The London Resort Development Consent Order

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Environmental Statement
Volume 2: Appendices

Appendix 14.9 – Historic Environment Framework, December 2020

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December 2020

Planning Act 2008
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2)(a)
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 12(1)

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The London Resort Company Holdings Limited

The London Resort

Environmental Statement

Document Reference 6.2.14.9

Appendix 14.9
The London Resort
Historic Environment Framework

wessexarchaeology

London Resort

Historic Environment Framework

Document Ref.: 106574.04
December 2020

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Front cover View looking north across Swanscombe Peninsula

Summary

Wessex Archaeology was commissioned by London Resort Company Holdings to prepare a Historic Environment Framework for the proposed London Resort. The Proposed Development consists of two Project Sites, the Kent Project Site located at Ebbsfleet and Swanscombe and the Essex Project Site located to the south of Tilbury, collectively referred to as the 'Project Site'. The purpose of this document is to outline a framework for the management of the archaeological and heritage resource of the Project Site and proposals for further assessment/evaluation and mitigation for the development proposals, where harm is unavoidable. Initial proposals for heritage interpretation and public engagement are also included to enhance public value and benefit from engagement with the historic environment, to contribute to place-making and to provide information on the special archaeological and historic interest of the area.

This is intended to be a live document that will updated and revised as archaeological works are completed. The results of initial evaluation and assessment phases will inform the need for and scope of further archaeological works.

Acknowledgements

This project was commissioned by London Resort Company Holdings, and Wessex Archaeology is grateful to them in this regard.

London Resort

Historic Environment Framework

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by London Resort Company Holdings, to prepare a Historic Environment Framework (HEF) for the proposed London Resort. The Proposed Development consists of two Project Sites, the Kent Project Site located at Ebbsfleet and Swanscombe and the Essex Project Site located to the south of Tilbury (**Figure 1**). The purpose of this document is to outline a framework for the management of the archaeological and heritage resource of the Project Site and proposals for further assessment/evaluation and mitigation of the development proposals, where harm is unavoidable.

1.1.2 This document will inform a Development Consent Order (DCO) application for a Nationally Significant Infrastructure Project (NSIP) to be submitted to the Planning Inspectorate for examination and determination. This strategy is intended to be a 'live' document that will be updated as further assessment is undertaken to inform the evolving mitigation for the development proposals. It is a high level document outlining the broad approaches to achieving preservation in situ of significant archaeological remains through embedded mitigation and the protocols to be followed with regard to further assessment, mitigation and monitoring, during detailed design and construction.

1.1.3 Written Schemes of Investigation (WSI) will be prepared, informed by this document, and preliminary WSIs for some phases of evaluation have been appended to this document. These will be agreed in consultation with the relevant statutory consultees prior to the works taking place.

1.2 The Project Site

1.2.1 The Kent Project Site comprises an irregular parcel of land of approximately 390ha located predominantly on the Swanscombe Peninsula and a corridor of land in a broadly north south direction between the peninsula and the A2, within the boroughs of Dartford and Gravesham. The Kent Project Site also includes a 3.5km length of the A2(T) corridor between the established junctions at Bean to the west and Pepper Hill to the east.

1.2.2 Due to the size of the area, the Kent Project Site currently operates under a variety of uses. The peninsula largely comprises open low lying former marshland with extensive former Cement Kiln Dust (CKD) tips and other brownfield former industrial land. A number of drains, filtration systems, aeration lagoons and other features are also present with much of the area which has revegetated naturally. A number of public footpaths also bisect the peninsula. The corridor of land to the south is occupied by the Ebbsfleet International Station, car parking and associated access and the A2.

1.2.3 The Kent Project Site also comprises an area of the River Thames immediately adjacent to the foreshore, as well as the structures of White's Jetty and Bell Wharf.

1.2.4 The Essex Project Site comprises approximately 26ha, located immediately to the east of the port of Tilbury within the borough of Thurrock. Tilbury Fort lies to the east of the Essex Project Site and Tilbury's second Port, Tilbury 2 currently under construction, lies further east.

1.2.5 The Essex Project Site currently comprises a large hard surfaced area used for vehicle storage, a large logistics shed and storage area, area of vegetation and hardstanding and Tilbury Ferry Terminal. It also includes an area of the Thames immediately adjacent to the foreshore, as well as marine structures associated with Tilbury Ferry Terminal. A second area of the Essex Project Site lies further north focussed on the roundabout across the A1089 at Dock Road and St Andrews Road. The Grade II* Riverside Station and floating landing stage lies within the Essex Project Site.

1.3 Scope of document

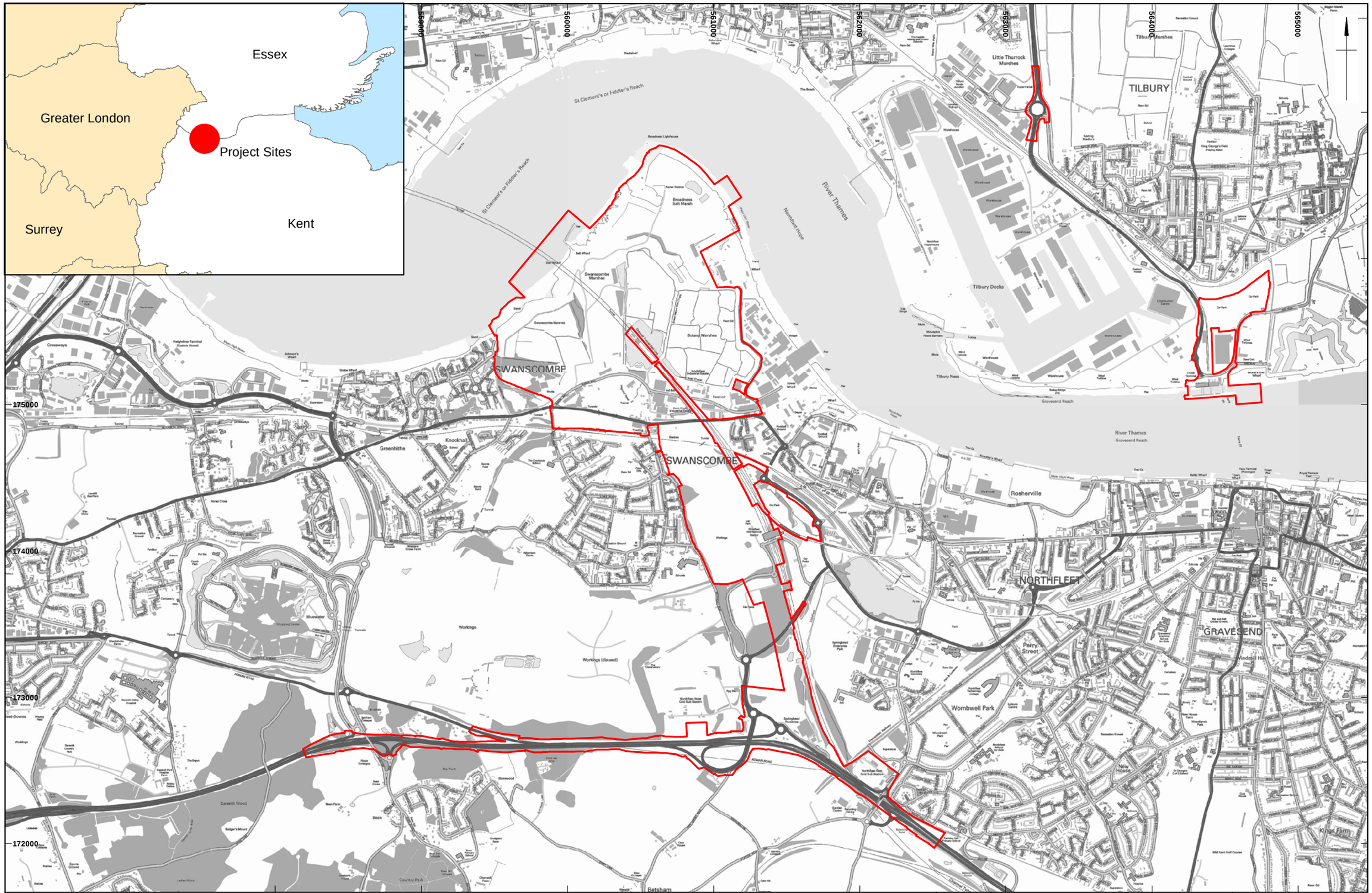
1.3.1 Chapter 14: *Cultural Heritage and Archaeology* of the Environmental Statement (ES) (document reference 6.1.14) has identified further assessment and mitigation measures to be undertaken to evaluate and/or mitigate potential effects of the Proposed Development on the archaeological resource. The baseline assessments and ES identified the need to preserve significant archaeological remains in situ, in consultation with the statutory consultees. This allowed the development proposals to respond to the archaeological constraints through the design process to minimise the harm. This document sets out the broad methodology for types of evaluation and mitigation that will be required for the Proposed Development and outlines in which of the characterisation zones that the work should take place.

1.4 Objectives

1.4.1 The specific objectives of this document are to:

- Identify where the Proposed Development does and does not have the capacity to affect archaeological remains;
- Outline how significant archaeological remains will be managed and preserved;
- Identify where further evaluation or assessment will be required to characterise and establish the significance of unknown archaeological remains;
- Outline mitigation measures through archaeological investigation, recording and publication of archaeological remains where harm is unavoidable; and
- Outline proposals for public engagement in order to enhance public value and benefit from the proposals, contribute to place-making and provide information on the special archaeological and historic interest of the area.

1.4.2 For each stage of the evaluation/mitigation an individual Written Scheme of Investigation will be prepared in consultation with the statutory authorities. This HEF will not act as a Written Scheme of Investigation but will provide a general outline of the expected archaeological work. As the archaeological assessment of a site is a staged process, the initial stages of investigation will inform the subsequent stages. The strategy will be revised and updated as necessary as new information becomes available. Written Schemes of Investigation for evaluation works have been appended to this document.



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Site Location Plan (Kent and Essex Project Sites)

Figure 1

2 PLANNING BACKGROUND AND TECHNICAL GUIDANCE

2.1 Legislative and Planning Background

2.1.1 There is national legislation and guidance relating to the protection of, and proposed development on or near, important archaeological sites or historical buildings within planning regulations as defined under the provisions of the *Town and Country Planning Act 1990*. In addition, local authorities are responsible for the protection of the historic environment within the planning system.

2.1.2 The Planning Background is provided within the ES Chapter (14: Cultural Heritage and Archaeology) (document reference 6.1.14) and Baseline Assessments, Archaeological Desk-Based Assessment (document reference 6.2.14.1) and Built Heritage Statement (document reference 6.2.14.2).

2.2 Guidance

2.2.1 The following general guidance will be used to guide the work undertaken;

- Chartered Institute for Archaeologists (CIfA) 2014a (revised 2019) Code of Conduct;
- Chartered Institute for Archaeologists (CIfA) 2014b (revised 2020) Standard and Guidance for Archaeological Field Evaluation;
- Chartered Institute for Archaeologists (CIfA) 2014c (revised 2020) Standard and Guidance for geophysical survey;
- Chartered Institute for Archaeologists (CIfA) 2014d (revised 2020) Standard and Guidance for Archaeological Excavation;
- Chartered Institute for Archaeologists (CIfA) 2014e (revised 2020) Standard and Guidance for Archaeological Watching Brief;
- Chartered Institute for Archaeologists (CIfA) 2014f (revised 2020) Standard and Guidance for Archaeological Investigation and Recording of Standing Buildings and Structures;
- Chartered Institute for Archaeologists (CIfA) 2014g (revised 2020) Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives;
- Chartered Institute for Archaeologists (CIfA) 2014h (revised 2020) Standard and Guidance for the collection, documentation, conservation and research of archaeological materials;
- Chartered Institute for Archaeologists (CIfA) 2014 (revised 2020) Standard and guidance for nautical archaeological recording and reconstruction;
- Department for Communities and Local Government (DCLG), 2018. National Planning Policy Guidance;
- Campbell, G, Moffett, L and Straker, V 2011 'Environmental Archaeology. A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition)'. Portsmouth: English Heritage;

- Historic England, 2008, MoRPHE Project Planning Note 3: 'Archaeological Excavation';
- Historic England, 2015b. Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide;
- English Heritage 2008. Conservation Principles, Policies and Guidance: For the sustainable management of the historic environment;
- Historic England, 2015. Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record;
- Historic England, 2016. Preserving Archaeological Remains: Decision-taking for Sites under Development;
- Historic England 2020. Deposit Modelling and Archaeology, Guidance for Mapping Buried Deposits;
- MOLA 2004. Mitigation of Construction Impact on Archaeological Remains;
- Plets et al, 2013. Marine Geophysics Data Acquisition, Processing and Interpretation;

2.2.2 For work undertaken within the County of Kent, guidance produced by Kent County Council will be followed, these are referenced in the relevant sections below.

3 PREVIOUS INVESTIGATION AND ASSESSMENT

3.1 Introduction

3.1.1 The rich archaeological resource surrounding both the Kent and Essex Project Sites has resulted in a large number of archaeological investigations in these areas ranging from chance finds in the 19th and 20th centuries, to research led excavations and finally development led investigations. A summary of key investigations is provided below. Further information is provided within the Archaeological Desk-Based Assessment (document reference 6.2.14.1) (Wessex Archaeology 2020a).

3.2 Assessment undertaken for London Resort

3.2.1 Assessment for the Proposed Development t has been undertaken to inform the ES Chapter 14 Cultural Heritage and Archaeology (document reference 6.1.14), these investigations have comprised:

- *Geophysical Survey, Land South of the A2, Detailed Gradiometer Survey (Wessex Archaeology September 2016), (this area now lies outside of the Kent Project Site to the south);*
- *Archaeological Evaluation (trial trenches and test pitting), Land North of Springhead Nursery (Wessex Archaeology 2017);*
- *Partial Geophysical Survey, Swanscombe Peninsula, Electrical Resistivity Tomography (ERT) and Electromagnetic Induction (EMI) Survey (Wessex Archaeology September 2017); and*
- *Monitoring of geotechnical boreholes (2015).*

3.3 Previous Archaeological Investigations undertaken within the Kent Project Site

3.3.1 There has been an archaeological interest in the Ebbsfleet area for over 100 years. The extensive quarrying of the area led to chance discoveries of Palaeolithic artefacts which were followed up by archaeological investigation. Due to the date of the excavation and the methods used some of the recording is incomplete and below modern standards of archaeological recording. These early investigations were focussed largely on prehistoric discoveries. A large number of Palaeolithic discoveries were made during the late 19th and early 20th centuries. Rather than being deliberate investigations for archaeological purposes most of this material was discovered as part of finds recovery during quarrying activity. Such material was recovered by Spurrell in the 1880s, by J Cross in 1906-08, and by Smith and Dewey in 1910.

3.3.2 The Roman settlement and ritual site of *Vagniacis* at Springhead has been known since at least the 19th century and has been investigated since this time. In the mid-20th century works associated with the construction of the A2 led to the excavation of a large area of the Roman town. Following this smaller excavations for services were undertaken which also encountered Roman remains. A large number of investigations were undertaken within the Kent Project Site in advance of the construction of High Speed 1 (HS1). This included fieldwalking, geophysics, borehole surveys, trial trench evaluation, excavations, test pitting and watching brief.

3.3.3 A detailed programme of archaeological evaluation, excavation and mitigation was undertaken prior to the construction of the HS1 railway line and associated infrastructure. This included the area for the railway line, the Ebbsfleet International Station and a junction with the A2. These works included fieldwalking, geophysics, borehole surveys, trial trench evaluation, excavation, test pits and watching brief. Principle Sites included:

- ARC SPH00 (sanctuary site),
- ARC ERC01 (Ebbsfleet River Crossing),
- ARC SHN02 (roadside settlement),
- ARC WCY02 (walled cemetery), A
- RC 324E02 (Watching Brief),
- WA 51724 (part of roadside settlement)
- ARC ESG00 (Ebbsfleet Sports Ground),
- ARC EBB01 (villa/mill site; western complex wetlands)
- ARC NKL 02 (North Kent Line; and
- ARC 342W02 (watching brief).

3.3.1 Outside of the works for HS1 other investigations have been undertaken on the Swanscombe peninsula. These have included a number of watching briefs predominantly upon geotechnical works and monitoring of test pits and boreholes for a sewerage pipeline. The North Kent Coast Rapid Coastal Zone Assessment covered the peninsula which comprised field survey and visual assessment of the coastline.

3.3.2 Adjacent to the HS1 site of ARC SHN02 was an evaluation, excavation and watching brief undertaken for the relocation of the glasshouses at Springhead Nursery (Wessex Archaeology 2004) and a watching brief was undertaken at Springhead service station. Archaeological evaluation and watching brief were undertaken at the Pepperhill recycling centre, neither of which revealed any archaeological finds or features.

3.3.3 The monitoring of two test pits was undertaken at Millbrook Garden Centre which did not reveal any finds or features. Ahead of the A2 widening scheme an archaeological excavation was undertaken.

3.3.4 Investigations have also been undertaken at Northfleet East Substation and immediately to the north at Wingfield Bank in advance of the construction of a superstore.

3.4 Previous Archaeological Investigation undertaken adjacent to the Essex Project Site

3.4.1 Immediately adjacent to the northern boundary of the Essex Project Site forms part of the area for the Tilbury 2 development and an archaeological evaluation was undertaken in 2019 in advance of construction of the access road. Due to on-site obstructions and underground services the two trenches planned for the western part of the area were divided into test pits and some of the other trenches had to be shortened. A total of 5 trenches and 5 test pits were excavated immediately to the north of the Essex Project Site. No archaeological finds or features were discovered in any of the trenches or test pits and made ground was found to a depth of at least 1.20m below ground level (bgl). In test two of the trenches/test pits a natural or redeposited natural was identified at a depth of 1.10m-1.20m+ bgl (Wessex Archaeology 2019; 216260).

4 ARCHAEOLOGICAL CHARACTERISATION ZONES

4.1 Introduction

4.1.1 As part of the Archaeological Desk-Based Assessment (document reference 6.2.14.1) the Project Site was characterised to demonstrate areas of archaeological potential and significance across the Project Sites. This has been based upon the data collected for the baseline including the Historic Environment Record, Historic mapping, Site visit, Aerial Photographs, LiDAR imagery and geological and topographic information as well as previous work undertaken to date for the London Resort, geophysical surveys and archaeological evaluation.

Archaeological Characterisation by period and Depth of Deposits (Holocene) (Stage 1)

4.1.2 The sources mentioned above were used to inform Stage 1 of the characterisation of the Project Site. This involved a detailed review of investigations undertaken within the Project Site, analysing the results from each period determining the potential for further remains to be found within this area and the predicted significance of the archaeological resource.

4.1.3 The archaeological characterisation draws together the archaeological information based upon previous investigations undertaken within the Project Site and characterised the Project Site based upon its archaeological potential ranging from ‘No potential’ to ‘High potential’. The depths of the archaeology encountered was included where this information was available within excavation reports from previous investigation. The stage 1 characterisation is presented within Appendix 8 of the Archaeological Desk-Based Assessment (document reference 6.2.14.1), as this was used to inform the Stage 2 characterisation (below) this has not been repeated here.

Archaeological Characterisation Zones (Stage 2)

4.1.4 The Stage 2 characterisation 'Zones' have been designed to provide an overview of the archaeological potential and significance based upon the detailed information collated for Stage 1. The sources mentioned above were used to inform Stage 1 of the characterisation of the Project Site, Stage 2 has collated and summarised the information as a whole over all periods and suggested measures for further archaeological assessment work and mitigation. Where further assessment in the form of evaluation has been identified evaluation objectives have been outlined. These are further developed within the Written Schemes of Investigation for the evaluation (see **Appendices 2**, **3** and **4** of this report).

4.1.5 For both the Stage 1 and Stage 2 characterisation entries in the table are assigned a *'Potential'* rating, which represents a measure of probability. This has been determined via the application of professional judgement, informed by the evidence presented in the preceding sections of this assessment. '*Potential'* is expressed on a four point scale, assigned in accordance with the following criteria:

- **High** Situations where heritage assets are known or strongly suspected to be present within the Site or its vicinity and which are likely to be well preserved.
- **Moderate** Includes cases where there are grounds for believing that heritage assets may be present, but for which conclusive evidence is not currently available. This category is also applied in situations in which heritage assets are likely to be present, but also where their state of preservation may have been compromised.
- **Low** Circumstances where the available information indicates that heritage assets are unlikely to be present, or that their state of preservation is liable to be severely compromised.
- **No Potential** Areas which have been formerly quarried for chalk extraction which will have removed archaeological remains as such no potential for archaeology exists in these areas.

4.2 Palaeolithic Character Areas (prepared by F. Wenban-Smith 2017)

4.2.1 The following Palaeolithic Character areas were prepared by Dr. Francis Wenban-Smith in 2017 for the Proposed Development. This has characterised the Kent Project Site in terms of Palaeolithic potential, significance and includes recommendations for evaluation works. Accompanying plans are presented in **Appendix 1**.

Table 1 Palaeolithic Character Areas

PP area#	Palaeolithic Potential	Likelihood of presence	Importance if present	Vulnerability to Impact	Likely Palaeolithic remains	Prelim evaluation recommended
PP1	High	High	High	High	Artefacts, Faunal remains, in stratified fluvial sequence	Yes
PP2	Uncertain	Moderate	Moderate	Low	Palaeoenvironmental remains in stratified fluvial sequence	

PP3	High	High	High	High	Artefacts, Faunal remains, in stratified fluvial sequence	Yes
PP4	High	High	High	High	Artefacts, Faunal remains, in stratified fluvial sequence	Yes
PP5	High	High	High	Moderate	Artefacts, Faunal remains, in stratified fluvial sequence	
PP6	High	High	High	Moderate	Artefacts, Faunal remains, in stratified fluvial sequence	Yes
PP7	High	High	High	Low	Palaeoenvironmental remains in stratified fluvial sequence	
PP8	Low	Low	Uncertain	Low	Derived artefacts	
PP9	Medium	High	Lo	High	Derived artefacts	
PP10	Very Low	Low	Low	Low	Derived artefacts	
PP11	High	High	Usually High	Variable	Concentrations of lithic artefacts, possibly associated with undisturbed palaeolandsurfaces; faunal remains	
PP12	Uncertain	Uncertain	Maybe High	Maybe High	lithic artefacts and faunal/ environmental remains	
PP13	Uncertain	Uncertain	Maybe High	Moderate/Low	lithic artefacts and faunal/ environmental remains	
PP14	High	High	High	High	lithic artefacts and faunal/ environmental remains, possibly associated with undisturbed landsurfaces	Yes
PP15	High/Moderate	Moderate	High	Moderate/Low	lithic artefacts and faunal/ environmental remains	
PP16	Moderate	Moderate	High	Moderate/Low	Lithic artefacts	
PP17	High	Moderate	High	Moderate/Low	Lithic artefacts and faunal/environmental remains, in stratified sequence	
PP18	Moderate	Moderate	Moderate	Moderate/Low	Faunal/environmental remains, in stratified sequence; possibly late Upper Palaeolithic (Long Blade)	
PP19	Moderate	Moderate	Moderate	Moderate/Low	Faunal/environmental remains, in stratified sequence; possibly late Upper	

					Palaeolithic (Long Blade)	
PP20	Uncertain, maybe high	Moderate	Maybe High	Low	Fluvial deposits with artefacts, below quarry backfill	
PP21	Low	Low	Low	Low	possibly occasional derived palaeolithic remains within clay; any underlying sediments may contain less disturbed remains and biological evidence	
PP22	High	Low	High	Moderate	None known, but likely to be present in places	
PP23	High	Moderate	High	Moderate	None known, but likely to be present in places	
PP24	Low	Low	Low	Low	Very unlikely to find any Palaeolithic remains, and any found would probably be re-worked from much older sediments	
PP25	Medium	Moderate	Moderate	Low	None known, but may be present in places	
PP26	Uncertain	Moderate	Maybe High	Moderate	Artefacts in fluvial terrace sands/gravels	Yes
PP27	Uncertain maybe high	uncertain	Maybe High	Maybe High	Concentrations of lithic artefacts, possibly associated with undisturbed palaeolandsurfaces; faunal/ environmental remains	
PP28	high	High	High	High	Concentrations of lithic artefacts, possibly associated with undisturbed palaeolandsurfaces; faunal/ environmental remains	
PP29	High	High	High	Variable	Lithic artefacts; faunal/environmental remains; important/rare deposit horizons	
PP30	High	High	High	High	Concentrations of lithic artefacts, possibly associated with undisturbed palaeolandsurfaces;	

					faunal/ environmental remains	
PP31	Uncertain	Moderate	Maybe High	Moderate	Artefacts in fluvial terrace sands/gravels; late Upper Palaeolithic (Long Blade) in colluvium/alluvium interdigitation zone	Yes
PP32	Uncertain	Moderate	Maybe High	Moderate	Artefacts in fluvial terrace sands/gravels	Yes
PP33	Uncertain	Moderate	Maybe High	Moderate	Artefacts in fluvial terrace sands/gravels	Yes
PP34	Uncertain	Moderate	Maybe High	Moderate	Late Upper Palaeolithic (Long Blade) in colluvium/alluvium interdigitation zone	Yes
PP35	Uncertain	Moderate	Maybe High	Moderate	Late Upper Palaeolithic (Long Blade) in colluvium/alluvium interdigitation zone	Yes
PP36	Uncertain	Moderate	Maybe High	Moderate	Artefacts in very old fluvial terrace sands/gravels or in slightly disturbed horizons under slopewash	Yes
PP37	Uncertain	Moderate	Maybe High	Moderate	Artefacts in very old fluvial terrace sands/gravels or in slightly disturbed horizons under slopewash	Yes
PP38	Uncertain	Moderate	Maybe High	Moderate	Artefacts in very old fluvial terrace sands/gravels or in slightly disturbed horizons under slopewash	

4.3 Archaeological Characterisation Zones

4.3.1 Below are the Stage 2 characterisation zones prepared for the Archaeological Desk-Based Assessment (document reference 6.2.14.1) for the Proposed Development. References within the tables below (e.g. P8, RB24, ASM6, PMM7) relate to the Stage 1 Characterisation, presented within Appendix 8 of the Archaeological Desk-Based Assessment (document reference 6.2.14.1). The Palaeolithic areas (PP1, PP2 etc) relate to those outlined in **Table 1** above. In addition to the characterisation zones, areas which have been previous evaluated are shown on the plans. The Zones below are shown in **Figures 2**-**5**.

Evaluation Objectives

4.3.2 Key research questions and the evaluation aims will be set out within WSI's and agreed in consultation with the statutory consultees such as Historic England, Kent County Council and Essex County Council as appropriate. However, some general objectives for further evaluation can be defined for the Archaeological Characterisation Zones where further evaluation will be required, and these can be utilised to define a set of research questions once the full development impacts and scope of the archaeological evaluation is clarified. The need to address site specific objectives will be determined by the scope of the evaluation works that will take into account the Proposed Development's impacts.

Table 2 Archaeological Characterisation Zone 1

ID No. Zone 1		
Description	Zone 1 occupies the centre of the Kent Project Site and is characterised by its former use for chalk quarrying and later landfilling.	
Previous Investigation	No previous intrusive archaeological investigation, as areas known to have been quarried and subsequently landfilled	
Previous Impacts	Area formerly subject to deep quarrying for chalk, no potential for archaeological remains of any period to exist	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	None	N/A
Prehistoric	None	N/A
Romano-British	None	N/A
Anglo-Saxon & Medieval	None	N/A
Post-Medieval to Modern	None	N/A
Summary		
Previous chalk quarrying has removed the potential for any post-Palaeolithic archaeological remains to exist within this area.		
Further Work		
Part of this area is to be evaluated for Palaeolithic deposits as part of the evaluation for the people mover and access road. This will identify whether previous quarrying in the area has affected Palaeolithic remains. Written Scheme of Investigation for this work is provided in **Appendix 2**.		
Evaluation Research Objectives		
Specific evaluation objectives for both the access road and the people-mover route are provided in **Appendix 2**. General evaluation objectives are listed below: • To establish with a high degree of confidence the nature, character, distribution, extent and depth of Quaternary deposits across the Site • To assess the Palaeolithic potential of the site and establish its importance and significance in the context of national and regional research priorities • To verify and improve the existing characterisation model above of surviving deposit character and potential		

Table 3 Archaeological Characterisation Zone 2

ID No. Zone 2		
Description	Zone 2 is located in the centre of the peninsula, area formerly used as sewage works	
Previous Investigation	None	
Previous Impacts	19th and 20th century sewage works	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	None	N/A
Prehistoric	None	N/A
Romano-British	None	N/A
Anglo-Saxon to Post-Medieval	None	N/A
19th Century and Modern	High	No Heritage Significance
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Shepperton Gravels	High	Present at the base of the Holocene sequence. Key context for Final Upper Palaeolithic archaeology with possibility for organic deposits with palaeoenvironmental potential.
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Potential for peat layers interbedded with alluvium. Key deposits for examining past vegetation change, environment and land use dating to the Mesolithic – Iron Age
Summary		
Zone 2 characterised by modern development of the sewage works on the peninsula, evidence of this has no heritage significance. It's possible that construction for the sewage works may have affected potential archaeological features although there is a high potential for deeply buried palaeoenvironmental remains to survive.		
Further Work		
This area was included as part of the work for the ERT and EMI survey and is proposed as part of the geoarchaeological borehole survey on the peninsula. A Written Scheme of Investigation for this work is provided in **Appendix 3**.		
Evaluation Research Objectives		
• Identify the presence of sequences of alluvium, peat and former land surfaces (e.g. soil or insipient soil horizons); • Obtain representative samples through deposits; • Assess the geoarchaeological and archaeological significance of the deposits • Make suitable, proportionate recommendations for further action • Ground-truth the results of the ERT and EMI geophysical survey across the peninsula		

Table 4 Archaeological Characterisation Zone 3

ID No. Zone 3		
Description	Zone 3 occupies the low lying ground of the Swanscombe peninsula, adjacent to the Thames.	
Previous Investigation	Recent EMI and ERT survey undertaken over part of the peninsula. Borehole survey currently being designed to evaluate the potential geoarchaeological remains.	
Previous Impacts	Deposits of Cement Kiln Dust overlie parts of the peninsula associated with the cement industry. Parts of this area used for tramway linking the cement works to the jetty. Marshland formerly and currently used for grazing. Preservation of deposits is expected to be varied.	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	None	N/A
Prehistoric	Medium (P6)	Low to Medium
Romano-British	Low (RB13)	Low
Anglo-Saxon & Medieval	Low (ASM11)	Low
Post-Medieval to Modern	High (PMM6, PMM7, PMM8)	Low
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Shepperton Gravels	High	Present at the base of the Holocene sequence. Key context for Final Upper Palaeolithic archaeology with possibility for organic deposits with palaeoenvironmental potential.
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Potential for peat layers interbedded with alluvium. Key deposits for examining past vegetation change, environment and land use dating to the Mesolithic – Iron Age
Summary		
Area holds potential for palaeoenvironmental remains and geophysical survey (partial complete) and borehole survey have been designed to evaluate the potential of this resource.		
Further Work		
Geophysical survey on Botany Marsh is to be completed, a WSI was agreed in 2017 with Kent County Council to undertake the rest of the ERT and EMI survey across the rest of the peninsula. A draft Written Scheme of Investigation for the borehole survey is presented in **Appendix 3**. This will inform the need for further assessment/ mitigation		
Evaluation Research Objectives		
• Identify the presence of sequences of alluvium, peat and former land surfaces (e.g. soil or insipient soil horizons) • Obtain representative samples through the deposits • Assess the geoarchaeological and archaeological significance of the deposits		

- Make suitable, proportionate recommendations for further action
- Ground-truth the results of the ERT and EMI geophysical survey across the peninsula

Table 5 Archaeological Characterisation Zone 4

ID No. Zone 4		
Description	Area of current and former industry from early 19th century, including the location of the former Portland Cement Works at Swanscombe. Located on low lying ground at the base of the chalk cliff on the peninsula	
Previous Investigation	None	
Previous Impacts	19th and 20th century industry	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	None	N/A
Prehistoric	None (P16)	N/A
Romano-British	None (RB18)	N/A
Anglo-Saxon to Post-Medieval	None (ASM16)	N/A
19th Century	Moderate to High (PMM3)	Moderate significance for remains associated with Portland Cement Works. Low significance for other 19th century industry
20th Century	High (PMM3)	Low Significance for 20th century industry
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
East Tilbury Marsh Terrace	High	Equivalent to the Kempton Park terrace (~160-25Kya). Localised deposits may be present towards south of Zone. Potential to contain late Middle Palaeolithic archaeology and associated palaeoenvironmental datasets
Shepperton Gravels	High	Present at the base of the Holocene sequence. Key context for Final Upper Palaeolithic archaeology with possibility for organic deposits with palaeoenvironmental potential.
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Potential for peat layers interbedded with alluvium. Key deposits for examining past vegetation change, environment and land use dating to the Mesolithic – Iron Age
Summary		

The cement industry thrived within this area due to ready access to an abundance of natural chalk and access to the river for transport. The Cement works within the Site was part of the Portland Cement Industry and a cement works is known to have existed at the Site in Swanscombe since at least 1811 when Frost is thought to have patented his 'British Cement' here, an early type of Portland Cement. Subsequent industry may have damaged or removed below ground structural remains associated with the cement works in some areas, although some surviving foundation pads and tramlines exist at ground level within this area.
Further Work
Archaeological evaluation and Historic Landscape Survey is required to establish the nature and survival of remains associated with the Portland Cement Works. A draft Written Scheme of Investigation for these works is presented in **Appendix 4**. Historic Building recording will be required for some of the structural remains within Zone 4 as outlined in section 7.6 . A separate Written Scheme of Investigation will be prepared for this work. Industrial specialists will be consulted during the post-excavation assessment.
Evaluation Research Objectives
• Record extant and at ground level elements of the Portland Cement Works, such as tramlines and extant foundation pads, through landscape survey techniques (survey and photography) • Identify, excavate, record and analyse any structural elements of the Portland Cement Works within the trial trenches. Structural elements have been identified from historic mapping but the survival of these remains below ground at the Site has not been investigated to date; • Gain an understanding of the development of the Portland Cement Works from its beginnings in the early 19th century to its demolition in the 1990s; • Identify, excavate, record and analyse any surviving remains of industrial processes, buildings or activities, including washmills, grinding mills, boiler houses, locomotive sheds and tramways; • Depending upon the nature of the remains, examine the site layout as a whole to understand the relationship between the use of the buildings and the operation of the works; • Examine the transport links within the Site (tramlines and connections to the jetty) and potential wider distribution of products (by rail or by river).

