProQuest to recover relevant PhD theses) and ALSF-derived grey literature to both identify key archaeological and palaeoenvironmentally significant sites (supplementing those SRPP, TERPS, Gazetteer and NRHE-derived entries in the Access database, adding new records and linking the entries to URLs of relevant open source publications/literature), but also to understand the age of the relevant geological strata.
 2. Database entries are cross-referenced with geological unit polygons using topological querying routines in ArcGIS 10.4.

3. Criteria for assessing Palaeolithic archaeological significance (Section 11.3) are applied to each geological polygon as a new entry in the attribute table on the basis of properties of cross-referenced sites and the wider geological literature.
4. Text is written (as HTML files hyperlinked to the relevant objects) as guidance on how to use polygon and key site data. The explanation of the relevant category of Palaeolithic archaeological potential is also hyperlinked to the relevant field in the attribute table.



Figure 4. River Basin Districts (RBD) of England: the zonal basis of the project (Environment Agency 2015)

- 11.5 An initial version of the dataset will be transferred to BGS' IT service once the routines set out in Section 11.3 have been completed for the South East, Thames and Anglian Project zones (RBDs), i.e. Project Stages 2-5 (see Section 12.2.2 below). Transfer will be as an ESRI Geodatabase (containing 'layer' files that instruct the GIS how particular components behave and are displayed) enabling easy incorporation within BGS' ESRI ArcGIS Server. With the aid of the Project team the latter body will thereafter implement, but not publish the dataset on the LandFIT portal. Select curators and officers from Historic England will then be given permissions to access the resource and test it over a three-month period. Feedback from the testing will then be used to improve implementation and guide the development of resources for the remaining Project zones. Implementation of Project data for the Southern England, Thames and Anglian Project zones is timed to coincide with the launch of Historic England's guidance for the Middle and Lower Palaeolithic in spring 2020.
- 11.6 Project data for Project zones other than those set out in Section 11.5 will be transferred to the BGS IT service in January 2020 for implementation by March 2020 (i.e. Project Stages 6-10 – see Section 12.2.2).
- 11.7 Once published via BGS' LandFIT portal the Project resource will be freely available to publicly funded planning authorities. In its initial implementation it will be possible to view (against topographic backdrop maps) and query the dataset, while hyperlinked web-pages will provide background information, definitions and gateways to further resources.
- 11.8 Text will be written by the Project team for an internet homepage and the Palaeolithic guidance document (i.e. the final product of the *Curating the Lower and Middle Palaeolithic* project) to explain the Project and how the resource should be used. Articles will also be written for the Chartered Institute for Archaeologists' *The Archaeologist* and the *Quaternary Research Association (QRA) Newsletter* (collectively the publications most likely to be seen by curators, consultants and those with an interest in the English Palaeolithic/Pleistocene) announcing and explaining the Project and its resources. Historic England's Science Advisors will be able to use these publications in publicising and explaining the Project resource to archaeological organisations working in their areas. Finally, UK University Archaeology departments will also be contacted to make relevant staff aware of the resource and its relevance for teaching and research.
- 11.9 The archive resulting from the Project will be entirely digital. It will reside with at the University of Winchester and with Historic England's IT service as well as with the BGS.

12. Stages, products and tasks

12.1 Products

- 12.1.1 The following products will result from the Project (Products 3-6 are considered 'core', and the remaining are 'supporting'):
1. An agreed [with Historic England officers, Palaeolithic archaeology/Pleistocene geological experts active on the PALNETUK@JISMAIL.AC.UK list serve, ALGAO members (curators) and attendees at workshops of the *Curating the Lower and Middle*

Palaeolithic project] suite of criteria for defining various level of Palaeolithic archaeological potential;