Table 6 Archaeological characterisation Zone 5

ID No. Zone 5		
Description	Area excavated for HS1	
Previous Investigation	Full excavation, Site ARC SHN02	
Previous Impacts	Subsequent construction works for HS1	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Potential Uncertain, likelihood moderate (PP26, PP31)	Maybe High
Prehistoric	None	N/A
Romano-British	None	N/A
Anglo-Saxon & Medieval	None	N/A
Post-Medieval to Modern	None	N/A
Summary		

Area formerly subject to full excavation as part of HS1, as such all archaeological features within this area have been excavated and recorded. Beneath the existing eastbound slip road onto the A2 a Roman Temple was preserved in situ as part of these works. Aside from the preservation of the temple, subsequent impact from the construction of HS1 is likely to have removed archaeological features within this area. Potential for Palaeolithic remains to be preserved at depth within character areas PP26 and PP31, below the level of impact for HS1.
Further Work
No further work required, currently development proposals indicate the no alterations will be undertaken to the eastbound slip road and as such the temple will continue to be preserved in situ. No deep excavation works are currently proposed in this area, should designs change at a later stage evaluation/assessment of Palaeolithic remains should take place as post consent mitigation.

Table 7 Archaeological Characterisation Zone 6

ID No. Zone 6a and 6b		
Description	Area excavated for HS1	
Previous Investigation	Full excavation, Site ARC SHP00	
Previous Impacts	Subsequent construction works for HS1	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Potential Uncertain, likelihood moderate (PP26, PP31)	Maybe High
Prehistoric	None	N/A
Romano-British	None	N/A
Anglo-Saxon & Medieval	None	N/A
Post-Medieval to Modern	None	N/A
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Potential for peat layers interbedded with alluvium. Key deposits for examining vegetation change, environment and human land-use during prehistory
Summary		
Area formerly subject to full excavation as part of HS1, as such all archaeological features within this area have been excavated and recorded. Subsequent impact from the construction of HS1 is likely to have removed archaeological features within this area. Potential for Palaeolithic remains to be preserved at depth within character areas PP26 and PP31.		
Further Work		
No further work required. Should deep construction impacts be required in this area, assessment of Palaeolithic remains should take place as post consent mitigation.		

Table 8 Archaeological Characterisation Zone 7

ID No. Zone 7		
Description	Area located at the A2 and the Northfleet East Substation, adjacent to HS1 excavation areas ARC SPH00 and ARC SHN02.	
Previous Investigation	Area partly covered by watching brief for HS1 works. Investigations undertaken at Northfleet East Substation included evaluation and excavation	
Previous Impacts	Construction of the A2 and construction of the Northfleet East Substation	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Potential Uncertain, likelihood moderate (PP26, PP34, PP35)	Maybe High
Prehistoric	Low (P8,P12)	Low to Medium
Romano-British	High to Low (RB1, RB11, RB8)	High to Low
Anglo-Saxon & Medieval	Medium to Low (ASM3, ASM7)	Low to Medium
Post-Medieval to Modern	Low (PMM10, PMM14)	Low
Summary		
Zone 7 partially covers three areas characterised as being of uncertain potential where the likelihood that Palaeolithic remains exists is expected to be moderate. Zone 7 covers the area of surrounding the head of the Ebbsfleet and is the focus of the Springhead ritual site and Roman town. The Scheduled area associated with the Roman Town extends into zone 7. Much of Zone 7 has already been investigated for HS1, part of the works for the A2 and as part of the Northfleet East Substation works and as such the archaeological resource in this area is well understood and documented. Adjacent areas Zones 5 and 6 were fully excavated and revealed an abundance of archaeological remains of high significance which are known to extend beyond these limits. Some of this will have been truncated by the A2. Areas surrounding the A2 that were impacted by HS1 were subject to watching brief.		
Further Work		
Small parts of Zone 7 have been identified as requiring preliminary evaluation for Palaeolithic remains as part of PP26 in the area of the A2. Development works associated with the A2 are would be limited to possible diversion of underground utility connections if required. Construction works should be avoided within area of the Springhead Roman Town to preserve these remains in situ where possible. Should utility diversion be a requirement be required close to the scheduled area archaeological monitoring in accordance with the methodology for targeted watching brief outlined in para 7.5.5 should be undertaken. Methods outlined for archaeological constraints in para 5.4.7 relating to fencing/demarcating the extent of known archaeological remains should be applied for any works undertaken within the proximity of the Scheduled Monument to ensure that preserved archaeological remains are not accidentally harmed. Construction works at Northfleet Substation will entail connections related to the existing UKPN Ebbsfleet Substation so are expected to be localised, archaeological monitoring is recommended in areas of the substation that haven't been previously investigated as per the methodology for a general watching brief as outlined in para 7.5.4 below.		

Table 9 Archaeological Characterisation Zone 8

ID No. Zone 8

Description	Zone 8 covers the south eastern extent of the Site around the A2.	
Previous Investigation	Southern Corner previously investigated as part of A2 widening scheme between Pepperhill and Cobham	
Previous Impacts	Previous impacts from construction of the A2	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	None	N/A
Prehistoric	Low (P8)	Low to Medium
Romano-British	Low (RB14)	Low to Medium
Anglo-Saxon & Medieval	Low (ASM7, ASM13)	Low
Post-Medieval to Modern	Low (PMM10)	Low
Summary		
This area seems to lie outside of the area of the main focus of activity associated with the Ebbsfleet but does lie close to the postulated route of the Roman Road. Much of this area has already been impacted by the A2. Survival of archaeological remains within this area is expected to be poor.		
Further Work		
Development works associated with the A2 are would be limited to possible diversion of underground utility connections if required. Should utility diversion be a requirement within Zone 8 archaeological monitoring in accordance with the methodology for general watching brief outlined in para 7.5.4 should be undertaken.		

Table 10 Archaeological Characterisation Zone 9

ID No. Zone 9		
Description	This area covers the A2 corridor extending east-west and the existing A2 junction. Located to the west of the main focus of the archaeological activity identified at the head of the Ebbsfleet	
Previous Investigation	Area around the existing A2 junction was subject to archaeological watching brief as part of HS1. Route of A2 has not been subject to archaeological investigations however remains are unlikely to exist beneath the road	
Previous Impacts	Construction of the A2 is likely to have damaged/removed archaeological remains within their footprint.	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Potential Uncertain, likelihood moderate (PP26, PP37)	Maybe High
Prehistoric	Low to Medium (P3, P4, P8, P11, P13)	Low to Medium
Romano-British	Low to Medium (RB5, RB9, RB10, RB11, RB14, RB21)	High to Low
Anglo-Saxon & Medieval	High to Low (ASM1, ASM2, ASM7, ASM8, ASM12, ASM13)	High to Low

Post-Medieval to Modern	High and Low (PMM1, PMM10, PMM15, PMM16, PMM18, PMM19)	High and Low
Summary		
The eastern part of Zone 9 has been already been subject to archaeological evaluation due to its potential for remains associated with Roman Springhead. Elsewhere within Zone 9 Archaeological potential within this area is generally considered to be low aside from a few small areas of increased potential such as the Scheduled Monument of medieval date just beyond the western extent of the Site and the potential for Palaeolithic remains at PP37 and PP26. PMM1 is of high significance but relates to an extant Listed structure rather than archaeological potential. Much of this area will have been truncated by the construction of the A2 although Palaeolithic remains could exist at depth within the areas identified (PP26 and PP37) beyond the depth of the works required for the construction of the A2.		
Further Work		
Trenches 12, 8, 5,2, 1 undertaken in 2017 within zone 9 did not reveal any archaeological remains. However due to the proximity of this area to Roman springhead archaeological monitoring during construction in areas not already subject to monitoring for HS1 will be required, particularly around the junction with the A2 as per the targeted watching brief methodology outlined in para 7.5.5 below. The western extent of zone 9 along the A2 is included within the Order Limits for the diversion of utilities. Should diversion works take place close to or within Springhead Scheduled Roman Town or close to the Medieval Woodland boundary at the western end of Zone 9 then these areas should be clearly demarcated/fenced in accordance with para 5.4.7 below to ensure that preserved archaeological remains are not accidentally harmed during construction works. A targeted archaeological watching brief (para 7.5.5.) should be implemented during construction activities close to the scheduled areas.		

Table 11 Archaeological Characterisation Zone 10

ID No. Zone 10		
Description	Area close to Ebbsfleet Station and HS1, designated as SSSI and Scheduled Monument at Bakers Hole for internationally/nationally significant Palaeolithic remains.	
Previous Investigation	A number of research investigations have been undertaken since the late 19th century until mid-20th century, when the monument was scheduled. Since this time research investigations and recording have been undertaken by Dr Francis Wenban Smith, small scale investigations for HS1 and ZR4 Pylon. Walkover and field investigations undertaken in Site B.	
Previous Impacts	Previous impacts associated with archaeological investigation and ZR4 Pylon.	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	High (PP04, PP07, PP08, PP14, PP15a)	High to Very High
Prehistoric	Low (P9, P14)	Low to Medium
Romano-British	Low (RB12, RB15)	Low to Medium
Anglo-Saxon & Medieval	Low (ASM10, ASM15)	Low to Medium
Post-Medieval to Modern	Low (PMM11 PMM21)	Low to Negligible
Summary		
Potential for significant remains dating to Palaeolithic period. No remains of later date recorded within this area to date.		
Further Work		

Pre-determination evaluation strategy has been devised and the draft Written Scheme of Investigation for the work presented in **Appendix 2**. The results of this evaluation will inform the need for further assessment and mitigation.
Evaluation Research Objectives
This area covers the Palaeolithic Scheduled Monument of Bakers Hole and SSSI. An evaluation strategy has been devised and a draft WSI is presented in **Appendix 2**. Specific evaluation objectives for the access road and the people mover route are provided within the WSI. General aims for the evaluation are provided below. • To establish with a high degree of confidence the nature, character, distribution, extent and depth of Quaternary deposits across the Site • To assess the Palaeolithic potential of the site and establish its importance and significance in the context of national and regional research priorities • To verify and improve the existing characterisation model above of surviving deposit character and potential

Table 12 Archaeological Characterisation Zone 11

ID No. Zone 11		
Description	Area adjacent to former quarrying activity, currently occupied by Ebbsfleet International Station and Car Park	
Previous Investigation	Area subject to series of open area excavations ARC EBB01 and also evaluated as part of ARC EFT 97 evaluation and as part of Ebbsfleet Sports Ground investigations	
Previous Impacts	Construction of HS1, Ebbsfleet International Station, car parking and access	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	High (PP7 PP14, PP15)	High
Prehistoric	Low (P10, P16)	Low to Medium
Romano-British	Medium to Low (RB5 RB23)	Low to Medium
Anglo-Saxon & Medieval	Medium to Low (ASM6, ASM16)	Low to Medium
Post-Medieval to Modern	Low (PMM20, PMM23)	Low
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Potential for peat layers interbedded with alluvium. Key deposits for examining vegetation change, environment and human land-use during prehistory
Summary		

This area has been subject to a large number of investigations which have investigated and recorded archaeological remains within these areas. These areas were subsequently developed and it is likely that archaeological remains within the footprint of these works will have been damaged or removed after recording. Small pockets of archaeological potential could survive in areas which have not been previously impacted. Geoarchaeological borehole evaluation and trial trench evaluation have previously been undertaken within Zone 11 as part of other developments.
Further Work
Archaeological evaluation required in some areas for Palaeolithic remains, a draft Written Scheme of Investigation is provided within **Appendix 2** which outlines the Palaeolithic evaluation. Archaeological monitoring will be required as per the methodology for targeted archaeological watching brief during construction in areas outside of previous investigations for Post-Palaeolithic archaeology.
Further Evaluation Objectives
This area covers the Palaeolithic Scheduled Monument of Bakers Hole and SSSI. An evaluation strategy has been devised and a draft WSI is presented in **Appendix 2**. Specific evaluation objectives for the access road and the people mover route are provided within the WSI. General aims for the evaluation are provided below. • To establish with a high degree of confidence the nature, character, distribution, extent and depth of Quaternary deposits across the Site • To assess the Palaeolithic potential of the site and establish its importance and significance in the context of national and regional research priorities • To verify and improve the existing characterisation model above of surviving deposit character and potential

Table 13 Archaeological Characterisation Zone 12

ID No. Zone 12		
Description	Area formerly subject to full excavation for HS1	
Previous Investigation	Formerly part of ARC EBB01	
Previous Impacts	Construction impacts associated with HS1	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Low to High	Low to High
Prehistoric	None	N/A
Romano-British	None	N/A
Anglo-Saxon & Medieval	None	N/A
Post-Medieval to Modern	None	N/A
Summary		
Area formerly subject to full excavation as part of HS1, as such all archaeological features within this area have been excavated and recorded. Subsequent impact from the construction of HS1 is likely to have removed archaeological deposits within this area. Any further impacts for the London Resort within this area will not affect post-palaeolithic below ground archaeological remains.		
Further Work		
No further work required as development proposals comprise ecological works in the form of scrub thinning and replanting of seeds to increase species diversity. As such earthmoving will be limited to planting replacement scrub and scarification to sow seed and is not expected to affect archaeological		

remains which will be preserved in situ below the level of impact. As such no further work is proposed in this area.

Table 14 Archaeological Characterisation Zone 13

ID No. Zone 13a and 13b		
Description	Area largely undeveloped and currently occupied by the Ebbsfleet River, grass and trees. Whilst currently undeveloped parts of this area were included within the land take for HS1 as working areas.	
Previous Investigation	STDR route lies alongside eastern boundary of the Project Site and investigations for this extend along the eastern boundary. Archaeological evaluation undertaken in this area for ARC EFT 97.	
Previous Impacts	Largely undeveloped, aside from some land take for HS1 and STDR.	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Low to High	Low to High
Prehistoric	Medium to Low (P5, P15)	Low to High
Romano-British	Medium to Low (RB6, RB7, RB16)	Low to Medium
Anglo-Saxon & Medieval	Low to Medium (ASM4 ASM5 ASM14)	Low to Medium
Post-Medieval to Modern	Low (PMM12, PMM17, PMM22)	Low to Negligible
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Potential for peat layers interbedded with alluvium. Key deposits for examining vegetation change, environment and human land-use during prehistory
Summary		
The proximity of Zone 13 to the Ebbsfleet would have made it an attractive place for utilisation during the prehistoric period. Whilst temporary or later, more permanent settlement would have been focused on the higher ground, prehistoric evidence of the marshy environment is known from preserved possible trackways providing a route through the area. The Northfleet Villa was established close to the Ebbsfleet to utilise the river for transport within Zone 12. It's possible that associated remains could exist within Zone 13. Anglo-Saxon settlement has been found further south on the eastern side of the Ebbsfleet.		
Further Work		
Construction activities in this area are limited landscape works related to ecology enhancements, which will comprise scrub thinning and replanting to increase species diversity. As such earthmoving will be limited to planting replacement scrub and scarification to sow seed and is not expected to affect archaeological remains which will be preserved in situ below the level of impact. As such no further work is proposed in this area.		

Table 15 Archaeological Characterisation Zone 14

ID No. Zone 14		
Description	Area largely undeveloped, aside from the STDR route along eastern site boundary. Area focussed on the Ebbsfleet and the surrounding area and contains the western Scheduled Monument of the two Neolithic Sites at Ebbsfleet Scheduled Monument.	
Previous Investigation	Archaeological evaluation and geoarchaeological test pit evaluation undertaken for London Resort 2017. Prior to this the area was evaluated for the HS1 works in 1997 and another evaluation in 2005.	
Previous Impacts	Impact associated with Springhead Nurseries in the southern part of this zone.	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Low to High	Low to High
Prehistoric	High to Low (P1, P2 P7)	High to Medium
Romano-British	Medium to Low (RB2 RB14)	Low to Medium
Anglo-Saxon & Medieval	Medium to Low (ASM9 ASM13)	Low to Medium
Post-Medieval to Modern	High and Low (PMM9,PMM19)	Negligible and Low
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Peat bands likely to be preserved in alluvium. Key deposits for examining vegetation change, environment and human land-use during prehistory
Summary		
Investigation undertaken within this area has revealed remains of prehistoric, Romano-British and Anglo-Saxon date. There is potential for additional remains and a continuation of features already identified to be found in areas not previously investigated. Due to previous investigations across this zone the archaeological resource is reasonably well understood. Recent investigations for the proposed development revealed a section of the Roman Road and roadside ditches, part of the walled cemetery (originally identified in previous investigations) containing 11 cremation burials and a possible inhumation, and a separate inhumation thought to have been associated with a cemetery to the west, occupation evidence was also found. A geoarchaeological test pit was excavated either side of the Scheduled Monument 'Neolithic sites at Ebbsfleet' this revealed made ground layers to a depth of at least 1.5m below ground level. Test pit 19 revealed peat layers beneath the made ground layers and fluvial silt and gravel deposits were recorded in Test Pit 20. The deposits are of high geoarchaeological significance with the potential to contain a range of palaeoenvironmental remains.		
Further Work		
Following the archaeological trial trench evaluation in 2017 which revealed significant archaeological remains dating to the roman period, a strip, map sample excavation prior to development impact is required as per the methodology outlined in para 7.4.3-7.4.10. A specific Written Scheme of Investigation will be prepared. The geoarchaeological deposits within and adjacent to the Scheduled Monument will not be affected by the development proposals as these will be preserved in situ beneath the *jablite* or similar polystyrene block construction of the Resort Access Road at this location. Further Evaluation of geoarchaeological deposits which may exist further south within the footprint of the Resort Access Road		

within Zone 14 may be required as per the methodology in para 6.3.6. This would also be subject to a WSI to be agreed with Statutory Consultees.

Table 16 Archaeological Characterisation Zone 15

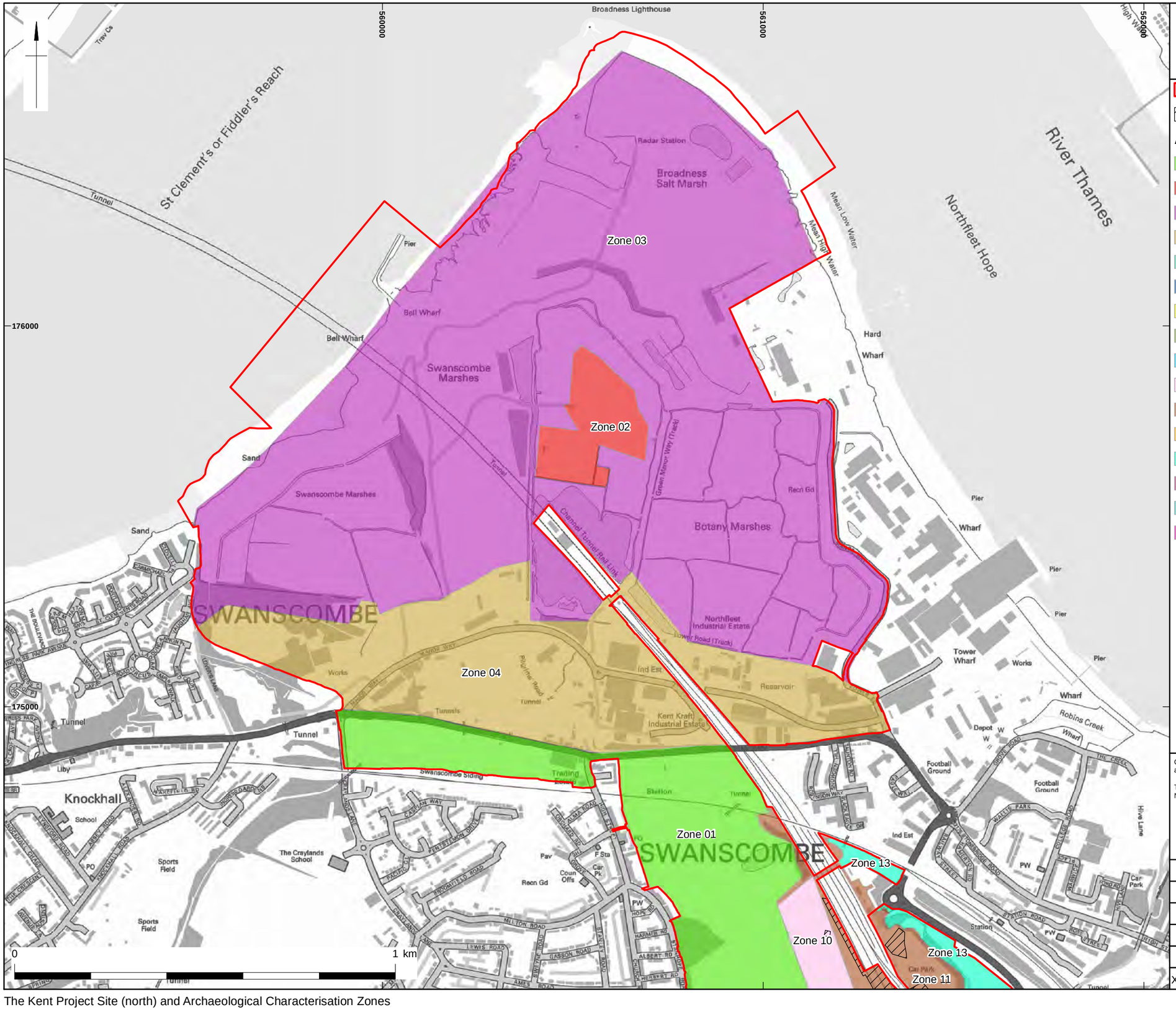
ID No. Zone 15		
Description	Area developed, including London Ferry Terminal, Fort Road, formerly part of the railway line and now used for surface level car parking, situated in a generally industrial environment. A low lying area adjacent to the Thames, formerly marshland. Higher ground located to the north at Tilbury. Site covered by asphalt surfacing.	
Previous Investigation	Immediately adjacent to the north of the Site was investigated for the access to the Tilbury 2 development located to the east.	
Previous Impacts	Previous impacts associated with the construction of the railway line and associated buildings (now removed), construction of Fort Road, Ferry Terminal and possibly from creation of surface level car parking. Possible bomb damage during WWII.	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Low to High	Low to High
Prehistoric	Medium to Low (P18, P19, P21)	Low to Medium
Romano-British	Low (RB20 RB22)	Low
Anglo-Saxon & Medieval	Low (ASM17 ASM19)	Low
Post-Medieval to Modern	High to Low (PMM26, PMM27, PMM28, PMM29, PMM31)	Low
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Shepperton Gravels	High	Present at the base of the Holocene sequence. Key context for Final Upper Palaeolithic archaeology with possibility for organic deposits with palaeoenvironmental potential.
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Key deposits for examining past vegetation change, environment and land use dating to the Mesolithic – Iron Age
Summary		
The Essex Project Site has been developed and as such the survival of archaeological remains is expected to be varied but predominantly low. Investigations undertaken adjacent to the northern Site boundary revealed made ground to more than 1.2m bgl in most of the trenches/test pits. In the remaining two a possible natural or redeposited natural was recorded at 1.10m bgl. However there is potential for deeply buried palaeoenvironmental deposits to exist below the level of previous truncation. The eastern part of the Site is probably more likely to have suffered less impact so there is considered to be better survival in this area, although this is area is not anticipated to be affected by the London Resort as it will continue to be used for surface level car parking. It is reported that WWII bomb damage occurred within the Site, the extent of this damage is currently unknown.		

Further Work
Geoarchaeological Borehole Survey to feed into a deposit model. Due to the ground conditions (asphalt across the Site) and following consultation with geophysical specialists deep geophysical survey techniques such as ERT and EMI would not be suitable as to conduct the survey probes need to be inserted into the ground. As such borehole survey and deposit modelling as per methodology in para's 6.3.2.- 6.3.7 is the most suitable evaluation technique to assess the geoarchaeological potential of the Essex Project Site.
Evaluation Research Objectives
• To provide information on the presence/absence, date, nature and extent of archaeological remains within the Essex Project Site • Ecology and Geomorphology – understanding the evolving landscape, vegetation, climate and past human land-use • Develop robust chronological frameworks allied to palaeoenvironmental data • Understanding the nature and pace of landscape change • Understanding the relationship between fluvial, wetland and terrestrial environments

Table 17 Archaeological Characterisation Zone 16

ID No. Zone 15		
Description	Area developed for roundabout and connecting roads	
Previous Investigation	None.	
Previous Impacts	Previous impacts associated with the construction of the modern road system and roundabout	
Archaeological Potential		
Period	**Potential Rating**	**Predicted Heritage Significance**
Palaeolithic	Low to High	Low to High
Prehistoric	Low (P20)	Low to Medium
Romano-British	Low (RB21)	Low
Anglo-Saxon & Medieval	Low (ASM18)	Low
Post-Medieval to Modern	Low (PMM30)	Low
Geoarchaeological Potential		
Deposit type	**Potential Rating**	**Comment**
Shepperton Gravels	High	Present at the base of the Holocene sequence. Key context for Final Upper Palaeolithic archaeology with possibility for organic deposits with palaeoenvironmental potential.
Alluvium	Low	Low geoarchaeological potential, but potential to contain or seal waterlogged archaeology
Peat	High	Key deposits for examining past vegetation change, environment and land use dating to the Mesolithic – Iron Age

Summary
The Essex Project Site has been developed and as such the survival of archaeological remains is expected to be low. As such it is considered that archaeological remains are unlikely to survive beneath the impact of the modern road and roundabout.
Further Work
Construction impacts within this Zone relate to roundabout upgrade works which may require below ground activities. Archaeological Monitoring of ground works which involve ground removal will be required as per methodology for general watching brief in para 7.5.4



Order Limits

Previous Archaeological Evaluation

Archaeological Characterisation Zones

- Zone 01
- Zone 02
- Zone 03
- Zone 04
- Zone 05
- Zone 06
- Zone 07
- Zone 08
- Zone 09
- Zone 10
- Zone 11
- Zone 12
- Zone 13
- Zone 14
- Zone 15
- Zone 16

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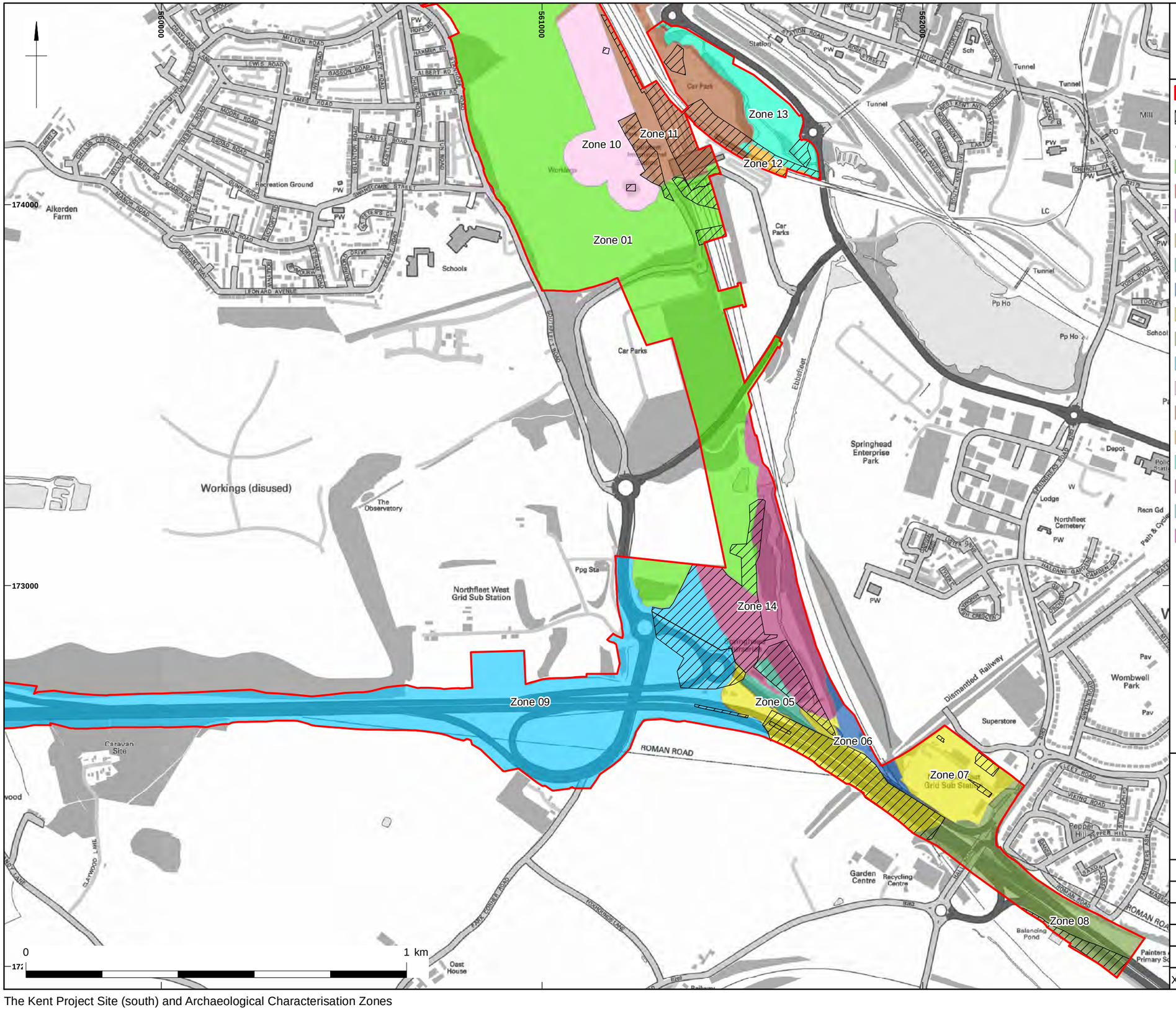
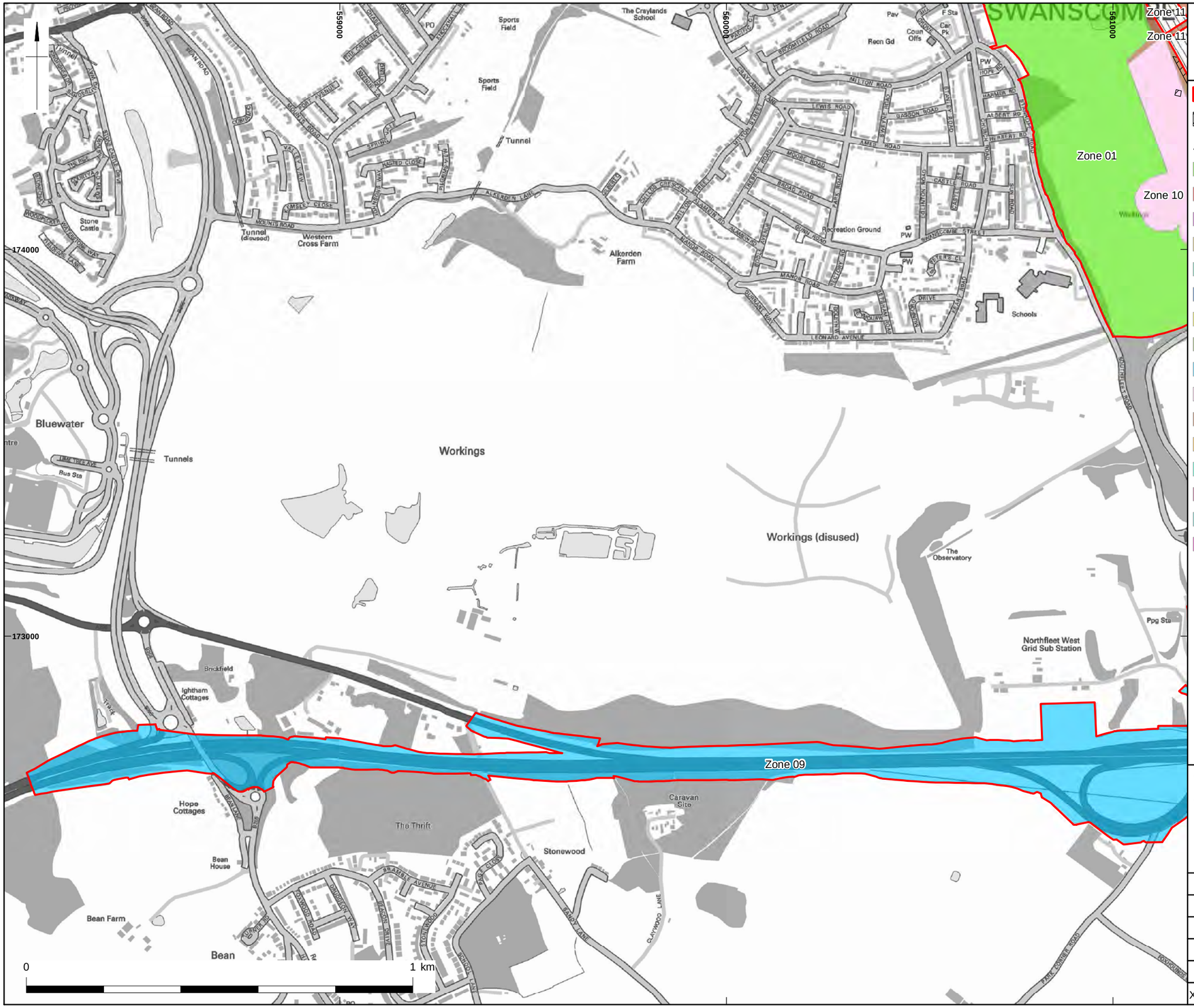
The Kent Project Site (north) and Archaeological Characterisation Zones

Figure 2



The Kent Project Site (south) and Archaeological Characterisation Zones

Figure 3



Order Limits

Previous Archaeological Evaluation

Archaeological Characterisation Zones

- Zone 01
- Zone 02
- Zone 03
- Zone 04
- Zone 05
- Zone 06
- Zone 07
- Zone 08
- Zone 09
- Zone 10
- Zone 11
- Zone 12
- Zone 13
- Zone 14
- Zone 15
- Zone 16

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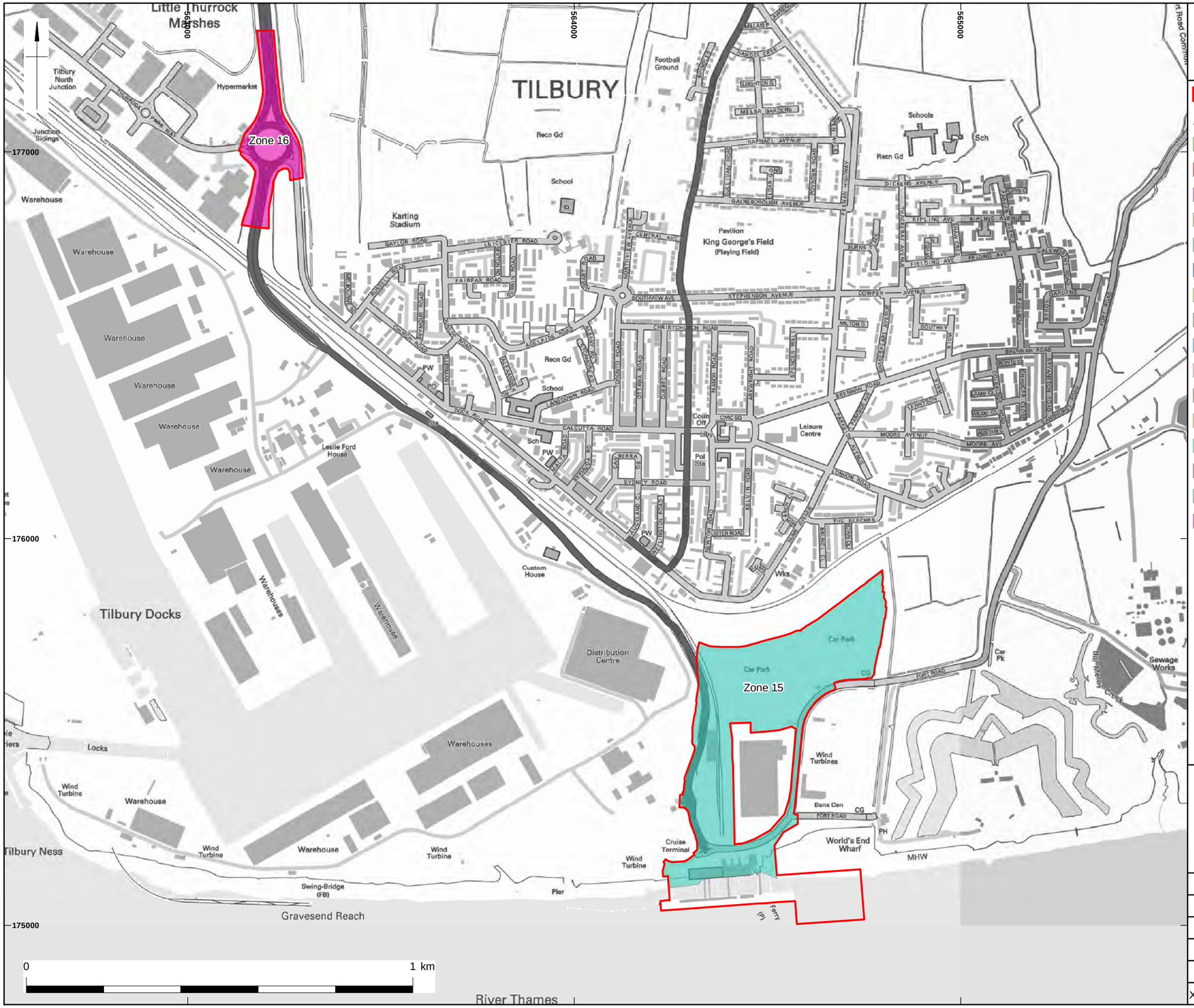
The Kent Project Site (west) and Archaeological Characterisation Zones

Figure 4



Order Limits

Archaeological Characterisation Zones

- Zone 01
- Zone 02
- Zone 03
- Zone 04
- Zone 05
- Zone 06
- Zone 07
- Zone 08
- Zone 09
- Zone 10
- Zone 11
- Zone 12
- Zone 13
- Zone 14
- Zone 15
- Zone 16

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The Essex Project Site and Archaeological Characterisation Zones

Figure 5

4.4 Marine and Inter-tidal Potential

4.4.1 There is potential for further archaeological evidence to be discovered in the marine study area. The terrestrial assessment identified Palaeolithic, Mesolithic and Neolithic sites within the Kent project site, and the findspots in the marine study area suggest the potential for further discoveries, particularly within peat and alluvial sediments.

4.4.2 In addition, the Thames has been used as an important waterway for hundreds, if not thousands, of years. Therefore there is potential for the discovery of watercraft and/or associated material lost or thrown overboard from the Neolithic to the present day. In particular, the evidence could relate to the local riverside settlements (as evidenced by Bronze Age, Roman, Anglo-Saxon and medieval sites and findspots in the terrestrial zone); Tilbury Fort in the 19th century; the modern industrial, commercial and passenger docks, quaysides, piers, and jetties related to Tilbury and Gravesend; as well as vessels lost while en-route on the Thames, or abandoned as derelict on the side of the river (as evidenced by the examples recorded in the HER and Heritage Gateway data).

4.4.3 The Heritage Gateway data has provided information about recorded losses, 74 vessels which have been lost but whose location is presently unknown. The recorded losses date from 1636 to 1963. The earliest was the *Anne Royal*, an English Third Rate ship of the line which was grounded at Tilbury Hope, on arrival at Tilbury from Chatham or Gillingham. The vessel was refloated, and taken to Blackwall but was later scrapped, however there could be evidence from the wrecking event still in the Study Area. Many of the vessels were wooden sailing ships, and ranged from cargo vessels to fishing vessels, and were described as yachts, brigs, ketches, barges, luggers, schooners, tugs and Spritsail barges. Most of the vessels were English or British. The vast majority (31) were lost due to collision, underlining the difficult navigation conditions and the number of vessels using the waterway. Other losses were due to stranding, lost during a storm, and sinking at moorings while at anchor. The Society for Spritsail Barge Research has indicated the last known locations for numerous Spritsail Barges, 10 of which became hulks in the marine study area, while another 15 were broken up. It is possible that remains of one or more of these recorded losses could be present within the Kent or Essex Project Sites.

4.4.4 There is also the potential for aircraft remains, particularly in relation to the Second World War, with the high amount of Allied and Axis air traffic over this area during the Battle of Britain, Blitz and bombing of Germany. There is also potential, although not as high, for aircraft crashes before and after the war. Aircraft crash sites often have poor or non-existent locational data for the crashes, particularly in water or in relatively lowly populated areas, due to poor weather conditions, inaccurate reporting, or lack of survivors or witnesses. Previous reports into aircraft crash sites at sea have indicated that over 10,000 aircraft have crashed into UK waters (Wessex Archaeology 2008: 18). Due to the predominance of military activity over the Thames estuary, this area can be considered to have a high number of these losses, and the potential to discover one would be low to medium.

5 OVERALL EVALUATION AND MITIGATION STRATEGY

5.1 Introduction

5.1.1 Due to the complex nature of the known and potential archaeological remains within the Project Site, a variety of techniques for evaluation and mitigation will be required. The assessment of archaeological remains is a staged process, with the results of initial stages of evaluation used to inform further assessment and mitigation. Equally, should archaeological remains or deposits be demonstrated to be absent or truncated in some areas, this would be reflected in the removal of these areas from any further investigation

(in consultation with the statutory authorities). As such this will be an evolving document that will be revised and amended as works are completed.

5.2 Development Impacts

5.2.1 The DCO is being sought under the 'Rochdale Envelope' which allows for flexibility within the consent to address uncertainties which are not known at the time of submission. Additional details will be submitted to the relevant local planning authorities once the DCO is made.

5.2.2 The construction of the Proposed Development is anticipated to entail the following sources of ground disturbance and excavations:

- Setting up a secure construction compounds within the Project Site;
- Plant movement;
- Topsoil stripping;
- Piling and/or excavation of new foundation trenches;
- Installation of services, drainage and other infrastructure;
- Installation of basements;
- Construction of car parking buildings including basement levels;
- Construction of access roads, cycle ways, footpaths and people mover;
- Compaction of deposits within peninsula and transport corridor;
- Ecological mitigation;
- Hard landscaping works (levelling, remodelling);
- Soft landscaping and environmental enhancement works, including planting;
- Piling and sheet piling associated with marine development;
- Anchors and spud leg impacts to the seabed;
- Dredging; and
- Changes to sedimentation and erosion regimes that could lead to exposure and damage to currently buried marine sites.

5.3 Off-Site Ecological Mitigation

5.3.1 Off site ecological mitigation may be required as part of the development proposals at the time of writing off-site ecological mitigation is in the process of being secured. The locations of such measures are currently unknown, however it is likely that some of these activities will require below ground activities. Archaeological Assessment and mitigation measures would be formulated based upon the development proposals, potential for and significance

of the archaeological resource in these areas, in accordance with the methodology's outlined below.

5.4 General Methodology

Health and Safety

5.4.1 Health and Safety considerations will be of paramount importance in conducting all archaeological fieldwork and safe working practices will override archaeological considerations at all times.

5.4.2 All work will be carried out in accordance with the Health and Safety at Work Act 1974 and the Management of Health and Safety Regulations 1992, and all other relevant Health and Safety legislation, regulations and codes of practice in force at the time of the fieldwork. A risk assessment and Method Statement (RAMS) will be prepared prior to the commencement of the fieldwork. Personal Protective Equipment (PPE) will be worn by all archaeologists and monitoring visitors in line with Health & Safety requirements.

Monitoring and Stakeholder Liaison

5.4.3 The Archaeological Contractor/Heritage Consultant will ensure that monitoring visits are arranged as necessary with the statutory consultees throughout the works. The Statutory Consultees and Principal Contractor will be notified of any changes to the agreed programme. Any changes to the methodology outlined within the WSI will be agreed in advance with the statutory consultees.

Setting out of Trenches/Areas

5.4.4 For intrusive investigations all trenches/areas will be set out using a Global Navigation Satellite System (GNS) or Total Station Theodolite (TST). Adjustments to the layout may be required at the start of the work to take account of constraints such as vegetation or located services, and to allow for machine manoeuvring. The trench/area locations will be tied into the Ordnance Survey (OS) National Grid and Ordnance Datum (OD) (Newlyn), as defined by OSTN15 and OSGM15.

Service Location and Other Constraints

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

5.4.6 Before excavation begins, the evaluation area will be walked over and visually inspected to identify, where possible, the location of any below/above ground services. All trench locations will be scanned before and during excavation with a Cable Avoidance Tool (CAT) to verify the absence of any live underground services. These measures will not be the responsibility of the Archaeological Contractor in a watching brief scenario, as the responsibility for live services within the footprint of the construction activities will lie with the principal contractor.

Archaeological Constraints

5.4.7 The extent of designated archaeological assets and significant non-designated archaeological assets will be mapped and fenced off prior to the start of construction works near to these areas as a safeguard to ensure that no damage accidentally occurs within these areas. Protection measures such as fencing off areas, clearly marked plans and tool box talks will be included within the Construction Environmental Management Plan (CEMP).

6 ASSESSMENT AND EVALUATION STRATEGY

6.1 Introduction

6.1.1 The following strategy sets out the staged process for archaeological assessment and evaluation of known and potential archaeological remains that lie within the development footprint or those which could be affected by changes to hydrology/scour or erosion caused by the implementation of the development. The key aim of the initial phase of evaluation/assessment is to identify, characterise and establish the significance of the archaeological resource within the Project Site. This will inform the need for further assessment/mitigation.

6.1.2 The Chartered Institute for Archaeologists defines evaluation as;

'…*a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits artefacts or ecofacts and their research potential, within a specified area or site on land, in an inter-tidal zone or underwater. If such archaeological remains are present, field evaluation defines their character, extent, quality and preservation, reports on them and enables an assessment of their significance in a local, regional, national or international context as appropriate*' (CIfA 2014 revised 2020).

6.1.3 Detailed Written Schemes of Investigation will be prepared for each phase of the archaeological assessment/mitigation.

6.2 Evaluation Strategy for Palaeolithic Remains

Investigations at Bakers Hole Scheduled Monument and SSSI

6.2.1 A draft Written Scheme of Investigation has been prepared for archaeological evaluation at Bakers Hole which will comprise the excavation of 14 combined test pits and boreholes, a single test pit with no borehole, and eight cable percussion boreholes, within the route of the proposed people mover and resort access road. This work will be carried out by Palaeolithic specialist Dr Francis Wenban-Smith. The details of the methods and aims of this work are outlined within the draft Written Scheme of Investigation (**Appendix 2**).

6.2.2 This work will be undertaken in accordance with CIfA *Standard and Guidance for Archaeological Evaluation* (2014) and Kent County Council Guidance *Specification for Preliminary Evaluation of Quaternary Deposits and Palaeolithic Potential* and *Specification for Detailed Evaluation of Quaternary Deposits and Palaeolithic Potential*, as appropriate.

6.3 Evaluation Strategy for Geoarchaeological Remains

EMI and ERT Geophysical Survey

6.3.1 An Electrical Resistivity Tomography (ERT) and Electromagnetic Induction (EMI) survey was conducted over part of the Swanscombe Peninsula (2017) with the aim of providing stratigraphic units across the site, in particular regarding the locations of any raised sand and gravel islands, major channels and alluvium/peat deposits and thus characterise the landscape in terms of archaeologically relevant topographic features. Due to on-site constraints such as flooding, livestock and overgrown vegetation the survey could not be completed. It is proposed that this geophysical survey should be completed as a first step in the staged assessment of geoarchaeological and archaeological remains on the peninsula. As part of this work has already taken place, a WSI has already been agreed with the KCC and will be followed for the remainder of this work (Wessex Archaeology 2017).

Geoarchaeological Borehole Survey and Deposit Model

6.3.2 Based upon consultation undertaken to date for the London Resort a draft Written Scheme of Investigation has been prepared for a geoarchaeological borehole survey on the Swanscombe Peninsula (Wessex Archaeology 2020; **Appendix 3**). The borehole survey is required to map and characterise the superficial deposits across the site, ground truthing the results of the geophysical survey and identifying areas of geoarchaeological and archaeological potential. The geoarchaeological survey will involve approximately 41 boreholes distributed across the peninsula to meet the following aims;

- *Identify the presence of sequences of alluvium, peat and former land surfaces (e.g. soil or insipient soil horizons);*
- *Obtain representative samples through the deposits;*
- *Assess the geoarchaeological and archaeological significance of the deposits; and*
- *Make suitable, proportionate recommendations for further action*
- *Ground-truth the results of the ERT and EMI geophysical survey across the peninsula*

6.3.3 The methodology for the fieldwork, recording and reporting is set out in the draft WSI (**Appendix 3**).

6.3.4 The results of the Geoarchaeological Borehole Survey would feed into a deposit model incorporating historic borehole results from previous investigations and geotechnical surveys undertaken within the Project Site. Additional geotechnical boreholes are proposed for the London Resort; input into the design of these investigations would ensure that the results could also be used for the geoarchaeological deposit model. This would be in co-ordination with the ground engineering team. The deposit model would be used to identify the geoarchaeological and archaeological significance of the deposits and inform the need for further assessment, targeted in those areas where significant deposits are likely to be physically impacted as result of the development.

6.3.5 A geoarchaeological borehole survey is also proposed for the Essex Project Site. Following consultation with geophysical specialists, due to the ground conditions at the Essex Project Site, EMI and ERT survey would not be suitable as probes need to be inserted into the ground to conduct the survey and the Essex Project Site is currently an asphalt surface. As such a borehole survey is proposed using the same general aims as those above and also would feed into a deposit model. Site specific aims would be presented within the Written Scheme of Investigation for this work.

Geoarchaeological Evaluation

6.3.6 Following on from the results of the Geophysical and Geoarchaeological borehole survey further assessment of archaeological deposits may be required, this may include a requirement for a geoarchaeological test pit evaluation to characterise and establish the significance of the deposits identified in the earlier phases of work.

6.3.7 Targeted palaeoenvironmental assessment (e.g. pollen, plant macrofossils, microfauna) and radiocarbon dating may also be required on retained core sequences, where relevant and appropriate.

6.3.8 Selected core sequences retained during the course of geoarchaeological borehole surveys can form an archive against which further assessment can be undertaken in the event mitigation is required.

6.4 Evaluation Strategy for Post-Palaeolithic Archaeology

Archaeological Trial Trench Evaluation

6.4.1 Archaeological trial trench evaluation will fulfil the purpose of informing an appropriate mitigation strategy for excavation and/or preservation in situ of significant archaeological remains. Trial trench evaluation provides a means of sampling a large area to record the density of archaeological features and finds and determine levels of recent disturbance. It can also be used to ground truth the results of non- intrusive surveys. The scope of any archaeological evaluation and methodology will be set out in a Written Scheme of Investigation to be submitted to the local authority for approval prior to the start of the works. Evaluation will be required where there is potential for surviving archaeological remains and where no evaluation has been undertaken within the development footprint to date.

6.4.2 Evaluation trenches would be excavated by mechanical excavator equipped with a toothless bucket. Machine excavation will be under the constant supervision and instruction of the monitoring archaeologist. Machine excavation will proceed in level spits of approximately 50-200mm until either the archaeological horizon or the natural geology is exposed. Where necessary, the base of the trench/surface or archaeological deposits will be cleaned by hand.

6.4.3 Trenches are typically up to 50m in length, approximately 2m width and 1.2m in depth. This may be varied to meet the specific aims of the trenching and/or the nature of the archaeology. Should the overburden require trenches of greater depth these would need to be stepped or shored to meet with health and safety requirements. Due to the variation across the Site specific dimensions and depths of trenches would be outlined within individual Written Scheme of Investigation. Evaluation would involve the partial excavation of any archaeological features identified sufficient enough to determine the features date, form and function.

6.4.4 The aim of the evaluation is to provide a representative sample of the remains affected by the development in order to generate accurate information on the archaeological assets within the Project Site.

6.4.5 Archaeological trial trenching would be carried out in accordance with *Standard and Guidance for archaeological field evaluation* (CIfA) and for archaeological work undertaken in Kent, *Manual of Specifications Part B, Evaluation-Trial Trenching Requirements* (KCC).

6.5 Evaluation Strategy for Marine and Inter-tidal Archaeology

Introduction

6.5.1 Avoidance of marine heritage assets is the primary mitigation strategy in accordance with the draft South East Inshore Marine Plan SE-HER-1 (Marine Management Organisation 2020). Where harm is unavoidable the following evaluation of the marine environment will be followed.

Marine Geophysical and Geotechnical Survey Interpretation

6.5.2 Available borehole survey data from the marine environment and geophysical survey data undertaken for the resort will be interpreted by an experienced and suitably qualified marine archaeologist in accordance with the relevant standard and guidance. The assessment of marine borehole survey data will take into account the terrestrial geoarchaeological results

and deposit model, for a seamless assessment. For any marine geotechnical or geophysical investigations planned for the development, a marine archaeologist/marine geoarchaeologist/marine archaeological geophysicist (as appropriate) should be consulted at the planning stages in order to maximise the results for archaeological purposes, and a Method Statement should be produced detailing the proposed archaeological assessment.

Marine Archaeological Assessment

6.5.3 Marine archaeological assessment could involve survey undertaken by remotely operated underwater vehicle (ROV) or diver for sites or assets which have the potential to be affected by the proposed development. This could comprise archaeological assessment of data gathered for other purposes or archaeologist led survey. Should an ROV/diver assessment be planned for other purposes, for example a Unexploded Ordnance (UXO) survey or prior to obstruction clearance, the Archaeological Consultant should be consulted at the planning stages in order to maximise the results for archaeological purposes, for example ensuring data can be reviewed by the Archaeological Consultant and sites of archaeological potential can be investigated. Should a significant site be discovered, a Method Statement will be prepared by the Archaeological Consultant, through discussions with the County Archaeologist, for further assessment/excavation, as agreed with the Regulator.

6.6 Built Heritage Assessment

6.6.1 A Built Heritage Assessment will be required for the Riverside Station (Grade II* listed) to assess the specifics of the proposed alterations as details of these designs become available. This will allow the design of the alterations to be informed by the assessment to avoid harm to heritage significance where possible. Ways in which the heritage significance of the building could be enhanced through alterations to the building would also be recommended.

7 FURTHER MITIGATION STRATEGY

7.1 Introduction

7.1.1 Preservation in situ and preservation by record through archaeological investigation are the two main options by which impacts to archaeological remains can be mitigated. Preservation in situ is the conservation of an archaeological asset in its original location and is the preferred method of conservation for assets of national or international significance in accordance with best practice. Preservation by record through archaeological investigation is the process by which archaeological remains are excavated, recorded and published to offset the construction effects and to disseminate the information to the public.

7.2 Preservation in Situ and Avoidance Measures Embedded in Project Design

Palaeolithic Sites near Bakers Hole Scheduled Monument and SSSI

7.2.1 The Palaeolithic Sites at Bakers Hole are located within the Project Site and are considered to be of International Significance. The monument is in two parts known as Site A and Site B. Site B (the smaller portion located to the south of Site A) is to be preserved in situ and unaffected by the development proposals.

7.2.2 Site A lies within the route for the people mover. The design of the people mover route has responded to this by using a method of construction that will minimise below ground impacts to the monument. The foundations for the people mover will be constructed on a shallow embankment utilising *Jablite* or similar polystyrene blocks across the Scheduled Monument and the SSSI. This would reduce the ground removal within this area to a maximum of 300mm for the laying of a sand foundation on which the polystyrene blocks will be placed.

7.2.3 The SSSI covers a larger area than the Scheduled Monument and the same construction technique will be used for the people mover south of the Scheduled Monument and for the proposed roundabout at the transport interchange. The lightweight construction of the polystyrene blocks has the additional benefit that if there was a substantiated requirement to investigate the SSSI area in the future that it would be relatively easy to remove the People Mover route carriageway and realign the foundations.

7.2.4 Whilst the design of the people move has managed to reduce the majority of the physical effects within the SSSI and Scheduled Monument, there is still a requirement for a retaining wall alongside part of the people mover. These will be designed to minimise the impact to the designated sites whilst delivering the requirements of the People Mover.

7.2.5 It is recognised that deposits of equal date and significance lie outside of the Scheduled and SSSI area which are non-designated. Where unavoidable impact will occur to these deposits as a result of the development, a programme of archaeological work to ensure preservation by record is proposed.

Neolithic Sites at Ebbsfleet Scheduled Monument

7.2.6 Neolithic Sites at Ebbsfleet is a Scheduled Monument of national significance and comprises two parts, one of which lies within the Kent Project Site. The eastern site lies outside of the Project Site and will be unaffected by the development proposals. The western site lies within the area for the proposed resort access road. The section of the resort road which is proposed to pass over the monument has been designed to minimise below ground impacts in this area. The resort road will be placed upon a shallow polystyrene fill embankment to minimise below ground effects using the same methods as those outlined above. This will also require a 300mm foundation to lay the sand foundation.

7.2.7 It is recognised that there is potential for deposits of equal date and significance lie outside of the Scheduled area which are non-designated. Where unavoidable impact will occur to these deposits as a result of the development, a programme of archaeological work to ensure preservation by record is proposed.

Springhead Roman Town Scheduled Monument

7.2.8 Springhead Roman Town lies along the southern boundary of the Kent Project Site. In previous iterations of the junction design, this area was to be used for the junction. In recognition of the national significance and scheduled status of the monument, this area was removed from the design proposals and from the order limits. There will be no impact to this monument as a result of the London Resort. Fencing/demarcation of the extents of the monument will be carried out prior to any works within the vicinity of the monument in accordance with paragraph 5.4.7 above to ensure that no harm is accidentally caused to the monument during the construction works.

7.2.9 It is recognised that deposits of equal date and significance lie outside of the Scheduled area to the north of the A2 which are non-designated. Where unavoidable impact will occur to these deposits as a result of the development, a programme of archaeological work to ensure preservation by record is proposed.

Foundations of Romano-British Temple

7.2.10 Foundations of a Romano-British Temple were found during the archaeological excavations associated with HS1 and were considered to be of national significance. The temple was fully excavated and recorded and then preserved in situ beneath the existing eastbound slip

road onto the A2. There are not currently any plans to alter the existing slip roads onto the A2 and as such the temple will be preserved in situ beneath the existing slip road.

7.3 Mitigation Strategy

7.3.1 Once the further evaluation of the Project Site has been undertaken and the significance of any deposits is known, the mitigation strategy can be refined, based on the results of the investigation. The details and scope of which will be discussed with the relevant statutory consultees. Where there is still some flexibility within the design through the Rochdale Envelope, the results of the evaluation will be used to inform the design of elements not yet finalised, where applicable. Mitigation could comprise;

- *Excavation; undertaken in areas where significant archaeology has been identified through evaluation within the development footprint;*
- *Preservation in situ; as described above where archaeological remains of national or international significance are identified and where it is practicable to do so;*
- *Redesign of development proposals; the Rochdale envelope will allow for some degree of flexibility within certain aspects of the design. Where these details are not finalised and where significant archaeological remains are identified, archaeological considerations could influence the design of the development. Where practicable, other elements of the design could be considered for redesign where significant archaeological remains are discovered.*
- *Watching Brief; a watching brief involves the monitoring of ground works during construction in areas where the archaeological potential is considered to be low.*

7.3.2 The design of the mitigation will be informed by the construction programme, so that appropriate techniques can be programmed (either before or during construction) without causing delay to the construction programme. Ideally as much of the mitigation would be carried out prior to the main construction phase to minimise delays during construction.