2. A webpage providing a portal to the Project data and explaining the resource;
3. GIS polygons (ESRI Shape files/geodatabase components for all Pleistocene strata mapped by the BGS (or otherwise published in the academic press) in England (stripped of most BGS attribute data);
4. Attribute data for each superficial geology polygon comprising an assessment of Palaeolithic archaeological potential on a qualitative scale;
5. Point data (ESRI Shape files/geodatabase component) providing the location, nature of finds and chronology (as above) and bibliography for key Pleistocene archaeological, palaeoenvironmental and geological sites in England;
6. A user manual/online help files as hyperlinks to the attribute data in the Shape files listed above providing definitions and instructions on how to perform relevant routines;
7. Inclusion of the Project resource via a link in the new Historic England Palaeolithic guidelines (Hosfield et al. 2017);
8. Articles in the *QRA Newsletter* and *The Archaeologist* (announcing and explaining the Project resource);
9. Promotion of the Project resource to Archaeology departments in British and North-west European universities (via formal email and social media).

12.1.2 Descriptions of the *core* products of the Project are further detailed in Appendix 2.

12.2 Stages and Tasks

12.2.1 The project will last for 12 calendar months in continuous mode (January - December 2019) followed by a further 3 months in discontinuous mode (January 2020-March 2020).

12.2.2 Tasks necessary to produce Products 1-10 (Section 12.1) are presented as a series of project Stages in Table 3. Note: two Project Officers (Monika Knul and Dr Jenni Sherriff) will be employed to carry out tasks associated with the South East, Thames and Anglian Project zones (i.e. Project Stages 2-4, 7-8) (see Figure 1) as the data from these areas is both more numerous and complex than those elsewhere.

Table 3. Project stages and staff time

Stage 1: Scoping and data collection			
Task	Description	Staff	Days
1	Develop a SurveyMonkey questionnaire on factors that contribute to Palaeolithic archaeological significance and distribute it to stakeholders via PALNETUK@JISCMAIL.AC.UK and ALGAO. Attend and present at <i>Curating the Lower and Middle Palaeolithic</i> workshops (see footnote ¹² above).	KW, MK	0.5 5
2	Design Project GIS structure and data representation within ArcGIS 10.4 and Access database software.	KW, MK, JS	1 5 1
3	Obtain baseline data, i.e. superficial geology polygons from the BGS/Digimap, <i>Southern Rivers Palaeolithic Project</i> and <i>English Rivers Palaeolithic Survey</i> databases from Historic England or download from Archaeology Data Service website: http://archaeologydataservice.ac.uk/archives/view/terps_eh_2009/d	MK	10

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Appendix 2. Product description

Product number:	3-5	6
Product title:	Geodatabase of Palaeolithic archaeological potential	User manual/help files
Purpose and composition:	Palaeolithic archaeological potential attributions and underpinning data, together with bibliographic links to publications where further detail can be obtained	Definitions of terms within the Shape files/geodatabase, guidance on how to perform relevant routines within the online GIS
Derived from:	BGS 1/50,000 maps, TERPS/SRPP database, published literature	None
Format:	ESRI Shape or geodatabase	HTML
Allocated to:	MK, JS	KW, MK, JS
Quality criteria and method:	Peer review	Peer review
Person/group responsible for quality assurance:	KW and Historic England advisors/steering group	KW and Historic England advisors/steering group
Planned completion date:	Initial version – September 2019 (assuming January 2019 start date); Final version – March 2020	Initial version – January 2020 (assuming January 2019 start date); Final version – March 2020

Key: KW – Keith Wilkinson, MK – Monika Knul; BGS – British Geological Survey, TERPS – English Rivers Palaeolithic Survey, SRPP – Southern Rivers Palaeolithic Project

The user manual/help files (Product 6) will contain the following:

1. Definitions

- 1.1 Chronological (archaeological and Pleistocene geological)
- 1.2 Geological (i.e. terminology used within attributes/descriptions of geological polygons)
- 1.3 Technological (lithic tool industries)
- 1.4 Potential classes (see Table 3, Task 8)

2. Methods

An explanation of how the GIS dataset was produced.

3. Instructions

Procedures to be employed to use the GIS resource.

4. Geological polygon classes

A description of each geological polygon class and justification of its allocated archaeological potential.