7.4 Excavation Methodology

Palaeolithic Archaeology

7.4.1 The methodology for the Palaeolithic excavation which may be required would be devised by Palaeolithic specialist Dr Francis Wenban Smith.

7.4.2 This work would be undertaken in accordance with CIfA *Standard and Guidance for Archaeological Excavation* (2014) and Kent County Council's *Mitigation-Specification for Detailed Palaeolithic Excavation-Manual of Specifications Part B* (KCC).

Post-Palaeolithic Archaeology

7.4.3 Archaeological excavation of post-Palaeolithic archaeological usually takes one of two forms, full excavation (usually single context excavation) or selective sample-based excavation (known as strip, map, sample excavation).

7.4.4 In accordance with the CIfA guidance, the general aims of the archaeological excavation are to;

- *Further define the features identified in the evaluation;*
- *Examine the archaeological resource within the Project Site;*

- *Seek better understanding of and compile a lasting record of the resource, within a defined framework of research objectives;*

- *Analyse and interpret the results and disseminate them.*

7.4.5 Full excavation is required where complex remains on several levels are expected to be found, whereas strip, map sample excavation can be used where remains are expected to be relatively shallow, at one level and likely to consist of negative features (pits/ditches) cut into the natural geology. Strip, map sample is likely to be the preferred method of excavation, however this would be informed by the earlier stages of investigation. The strip, map sample excavation should entail;

- *Removal of the topsoil or made ground under archaeological supervision to either the subsoil or the first archaeological horizon*

- *Hand cleaning of archaeological deposits to identify the extent of discrete features. Features should be surveyed, photographed and recorded;*

- *Sampling techniques and sizes will be set out within the WSI but this could include sections of circular or linear features, quadrants of large circular features. Features would be hand excavated to record internal stratigraphy and for artefact recovery. Typical sample based excavations involve hand excavation of 50% of discrete features and 20-25% of linear features.*

- *Certain types of features (burials, hearths, stratified remains or significant features) may be hand excavated in their entirety by the archaeologist and recorded*

- *Palaeoenvironmental sampling of buried soil horizons and bulk sampling of certain deposits will also be undertaken to retrieve additional evidence.*

7.4.6 The depth and complexity of archaeological deposits across the Site will be assessed. Sections shall be positioned to record accurate cross-section profiles of any remains and to identify structural/phasing sequences (for example terminus and intersections).

7.4.7 The spot height of all principal features and levels will be calculated in meters relative to Ordnance Datum, correct to two decimal places. Plans, sections and elevations will be annotated with spot heights as appropriate.

7.4.8 A full photographic record will be maintained using digital images, to include detailed views of archaeological features and deposits, the general context of archaeological remains and to record the progress of the investigations, including images potentially suitable for use in publicity material.

7.4.9 Metal detectors may be used as appropriate to scan stripped surfaces and archaeological features prior to and during excavation as appropriate, and to scan spoil heaps where practicable.

7.4.10 Archaeological excavation will be undertaken following *Standards and Guidance for Archaeological Excavation* (CIfA 2020) and *Kent County Council, Manual of Specifications Part B, Mitigation- Strip, Map and Sample Requirements* (KCC).

7.5 Additional Sampling (Bakers Hole)

7.5.1 Natural England have identified an issue with perceived "sterilisation" of the SSSI for purposes of future research (i.e., they consider that the site will be effectively unable to be used for currently unspecified future research). Embedded mitigation for this is made in the form of the construction of the people mover on blocks, which can be removed to allow later access. However, additional mitigation is proposed in the form of a programme of sampling the site to "bank" material of use to researchers.

7.5.2 It is proposed to undertake a comprehensive programme of sampling across the SSSI (and the Scheduled Monument). The sampling programme will take advantage of preconstruction investigation opportunities to take a suite of samples of the full depth and extent of the deposits of interest. Samples will be taken by various techniques (cores, columns, bulk samples etc.) for application of a range of techniques (including for scientific dating). Provision will be made for this suite of samples to be curated in appropriate conditions at a suitable repository. This would effectively serve as a "library" for future researcher to use in pursuit of their specific research aims, or against a future research programme developed by Natural England.

7.5.3 The scope and extent of this programme, including techniques for taking the samples as well as the types of material and locations to be sampled, will be agreed with Natural England, Historic England and Kent County Council as appropriate. Such agreement will also include curation, repository and access arrangements.

7.6 Watching Brief

7.6.1 An Archaeological Watching Brief is a programme of observation, investigation and recording of archaeological remains discovered during the construction of the proposed development. It is used where archaeological remains have not been identified during the earlier stages of assessment (Desk-Based Assessment and Evaluation) but where there remains potential for archaeological remains to exist. The ground works would be monitored by an archaeologist and as such the method of working would not be directly controlled by the archaeologist (unless significant discoveries are found).

7.6.2 Both of the types described below involve monitoring attendance to observe the ground works and make a basic record and investigation and recording if archaeological remains are revealed within the works.

7.6.3 All work would be carried out in accordance with CIfA *Standards and Guidance for an Archaeological Watching Brief* (2014) and Kent County Council's *Specification for An Archaeological Watching Brief in Kent* (KCC) and where required *Mitigation-Palaeolithic Archaeological Watching Brief-Part C* (KCC). A Written Scheme of Investigation would be prepared for a Watching Brief and agreed with the relevant stakeholders.

General Watching Brief

7.6.4 A General Watching Brief would monitor the ground works as they occur with no specific requirements on the method of operation. This can be used in areas where there is a low potential for archaeological remains or for activities such utilities and service diversions.

Targeted Watching Brief

7.6.5 A targeted watching brief involves closer monitoring and supervision of the works by the archaeologist. This may include particular requirements on the method of the works or the types of plant that can be used. In areas where greater care is needed to minimise damage for example near areas where preservation in situ is required.

7.7 Historic Building Record

7.7.1 Historic Building Record will be required where a total loss of significance will occur through the demolition of buildings with heritage significance within the Project Site and also where alteration to historic buildings will also take place. The Historic Building Record will be undertaken in accordance with Historic England's *Understanding Historic Buildings, A Guide to Good Recording Practice* (Historic England 2016). Historic Building Recording is tiered by the level of detail, Level 1 is a basic visual record, Level 2 is a descriptive record, Level 3 is an analytic record and Level 4 is a comprehensive analytical record. The level of detail required is based upon the significance of the building and the purpose of the record.

7.7.2 It is proposed that a Historic Building Record will be made for;

- *Historic dwelling on London Road (Level 2);*
- *Tramway Tunnel beneath London Road (Level 2)*
- *Thames Tar Distillery Works (Level 2);*
- *British Vegetable Parchment Mills (Level 2);*
- *Whites Jetty/Bell Wharf (Level 2/3);*
- *Portland Cement Works (Level 2/3); and*
- *Grade II* Riverside Station and Landing Stage (Level 3).*

7.7.3 The Level 2 survey will make a descriptive record of both the interior and exterior of the buildings, which will be seen, described and photographed. An analysis of the development and use of the building will be produced based upon an examination of the building.

7.7.4 A Level 3 survey will be required for Grade II* listed Riverside Station and Landing Stage prior to the alterations and refurbishment as part of the development proposals following on from the Built Heritage Assessment described above. This will involve a systematic account of the buildings origins, development and use, and will document the evidence on which the analysis is based. Drawn and photographic records will be included to demonstrate the appearance of the structure and to support the historical analysis.

7.7.5 The recording would be undertaken in accordance with CIfA *Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings or Structures* (CIfA 2014) and Historic England's *Understanding Historic Buildings, A Guide to Good Recording Practice* (Historic England 2016). A Written Scheme of Investigation would be prepared and submitted to the relevant stakeholders prior to the works taking place.

7.8 Monitoring of Geotechnical Works

7.8.1 Geotechnical boreholes are planned to be undertaken post-consent for geotechnical purposes. Borehole drilling or excavation of samples for geotechnical purposes will be monitored by a geoarchaeologist and where possible input into the design of the geotechnical works will be allowed so that the samples retrieved can be used for geotechnical and geoarchaeological purposes.

7.9 Marine and Inter-tidal Mitigation

Watching Brief

7.9.1 A watching brief in the marine and inter-tidal zone could be implemented to mitigate effects to archaeological assets within the marine zone during the construction phase. This would be undertaken in accordance with the CIFA *Standards and Guidance for archaeological watching brief* and would be subject to a specific Written Scheme of Investigation.

7.9.2 An archaeological watching brief could be required for dredging or clearance activities which would involve a formal programme of archaeological monitoring and attendance by a suitably qualified archaeologist during dredging. A Written Scheme of Investigation would be prepared to include archaeological monitoring on board the dredger and should any material be recovered, it would be analysed and recorded according to the Written Scheme of Investigation. Excavated surfaces and up-cast material will be inspected by the archaeologist and any finds will be collected and allocated a record number and their position will be logged. Archaeological features or structures that are encountered will be examined and/or excavated using divers. A sufficient sample of each layer/feature type will be investigated in order to elucidate the date, character, relationships and function of the feature/structure. Recording will include written, drawn and photographic elements as conditions allow.

7.9.3 Watching brief in the inter-tidal area will be subject to a Written Scheme of Investigation. Archaeological features or structures will be examined and/or excavated during low tide. A sufficient sample of each layer/feature type will be investigated in order to elucidate the date, character, relationships and function of the feature/structure. Recording will include written, drawn and photographic elements as conditions allow.

7.9.4 The finding of any watching brief will be compiled as an archaeological watching brief report consistent with industry standards.

Marine Protocol for unexpected archaeological discoveries

7.9.5 A Protocol for archaeological discoveries within the marine area could be implemented for the construction phase and would continue to be used for any operational maintenance or future dredging. The Protocol provides a system for reporting and investigating unexpected archaeological discoveries encountered during the course of the Project, for example, when it is not practical or safe for an archaeologist to be present during works or in areas of low archaeological potential. The aim of the Protocol is to reduce any adverse effects of the development upon the historic environment by enabling project staff, contractors and sub-contractors to report finds in a manner that is both convenient to their every-day work and effective with regard to curatorial requirements. Archaeological discoveries reported via the Protocol may include submerged prehistoric material, shipwreck material or aviation material. The Protocol will also make provision for the institution of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice and if necessary, for archaeological inspection of important features prior to further works in the area.

7.10 Geoarchaeological Borehole Sampling

7.10.1 Where earlier phases of palaeoenvironmental sampling have identified significant deposits. Further collection and assessment of additional boreholes may be required to mitigate the effects of the development where necessary. Targeted palaeoenvironmental assessment (e.g. pollen, plant macrofossils, microfauna) and radiocarbon dating may also be required on retained core sequences, where relevant and appropriate. This work would be subject to a Written Scheme of Investigation.

8 POST-EXCAVATION STRATEGY

8.1 Introduction

8.1.1 After the on-site fieldwork has taken place post-excavation assessment is required. Set out below is a general process for the post-excavation assessment. Due to the varied nature of the archaeological fieldwork outlined above, the below will need to be tailored to each project type. This would be set out in the individual WSI's for separate pieces of work.

8.1 Finds

General

8.1.1 All archaeological finds from excavated contexts will be retained, although those from features of modern date (19th century or later) may be recorded on site and not retained, depending on the research objectives set out in the Written Scheme of Investigation. Where appropriate soil samples may be taken and sieved to aid in finds recovery. Any finds requiring conservation or specific storage conditions will be dealt with immediately in line with *First Aid for Finds* (Watkinson and Neal 1998). Marine finds will be processed in accordance with *First Aid for Underwater Finds* (Robinson 1998).

Human Remains

8.1.2 In the event of the discovery of any human remains (articulated or disarticulated, cremated or unburnt), all excavation of the deposit(s) will cease pending the Archaeological Contractor obtaining a Ministry of Justice Licence (this includes cases where remains are to be left in situ).

8.1.3 Should human remains require removal, all excavation and post-excavation will be in accordance with the Archaeological Contractors protocols and current guidance documents (McKinley 2013) and CIfA Technical Paper 13 Excavation and post-excavation treatment of cremated and inhumed remains. Appropriate specialist guidance/site visits will be undertaken if required.

8.1.4 The final deposition of human remains subsequent to the appropriate level of osteological analysis and other specialist sampling examinations will follow the requirements set out in the Ministry of Justice licence.

Treasure

8.1.5 The Archaeological Contractor will immediately notify the client and the County Archaeologist on discovery of any material covered, or potentially covered, by the Treasure Act 1996 (as amended by The Coroners and Justice Act 2009). All information required by the Treasure Act (i.e. finder, location, material, date, associated items etc.) will be reported to the Coroner within 14 days.

Wreck

8.1.6 The Archaeological Contractor will notify the Receiver of Wreck within 28 days of the discovery or recovery of any 'wreck' as defined by the Merchant Shipping Act 1995.

Aircraft

8.1.7 The Archaeological Contractor will notify the Joint Casualty and Compassionate Centre (JCCC) of the Ministry of Defence for discoveries of military aircraft material, as aircraft lost during military service are automatically protected under the Protection of Military Remains Act 1986.

Finds Processing

8.1.8 All retained finds will, as a minimum be washed, weighed, counted and identified. They will then be recorded to a level appropriate to the aims and objectives of the project. The report will include a table of finds by period and/or feature group.

8.1.9 Metalwork from stratified contexts will be X-rayed and along with other fragile and delicate materials, stored in a stable environment. The X-raying of objects and other conservation needs will be undertaken by Wessex Archaeology in-house conservation staff, or by another approved conservation centre.

8.1.10 Artefacts and other finds will be suitably bagged and boxed in accordance with the guidance given by the relevant museum and generally in accordance with the standards of the CIfA (2014).

8.2 Environmental Sampling

Introduction

8.2.1 All sampling will adhere to the principles outlined in Historic England's Guidance (English Heritage 2011 and Historic England 2015c). Note that the following provisions will apply equally to the additional sampling outlined in section 7.5 above.

Sampling Strategy

8.2.2 Depending on the size, complexity and duration of the work, the formulation of a site-specific sampling strategy will be considered at an early stage. Initially informed by prior works or predicted conditions, the strategy will be developed and adapted as the excavation continues, with support provided by specialist site visits and/or phone advice as appropriate. The aim of the strategy will be to effectively target both archaeological landscape and features in order to address the aims and objectives of the project, if appropriate with reference to local or regional research agendas. Any change in strategy will be agreed with the County Archaeologist.

Sampling Methods

8.2.3 Bulk environmental soil samples, for the recovery of plant macrofossils, wood charcoal, small animal bones and other small artefacts, will be taken as appropriate from well-sealed and dateable contexts or features. In general, features directly associated with particular activities (e.g. pits, latrines, cesspits, hearths, ovens, kilns,, and corn driers) should be prioritised for sampling over features such as ditches or postholes which are likely to contain reworked and residual material.

8.2.4 If waterlogged or mineralised deposits are encountered an environmental sampling strategy will be devised and agreed with the County Archaeologist as appropriate. Specialist guidance will be provided by a geoarchaeologist, with site visits undertaken as required.

8.2.5 Any sample will be of an appropriate size- typically 40 litres for the recovery of environmental evidence from dry contexts, and 10 litres from waterlogged deposits

8.2.6 Following specialist advice, other sampling methods such as monolith, Kubiena or contiguous small bulk (column) samples may be employed to enable investigation of deposits with regard to microfossils (e.g. pollen, diatoms) and macrofossils (e.g. molluscs, insects), soil micromorphological and soil chemical analyses.

Environmental Processing

8.2.7 Bulk environmental soil samples will be processed by standard flotation methods and scanned to assess the environmental potential of deposits. The flot will be retained on a 0.25mm mesh, with residues fractionated into 5.6/4 mm, 2mm, 1mm and 0.5mm and dried if necessary. Coarse fraction (>5.6/4mm) will be sorted, weighed and discarded, with any finds recovered given to the appropriate specialist. Finer residues will be retained until after any analyses and discarded following final reporting.

8.2.8 In the case of samples from cremation related deposits the flots will be retained on a 0.25mm mesh, with residues fractionated into 4mm, 2mm and 1mm. In the case of samples from inhumation deposits, the sample will be artefact sieved through 9.5mm and 1mm mesh sizes. The coarse fractions (9.5mm) will be sorted with any finds recovered given to the appropriate specialist together with finer residues.

8.2.9 Any waterlogged or mineralised samples will be processed by standard waterlogged flotation methods.

8.3 Post-Excavation Assessment

8.3.1 The Post-Excavation Assessment will assess the results of the fieldwork against the aims, objectives and research questions identified in the Written Scheme of Investigation and will identify opportunities for analysis, publication and community engagement.

8.3.2 A fieldwork archive will be created, involving the processing and packaging of finds and samples and entering these into a database. The object of the initial processing is to create a checked and ordered corpus of data, with supporting stratigraphic matrices, and digitised feature plans

8.3.3 The post-excavation assessment allows a review of the findings and identifies the need for further analytical work or where less significant remains are found- no further work. The assessment will inform the analysis and publication stage by creating a revised framework of priorities following the completion of the fieldwork. The post-excavation assessment will be submitted to the relevant stakeholders for approval.

8.4 Publication, Dissemination and Heritage Interpretation

8.4.1 Where the post-excavation assessment has identified that further analysis should be carried out this will be undertaken in accordance with the updated project design. The post-excavation assessment will make recommendations for appropriate publication and dissemination of the results based on the significance of the findings. This could include journal publication, booklet, exhibitions or web-based initiatives.

Heritage Interpretation and Community Engagement

8.4.2 Public benefit and engagement with the community could help to offset some of the physical effects of the development proposals. This would enhance the public value and engagement with the historic environment, contribute to place-making and provide information to the public on the special archaeological and historic interest of the area. The form of the community engagement will be dependent upon the findings of the investigations but some options could include;

- *School Workshops, activities and loan boxes;*
- *Workshops for Local Groups including finds handling and QA sessions;*

- *Guided site tours while archaeological excavations are in progress;*
- *Lectures and talks to local community groups to include both professional archaeologists and specialists;*
- *Themed hoarding during archaeological investigations/construction- to include information on the ongoing archaeological investigations and the findings;*
- *Digital outputs such as webinars/podcasts and Virtual Reality (VR) experiences;*
- *Ongoing blogs/Vlogs or social media updates as the archaeological works progress;*
- *Information for use by the client for newsletters, web content or media (social media or traditional media outlets)*
- *Provision of content for third party publishers (TV companies/ journalists)*
- *Displays and Exhibitions in the local area either permanent or temporary;*
- *Volunteer or student placements.*

8.4.3 Specific proposals could involve offsite heritage interpretation within the existing Swanscombe Heritage Park and a management plan (Section 8.6 below) for Site B of the Palaeolithic Sites near Bakers Hole which is currently on the Heritage at Risk Register.

8.5 Archive Preparation and Deposition

Museum

8.5.1 It is recommended that the project archive resulting from the excavation be deposited with a suitable museum. At present the Dartford Museum and Thurrock Museums are not currently accepting archives. In the absence of a museum in the area actively collecting archaeological archives at the time of deposition, the archive will be stored by the Archaeological Contractor until such time as the situation is resolved.

Preparation of Archive

8.5.2 The complete archive which may include paper records, graphics, artefacts, ecofacts and digital data, will be prepared following the standard conditions for the acceptance of excavated archaeological material by the accepting museum, and in general following nationally recommended guidelines (SMA 1995; CIFA 2014c, Brown 2011; ADS 2013). The archive will usually be deposited within one year of the completion of the project, with the agreement of the client.

8.6 Management Plan

8.6.1 A management plan is a document prepared to aid the efficient and effective management of a monument for the future as well as to provide a framework for standard maintenance ensuring the longevity of the monument within the landscape. A management plan would set out the long-term objectives for the management of a scheduled monument (or other nationally significant archaeology) and outline specific proposals for appropriate management and maintenance operations.

8.6.2 The key principles of the management plan would be to;

- *Propose and undertake measures designed to minimise further degradation of the monument;*

- *Promote the Sites presence within the surrounding landscape and understanding of the monument;*

- *Remove features/vegetation which detract from the Site's character or affect the below ground survival of archaeological remains; and*

- *Reinstate/repair or stabilise areas which have been previously lost or damaged.*

8.6.3 The management plan would set out the vulnerabilities and potential threats to the monument as well as identifying opportunities for improving the site, enhancing its significance and ensuring its ongoing conservation. Opportunities for positive change will be outlined for the short and long term, and it will be necessary to review and update the management plan on a regular basis as issues are addressed to ensure that the site is continuously managed for future generations and enjoyment of the monument.

8.6.4 Following the DCO application monuments such as Palaeolithic Sites at Bakers Hole and Neolithic Sites at Ebbsfleet may require a management plan. Any such plan would have similar broad aims, and would be designed to assist the Statutory Authorities in the goal of improving the status of the Scheduled Monument (which is currently "at risk") and the SSSI (which is in a declining condition).

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APPENDICES

Appendix 1: Palaeolithic Character Areas (Dr. Francis Wenban-Smith)

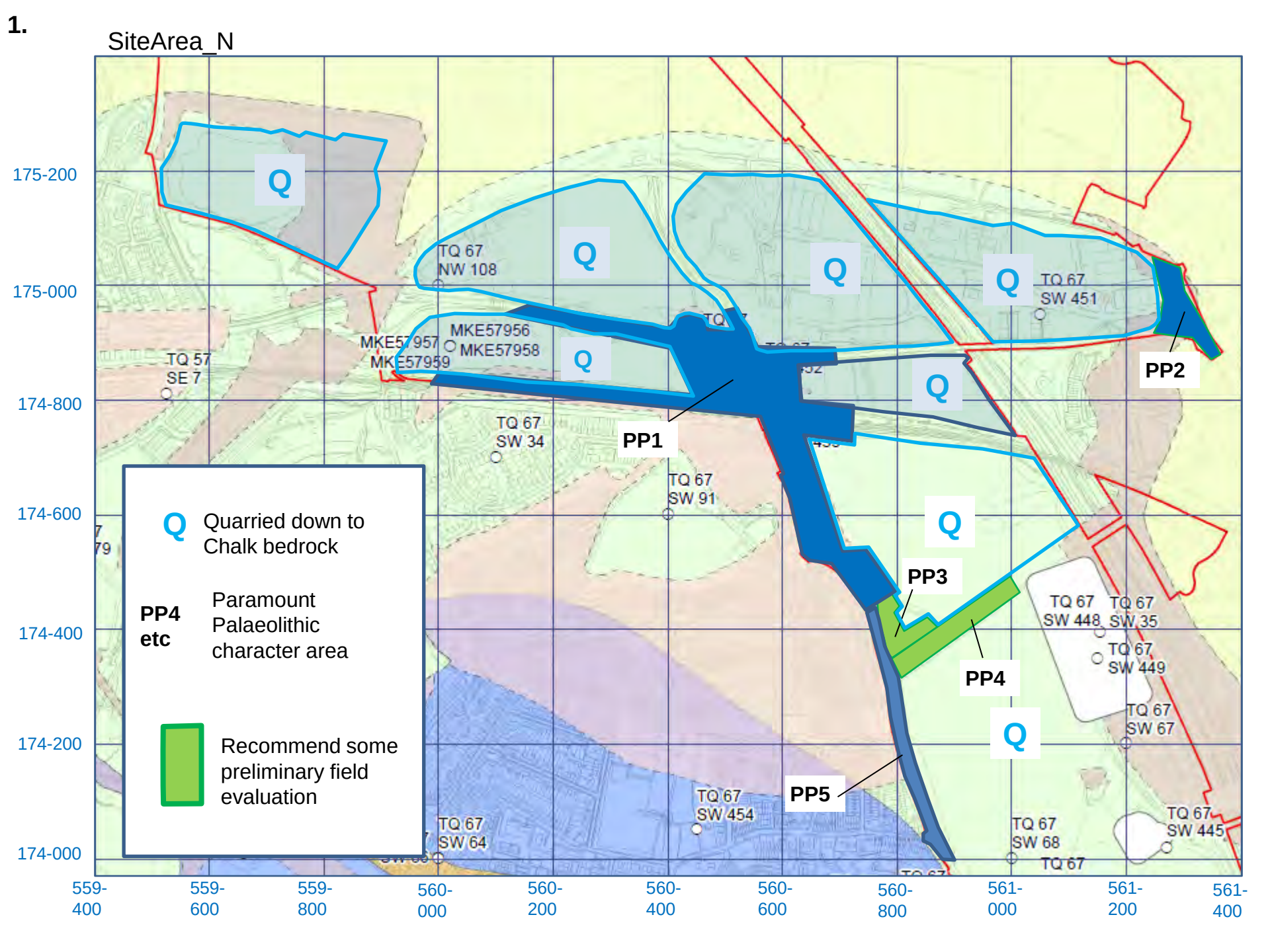
Table 1. *Areas of Palaeolithic potential: summary*

PP area #	*Palaeolithic potential*	*Likelihood of presence*	*Importance, if present*	*Vulnerability to impact*	*Likely Palaeolithic remains*	*Prelim field evaluation recommended*
PP1	HIGH	High	High	High	Artefacts, faunal remains, in stratified fluvial sequence	Yes
PP2	UNCERTAIN	Moderate	Moderate	Low	Palaeo-environmental remains in stratified fluvial sequence	-
PP3	HIGH	High	High	High	Artefacts, faunal remains, in stratified fluvial sequence	Yes
PP4	HIGH	High	High	High	Artefacts, faunal remains, in stratified fluvial sequence	Yes
PP5	HIGH	High	High	Moderate	Artefacts, faunal remains, in stratified fluvial sequence	-
PP6	HIGH	High	High	Moderate	Artefacts, faunal remains, in stratified fluvial sequence	Yes
PP7	HIGH	High	High	Low	Palaeo-environmental remains in stratified fluvial sequence	-
PP8	LOW	Low	Uncertain	Low	Derived artefacts	-
PP9	MEDIUM	High	Low	High	Derived artefacts	-
PP10	VERY LOW	Low	Low	Low	Derived artefacts	-
PP11	HIGH	High	Usually high	Variable	Concentrations of lithic artefacts, possibly associated with undisturbed palaeo-landsurfaces; faunal remains	-
PP12	UNCERTAIN	Uncertain	Maybe high	Maybe high	Lithic artefacts and faunal/environmental remains	-
PP13	UNCERTAIN	Uncertain	Maybe high	Moderate/low	Lithic artefacts and faunal/environmental remains	-
PP14	HIGH	High	High	High	Lithic artefacts and faunal/environmental remains, possibly associated with undisturbed landsurfaces	Yes
PP15	HIGH /MODERATE	Moderate	High	Moderate/low	Lithic artefacts and faunal/environmental remains	-
PP16	MODERATE	Moderate	High	Moderate/low	Lithic artefacts	-
PP17	HIGH	Moderate	High	Moderate/low	Lithic artefacts and faunal/environmental remains, in stratified sequence	-

PP18	MODERATE	Moderate	Moderate	Moderate/low	Faunal/environmental remains, in stratified sequence; possibly late Upper Palaeolithic (Long Blade)	-
PP19	MODERATE	Moderate	Moderate	Moderate/low	Faunal/environmental remains, in stratified sequence; possibly late Upper Palaeolithic (Long Blade)	-
PP20	UNCERTAIN, maybe HIGH	Moderate	Maybe High	Low	Fluvial deposits with artefacts, below quarry backfill	-
PP21	LOW	Low	Low	Low	Possibly occasional derived Palaeolithic remains within clay; any underlying sediments may contain less disturbed remains and biological evidence	-
PP22	HIGH	Low	High	Moderate	None known, but likely to be present in places	-
PP23	HIGH	Moderate	High	Moderate	None known, but likely to be present in places	-
PP24	LOW	Low	Low	Low	Very unlikely to find any Palaeolithic remains, and any found would probably be reworked from much older sediments	-
PP25	MEDIUM	Moderate	Moderate	Low	None known, but may to be present in places	-
PP26	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in fluvial terrace sands/gravels	Yes
PP27	UNCERTAIN, maybe HIGH	Uncertain	Maybe high	Maybe high	Concentrations of lithic artefacts, possibly associated with undisturbed palaeo-landsurfaces; faunal/environmental remains	-
PP28	HIGH	High	High	High	Concentrations of lithic artefacts, possibly associated with undisturbed palaeo-landsurfaces; faunal/environmental remains	-
PP29	HIGH	High	High	Variable	Lithic artefacts; faunal/environmental remains; important/rare deposit horizons	-

PP30	HIGH	High	High	High	Concentrations of lithic artefacts, possibly associated with undisturbed palaeo-landsurfaces; faunal/environmental remains	-
PP31	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in fluvial terrace sands/gravels; late Upper Palaeolithic (Long Blade) in colluvium/alluvium interdigitation zone	Yes
PP32	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in fluvial terrace sands/gravels	Yes
PP33	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in fluvial terrace sands/gravels	Yes
PP34	UNCERTAIN	Moderate	Maybe high	Moderate	Late Upper Palaeolithic (Long Blade) in colluvium/alluvium interdigitation zone	Yes
PP35	UNCERTAIN	Moderate	Maybe high	Moderate	Late Upper Palaeolithic (Long Blade) in colluvium/alluvium interdigitation zone	Yes
PP36	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in very old fluvial terrace sands/gravels, or in slightly disturbed horizons under slopewash	Yes
PP37	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in very old fluvial terrace sands/gravels, or in slightly disturbed horizons under slopewash	Yes
PP38	UNCERTAIN	Moderate	Maybe high	Moderate	Artefacts in very old fluvial terrace sands/gravels, or in slightly disturbed horizons under slopewash	-

1.


SiteArea_N
Q
Quarried down to Chalk bedrock
PP4 etc
Paramount Palaeolithic character area
Recommend some preliminary field evaluation
PP1
PP2
PP3
PP4
PP5
TQ 67 NW 108
TQ 57 SE 7
MKE57957
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TQ 67 SW 34
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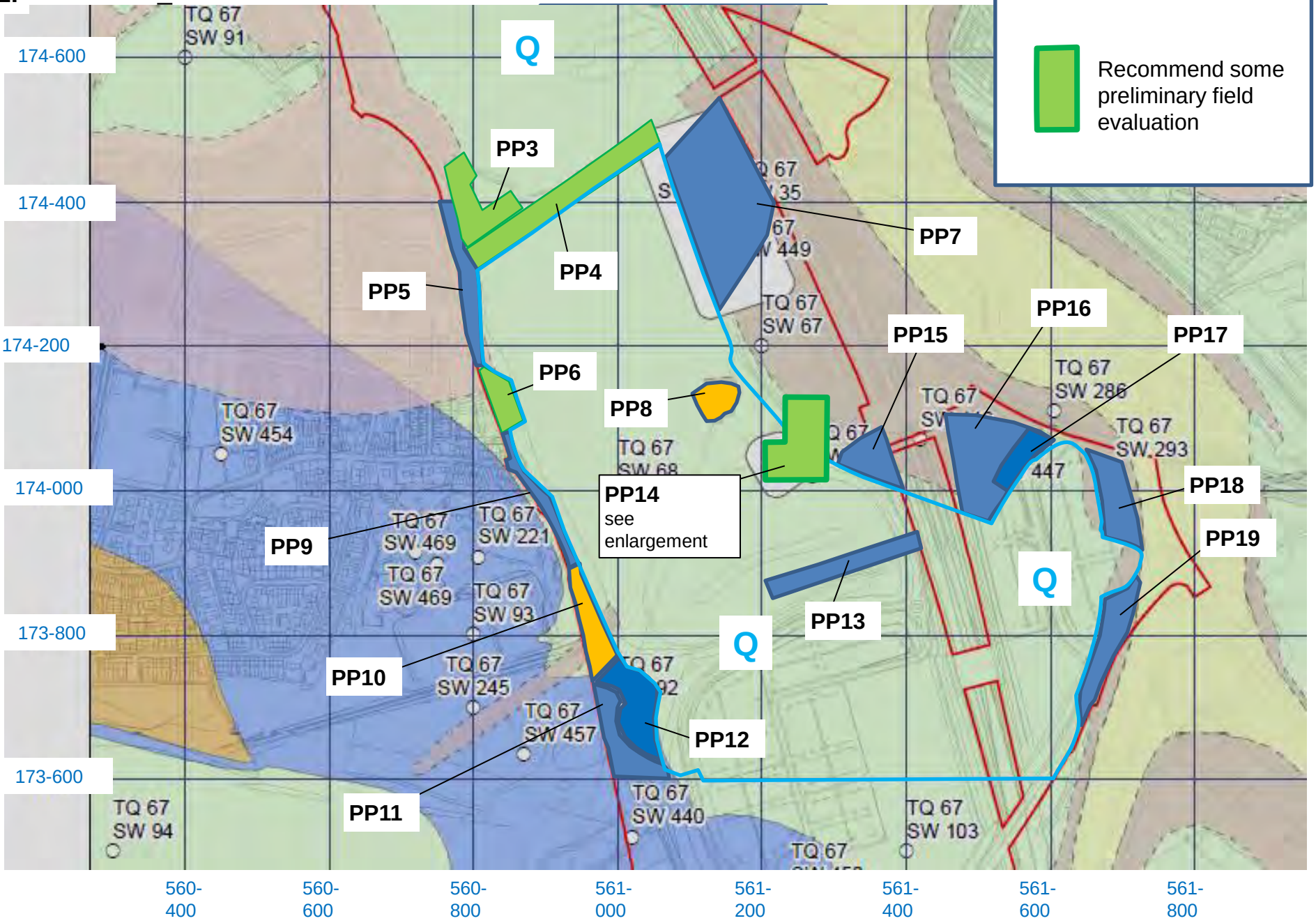
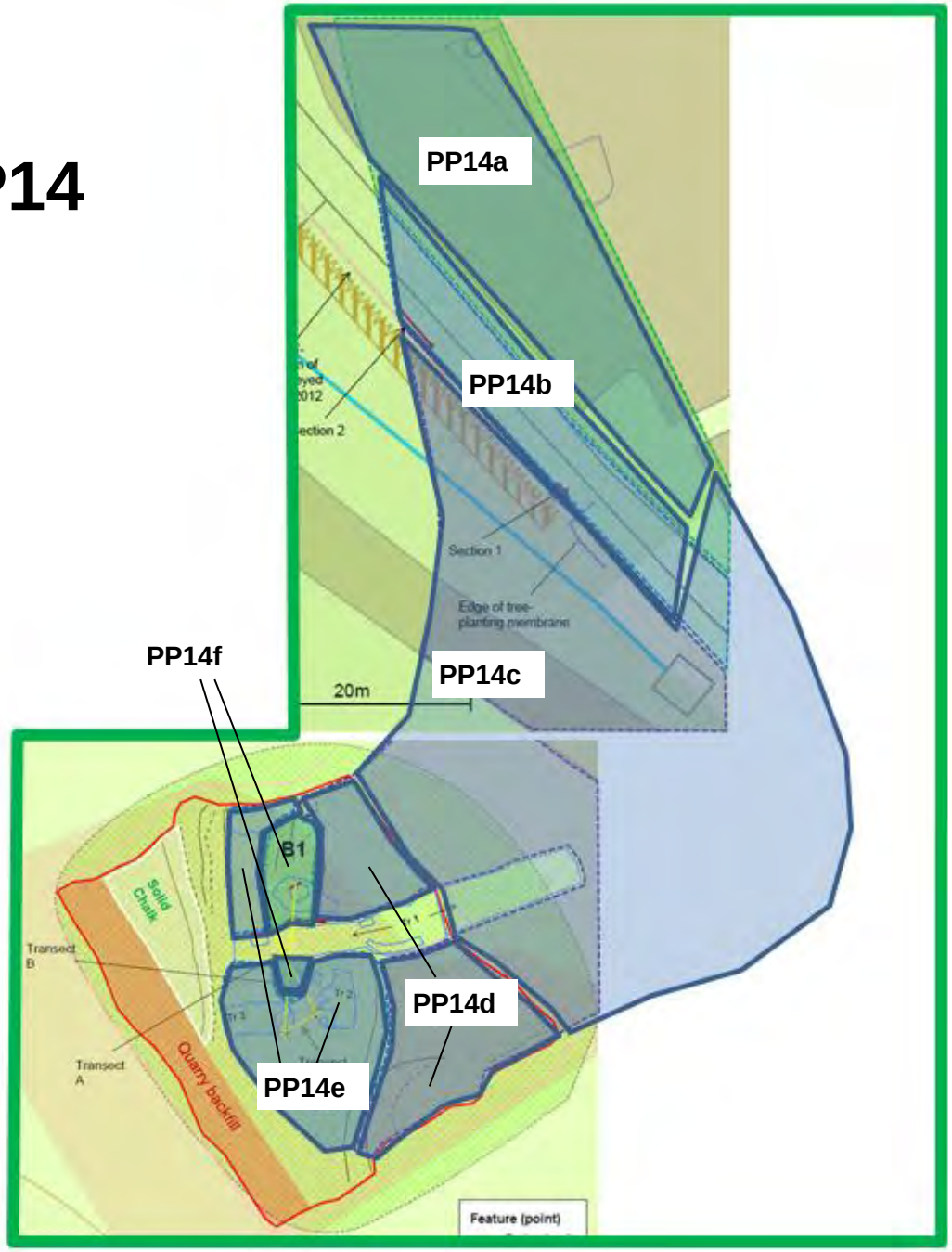
2. SiteArea_CentralN



3.

PP14


PP14a
PP14b
PP14c
PP14d
PP14e
PP14f
Section 1
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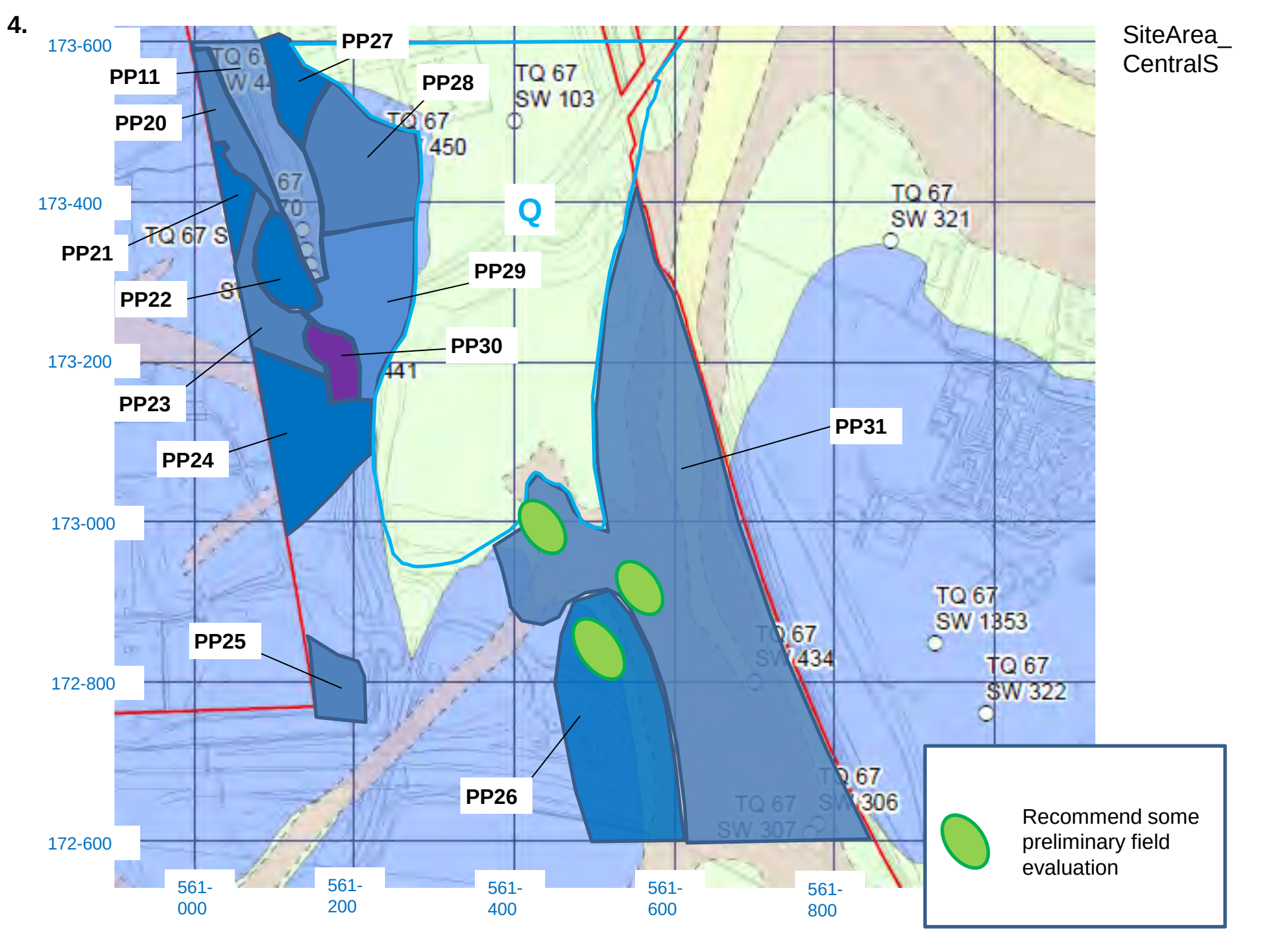
20m
B1
Solid Chalk
Quarry backfill
Transect B
Transect A
Feature (point)

4.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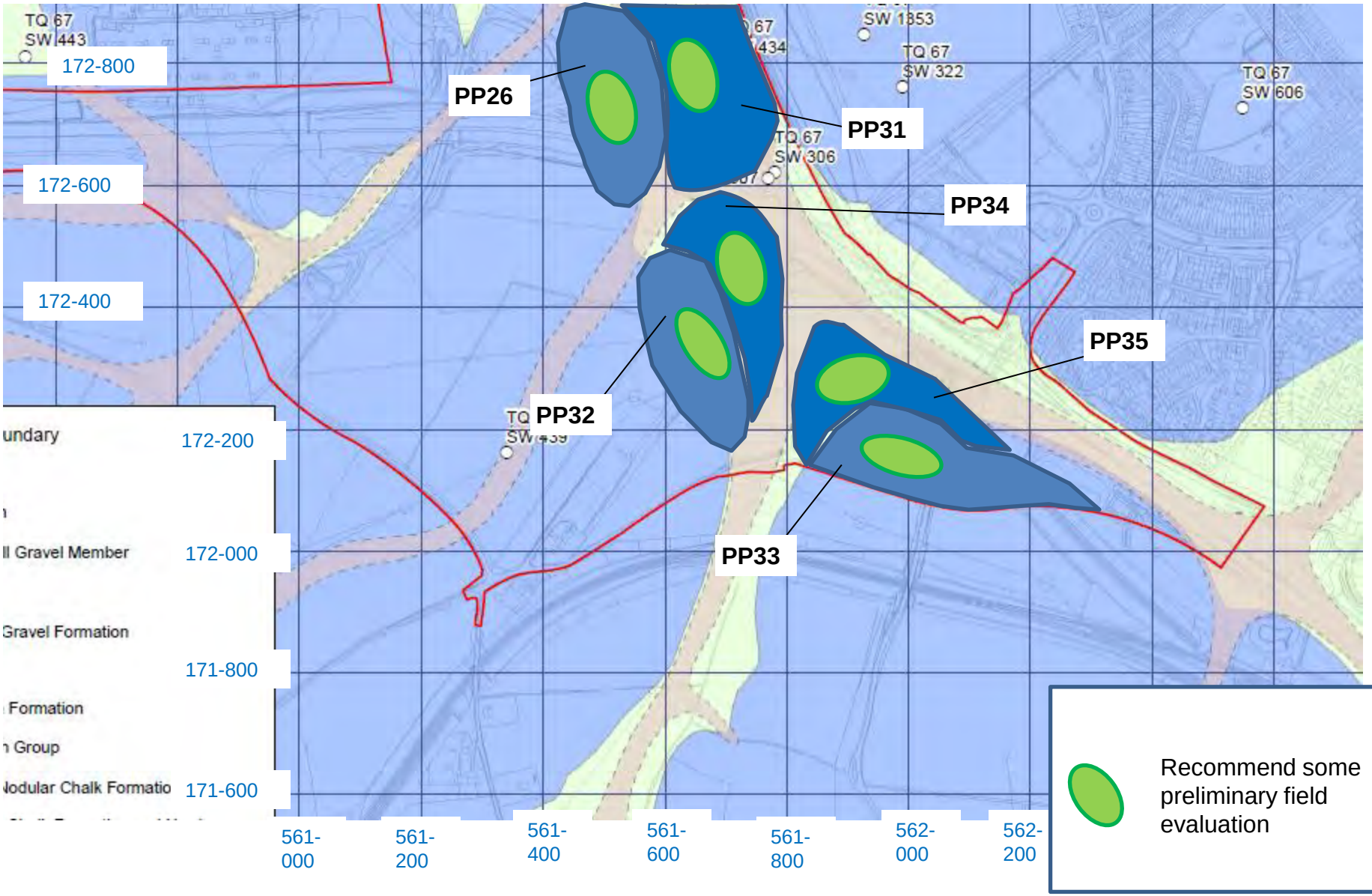
173-400
173-200
173-000
172-800
172-600
561-000
561-200
561-400
561-600
561-800
PP11
PP20
PP21
PP22
PP23
PP24
PP25
PP26
PP27
PP28
PP29
PP30
PP31
TQ 67 SW 103
TQ 67 SW 321
TQ 67 SW 1353
TQ 67 SW 322
TQ 67 SW 307
TQ 67 SW 306
Q
Recommend some preliminary field evaluation

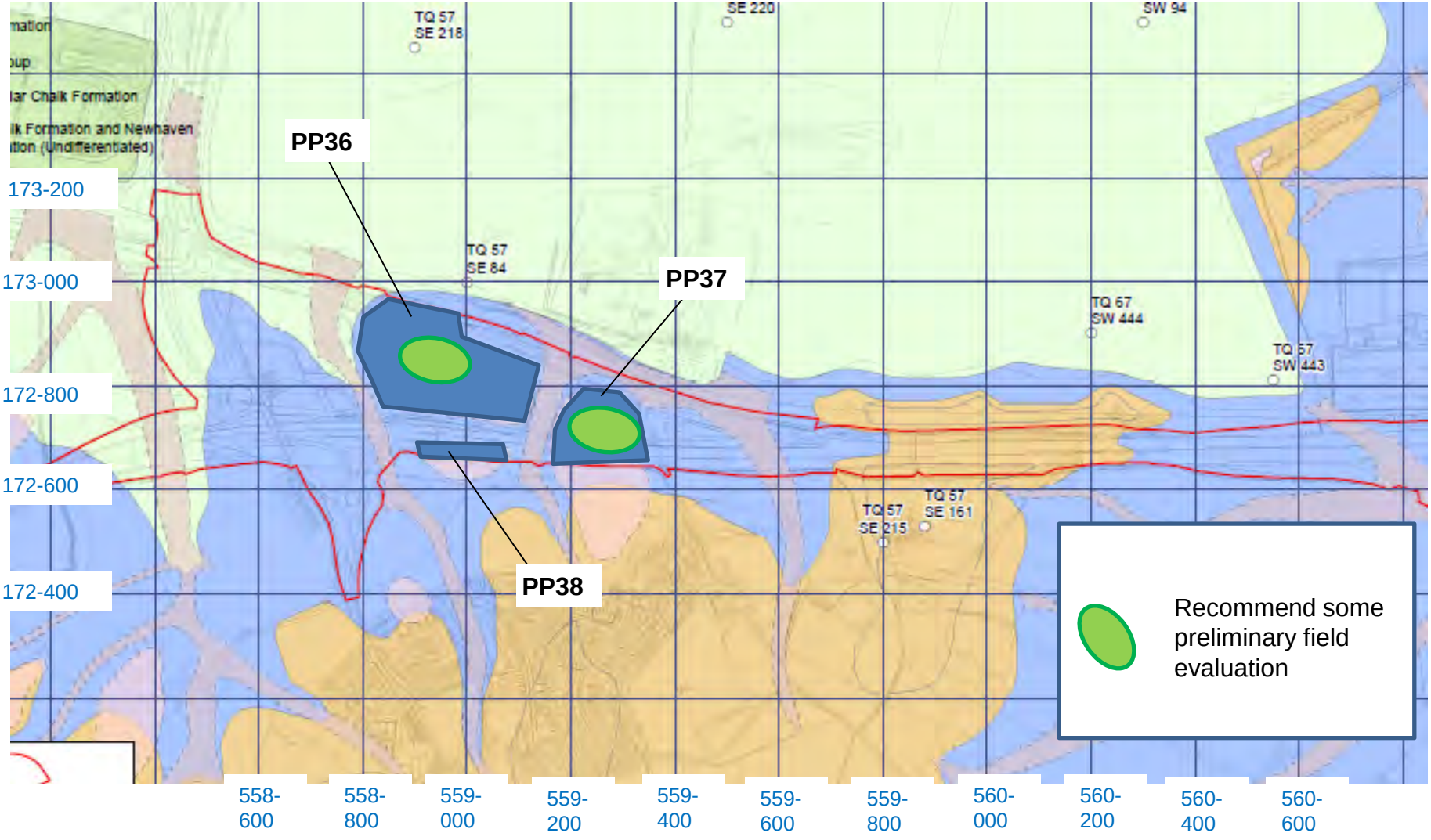
5.

SiteArea_SE



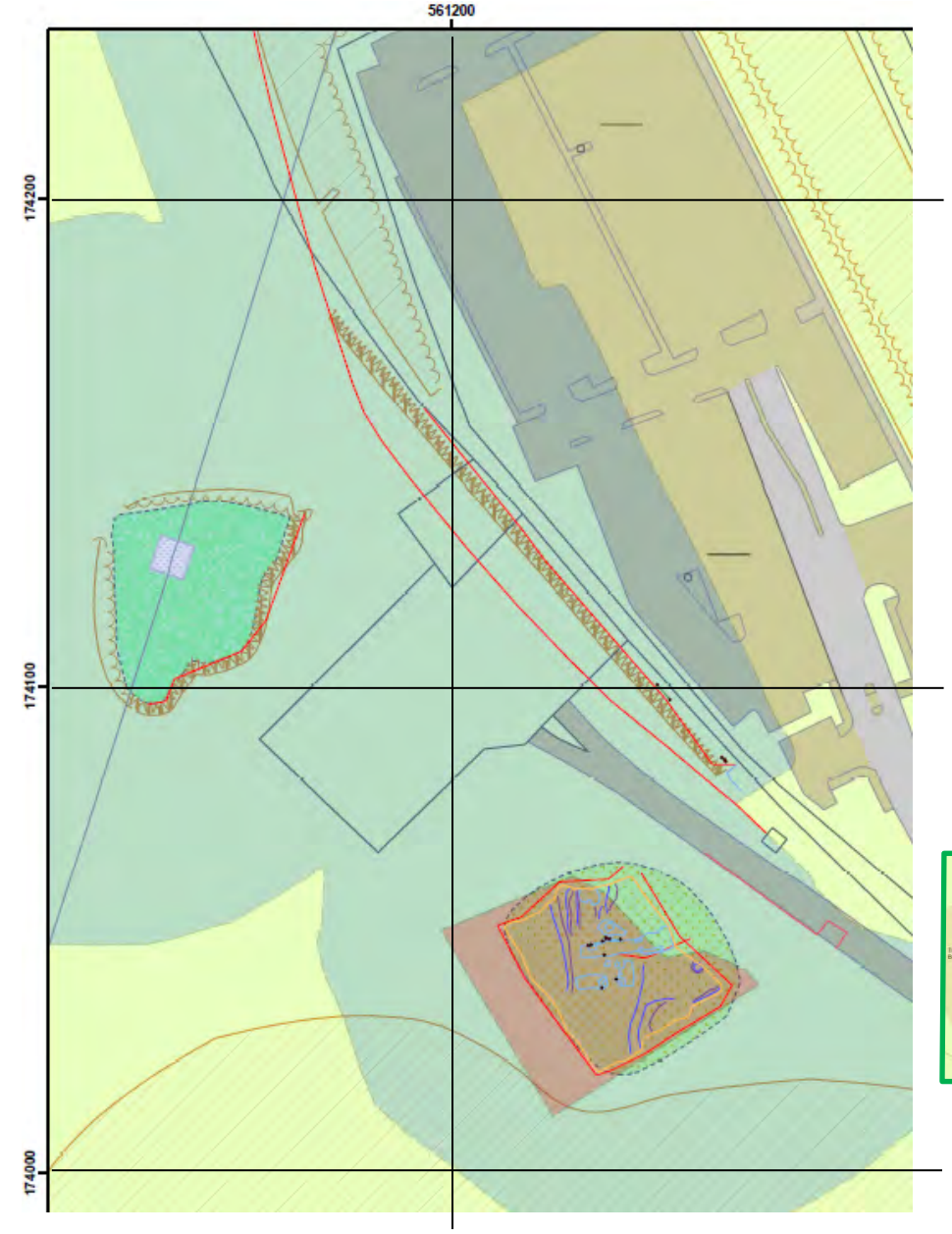
6.

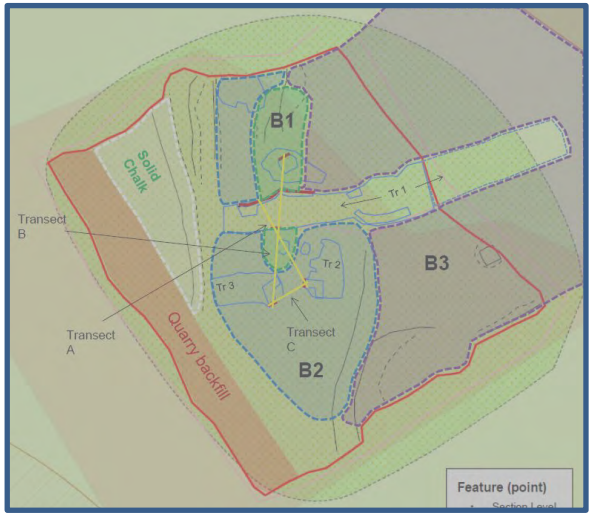
SiteArea_SW

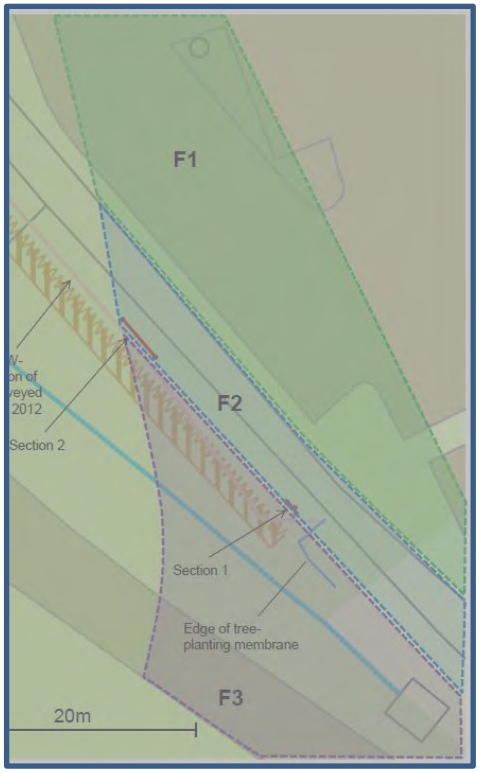


7.

Grid line locator for area PP14







Appendix 2: Draft Written Scheme of Investigation for Palaeolithic Evaluation at Bakers Hole Scheduled Monument and SSSI

London Resort

Written Scheme of Investigation for targeted Stage 1 Palaeolithic field evaluation in vicinity of Baker's Hole SSSI and Scheduled Monument in advance of proposed Access Road and People-mover corridor (Option D)

By

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Summary

The proposed routes for the main access road to the site and a separate people-mover corridor (Option D) pass through the Baker's Palaeolithic Site, a designated Scheduled Monument and Site of Special Scientific Interest.

This document provides a Written Scheme of Investigation (WSI) for Stage 1 field evaluation of the affected area. Three types of investigation methods are required: cable/percussion boreholes (n=8, CP1-CP8), machine-dug test pits (n=1, TP15), and combined test pits with windowless boreholes (n=14, TP1-TP14 and BH1-BH14).

London Resort

Written Scheme of Investigation for targeted Stage 1 Palaeolithic field evaluation in vicinity of Baker's Hole SSSI and SM in advance of proposed Access Road and People-mover corridor (Option D)

1 INTRODUCTION

1.1 Project and planning background

1.1.1 A new entertainment resort is proposed for the Swanscombe Peninsula in the southwest outskirts of the Greater London area, henceforth "the Resort" (**Figure 1**). As a nationally significant infrastructure project (NSIP) the proposed development requires a Development Consent Order (DCO). WSP have been engaged to provide transport and highways advice for the DCO application. A sensitive aspect of the application is the impact of essential transport corridors - the main vehicle access road and a people-mover corridor - upon the designated heritage and natural environmental assets of the Baker's Hole Palaeolithic Scheduled Monument (SM) and Site of Special Scientific Interest (SSSI), which are located within the Order Limits (**Figure 2**).

1.1.2 The preferred route of the main access road was fixed at an early stage in the transport design process as passing immediately to the east of the Baker's Hole SM, between it and the west side of the HS1 corridor (**Figure 2**). Following a desk-based assessment (Wessex Archaeology & Wenban-Smith 2017) of the impact of various people-mover route options and in consultation with curatorial stakeholders, Option D was agreed (WSP 2020) as an acceptable route for all parties (**Figure 2**). It was viable from a civil engineering point of view, and avoids disturbing the landfilled ground of the old chalk pit (Bamber Pit) to the west of the SM and SSSI. And, although it crosses undisturbed ground within the SM and SSSI, it was thought likely by the various curatorial stakeholders - Historic England, Natural England and Kent County Council Heritage Conservation - to have a lesser and more-easily mitigated impact upon the designated heritage and environmental assets.

1.1.3 Wessex Archaeology have therefore been commissioned by London Resort Company Holdings (LRCH) to carry out preliminary (Stage 1) archaeological field evaluation of deposits impacted by the access road and people-mover corridors in the vicinity of the Baker's Hole Palaeolithic SM and SSSI.

1.1.4 Prior to the works beginning on site Scheduled Monument Consent will be sought from Historic England for works within the Scheduled area and consent will be sought from Natural England for works within the SSSI. This WSI will be agreed with all parties and the County Archaeologist at Kent County Council.

1.2 Scope of document

1.2.1 This WSI sets out the aims of the evaluation, and the methods and standards that will be employed. In format and content, it conforms to current best practice, as well as to the guidance in *Management of Research Projects in the Historic Environment* (MoRPHE, Historic England 2015a) and the Chartered Institute for Archaeologists' (CIfA) *Standard and guidance for archaeological field evaluation* (CIfA 2014a) Kent County Council's (KCC) *Specification for Detailed Evaluation of Quaternary Deposits and Palaeolithic Potential* (**Appendix 5**).

1.2.2 This document comprises a Written Scheme of Investigation (WSI) for the preliminary (Stage 1) archaeological evaluation of deposits impacted by the access road and people-mover corridors in the vicinity of the Baker's Hole Palaeolithic SM and SSSI. It has been prepared for Wessex Archaeology by the Palaeolithic and Pleistocene geo-archaeological specialist Francis Wenban-Smith (Department of Archaeology, University of Southampton).

2 THE SITE

2.1 Location, topography and geology

2.1.1 The overall area of the proposed Resort covers several square km in the vicinity of Swanscombe, Kent, mostly north of the A2 and west of HS1 (**Figure 1**). The part of the Resort area under consideration for this DBA - henceforth, "the Site" - is located in the Ebbsfleet valley, immediately to the west of Ebbsfleet International Station and the HS1 corridor, centred on NGR 561200 174200 (**Figure 2**).

2.1.2 The main Ebbsfleet valley cuts northward from Springhead to the south side of the Thames estuary through Chalk bedrock and the major east-west trending Boyn Hill/Orsett Heath Pleistocene fluvial terrace formation. This formation, which here runs above (and broadly parallel with) the south side of the Thames between Dartford and Gravesend, forms a morphological terrace on the south side of the Thames with a ground surface of c. 100ft OD (c. 30m OD), hence its older traditional name of the "Swanscombe 100ft terrace". Thus the high ground above the east and west flanks of the Ebbsfleet valley consists of these older Middle Pleistocene terrace deposits, whereas the Ebbsfleet valley has cut through these terrace deposits and is infilled with younger sediments.

2.1.3 The landscape of the Ebbsfleet valley has been heavily affected (a) by chalk extraction in the late 19th and 20th centuries, and then (b) by development of HS1 and the Ebbsfleet International station in the early 21st C. Pre-quarrying (**Figure 3**), the ground on the west side of the Ebbsfleet valley sloped steadily down from the built-up eastern part of Swanscombe at c. 30m OD down to the alluvial floor of the Ebbsfleet valley at c. 5m OD. The original pre-quarrying valley-side slope is preserved along the route of the footpath that passes to the north of the Site.

2.1.4 This western valley slope was dissected by two dry valleys in the vicinity of the Site. The more northerly of these passed down from southwest to northeast past the wooded island of unquarried ground with pylon ZR3 on it (NGR 561130 174125) and the more southerly passed down in the same direction c. 250m further south, from the games field to the southeast of the Ebbsfleet Academy towards Ebbsfleet International Station.

2.1.5 The bedrock geology in the vicinity of the Site is formed by Chalk (British Geological Survey 1977 & 1998), hence the intensive historic quarrying for this commercially valuable resource. The Chalk was capped along the higher western side of the Ebbsfleet valley by c. 5m thickness of Middle Pleistocene Boyn Hill/Orsett Heath terrace deposits (**Figure 3**). It was close beneath the ground-surface along the central parts of the western valley flank, between c. 26m and 18m OD but along the lower part of the valley flank, where the transport corridors for the Resort cross the unquarried designated Baker's Hole assets, the Chalk is covered by a significant thickness of late Middle Pleistocene colluvial and fluvial deposits, present between c. 5m and 15m OD. These deposits, and their significant contained Palaeolithic remains, are reviewed below (Section 3).

2.2 Current land use

2.2.1 The northern unquarried part of the Site (Area A, designated as a Scheduled Monument - see below, Section 2.3) is covered by scrub and light woodland, with some more-open areas. The southern part of the Site is partly occupied by asphalt-covered car-parking to the west of the HS1 rail line and the Ebbsfleet International Station. The previously-quarried ground to the south and west has been backfilled with landfill (capped by topsoil with coarse grass) to form a mounded landscape that is much higher than the pre-quarrying landscape. In amongst this undulating grassy landscape there are two wooded "islands" of unquarried ground. The larger of these islands (Area C - see below, Section 2.3) is mostly covered by woodland and has pylon ZR3 on it. The smaller and more southerly island (Area B, also designated as a Scheduled Monument - see below, Section 2.3) has an uneven surface and is generally covered by light scrub, as it subject to periodic devegetation under a management agreement with the landowner. A line of high voltage electricity cables crosses the Site from SSW-NNE, supported by three pylons (from the south: ZR3, ZR3A and ZR4). The whole Site is fenced off from public access, and dotted with capped boreholes for monitoring the underlying landfill.

2.3 Statutory designations

2.3.1 The Site includes areas (**Figure 2**) that have two different types of designation, Scheduled Monument (SM) due to its cultural heritage, part of the list of nationally important cultural heritage sites maintained by Historic England), and Site of Special Scientific Interest (SSSI) for its Quaternary geological importance, part of the list of nationally important scientific and environmental sites maintained by Natural England. The cultural heritage designation relates to Palaeolithic archaeological remains, discussed in more detail further below (Section 3), and the Quaternary geological designation relates to the geological deposits that have produced the Palaeolithic evidence and associated palaeo-environmental remains. In practice the archaeological and scientific aspects of the Site's importance are indivisible, since the deposits and scientific evidence (which provides important dating and palaeo-environmental information) are intrinsic to its archaeological importance. However, the areas of the Site subject to these archaeological and scientific designations do not directly correspond. The SSSI area is larger; it includes all of the areas that are designated as SM, as well as some additional areas not included as part of the SM.

2.3.2 The Scheduled Monument (SM) - formally listed as LN 1003557, Baker's Hole Palaeolithic Site - comprises two separate areas. The first and more-northerly of these (previously SM Kent 267a), also historically known as Area A (Wenban-Smith 1995), is a roughly rectangular area immediately to the west of the HS1 corridor (**Figure 2**). It remained unquarried due to the thick Pleistocene overburden on top of the Chalk, and was used for allotments in the second half of the 20th C. The boundaries of the scheduled area aren't marked in any way, and backfill directly abuts the unquarried ground so the boundary of the latter is also unclear. The SM was re-surveyed in 2012 (Wenban-Smith 2012). This survey established (a) that the west edge of unquarried ground is 10m to the west of the present-day fence-line along the west side of the SM area (**Figure 4a**), and (b) that the west boundary of the scheduled area is 10m further west, ie. c. 20m west of the fence-line. The other boundaries of this northern part of the Palaeolithic SM are easily identified on the ground in relation to clearly-visible features. The straight line forming the north side of the SM can be measured relative to the footpath right-of-way. The east side passes through the ZR4 pylon. And the south side passes through the northwest corner of the ZR3A pylon.

2.3.3 The second, more-southerly, part of the Baker's Hole Palaeolithic SM (previously SM Kent 267b), also historically known as Area B (Wenban-Smith 1995), comprises a small island of unquarried ground c. 100m to the west of Ebbsfleet International Station. This part of the

SM can easily be identified on the ground (**Figure 4b**), as landfill does not directly abut it. Although subject to periodic de-vegetation as part of a management agreement, its surface is generally covered by scrub, and slopes down from southwest to northeast. Its sides are mostly free-standing vertical faces up to 5m high, although its northwest side is much lower relative to the surrounding ground.

2.3.4 The area designated as the Baker's Hole Palaeolithic Site of Special Scientific Interest (SSSI) is a single larger area that fully encompasses the two parts of the Scheduled Monument (**Figure 2**). It also includes two other patches of unquarried ground, historically attributed as Areas C and F (Wenban-Smith 1995). The outer edges of the SSSI area extend up to 50m beyond the edges of surviving natural deposits. There are also areas within the SSSI, between the various unquarried patches, that have been previously quarried and backfilled. The SSSI therefore includes substantial areas of no intrinsic scientific value. However, development activity in these proximal areas has the potential to impact important aspects of the SSSI's value including accessibility, and thus controlling activity in them is an important aspect of managing the SSSI.

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 Palaeolithic background: introduction and overview

3.1.1 This WSI follows from the previously-issued desk-based assessment (Wessex Archaeology 2017) of various transport route options across the Site. The desk-based assessment provides full details of the archaeological background of the Site, which is characterised by (a) a long history of quarrying from the mid-19th to the late 20th century followed by major re-landscaping and development for HS1 in the period 2000-2004, (b) complex and extensive Pleistocene deposits with abundant Palaeolithic remains, and (c) a long history of archaeological investigation going back to the late 19th century.

3.1.2 This background information is not fully repeated here. Rather, a brief summary is provided of the present understanding of the Site, and of the areas where deposits survive that are affected by the proposed transport corridors. This is then followed (Section 3.2) by a recap of surviving deposit character areas that were defined for the project-specific London Resort Palaeolithic Character Areas, and then (Section 3.3) by a recap of the zones of different potential that were recognised in the desk-based assessment of different transport route options through the Site (Wessex Archaeology 2017).

3.1.3 The Ebbsfleet Valley and its environs has been a key area for Palaeolithic research for over a hundred years. Palaeolithic sites in the area form three main groups. Firstly, and earliest, are Lower Palaeolithic sites associated with the Boyn Hill/Orsett Heath terrace formation. Secondly, and slightly younger, are Lower/Middle Palaeolithic sites associated with sediments filling the Ebbsfleet Valley, and dating from c. 250,000 to 150,000 BP, corresponding with marine isotope stages (MIS) 8-6 in the global chrono-stratigraphic framework, and relating to early Neanderthal occupation of Britain (Wenban-Smith 1995; Wenban-Smith et al. 2020), and thirdly, and much younger, are Late Upper Palaeolithic sites dating to c. 12,000 BP associated with Late Glacial slopewash sediments which have infilled various dry valleys that cut down across the present-day topography, and at the base of Holocene alluvium that spreads over the Thames floodplain and into its tributaries.

3.1.4 It is only the second of these groups, namely the Lower/Middle Palaeolithic sites associated with the suite of deposits from the period MIS 8-6 infilling the Ebbsfleet valley in the vicinity of the Site, that are liable to be affected by the proposed transport corridors through the Baker's Hole SM and SSSI. Before quarrying, these deposits were widely spread within the

Ebbsfleet valley, and comprised a mixture of fluvial, colluvial and solifluction deposits that mostly lay between 5m and 15m OD (**Figure 3**). Although now substantially removed by quarrying, the Ebbsfleet valley deposits have produced unique records in Britain of abundant well-provenanced Levalloisian lithic remains, a distinctive lithic technology associated with early Neanderthals, named after the Paris suburb of Levallois-Perret, where it was first recognised. The Levalloisian lithic remains were associated with deposits rich in a range of faunal remains, allowing the Levalloisian occupation to be reliably dated to early in MIS 7, c. 240,000 BP. The Levalloisian occupation horizons are situated within a deep sequence of deposits, which provide a wider Quaternary context for this occupational episode, and facilitate correlation with other key sites in the region, as well as nationally and internationally.

3.1.5 The surviving deposits in the Site area are of particular importance as the only locality in Britain (and indeed perhaps Europe, or even globally) where separate deposits are known to be present that represent three distinct episodes of interglacial warmth with woodland development that can all be linked to the MIS 7 interglacial. This complex interglacial is known to have three distinct warm peaks, but it has only recently been recognised - in work recently published as part of the High Speed 1 archaeology programme (Wenban-Smith et al. 2020) - that all three of these peaks are associated with development of woodland, and that all have distinct biostratigraphic signatures. In particular each warm peak is accompanied by distinctive small vertebrate assemblages.

3.1.6 Thus the deposits at the Site are of crucial importance in establishing a framework within which to understand Palaeolithic and palaeo-environmental remains from other MIS 7 localities where only one, or sometimes two, interglacial episodes are represented: for instance at Aveley and Crayford, other nationally important localities in the Lower Thames basin. The surviving deposits at the Site retain high potential for further improving understanding of MIS 7, since they contain faunal remains that can be used for palaeo-environmental reconstruction and biostratigraphic dating, as well as molluscan remains that can be used for amino acid dating. The sediments themselves are also predominantly sand-rich, and thus have potential for OSL dating.

3.1.7 The history of previous investigation of Palaeolithic remains in the Site area has been extensively reviewed in the previous desk-based assessment (Wessex Archaeology 2017). Therefore only a brief recap of the main phases of investigation is repeated here. Key results from this extensive history of previous work are subsumed within the character area descriptions (Section 3.2) and the assessment of potential for different zones along the transport route corridors (Section 3.3).

3.1.8 From an archaeological viewpoint, the area under consideration corresponds with a complex of Palaeolithic sites that have become broadly known as "Baker's Hole" and "the Ebbsfleet Channel". These names are, however, often used imprecisely for the numerous and varied deposits and remains from different parts of the Site. There has been a substantial history of previous investigation, going back to the 19th century (Spurrell 1883). Besides numerous instances of amateur collecting and minor investigations, the most significant investigations are listed below (Table 1). The Ebbsfleet valley deposits were first recognised as of Palaeolithic/Quaternary significance in the later 19th century by Spurrell (ibid.). Field investigation has subsequently been carried out on numerous occasions, initially against a backdrop of increasing chalk extraction in the immediate surrounds through the late 19th century and the first half of the 20th century. Various research investigations were then carried out between the 1960s and the 1990s, followed by a major phase of work in conjunction with the construction of High Speed 1 and the Ebbsfleet International station. Most recently, a walk-over survey and some targeted field

investigations were carried out under Historic England's Heritage-at-Risk programme between 2012 and 2015.

Table 1 Previous Palaeolithic work in the Site area, main investigations

Date	*Principal investigator/s*	*Key results*	*Surviving sediments [HEF area]*	*Reference/s*
1880s	FCJ Spurrell	First discovery of Ebbsfleet Valley as containing richly-fossiliferous Pleistocene deposits with Palaeolithic artefacts; identified Levalloisian "tortoise-core" technology - "Tramway Cutting" site	-	Spurrell 1883, 1884
1910	British Museum (RA Smith and H Dewey)	Targeted collection of Levalloisian artefacts from Coombe Rock in NW corner of Southfleet Pit [aka "Baker's Hole"]	-	Smith 1911
1930s, 1950s	JPT Burchell	Discovered artefact-bearing and fossiliferous "Ebbsfleet Channel" deposits [Area B]; made large lithic and small faunal collections; identified interglacial "Temperate Bed" at Area B	Area B [PP14]	Burchell 1933, 1935a,b, 1936, 1954 & 1957
1950s, 1960s	AT Marston and JN Carreck	Discovered new area of Pleistocene sediments rich in mammalian fossils and molluscs - "Northfleet Allotments" site [Area A]	Area A [PP 07] Area F [PP 14]	Carreck 1972
1969-1971	British Museum (G Sieveking and MP Kerney)	Made records of key sediment sequences; carried out more detailed molluscan investigations at both of Area A ("Site A") and Area B	Area A [PP 07] Area B [PP 14]	Kerney & Sieveking 1977
1989-1995	FF Wenban-Smith	**PhD.** More detailed primary records of surviving deposits; more intensive palaeo-environmental work on molluscs, small vertebrates and ostracods; chronometric dating with OSL and amino acid racemisation	Area A [PP 07] Area B [PP 14] Area C [PP 08] Area D [PP 13] Area E [PP 15] Area F [PP 14]	Wenban-Smith 1990, 1992, 1995 & 1996
1997-2003	Oxford Wessex Archaeology	**HS1.** Numerous small-scale investigations of area affected by HS1 and Ebbsfleet International station; also major investigation in advance of new pylon ZR4 in Area A	Area A [PP 07] Area D [PP 13] Area E [PP 15]	Oxford Archaeological Unit 2000; Wenban-Smith *et al.* 2020

2012-2015	FF Wenban-Smith	**Heritage-at-Risk survey.** Site-wide walkover survey; field investigations at Area B	Areas B, F [PP 14]	Wenban-Smith 2012, 2015, 2016 & 2017

3.2 Palaeolithic Characterisation Areas

3.2.1 A project-wide Palaeolithic Characterisation was prepared in 2015. Information on Palaeolithic sites in the Resort footprint and its environs was collated from a wide range of primary and secondary sources, including unpublished "grey" reports relating to the work listed in **Table 1**. Geological mapping and on-line borehole data were consulted, and historic map regression was undertaken to track the expansion of quarrying and other development.

3.2.2 Areas where natural deposits survive were defined, and given unique identifiers prefixed by "PP" for Palaeolithic [as distinct from just "P" for Prehistoric, which was used to define post-Palaeolithic Prehistoric character zones within the Resort footprint]. Information about each PP area was systematically collated - such as its topographic situation, the nature and age of surviving sediments, the range and quality of previous finds, the history of investigation, and key primary sources. The Palaeolithic potential of the PP areas was then assessed based on the likelihood and importance of Palaeolithic remains, and their relevance to national and regional research priorities, in particular the Research and Conservation Framework for the British Palaeolithic (English Heritage 2008) and the South-East Research Framework (SERF), Resource Assessment and Research Agenda for the Early Palaeolithic (Wenban-Smith et al. 2010). Areas of greater and lesser potential were defined, as well as areas of uncertain potential requiring preliminary Stage 1 field investigation to improve their understanding.

3.2.3 The present Site forms only a small part of the wider Resort footprint. It does however contain some of the most important Palaeolithic areas, based on currently-known desk-based information. Of the overall total of 38 PP deposit areas, six of them occur in the present Site and are directly affected by, or very near to, the proposed access road and people-mover transport routes. Key information about these zones is collated as an appendix (**Appendix 2**), a summary is tabulated below (**Table 2**), and their locations are labelled on the site layout maps (**Figure 5 and 6**).

Table 2 Palaeolithic (PP) character zones in the Site area, summary information

Zone	*Pal. potential*	*Likely Palaeolithic remains*	*Key events and sources*
PP 04	HIGH	Artefacts and faunal remains, in stratified fluvial sequence	- Rickson's/Barracks Pit records/collecting (Dewey 1932) - observations and some B/W photos by F Wenban-Smith in 1989 (unpublished)
PP 07	VERY HIGH	Palaeo-environmental remains in stratified fluvial sequence	- British Museum Site A investigations (Kerney & Sieveking 1977; Wenban-Smith 1995) - HS1 investigations: ZR4 pylon, TP 3790 and Area 8 (Wenban-Smith *et al.* 2020, Ch 5)
PP 08	LOW	Derived artefacts	- Carreck fieldwork: Channel C (Carreck 1972) - Wenban-Smith fieldwork: Site C, section 7 (Wenban-Smith 1996)
PP 13	UNCERTAIN	Lithic artefacts and faunal/environmental remains (derived?)	- Wenban-Smith fieldwork: Site D, section 40 (Wenban-Smith 1996)

PP 14 (a, b and c)	UNCERTAIN (HIGH in places)	Lithic artefacts and faunal/environmental remains, possibly associated with undisturbed landsurfaces in places	- Carreck's Channel D (Carreck 1972) - British Museum Site B investigations (Kerney & Sieveking 1977; unpublished archive records of various trenches) - Wenban-Smith PhD fieldwork: Area F, section 3 (Wenban-Smith 1995)
PP 15	HIGH	Lithic artefacts and faunal/environmental remains	- HS1 investigations: 3829B TT, 3972 TT, 4017 TT, Jayflex remediation (Wenban-Smith *et al.* 2020, Ch 10)

3.3 Desk-based assessment: transport routes, people-mover Option D

3.3.1 In 2017 the curatorial authorities (Historic England, Natural England and Kent County Council) requested preparation of a Palaeolithic Desk-based Assessment (DBA) and Statement of Significance for areas of higher Palaeolithic potential in the central part of the proposed Resort site. The purpose of this report (Wessex Archaeology 2017) was to help inform decision-making concerning the proposed London Resort, and in particular to inform decision-making in relation to different options for the main access road and various people-mover cycle/tram routes passing broadly north-south through the Baker's Hole Palaeolithic Site designated Scheduled Monument and Site of Special Scientific Interest.

3.3.2 The main access route was fixed at an early stage (Option 1) as passing immediately to the west of the HS1 corridor. Although this route crosses some areas of high or unknown Palaeolithic potential (PP 07, PP 13 and PP 15), it just avoids the designated SM and SSSI areas, passing to their east - although it needs to be remembered that a principle of the National Planning Policy Framework (MHCLG 2012, updated in 2019) is that adjacent undesignated continuations of designated deposits/sites need to be treated as of equal importance. The route of the main access road through the Site was divided into seven zones (1.1-1.7) based on changing character and Palaeolithic potential of the underlying deposits (**Figure 5**; **Table 3**; **Appendix 3**).

3.3.3 Three different route options - A, B and C - were initially considered for the people-mover tram/cycle/bus route. However, all of them had major problems, either for their impact upon the designated assets, or from a civil engineering point of view (including disturbing landfill). therefore a fourth option "west-side" route (D) was considered with the people-mover route passing within the west side of the undisturbed deposits of area PP 07. Although this route passes across the designated SM and SSSI, the curators were prepared to accept it as a least-worst option (discussed at a meeting held at Savills, Margaret Street, London on 24th July 2017), reserving final decision-making pending suitable investigations and the provision of further information. Therefore the Palaeolithic DBA report (Wessex Archaeology 2017) was issued after this meeting with an assessment of the impact of Option D upon Palaeolithic remains - although it should be noted that the Option D route was labelled as "Option 3" in the Palaeolithic DBA report.

3.3.4 The various route options A-D were subsequently reviewed by WSP (2020) and Option D was also found to be acceptable from a civil engineering point of view. The route of the people-mover Option D [= Option 3 of the Palaeolithic DBA] through the Site was divided into nine zones (3.1-3.9) based on changing character and Palaeolithic potential of the underlying deposits (**Figure 5**; **Table 3**; **Appendix 4**).

Table 3 DBA zones for main access road and People-mover corridor Option D

Main access road		*People-mover Option D*		
DBA zone	Palaeolithic potential	DBA zone	Palaeolithic potential	*Notes, comments*
-	-	3.9	None	Bamber Pit to N of footpath, quarried-out
1.7	VERY LOW	3.8	VERY LOW	1.7 equivalent to 3.8
1.6	VERY HIGH	3.7 3.6	VERY HIGH VERY HIGH	1.6 equivalent to 3.6 and 3.7
1.5	VERY LOW - Lower/Middle Pal MODERATE - Upper Pal	3.5	VERY LOW	Deeply buried, under old sports pitches
1.4	LOW	3.4	LOW	1.4 equivalent to 3.4
1.3 [=PP 15]	HIGH	3.3 [=PP 15a]	HIGH	-
1.2	VERY LOW	3.2	VERY LOW	1.2 equivalent to 3.2
1.1	MODERATE	3.1	MODERATE	1.1 equivalent to 3.1

4 PROPOSED DEVELOPMENT AND ANTICIPATED IMPACT

4.1 Main access road

4.1.1 Design parameters of the main access road may include substantial cuttings into the natural ground, as well as bridge and tunnel sections. The road is planned as a dual carriage-way, so the overall impact corridor may be c. 25m wide. However, the precise design parameters are less important than the footprint of the route. In the meeting held at Wessex Archaeology in October 2016 and in the briefing information received from Historic England on behalf of the combined curatorial authorities [email from Peter Kendall, sent 15th June 2017, 16:17], "impact" is construed as including "lack of future access". This therefore includes deposits under the footprint of any particular route, regardless of the actual depth of cut impact, as well as deposits rendered inaccessible by proximity to a route.

4.1.2 The impact of the main access road is therefore considerable (Figure 5), passing through a substantial stretch of ground (DBA zone 1.6) attributed as of VERY HIGH Palaeolithic potential, one zone (DBA zone 1.3) attributed as of HIGH potential, and two zones (1.1 and 1.5) attributed as of MODERATE potential.

4.2 People-mover corridor (Option D)

4.2.1 Some design parameters for the Option D people-mover corridor were provided in the comparative review of the various people-mover route options A-D (WSP 2020). The overall width of the corridor is estimated as less than 20m total width, including embankments and cuttings. The construction principles are to minimise damage to the ground and use a form of construction that reduces loads on the underlying natural deposits, and thus reduce impact upon the SM and SSSI. However, as outlined above, "impact" is construed as including "lack of future access". Therefore, while a lack of actual damage is welcome,

impact for curatorial purposes includes deposits under the footprint of the route regardless of the direct impact, as well as deposits rendered inaccessible by proximity to the route.

4.2.2 Part of the rationale of the original Option 3 west-side route was that it would pass directly along the west side of the unquarried ground of area PP07, and thus avoid affecting the important area between the previously-investigated deposits - at BM Site A - on the extreme west side of the area and those in the central part of Area A, at the ZR4 pylon. The newly-proposed Option D (**Figure 6**), while still close to the west side of PP07, passes to the east of the BM Site A and up to 30m east of the west edge of Area PP07. Bearing in mind the proven potential - as seen by field investigations of the different footings of the ZR4 pylon (Wenban-Smith et al. 2020, Ch 5) - for deposits to vary substantially over very short distances, the route thus passes over a stretch of ground within the SM and SSSI - DBA zone 3.7 of PP07 - that is of VERY HIGH potential, and for which there is some uncertainty over the precise underlying sequence - although one would expect that it would be broadly relatable to the deposits investigated at the BM Site A and recorded in the west face of PP07.

4.2.3 Besides impacting the VERY HIGH potential DBA zone 3.7, the Option D route passes through another zone to its south (DBA zone 3.6) attributed as of VERY HIGH potential, one zone (3.3) attributed as of HIGH potential, and one zone (3.1) attributed as of MODERATE potential.

5 AIMS AND OBJECTIVES

5.1 General Aims

5.1.1 Bearing in mind the high potential of some areas crossed by the proposed transport corridors, it is necessary carry out some preliminary field evaluation to inform the DCO application as to the impact of the proposed routes upon the designated heritage assets, and upon adjacent assets of equivalent importance.

5.1.2 In accordance with CIfA definitions of evaluation (CIfA 2014), and the Kent County Council specification for Palaeolithic evaluation (KCC Spec Manual B_GenericFurtherPalEval_DRAFT_Rev07.11.16), the evaluation has been designed to be minimally intrusive to archaeological remains, whilst recovering sufficient information to inform decision-making. The general aims of the proposed work are:

- to establish with a high degree of confidence the nature, character, distribution, extent and depth of Quaternary deposits across the Site;
- to assess the Palaeolithic potential of the site, and establish its importance and significance in the context of national and regional research priorities;
- to verify, and improve, the existing HEF/characterisation model of surviving deposit character and potential.:

5.2 Specific Objectives: main access road

5.2.1 For the route of the main access road, more specific objective area:

- to ascertain (where Quaternary deposits are encountered) their extent, depth below ground surface, character, date and Palaeolithic potential
- to determine the presence and potential of lithic artefacts and faunal remains in the sediments encountered

- to assess the range and preservation of palaeo-environmental evidence, in particular of small vertebrates, molluscs, ostracods, pollen, plant macro-remains and insects
- to determine the presence of, or potential for, undisturbed primary context Palaeolithic occupation surfaces in the sediments encountered
- to assess the potential dating evidence contained within the deposits, and if possible to establish the date of the sequences investigated by means of direct chronometric methods (amino acid dating, OSL dating or carbon 14 dating as appropriate) or by biostratigraphic comparison
- to interpret the depositional and post-depositional history of any artefactual or biological evidence found
- to improve understanding of the thickness of modern made-up ground overlying natural Quaternary sediments, especially in Palaeolithic DBA zones 1.1, 1.3, 1.4 and 1.5
- to establish the full Quaternary sequence down to Chalk bedrock, especially in Palaeolithic DBA zones 1.1, 1.3 and 1.6
- to relate the sequences encountered to previously-recorded sequences in Area A, in particular those at the British Museum Site A, the ZR4 pylon and the Area 8 batter, and to other fossiliferous sequences recorded in the footprint of the High Speed 1 close to the east, in particular at 3790 TT and borehole SA-0021
- to investigate for Late Pleistocene and/or Early Holocene deposits that may have Late Upper Palaeolithic (Long Blade industry) potential in DBA zone 1.5
- to date any Quaternary deposits encountered in relation to regional stratigraphic and national/international climatic and chrono-stratigraphic frameworks, in particular the MIS 7 deposits at the other Baker's Hole localities, Areas B and F, and to the global marine isotope stage (MIS) framework
- to assess the significance of any Pleistocene deposits and Palaeolithic remains encountered in relation to the national Palaeolithic Conservation and Research Framework (English Heritage 2008) and the South-East England Palaeolithic Research Framework (Wenban-Smith *et al.* 2010), and their potential to fulfil current research objectives
- to establish the likely impact of the proposed development upon any Palaeolithic remains, to identify priorities for further investigation, and to make recommendations on suitable methods and approaches for further investigation

5.3 Specific Objectives: people-moved corridor

5.3.1 For the route of the people-mover corridor (Option D), more specific objectives are:

- to ascertain (where Quaternary deposits are encountered) their extent, depth below ground surface, character, date and Palaeolithic potential
- to determine the presence and potential of lithic artefacts and faunal remains in the sediments encountered
- to assess the range and preservation of palaeo-environmental evidence, in particular of small vertebrates, molluscs, ostracods, pollen, plant macro-remains and insects

- to determine the presence of, or potential for, undisturbed primary context Palaeolithic occupation surfaces in the sediments encountered
- to assess the potential dating evidence contained within the deposits, and if possible to establish the date of the sequences investigated by means of direct chronometric methods (amino acid dating, OSL dating or carbon 14 dating as appropriate) or by biostratigraphic comparison
- to interpret the depositional and post-depositional history of any artefactual or biological evidence found
- to improve understanding of the thickness of modern made-up ground overlying natural Quaternary sediments, especially in Palaeolithic DBA zones 3.1, 3.3, 3.4 and 3.5
- to establish the location of the north-western bank of the MIS 7 fluvial channel (thought to be in Palaeolithic DBA zone 3.8)
- to investigate for Late Pleistocene and/or Early Holocene deposits that may have Late Upper Palaeolithic (Long Blade industry) potential in Palaeolithic DBA zone 3.5
- to establish the full Quaternary sequence down to Chalk bedrock, especially in Palaeolithic DBA zones 3.1, 3.3, 3.6 and 3.7
- to establish how any Pleistocene sediments found in Palaeolithic DBA zone 3.6 relate to any found in zone 3.7, and in particular if they are different MIS 7 terraces
- to relate the sequences encountered to previously-recorded sequences in Area A, in particular those at the British Museum Site A, the ZR4 pylon and the Area 8 batter, and to other fossiliferous sequences recorded in the footprint of the High Speed 1 close to the east, in particular at 3790 TT and borehole SA-0021
- to relate the sequences encountered to previously-recorded sequences in Areas B and F, in particular those at the British Museum Site B, Wenban-Smith Log F3a, Carreck's Channel D Tramway Cutting, and to other sequences recorded during the work for High Speed 1, in particular at 3972TT, 4017TT and section 50552 of the Jayflex remediation work
- to ascertain if undisturbed Levalloisian occupation horizons survive in Palaeolithic DBA zone 3.3
- to date any Quaternary deposits encountered in relation to regional stratigraphic and national/international climatic and chrono-stratigraphic frameworks, in particular the MIS 7 deposits at the other Baker's Hole localities (Areas B and F), and to the global marine isotope stage (MIS) framework
- to assess the significance of any Pleistocene deposits and Palaeolithic remains encountered in relation to the national Palaeolithic Conservation and Research Framework (English Heritage 2008) and the South-East England Palaeolithic Research Framework (Wenban-Smith et al. 2010), and their potential to fulfil current research objectives
- to establish the likely impact of the proposed development upon any Palaeolithic remains, to identify priorities for further investigation, and to make recommendations on suitable methods and approaches for further investigation

6 FIELDWORK METHODS

6.1 Introduction and Overview

6.1.1 Three types of investigation methods are required: cable/percussion boreholes (n=8, CP1-CP8), machine-dug test pits (n=1, TP15), and combined test pits with windowless boreholes (n=14, TP1-TP14 and BH1-BH14). This combination of work has been designed to address the aims and objectives of the evaluation with a high likelihood of success, but also in a pragmatic fashion without excessively high cost. The locations of all these interventions will be surveyed on site by GPS based on the layout plan (**Figure 6**). Some locations may be slightly moved on site to avoid obstacles, but any movement more than 5m will be agreed with the Kent County Council heritage conservation team.

6.1.2 The cable-percussion boreholes will be drilled to 15m bgs (below ground surface) at key points along the routes of the main access road and the Option D people-mover corridor, and at regular intervals between the BM Site A excavation of Area A and the ZR4 pylon. The purpose of these boreholes is to ensure that the base of the Quaternary sequence is reached and the full sequence recorded at key points, with the potential for palaeo-environmental assessment, and to facilitate relating the deposits along the Option D people-mover corridor to those along the main access road.

6.1.3 The machine-dug test pit will be dug at the north end of the route of the Option D people-mover corridor across Area A of the Scheduled Monument. The purpose of this test pit is to verify previous records that show Chalk bedrock close to the present ground surface, and thus to establish the location of the constraining bank of the more-important and thicker colluvial and fluvial deposits that underlie most of Area A.

6.1.4 The combined test pits and windowless boreholes will be excavated/drilled at key points along the routes of the main access road and the Option D people-mover corridor. The purpose of these is to ensure a good description of the Quaternary sequence down to a reasonable depth, with potential for palaeo-environmental sampling. Using these methods in combination is a proven method for achieving investigation of deposits deeper than can be achieved just by a test pit, but with better examination and opportunity of sampling of higher levels than can be achieved just by a borehole. The methods for combining these two types of intervention are outlined below (Section 6.4). The overall depth of investigation is anticipated as 9m bgs (below ground surface), although may be less if the borehole refuses due to encountering an obstruction or an impenetrable deposit.

6.1.5 All reasonable care should be taken to check for the presence of services before any intervention, checking for known records and also using suitable pre-excavation prospection methods (see below, Section 6.5).

6.2 Setting out of the trenches

6.2.1 All trenches will be set out using a Global Navigation Satellite System (GNSS) in the approximate positions shown in **Figure 6**. Minor adjustments to the layout may be required to take account of constraints such as vegetation or located services, and to allow for machine manoeuvring. The test pit/borehole locations will be tied in to the Ordnance Survey (OS) National Grid and Ordnance Datum (OD) (Newlyn), as defined by OSTN15 and OSGM15.

6.3 Service location and other constraints

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

6.3.2 Before excavation begins, the evaluation area will be walked over and visually inspected to identify, where possible, the location of any below/above-ground services. All borehole and test pit locations will be scanned before and during excavation with a Cable Avoidance Tool (CAT) to verify the absence of any live underground services.

6.4 Monitoring

6.4.1 The client will inform the County Archaeologist, Historic England and Natural England of the start of the evaluation and its progress. Reasonable access will be arranged for the County Archaeologist/Historic England/Natural England to make site visits to inspect and monitor the progress of the evaluation. Any variations to the WSI, if required to better address the project aims, will be agreed in advance with the client and the County Archaeologist/Historic England/Natural England.

6.5 Reinstatement

6.5.1 Test pits completed to the satisfaction of the client and the County Archaeologist/Historic England/Natural England will be backfilled using excavated materials in the order in which they were excavated, and left level on completion. No other reinstatement or surface treatment will be undertaken.

6.6 Cable percussion boreholes

6.6.1 Eight cable-percussion boreholes are required for the project (**Figure 6**): CP1, CP5 and CP8 along the Option D corridor; CP4, CP6 and CP7 along the main access road; and CPs2-3 between Site A and the ZR4 pylon.

6.6.2 Cable-percussion boreholes with a diameter of 4"/10cm will be dug in accordance with the methods specified in Kent County Council's (KCC) Specification for Detailed Evaluation of Quaternary Deposits and Palaeolithic Potential (**Appendix 5**, Section 5.4). Full details are provided in **Appendix 5** of the methods for the borehole's drilling and recording, but key aspects are summarised below

6.6.3 Boreholes will be drilled to a depth of 15m bgs [below ground surface], or 2m below the top of Chalk bedrock, if the latter occurs less than 13m bgs. Samples will be recorded, collected and then analysed in accordance with the KCC specification. The drilling will be monitored by a Palaeolithic and Pleistocene geo-archaeological specialist who will also make a record of the deposit sequence on-site, relating it to retained sample elevations and numbering, and ensure that shoe-samples between the U4 sleeved samples (the former typically covering a length of c. 10cm, and the latter typically of c. 45cm) are also properly labelled and retained. Consideration will be given to sub-sampling the retained U4 and shoe samples for palaeo-environmental assessment as part of the analysis and reporting of the work.

6.6.4 A GPS record will be made of the location and elevation of the ground surface at the top of each borehole.

6.6.5 It is recommended that the drilling contractor visit the local terrain and examine the borehole locations before finalising costs, and to agree how access can be achieved.

6.7 Test pits

6.7.1 One test pit is required for the project, TP15 at the north end of the Option D people mover route across Area A of the Site. Previous records (Carreck 1972; Kerney & Sieveking 1977; Wenban-Smith 1995) of the deposits exposed by quarrying in the west face of Area A suggest that solid Chalk bedrock is likely to be present less than 3m below ground surface here.

6.7.2 The test pit will be dug in accordance with the methods specified in Kent County Council's (KCC) Specification for Detailed Evaluation of Quaternary Deposits and Palaeolithic Potential (**Appendix 5**, Section 5.6). Full details are provided in **Appendix 5** of the methods for the test pit's excavation and recording, but key aspects are summarised below.

6.7.3 The test pit will be dug with a tracked 15-20 tonne 360o mechanical excavator (or other suitable type to be agreed with the County Archaeologist) with a toothless bucket of approximately 1.80m width, and with the capacity to reach 5m bgs. It will be one bucket-width wide, c. 4m long and up to 5m deep. Excavation will cease at a shallower depth if it is clear that pre-Quaternary deposits have been reached.

6.7.4 The work will be directed by a recognised Palaeolithic specialist with experience of recording and interpreting Pleistocene sediments, who will record and number the sequence of sedimentary units as excavation progresses following standard descriptive practices. Test pits will be entered at the maximum safe depth (based on an assessment of the ground conditions by a competent person) to record the upper stratigraphy. After excavation has progressed beyond this depth, recording will typically take place without entering the test pit.

6.7.5 A GPS survey record will be made of the outline of the test pit after its completion, and of a logging reference point in the middle of one face, the latter being tied in with the detailed sequence record made on site by the Palaeolithic/Pleistocene specialist.

6.8 Combined test pits and windowless boreholes

6.8.1 Fourteen combined test pits and windowless boreholes are needed, distributed at key points along the people-mover corridor (TP/BH 1-7) and the main access road (TP/BH 8-14). The first stage of work at each location is to excavate a stepped machine-dug test pit to a depth of 2.4m (or less if dictated by ground conditions), using the same specification of excavator as for TP1 (see above, Section 6.3). The precise dimensions of the footprint of the test pit at the ground surface depend upon the width of the bucket being used. The width should be the width of the bucket plus 2.4m. The length should be 4m initially, although the eventual footprint will become longer due to ramping and stepping at each end.

6.8.2 The upper part of the test pit should be dug down to a depth of 1.2m from the ground surface (or a lesser maximum safe depth to allow access). Steps should be made at the far end to facilitate access, and then a deeper second level of the test pit one bucket-width wide and 1.2m deep (or less, if ground conditions dictate for safety reasons) should be dug in the centre of the test pit, leaving a surrounding platform 1.2m wide on each side and the far end. Then steps should be made in the far end to facilitate access, and both levels of the near end of the test pit should be ramped back towards the mechanical excavator to allow safe access for a tracked Premier (or Terrier) drilling rig. If suitable lifting chains/straps and expertise is available on site, an alternative approach for access of the drilling rig to the test pit is for it to be lifted in by the mechanical excavator.

6.8.3 The exposed sequence should then be cleaned and recorded in a strip at least 1m wide, and GPS reference points should be surveyed at the top of each of the two cleaned sections, as well as in the middle of the bottom of the trench.

6.8.4 The second stage of the work is then for the drilling rig to enter the test pit, and recover seven consecutive plastic-sleeved windowless tube-samples 1m long, going down from the floor of the stepped test pit. Recovered sample-tubes should be carefully marked with their top and bottom, and their depth-range, and then laid out beside the hole and cut open on site, with removal of a strip of plastic c. 6cm wide down the full length of each tube. The exposed sediments should then be cleaned with a trowel, and a sedimentological log recorded down through the sequence, noting junctions between different beds, and following the same descriptive practices as for the test pit sections. The cleaned tube-samples should then be laid out and photographed side-by-side, in depth order and with the upper ends of each sample tube oriented in the same direction. Consideration should be given to the taking of samples from the recovered sediments for dating and/or palaeo-environmental purposes, and any samples thought useful should be taken.

6.8.5 The third stage of work is then for the mechanical excavator to re-enter the trench (backfilling the lower ramp if necessary to support the machine) and to excavate the central part deeper to allow better recording (in particular of sedimentary structures and deposit boundary geometry) and, if necessary, additional sampling of the deeper sediments. Horizons that would benefit from larger-scale palaeo-environmental sampling can be identified in advance from the borehole record. The deepened central part of the test pit should not be entered, but recording should take place by measuring down from the surrounding platform that was originally created up to 1.2m below the ground surface.

6.8.6 A complete record of excavated archaeological features and deposits will be made. This will include plans and sections, drawn to appropriate scales (generally 1:20 or 1:50 for plans, 1:10 for sections) and tied to the Ordnance Survey (OS) National Grid.

6.8.7 A full photographic record will be made using digital cameras equipped with an image sensor of not less than 10 megapixels. This will record both the detail and the general context of the principal features and the site. Digital images will be subject to managed quality control and curation processes which will embed appropriate metadata within the image and ensure long term accessibility of the image set.

6.9 Palaeo-environmental sampling

6.9.1 The presence/potential for palaeo-environmental micro-biological evidence such as pollen, insects, molluscs and small vertebrates will be assessed for each sediment unit by field inspection. Such evidence, if present, is of critical importance to the potential of a site, and it is necessary to establish presence/quality as part of the evaluation process. Besides providing information on past climate, local environment and depositional processes, palaeo-environmental remains can contribute to dating by bio-stratigraphic correlation, or (for mollusc remains) can be used for amino acid racemisation (AAR) dating. For younger deposits they can also be used for C14 dating. Different forms of evidence are present in different types of sediment, and an important aspect of the work of the Palaeolithic/geo-archaeological specialist is to consider the potential of the sediments encountered, and to guide the sampling as appropriate. Provision should be built into the archaeological programme for processing any samples taken and reporting on the results at the evaluation stage.

6.10 Chronometric dating

6.10.1 Consideration will also be given to the suitability of any sediment units encountered for optically stimulated luminescence dating (OSL). In the absence of suitable biological evidence, this is likely to be the only and most reliable way of dating many sequences. Samples for analysis should ideally be taken with in situ dosimetry readings using a portable gamma ray spectrometer. This can be done under the guidance of the Palaeolithic specialist in the field at the evaluation stage, if the appropriate equipment is available, or carried out at a later point. However, if a suitable sediment is encountered, it is advisable to take an OSL sample anyway, even without in situ dosimetry measurement, as this sample can still provide a date, and there may not be a future opportunity for renewed investigation.

6.11 Recording of post-Palaeolithic features

6.11.1 The sampling level for post-Palaeolithic archaeological remains will be determined according to their importance, quality and nature of survival, but should normally seek to identify areas of potential/absence, relationships, extent, depth, complexity and approximate date. If post-Palaeolithic features are encountered during excavation of a deep geo-archaeological test pit, suitable records will be made, and if possible the test pit will be moved to avoid them. If this isn't possible, a decision will be made as to whether recording has been sufficient for the test pit to continue without compromising post- Palaeolithic evidence, or whether the test pit needs to be cancelled.

6.11.2 All exposed post-Palaeolithic archaeological deposits will be recorded using Wessex Archaeology's pro forma recording system. A further more general record of the work comprising a description and discussion of the archaeology is to be maintained as appropriate. Context sheets are to be primarily filled in by the archaeologist excavating the feature or deposit.

6.11.3 Where appropriate, significant artefacts will be 3d recorded and detailed plans made of any special or placed deposits.

6.11.4 A digital photographic record will be maintained. The photographic record will illustrate both the detail and the general context of the principal features, finds excavated, and the Site as a whole.

6.11.5 A complete drawn record of mapped archaeological features and deposits will be compiled. This will include both plans and sections, drawn to appropriate scales (1:20 for plans, 1:10 for sections), and with reference to a site grid tied to the Ordnance Survey National Grid. The Ordnance Datum (OD) height of all principal features and levels will be calculated and plans/sections will be annotated with OD heights.

6.11.6 All plans and sections are to be drawn on polyester based drafting film and clearly labelled.

6.11.7 Wessex Archaeology will ensure that the complete site archive including finds and environmental samples are kept in a secure place throughout the period of excavation and post excavation works.

6.12 Finds

General

6.12.1 All archaeological finds from excavated contexts will be retained, although those from features of modern date (19th century or later) may be recorded on site and not retained. Where appropriate, soil samples may be taken and sieved to aid in finds recovery. Any finds

requiring conservation or specific storage conditions will be dealt with immediately in line with *First Aid for Finds* (Watkinson and Neal 1998).

Human Remains

6.12.2 In the event of discovery of any human remains (articulated or disarticulated, cremated or unburnt), all excavation of the deposit(s) will cease pending Wessex Archaeology obtaining a Ministry of Justice licence (this includes cases where remains are to be left *in situ*).

6.12.3 Initially the remains will be left *in situ,* covered and protected, pending discussions between the client, Wessex Archaeology's osteoarchaeologist and the County Archaeologist regarding the need for excavation/removal or sampling. Where this is deemed appropriate, the human remains will be fully recorded, excavated and removed from site in compliance with the Ministry of Justice licence.

6.12.4 Excavation and post-excavation processing of human remains will be in accordance with Wessex Archaeology protocols and in-line with current guidance documents (eg, McKinley 2013) and the standards set out in CIfA Technical Paper 13 *Excavation and post-excavation treatment of cremated and inhumed remains*. Appropriate specialist guidance/site visits will be undertaken if required.

6.12.5 The final deposition of human remains subsequent to the appropriate level of osteological analysis and other specialist sampling/examinations will follow the requirements set out in the Ministry of Justice licence.

Treasure

6.12.6 Wessex Archaeology will immediately notify the client and the County Archaeologist on discovery of any material covered, or potentially covered, by the *Treasure Act 1996*. All information required by the Treasure Act (ie, finder, location, material, date, associated items etc.) will be reported to the Coroner within 14 days.

6.13 Environmental Sampling

6.13.1 All sampling will be undertaken following Wessex Archaeology's in-house guidance, which adheres to the principles outlined in Historic England's guidance (English Heritage 2011 and Historic England 2015b).

6.13.2 Bulk environmental soil samples, for the recovery of plant macrofossils, wood charcoal, small animal bones and other small artefacts, will be taken as appropriate from well-sealed and dateable contexts. In general, features directly associated with particular activities (eg, pits, latrines, cesspits, hearths, ovens, kilns, and corn driers) should be prioritised for sampling over features, such as ditches or postholes, which are likely to contain reworked and residual material.

6.13.3 If waterlogged or mineralised deposits are encountered, an environmental sampling strategy will be devised and agreed with the County Archaeologist as appropriate. Specialist guidance will be provided by a member of Wessex Archaeology's geoarchaeological and environmental team, with site visits undertaken if required.

6.13.4 Any samples will be of an appropriate size – typically 40 litres for the recovery of environmental evidence from dry contexts, and 10 litres from waterlogged deposits.

6.13.5 Following specialist advice, other sampling methods such as monolith, Kubiena or contiguous small bulk (column) samples may be employed to enable investigation of

deposits with regard to microfossils (eg, pollen, diatoms) and macrofossils (eg, molluscs, insects), soil micromorphological or soil chemical analyses.

7 POST-EXCAVATION METHODS AND REPORTING

7.1 Introduction and overview

7.1.1 Following completion of the fieldwork, the Palaeolithic specialist will produce a 1-page Interim Evaluation Report on the preliminary interpretation of the sediments encountered, with particular reference to the nature and correlation of any Pleistocene sediments encountered and the nature and significance of any Palaeolithic archaeological evidence. The Palaeolithic specialist will also report verbally to the County Archaeological Service during and at the end of fieldwork.

7.1.2 Within one month of completion of the fieldwork (or within a reasonable timeframe agreed with the County Archaeological Service for any necessary sample processing and analysis to be carried out) a written Evaluation Report will be produced, addressing the evaluation aims and objectives, and including:

- a site location plan showing test pit locations at an appropriate scale
- a descriptive summary and interpretation of the Palaeolithic archaeology and Pleistocene
- Geology of the site, including provisional dating of major sedimentary units
- a table showing, per test pit, the quantity and nature of any artefactual and/or biological evidence noted or recovered
- a 1-page summary for each test pit of the stratigraphic sequence, sampling locations and archaeological evidence recovered, if any
- a consideration of the methods used, including a confidence rating
- a 100 word summary
- recommendations for further mitigating archaeological works, or other safeguarding measures, if the evaluation suggests that the development will impact archaeological remains

7.1.3 Samples taken for biological remains will be processed and assessed, and the results summarised in the evaluation report; detailed analysis of biological remains or artefact collections will not however take place, but will be held over (if any are needed) as part of the wider programme of overall analysis and reporting that will take place following completion of fieldwork (see further below, according to a timetable to be agreed with the KCC County Archaeologist and Dartford Borough Council).

7.2 Stratigraphic evidence

7.2.1 All written and drawn records from the evaluation will be collated, checked for consistency and stratigraphic relationships. Key data will be transcribed into a database, which can be updated during any future analyses. The preliminary phasing of archaeological features and deposits will be undertaken using stratigraphic relationships and the spot dating from finds, particularly pottery.

7.2.2 A written description will be made of all archaeologically significant features and deposits that were exposed and excavated, ordered either by test pit/borehole or by period as

appropriate. Detail of all contexts will be provided in trench tables in the appendix of the report.

7.3 Finds evidence

7.3.1 All retained finds will, as a minimum, be washed, weighed, counted and identified. They will then be recorded to a level appropriate to the aims and objectives of the evaluation. The report will include a table of finds by feature/context or test pit/borehole.

7.3.2 Metalwork from stratified contexts will be X-rayed and, along with other fragile and delicate materials, stored in a stable environment. The X-raying of objects and other conservation needs will be undertaken by Wessex Archaeology in-house conservation staff, or by another approved conservation centre.

7.3.3 Finds will be suitably bagged and boxed in accordance with the guidance given by the relevant museum and generally in accordance with the standards of the CIfA (2014b).

7.4 Environmental evidence

7.4.1 Bulk environmental soil samples will be processed by standard flotation methods. The residues will be fractionated into 5.6/4 mm and 1 mm and dried if necessary. The coarse fraction (>5.6/4 mm) will be sorted, weighed and discarded, with any finds recovered given to the appropriate specialist. The flot, and fine residue fraction when appropriate, will be retained on a 0.25 mm mesh and scanned to assess the environmental potential of deposits. Unsorted fine residues will be retained until after any analyses, and discarded following final reporting (in accordance with the Selection policy, below).

7.4.2 In the case of samples from cremation-related deposits the flots will be retained on a 0.25 mm mesh, with residues fractionated into 4 mm, 2 mm and 1 mm. In the case of samples from inhumation burial deposits, the sample will be artefact sieved through 9.5 mm and 1 mm mesh sizes. The coarse fractions (9.5 mm) will be sorted with any finds recovered given to the appropriate specialist together with the finer residues.

7.4.3 Any waterlogged or mineralised samples will be processed by standard waterlogged flotation methods.

7.5 Detailed specification for the report

7.5.1 The report will, as a minimum, include the following elements:

- An **Abstract** summarising the scope and results of the archaeological work.
- An **Introduction** including:

  - the location of the site including a National Grid Reference to 8 figures for the centre of the site;

  - an account of the background and circumstances of the work;

  - a description of the development proposals, planning history and planning reference together with the archaeological condition (where appropriate);

  - the nature of potential impacts arising from the proposals;

  - the scope and date of the fieldwork, the personnel involved and who commissioned it;
- An account of the **Archaeological Background** of the development site including:

- geology, soils and topography;

- any known existing disturbances on the site;

- background archaeological potential of the site. This should include a summary of the known Sites and Monuments Record entries within a 500m radius of the boundaries of the site. The SMR entries should be quoted with their full KSMR identifier (e.g TR36NW 12);

- summary of any previous phases of archaeological investigation at the development site;

- any constraints on the fieldwork.

- An account of the **Methodology** employed during the programme of works will be provided. Any aims and objectives specified in this specification will be included as will any further objectives identified during the course of the excavation/evaluation. Constraints on the excavation will also be detailed; the report will also include a quantification of the archive contents, their state and future location.

- **Results** of the findings from the evaluation area, will include the following:

  - the dimensions and location of the evaluated area;

  - the nature and depth of overburden soils encountered;

  - description of all archaeological features and finds encountered, their dimensions, states of preservation and interpretation;

  - a description of the geological subsoil encountered;

  - the heights related to Ordnance Datum should be provided for each feature and deposit. Where the trench results are complex a table showing the dimensions and heights of features and deposits should be included for each trench.

  - For complex remains a Harris Matrix diagram should be provided

  - Deposit model showing horizontal and vertical stratigraphic relationships identified and recorded - in relation to other recently completed investigations and in relation to the planned development in order to identify exactly the extent of recording and where in future deposits might survive beyond current impact areas and potentially be threatened by any subsequent development of the Site.

7.5.2 The Finds recovered during the course of the evaluation will be described, quantified and assessed by artefact type within the report. The report will also provide an indication of the potential of each category of artefact for further analysis and research. For each category of artefact the report should describe the method of processing, any sub-sampling, conservation and assessment undertaken. Where appropriate local reference collections will be referred to for descriptive and analytical consistency. Any implications for future archive, conservation or discard of the artefacts will be detailed.

7.5.3 The report will include a table showing, the contexts, classes and quantity of artefacts recovered, together with their date and interpretation. The report will also include clear comments from the Palaeolithic specialist (and where appropriate from the relevant geo-archaeologist) with regard to the key deposit finds and environmental results. The report will include an assessment of the Environmental Potential of the Site. Details will be provided of any environmental sampling undertaken in connection with the fieldwork and the results of any processing and assessment of the samples. The report will describe the method of processing, any sub-sampling and assessment. Any potential for future analysis of the samples or environmental remains recovered from the excavation/evaluation will be

described. Implications for future archive, conservation or discard of environmental samples or remains should be detailed.

7.5.4 The report will include, as appropriate, tables summarising environmental samples taken, together with the results of processing and assessment. Any results from the application of archaeological scientific techniques e.g. specialist dating will be included in an appropriate section of the report.

7.5.5 An **Interpretation** of the archaeology of the site, including its location, extent, date, condition, significance and importance will be provided. This will comprise a synthesis of the stratigraphic, finds and environmental results of the investigation and should include, even if no archaeology is identified as present on the Site, description of areas of disturbance, non-archaeological deposits and changes in geological subsoil where appropriate.

7.5.6 The **Conclusion** of the report will summarise the archaeological results, describe how the deposits identified relate to those previously recorded elsewhere within the Site, assess their archaeological significance and place them within the wider Palaeolithic context of the Swanscombe/Ebbsfleet area. Particular note will be made of any variations in the depth of overburden covering any archaeological deposits revealed.

7.5.7 The Palaeolithic specialist will provide recommendations (within the Conclusion of the report) with regard to any further mitigating archaeological work, or other safeguarding measures, required in conjunction with the proposed development.

7.5.8 The report will include comments on the effectiveness of the methodology employed and the confidence of the results and interpretation.

7.5.9 The report will include sufficient **Figures and Illustrations** to support descriptions and interpretations within the report text. Figures will be fully cross-referenced within the document text. As a minimum the evaluation report will include the following figures:

- a site location plan tied into the Ordnance Survey at 1:1250 or in the case of larger sites at 1:2500. The plan will also include at least two National Grid points and show the site boundary;
- plans of the evaluated area and its surrounds at 1:100 or 1:200 showing the layout of archaeological features, coloured by phases or period as related to the development site. The plan will show the location of all previous investigations and test pits. Where possible, projection of archaeological features outside of the evaluated area will be included on the plan. This plan will also include at least two National grid points;
- plans of the features revealed at a larger scale e.g. 1:20 or 1:50; such plans will also illustrate areas of disturbance, change in subsoil and location of sections; The location of significant finds and samples taken will also be indicated as appropriate;
- relevant section drawings and soil trench profiles as appropriate;
- illustrations and/or photographs of significant finds will be included where appropriate.
- deposit model identifying deposit sequences within the evaluated area and correlating these with previously recognised deposits in the surrounding area

7.5.10 A copy of the final report will be deposited with the HER, along with surveyed spatial digital data (.dxf or shapefile format) relating to evaluation.

OASIS

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

8 ARCHIVE STORAGE AND CURATION

8.1 General considerations

8.1.1 The complete Site archive, which will include paper records, photographic records, graphics, artefacts, ecofacts and digital data, will be prepared following the standard conditions for the acceptance of excavated archaeological material by the appropriate Museum, and in general following nationally recommended guidelines (SMA 1995; Brown 2011; ADS 2013).

8.1.2 All archive elements will be marked with the **Site code** and a full index will be prepared.

8.1.3 The Site archive will be prepared for long-term storage in accordance with Guidelines for the preparation of excavation archives for long term storage (Walker 1990) and Standards in the museum care of archaeological collections (Museums and Galleries Commission 1994).

8.2 Museum

8.2.1 In the absence of any museum in the area actively collecting archaeological archives, no final repository for the project archive has yet been identified. The archive will continue to be stored at the offices of Wessex Archaeology until such time as the situation is resolved. However, ongoing storage charges may be levied after a set time after project completion.

8.3 Transfer of title

8.3.1 On completion of the excavation, every effort will be made to persuade the legal owner of any finds recovered (ie, the landowner), with the exception of human remains and any objects covered by the *Treasure Act 1996 (as amended by the Coroners and Justice Act 2009)*, to transfer their ownership to the museum in a written agreement.

8.4 Preparation of archive

8.4.1 The complete archive, which may include paper records, graphics, artefacts, ecofacts and digital data, will be prepared following the standard conditions for the acceptance of excavated archaeological material, and in general following nationally recommended guidelines (SMA 1995; CIfA 2014c; Brown 2011; ADS 2013). The archive will usually be deposited within one year of the completion of the project, with the agreement of the client.

8.5 Selection policy

8.5.1 Wessex Archaeology follows national guidelines on selection and retention (SMA 1993; Brown 2011, section 4). In accordance with these, and any specific guidance prepared by the museum, a process of selection and retention will be followed so that only those artefacts or ecofacts that are considered to have potential for future study will be retained.

The selection policy will be agreed with the museum, and fully documented in the project archive. Material not selected for retention may be used for teaching or reference collections by the museum, or by Wessex Archaeology.

8.6 Security copy

8.6.1 In line with current best practice (eg, Brown 2011), on completion of the project a security copy of the written records will be prepared in the form of a digital PDF/A file. PDF/A is an ISO-standardised version of the Portable Document Format (PDF) designed for the digital preservation of electronic documents through omission of features ill-suited to long-term archiving.

9 COPYRIGHT

9.1 Archive and report copyright

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

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

9.2 Third party data copyright

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

10 WESSEX ARCHAEOLOGY PROCEDURES

10.1 External quality standards

10.1.1 Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its *Code of conduct* (CIfA 2014d) and *Regulations for professional conduct* (CIfA 2014e). All staff directly employed or subcontracted by Wessex Archaeology will be of a standard approved by Wessex Archaeology, and archaeological staff will be employed in line with the CIfA codes of practice, and will normally be members of the CIfA.

10.2 Personnel

10.2.1 The fieldwork will be directed and supervised by an experienced archaeologist from Wessex Archaeology's core staff, who will be on site at all times for the length of archaeological

fieldwork as required. The overall responsibility for the conduct and management of the project will be held by one of Wessex Archaeology's project managers, who will visit the fieldwork as appropriate to monitor progress and to ensure that the scope of works is adhered to. Where required, monitoring visits may also be undertaken by Wessex Archaeology's Health and Safety manager. The appointed project manager and fieldwork director will be involved in all phases of the investigation through to its completion.

10.2.2 The following key staff are proposed:

- Project Manager Mark Williams
- Fieldwork Director TBC
- Palaeolithic Specialist Dr. Francis Wenban-Smith

10.2.3 The analysis of any finds and environmental data will be undertaken by Wessex Archaeology core staff or external specialists, using Wessex Archaeology's standard methods, under the supervision of the departmental managers and the overall direction of the project manager. A complete list of specialists is provided in the Appendix.

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

10.3 Internal quality standards

10.3.1 Wessex Archaeology is an ISO 9001 accredited organisation (certificate number FS 606559), confirming the operation of a Quality Management System which complies with the requirements of ISO 9001:2008 – covering professional archaeological and heritage advice and services. The award of the ISO 9001 certificate, independently audited by the British Standards Institution (BSI), demonstrates Wessex Archaeology's commitment to providing quality heritage services to our clients. ISO (the International Organisation for Standardisation) is the most recognised standards body in the world, helping to drive excellence and continuous improvement within businesses.

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

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

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

10.4 Health and Safety

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

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

10.4.3 All fieldwork staff are certified through the Construction Skills Certification Scheme (CSCS) or UK equivalent and have had UKATA Asbestos Awareness Training. Key staff also have qualifications in the use of CAT and Genny equipment and as banksmen/Plant Machinery Marshalls through the National Plant Operators Recognitions Scheme (NPORS).

10.5 Insurance

10.5.1 Wessex Archaeology has both Public Liability (£10,000,000) and Professional Indemnity Insurance (£5,000,000).

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Order Limits

Palaeolithic Sites near Baker's Hole Scheduled Momument

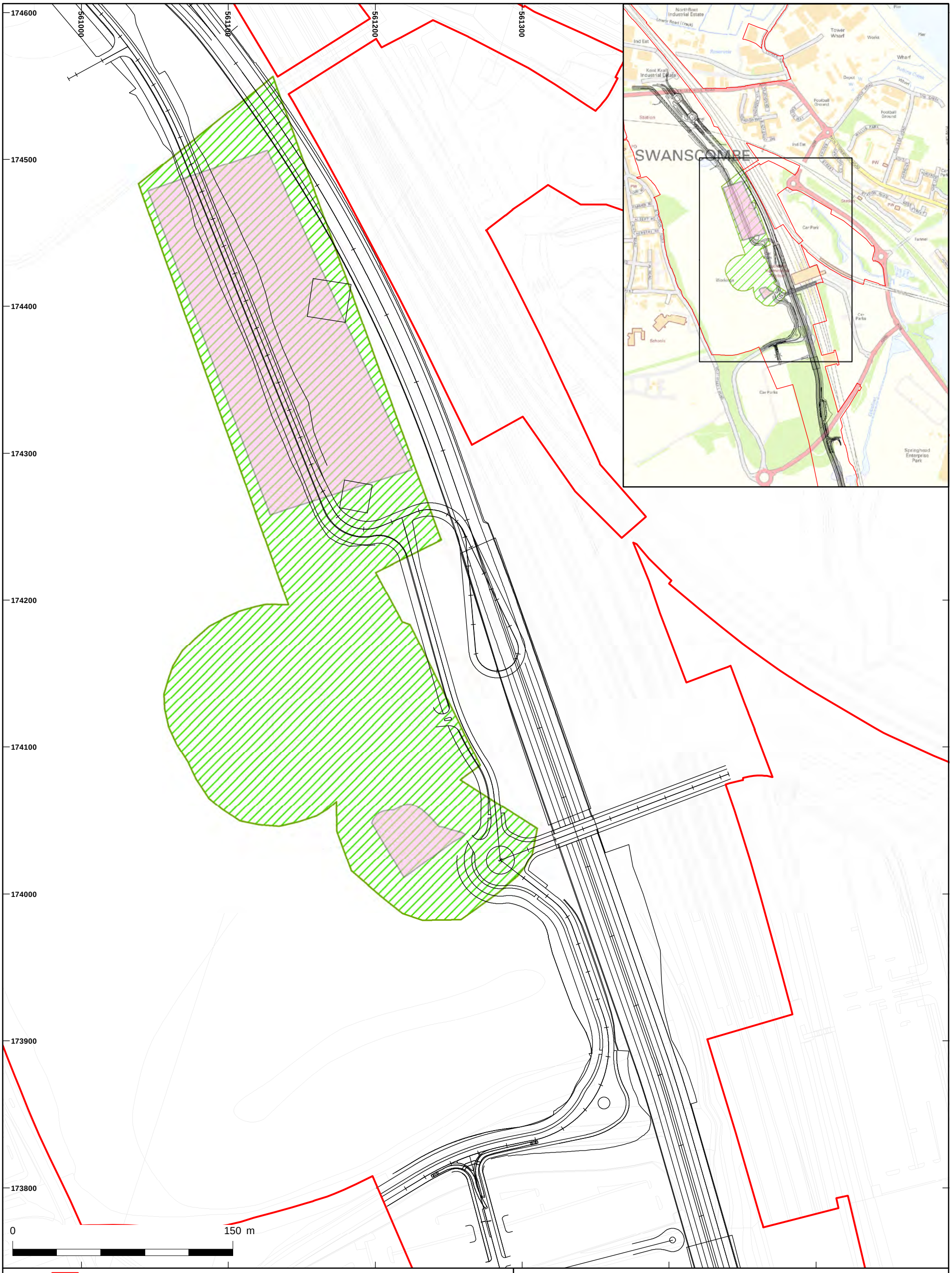
Site of Specific Scientific Interest (SSSI)

Date:	09/12/2020
Revision Number:	0
Scale:	1:22,500
Illustrator:	Thomas_P
Path:	

GIS\wessex\Projects\106574\GIS

Order Limits with Palaeolithic Sites near Baker's Hole Scheduled Monument and Site of Specific Scientific Interest

Figure 1



Date:	09/12/2020	Revision Number:	0
Scale:	1:2,500	Illustrator:	Thomas_P
Path:	GIS\wessex\Projects\106574\GIS		

Order Limits with Palaeolithic Sites near Baker's Hole Scheduled Monument and Site of Specific Scientific Interest overlain with Proposed Transport Corridors

Figure 2

560900
561000
561100
561200
561300
174500
174400
174300
174200
174100
174000
173900
100'
75'
50'
25'
Dry Valley Axis
0
125 m

Order Limits
Palaeolithic Sites near Baker's Hole Scheduled Momument
Site of Specific Scientific Interest (SSSI)
Boyne Hill/100ft terrace
Colluvial Slopewash
Contour (feet)

Date:	03/12/2020	Revision Number:	0
Scale:	1:2,000	Illustrator:	Thomas_P
Path:	GIS\wessex\Projects\106574\GIS		

Landscape Context: Pre-quarrying Geology and contours

Figure 3

A)) fence-line along west side of Area A

B)) Areas B and C, wooded blocks of upstanding deposits surrounded by grassed-over landfill (Area B smaller and further away; Area C in foreground, with pylon)

Date:	02/12/2020	Revision Number:	0
Scale:	1:13,000	Illustrator:	Thomas_P
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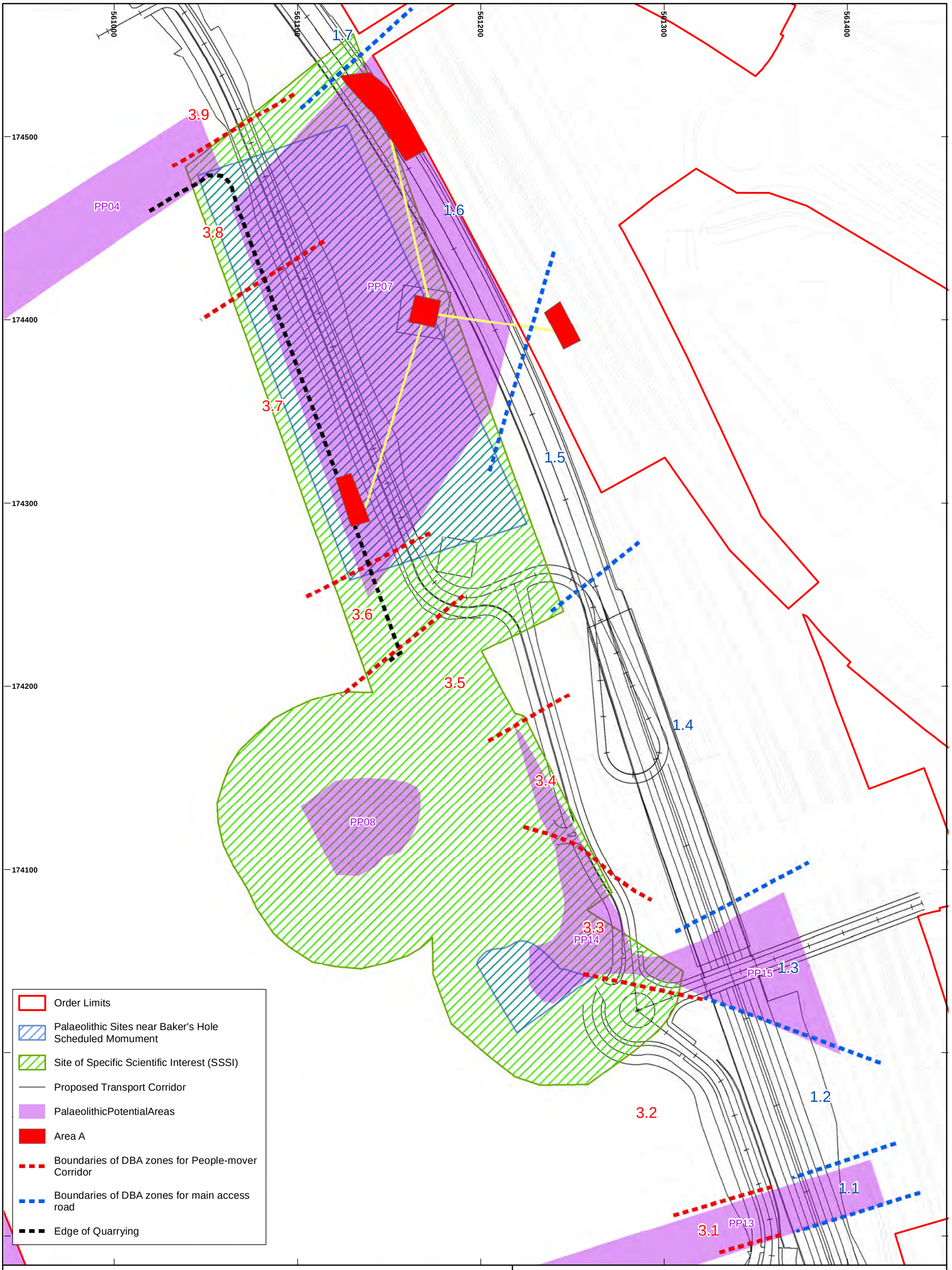
Baker's Hole Palaeolithic SM and SSSI

Figure 4



Date:	09/12/2020	Revision Number:	0
Scale:	1:2,000	Illustrator:	Thomas_P
Path:	GIS\wessex\Projects\106574\GIS		

Site layout: transport routes, designated assets (SM and SSSI), unquarried ground (PP areas) and Palaeolithic DBA zones

Figure 5

561000
561100
561200
561300
561400
174500
174400
174300
174200
174100
TP/BH-8
TP15
TP/BH-9
TP/BH-1
TP/BH-10
CP4
CP3
TP/BH-2
TP/BH-11
CP2
CP1
TP/BH-3
TP/BH12
TP/BH-4
TP/BH-5
CP6
CP5
TP/BH-6
TP/BH-7
CP7
TP/BH-13
TP/BH-14
CP8
PP04
PP07
PP08
PP14
PP15
PP13
Order Limits
Palaeolithic Sites near Baker's Hole Scheduled Momument
Site of Specific Scientific Interest (SSSI)
Proposed Transport Corridor
PalaeolithicPotentialAreas
Area A
Test Pit
Cable-percussion Borehole, 15m
Combined Test pit and 6m Windowless Borehole
0
125 m

Date:	09/12/2020	Revision Number:	0
Scale:	1:2,000	Illustrator:	Thomas_P
Path:	GIS\wessex\Projects\106574\GIS		

Site layout: Stage 1 Palaeolithic Evaluation

Figure 6

APPENDICES

Appendix 1 Finds and environmental specialists

Name	Qualifications	Specialism
Phil Andrews	BSc; FSA; MCIfA	Slag and metal working debris
Pippa Bradley	BA; MPhil; Dip Post Ex; FSA; MCIfA	Prehistoric flint and worked stone, shale and jet
Elina Brook	BA; MA; PCIfA	Later prehistoric and Romano-British pottery, and small finds
Alex Brown	BA; MSc; PhD	Geoarchaeology, palynology
Ceridwen Boston	B.Soc.Sc.; MA; MSc.; D.Phil.	Osteoarchaeology; funerary archaeology
Andrew Shaw	BA; MA; PhD	Palaeolithic lithic artefacts and Pleistocene geoarchaeology
Kirsten Egging Dinwiddy	BA; MA; MCIfA	Human remains (inhumations)
Inés López-Dóriga	BA; MA; PhD	Archaeobotanical remains
Erica Gittins	BA; MA; PhD	Prehistoric flint
Phil Harding	PhD	Prehistoric flint, particularly Palaeolithic flint
Lorrain Higbee	BSc; MSc; MCIfA	Animal bone
Grace Jones	BA; MA; PhD; MCIfA	Prehistoric and Roman pottery, ceramic building material, fired clay, and small finds
Matt Leivers	BA; PhD; ACIfA	Prehistoric pottery and flint
Jacqueline McKinley	BTech; FSA	Human remains (inhumations and cremations)
Erica Macey-Bracken	BA; ACIfA	Post-medieval finds, ceramic building material and worked wood
Katie Marsden	BSc	Pottery from prehistoric to post-medieval/modern. Metalwork of all periods, including coins. Small and bulk finds including fired clay, ceramic building material, worked bone
Nicki Mulhall		Geoarchaeology and archaeobotanical remains
David Norcott	BA; MSc; MCIfA	Geoarchaeology
Richard Payne	BSC; MSc; MPhil	Geoarchaeology
Holly Rodgers	BA; MSc	Geoarchaeology
Lorraine Mepham	BA; MCIfA	Pottery and other ceramic finds of all dates, concentrating on later prehistoric and post-Roman;
Sue Nelson	BA; MA; ACIfA	Prehistoric and Romano-British pottery, small finds, glass, and tile
Emma Robertson	BA; MSc	Human remains (inhumations)
Rachael Seager Smith	BA; MCIfA	Pottery with particular emphasis on Roman ceramics; and metalwork, fired clay, ceramic building material, stone, worked bone, shale, glass, and wall plaster
Amy Thorp	BA; MA	Pottery with emphasis on Roman ceramics, small finds
Lynn Wooten	BSc; ICON; MIoC	Archaeological conservator

Appendix 2. Palaeolithic (PP) character zones in the Site area

Zone	PP 04
Geological section diagram/s	-
Palaeolithic potential	HIGH
Geomorphological situation	Strip of unquarried deposits under footpath that runs east from Swanscombe to Northfleet over HS1, dipping eastward from Boyn Hill terrace down to Ebbsfleet Holocene alluvium
Sediment sequence, depth and distribution of deposits	Boyn Hill deposits between 30 and 23 m OD at the west end of the footpath — Lower Gravel (fluvial gravel), Lower Loam (fluvial sand/silt with palaeo-landsurface), Lower Middle Gravel (fluvial gravel), Upper Middle Gravel (fluvial gravel-rich sand) — overlain by slopewash/solifluction deposits. Boyn Hill deposits will thin and disappear at east end of zone, truncated by slope of ground surface.
Archaeological remains	Clactonian artefacts (flakes, cores and flake-tools) in Lower Gravel and Lower Loam, associated with undisturbed horizons in Lower Loam; Acheulian artefacts (handaxes, flakes and occ. flake-tools) in Lower Middle Gravel, also associated with undisturbed palaeo-landsurfaces; possibly scarce remains in UMG
Faunal/palaeo-environmental remains	Large mammalian faunal remains in Lower Gravel, Lower Loam, Lower Middle Gravel; poss. scarce remains in UMG; molluscan and small vertebrate remains present in LG and LL, possibly also in LMG and UMG in undecalcified patches
Cultural period	Lower Palaeolithic
Age/correlation	MIS 11 (Hoxnian) Boyn Hill deposits, overlain by younger (MIS 10, or even younger) solifluction/slopewash deposits
Key event/s and sources	- Rickson's/Barracks Pit records/collecting (Dewey 1932) - observations and some B/W photos by F Wenban-Smith in 1989 (unpublished)
Representative sequence logs	-
Research priorities	Establish where natural deposits survive, their geological age/nature and their Palaeolithic potential
Strategies for investigation	Test pits and boreholes either side of footpath; clean N-facing and S-facing sections below footpath
Notes/comments	Uncertain if/where Boyn Hill phase 1 channel deposits (Lower Gravel and Lower Loam) occur

Zone	PP 07
Geological section diagram/s	- Kerney&SievekingSiteA - PreEbbsFig5.6.xx1
Palaeolithic potential	VERY HIGH
Geomorphological situation	Unquarried ground [old Northfleet allotments] to west of HS1 and south of Swanscombe-Northfleet footpath
Sediment sequence	• Fluvial/alluvial silts, sands & gravels (probably several phases of terrace deposition) • Marsh deposits (clayey sands and silts) • Colluvial/aeolian deposits (sands/silts)

Depth	Base of Pleistocene sequence dips down to east from c. 9m to below 0m OD. Key horizons mostly buried by at least 2m of unimportant colluvial sand/silt - except at east side of area, where truncated by sloping west side of HS1 cutting
Archaeological remains	Few artefacts known, but records of a handaxe and flake from fine-grained loam towards the base of the sequence
Faunal/palaeo-environmental remains	Very abundant and well-preserved vertebrate, molluscan and ostracod remains
Cultural period	-
Age/correlation	MIS 7
Key event/s and sources	- British Museum Site A, initial investigation (Kerney & Sieveking 1977) - British Museum Site A, re-investigation (Wenban-Smith 1995) - HS1, ZR4 pylon evaluation and mitigation (Oxford Archaeology 1998, 2000; Wenban-Smith *et al.* 2020, Ch 5); - HS1, Ebbsfleet Sports Ground field evaluation (ESG 00): TP 3790 - HS1 Area 8 batter recording (Wenban-Smith *et al.* 2020, Ch 5)
Representative sequence logs	- Site A (F Wenban-Smith): A-TP1 - HS1: 3776 TT - HS1: 3777 TT - HS1: Area 8 batter - HS1: 3790 TT
Research priorities	Establish how Site A and ZR4 sequences relate, what lithostratigraphic variations there are within the zone, and overall Palaeolithic/Pleistocene importance of different deposits present
Strategies for investigation	Boreholes and test-pits, with a significant degree of palaeo-environmental assessment; geo-physics
Notes/comments	This zone is part of the Baker's Hole Scheduled Monument and Site of Special Scientific Interest. It contains palaeo-environmental evidence of different sub-stages of MIS 7, which makes it of national importance.

Zone	**PP 08**
Geological section diagram/s	FWS PhD, Site C, Section 7
Palaeolithic potential	LOW
Geomorphological situation	Island of predominantly-natural sediments with a pylon, surrounded by made-up ground (landfill) filling old Chalk quarries. In centre of what used to be a dry valley dipping ENE from Swanscombe down to the Ebbsfleet alluvial floodplain
Sediment sequence	Thick body of colluvial/aeolian sand/silt over Chalk bedrock, filling a dry valley that comes down into the Ebbsfleet valley from higher ground to the west; includes minor channel of fluvial/slopewash gravels at east side
Depth	Top surface of sequence slopes gently NE from c. 15 m to 13 m OD; there is a thick covering of made ground down to Chalk at the western side; the central and eastern parts are covered with between 3 and 5 m of colluvial sand/silt deposits, with a minor stream channel infilled with gravel outcropping at the eastern side
Archaeological remains	None known
Faunal/palaeo-environmental remains	None known

Cultural period	-
Age/correlation	MIS 6/5/2?
Key event/s and sources	- Carreck fieldwork, Channel C (Carreck 1972) - FW-S PhD fieldwork, Site C, section 7 (Wenban-Smith 1996)
Representative sequence logs	- Site C, section 7
Research priorities	-
Strategies for investigation	-
Notes/comments	Unlikely to contain Palaeolithic remains; perhaps a low possibility of Late Upper Palaeolithic Long Blade remains

Zone	**PP 13**
Geological section diagram/s	FWS Site D drawing, Section 40
Palaeolithic potential	UNCERTAIN
Geomorphological situation	In waste ground (Made ground? Under new landfill mound?) to north of station access road
Sediment sequence	Chalk-rich solifluction deposits (Coombe Rock) under between 1 and 2 metres of brickearth along most of the length of the zone; this sequence may be overlain (or truncated) by sand/silt slopewash deposits in places, especially at the eastern end
Depth	Very uncertain; the top surface of the natural sequence probably slopes gently up to the west from c. 10 to 15 m OD; natural deposits may now have been buried by a substantial thickness of made ground (including remediated landfill) during the HS1 development programme.
Archaeological remains	None known from this zone, although laterally equivalent Coombe Rock deposits have produced Levalloisian material, including the material from RA Smith's original "Baker's Hole" Levalloisian site
Faunal/palaeo-environmental remains	The "Baker's Hole" Coombe Rock also contained mammoth, horse, red deer and rhinoceros remains.
Cultural period	Levalloisian (Early Middle Palaeolithic)
Age/correlation	MIS 8-6
Key event/s and sources	- F Wenban-Smith recording of exposed section as "Site D, Section 40" (Wenban-Smith 1996) - test pit investigation for HS1 (Wenban-Smith *et al.* 2020, Ch 9)
Representative sequence logs	F Wenban-Smith's Site D drawing (Section 40)
Research priorities	Establish where natural sediments survive; establish their nature and Palaeolithic potential
Strategies for investigation	Test pit, boreholes
Notes/comments	This section was preserved under a conveyor belt, while chalk quarrying took place all around

Zone	**PP 14a**
Geological section diagram/s	-
Palaeolithic potential	UNCERTAIN-HIGH?
Geomorphological situation	Part of the Baker's Hole SSSI that is within the Ebbsfleet International station reserved car park. Before the HS1 development, this area was a bank of unquarried ground west of the football pitches behind the Blue Circle pavilion
Sediment sequence, depth and distribution of deposits	Deep thickness of made ground (uncertain thickness, probably 2-3m), but likely to be natural Pleistocene deposits (silts, sands, gravels, Coombe Rock) under the made ground
Archaeological remains	None reliably provenanced to this specific area, but Pleistocene deposits in the near vicinity have produced rich and varied remains, including undisturbed Levalloisian horizons
Faunal/palaeo-environmental remains	None reliably provenanced to this specific area, but Pleistocene deposits in the near vicinity have produced rich and varied mammalian remains, including horse and red deer bones, mammoth teeth. A rhino skull whose provenance is uncertain, may well have come from a trial trench dug in this area by G Sieveking in 1969-1970
Cultural period	Lower/Middle Palaeolithic
Age/correlation	MIS 7-2
Key event/s and sources	- Carreck's 1950s Channel D section recording (Carreck 1972) - British Museum work by G Sieveking in late 1960s (Kerney & Sieveking 1977; unpublished archive records of various trenches)
Representative sequence logs	-
Research priorities	Establish distribution and depth of natural Quaternary sediments, and then assess presence/potential of Palaeolithic artefactual and palaeo-environmental remains
Strategies for investigation	Test pits
Notes/comments	Some geotechnical investigations were done for HS1 here, and monitored by Oxford Archaeology [Rob Early], but I've never seen a report on these. If either the original geotechnical report or a report on the archaeological monitoring could be tracked down, I'm sure these would have numerous useful data

Zone	**PP 14b**
Geological section diagram/s	- Carreck's Channel D log/photo on N side of "Tramway Cutting" (Carreck 1972: 85-86, Plate 6) - F Wenban-Smith section drawing, Area F, Section 3 (south-east end)
Palaeolithic potential	HIGH
Geomorphological situation	Overgrown part of Baker's Hole SSSI to west of the Ebbsfleet International station reserved car park, with exposed south-west-facing face. Prior to the HS1 works this used to be a raised bank of ground behind the Blue Circle football pitches.
Sediment sequence, depth and distribution of	The exposed deposits are probably made ground. This is probably up to 3m thick, although may be shallower towards the north-west end of the zone. Natural deposits (silts, sands, gravels, coombe rock) are known to be present under the made ground, recorded in 1990 in the vicinity of the tree-planting membrane, and

deposits	still present in 2004 after completion of HS1 works
Archaeological remains	Sand and gravel sediments under the made ground in the south-east part of this area have produced abundant mammalian fossils, including horse, deer and mammoth. and a few flint artefacts.
Faunal/palaeo-environmental remains	Sand and gravel sediments under the made ground in the south-east part of this area have produced a few flint artefacts. Levalloisian occupation horizons may also be present
Cultural period	Lower/Middle Palaeolithic
Age/correlation	MIS 7-2
Key event/s and sources	- Carreck's 1950s work (Carreck 1972) - F Wenban-Smith PhD research (Wenban-Smith 1996) - F Wenban-Smith field survey (Wenban-Smith 2015)
Representative sequence logs	- Carreck photo/log, Plate 5j - Carreck photo/log, Plate 6 - F Wenban-Smith (1996) section drawing: Area F, Section 3 - F Wenban-Smith (2015) log: Section 1 - F Wenban-Smith (2015) log: Section 2
Research priorities	Establish depth of Pleistocene sequence, its Palaeolithic and palaeo-environmental potential, and its relationship with the better-known sequence from Area B a short distance to the southwest.
Strategies for investigation	Clean parts of the south-west facing face of this area, and excavate down to chalk bedrock, make proper records of sequence and take samples for palaeo-environmental assessment
Notes/comments	There are unanswered questions about how the natural sediments that underlie the made ground at the south-east tip of Area F correlate with the sequence at Area B; the current tree-planting at the southern end of the area obscures access to the most important deposits, and threatens them in the longer run by root growth

Zone	**PP 14c**
Geological section diagram/s	- Kerney&Sieveking1977SiteBSection (east end)
Palaeolithic potential	UNCERTAIN-HIGH?
Geomorphological situation	Area to the south and southwest of the exposed face of Area F, extending towards the Scheduled Monument of Area B across (and including) the paved track, up to the upstanding north-east facing edge of area PP 14d.
Sediment sequence, depth and distribution of deposits	The upper part of the sequence is formed of made ground of uncertain thickness, and includes the old quarry haul road. However natural deposits (silts, sands, gravels, coombe rock) may to be present under the made ground
Archaeological remains	None known from deposits in this specific area, but possibly-equivalent deposits in the near vicinity have produced important remains, including diverse palaeo-environmental remains and undisturbed Levalloisian occupation horizons
Faunal/palaeo-environmental remains	None reliably provenanced to this specific area, but Pleistocene deposits in the near vicinity have produced rich and varied mammalian remains, including horse and red deer bones, mammoth teeth, and (possibly) a rhino skull whose provenance is uncertain, but which may have come from this area
Cultural period	Lower/Middle Palaeolithic
Age/correlation	MIS 7-2

Key event/s and sources	- British Museum work by G Sieveking in late 1960s (Kerney & Sieveking 1977; unpublished archive records of various trenches)
Representative sequence logs	- Kerney & Sieveking (1977): Site B section (eastern half)
Research priorities	Establish distribution and depth of natural Quaternary sediments, and then assess presence/potential of Palaeolithic artefactual and palaeo-environmental remains
Strategies for investigation	Test pits
Notes/comments	Uncertain if any natural deposits survive, and if so at what depth; perhaps the best place to expect the best remains is right under the paved haul road, which might have served to protect natural sediments

Zone	**PP 15**
Geological section diagram/s	- sections 50552 and 50553 for HS1 works [Ebbs Pre zone 6], Jayflex remediation
Palaeolithic potential	HIGH
Geomorphological situation	Small patch of natural ground preserved just to southwest of Ebbsfleet International
Sediment sequence	Made ground 1-2 m thick overlying varied Pleistocene sequence, generally dipping and thickening northeast, from base: Coombe Rock, gravel (thought to be fluviatile), colluvial/slopewash sands/silts/gravels (with bed of tufa in one place)
Depth	Pleistocene deposits between c. 9 and 4 m OD
Archaeological remains	Flint artefacts (Levalloisian) from slopewash silts/sands/gravels, basal fluvial gravel and Coombe Rock
Faunal/palaeo-environmental remains	Molluscs and ostracods in tufa
Cultural period	Levalloisian, and possibly later remains
Age/correlation	MIS 7 through to MIS 2 (Devensian)
Key event/s and sources	CTRL Jayflex WB section 50552; CTRL ESG 00, 3829B TT; CTRL EBB 01, 3972 TT and 4017 TT (Wenban-Smith *et al.* 2020, Ch 10)
Representative sequence logs	Unpublished ARC EBB 01 and ARC 342 W 02 archive
Research priorities	Establish where (and at what depth) natural deposits survive, and assess their nature and Palaeolithic potential
Strategies for investigation	Test pits
Notes/comments	Uncertain how CTRL works have affected this area; probable that natural sediments are now buried by increased thickness of made-up ground

Zone	**PP 15a**
Geological section diagram/s	Section 50552 from HS1 Jayflex remediation
Palaeolithic potential	HIGH
Geomorphological	Small patch of unquarried ground preserved under old quarry road and Ebbsfleet

situation	International access road
Sediment sequence	Made ground of varying thickness (1-2 m thick!) overlying Pleistocene deposits that continue towards Site B from west end of Jayflex remediation area, from base: Coombe Rock, gravel (thought to be fluviatile), sand/silt that could be alluvial and/or colluvial
Depth	Pleistocene deposits between c. 9 and 4 m OD
Archaeological remains	Flint artefacts (Levalloisian) from historic (Burchell) investigations in generally equivalent deposits in this general area
Faunal/palaeo-environmental remains	Mammalian fossils from historic (Burchell) investigations in generally equivalent deposits in this general area
Cultural period	Levalloisian, and possibly later remains
Age/correlation	MIS 7 through to MIS 2 (Devensian)
Key event/s and sources	CTRL Jayflex WB section 50552; CTRL ESG 00, 3829B TT
Representative sequence logs	Unpublished ARC EBB 01 and ARC 342 W 02 archive
Research priorities	Establish where (and at what depth) natural deposits survive, and assess their nature and Palaeolithic potential
Strategies for investigation	Test pits
Notes/comments	This is probably one of the highest potential areas for the possibility of relocating any surviving trace of Burchell's in situ Levallois "floors"

Appendix 3. Zones of Palaeolithic potential along the main road access (eastern route)

Contents

Page	*Details*	*Notes, comments*
1	Contents	-
2	Table structure, and entry explanations	Tabular overview
3	Attribute grades for *Likelihood* and *Importance* of Palaeolithic remains	Tabular overview
3	Attribute grades for *Palaeolithic potential*	Tabular overview
4-10	Attribute tables for zones along the main eastern access road	Separate tables for DBA zones 1.1 through to 1.7

Attribute table structure, and field entry explanations

Attribute	*Field entry*
Zone #	Zone along route
Summary description	Short summary text of geomorphological and topographic situation
Sediment sequence	Description of the Quaternary deposits that may be, or are likely to be, present
Sediment depth	Likely elevation OD of natural sediments, and depth of burial, if known
Palaeolithic artefacts	Description of Palaeolithic artefactual remains that may be, or are likely to be, present
Palaeo-environmental remains	Description of faunal (and other palaeo-environmental) remains that may be, or are likely to be, present
Age/correlation	Presumed/possible age of deposits, and regional correlations to significant deposits, if known
Palaeolithic potential	Attribution based on matrix of likelihood and importance, and supported by brief explanatory text *
Likelihood of Palaeolithic remains	Attribution based on likely type/s of deposit present and previous artefact and palaeo-environmental find records, supported by brief explanatory text *
Likely importance of Palaeolithic remains	Attribution based on likely type/s of deposit present, and supported by brief explanatory text *
Priorities for evaluation	Key questions that need answering, to allow fully-informed consideration of the Palaeolithic potential/importance of the area
Approaches to evaluation	Suitable methods and approaches that could be applied to address the priority evaluation questions specified above
Any other comments	Any particular points not covered by other fields

* See page 3 (below) for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Attribute grades for Likelihood and Importance of Palaeolithic remains

Attribution	*Likelihood*	*Importance*
VERY HIGH	Certain knowledge of Pleistocene deposits with lithic or palaeo-environmental remains	Nationally important remains: undisturbed occupation surfaces or minimally disturbed artefact concentrations; abundant faunal /palaeo-environmental remains, deposits with key sequences and lithostratigraphic relationships
HIGH	High likelihood of Pleistocene deposits with lithic or palaeo-environmental remains	Undisturbed occupation surfaces or minimally disturbed concentrations; abundant remains from deposits of good stratigraphic and chronological integrity, biological associations; deposits with important lithostratigraphic sequences and relationships
MODERATE	Reasonable likelihood of deposits with remains	Less abundant disturbed artefactual and/or faunal remains from units of reasonable stratigraphic and chronological integrity; deposits with moderate lithostratigraphic sequences and relationship
LOW	Remains are known to occur, but rare	Disturbed remains from deposits of low stratigraphic and chronological integrity; deposits with minimal lithostratigraphic sequences and relationships
VERY LOW	Remains very unlikely to occur	Thought extremely unlikely for there to be any Pleistocene deposits containing remains, any remains found will be residual and reworked
NONE	No possibility of remains	Not applicable
UNCERTAIN	Insufficient information on which to assess likelihood	Insufficient information on which to assess importance

Matrix for assessment of Palaeolithic potential

Palaeolithic potential	*Likelihood*	*Likely importance*
VERY HIGH	Very high	High
	High	Very high
HIGH	High	High, Moderate
	Moderate	High
MODERATE	High	Low
	Moderate	Moderate
	Low	Very high, High
LOW	Moderate	Low
	Low	Moderate
	Very low	Very high, High, Moderate,
VERY LOW	Moderate	Very low
	Low, Very low	Low, Very low
NONE	None	na
UNCERTAIN	Uncertain	High, moderate, low or very low

	High, moderate, low or very low	Uncertain

Zone #	1.1 [= 3.1; = PP 13]
Summary description	In waste ground (Made ground? Under new landfill mound?) to north and west of station access road
Sediment sequence	Chalk-rich solifluction deposits (Coombe Rock) under between 1 and 2 metres of brickearth along most of the length of the zone; this sequence may be overlain (or truncated) by sand/silt slopewash deposits in places, especially at the eastern end
Sediment depth	Very uncertain; the top surface of the natural sequence probably slopes gently up to the west from c. 10 to 15 m OD; natural deposits may now have been buried by a substantial thickness of made ground (including remediated landfill) during the HS1 development programme.
Palaeolithic artefacts	None known from this zone, although laterally equivalent Coombe Rock deposits have produced Levalloisian material, including the material from RA Smith's original "Baker's Hole" Levalloisian site
Palaeo-environmental remains	The "Baker's Hole" Coombe Rock also contained mammoth, horse, red deer and rhinoceros remains.
Age/correlation	MIS 8 - 6
Palaeolithic potential	MODERATE
Likelihood of Palaeolithic remains	Moderate
Likely importance of Palaeolithic remains	Moderate
Priorities for evaluation	Establish where natural sediments survive; establish their nature and Palaeolithic potential
Approaches to evaluation	Test pit, boreholes
Any other comments	This section was preserved under a conveyor belt, while chalk quarrying took place all around

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	1.2 [= 3.2]
Summary description	Old chalk pit, filled with landfill (mixed domestic waste) in 1980s, and then this removed and replaced with sterile made ground ("Jayflex remediation") as part of HS1 works

Sediment sequence	Made ground over chalk bedrock, which contains basal remnants of dry valley channels filled with Pleistocene slopewash/solifluction deposits
Sediment depth	At least 5m of made ground
Palaeolithic artefacts	A few flint artefacts were found in the basal Pleistocene slopewash/solifluction deposits during a Watching Brief for the Jayflex remediation work in 2002
Palaeo-environmental remains	None known
Age/correlation	Pleistocene channels probably formed MIS 8 - MIS 2
Palaeolithic potential	VERY LOW
Likelihood of Palaeolithic remains	Low
Likely importance of Palaeolithic remains	Low
Priorities for evaluation	-
Approaches to evaluation	-
Any other comments	-

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	1.3 [= PP 15]
Summary description	Small patch of natural ground preserved just to southwest of Ebbsfleet International
Sediment sequence	Made ground 1-2 m thick overlying varied Pleistocene sequence, generally dipping and thickening northeast, from base: Coombe Rock, gravel (thought to be fluviatile), colluvial/slopewash sands/silts/gravels (with bed of tufa in one place)
Sediment depth	Pleistocene deposits between c. 9 and 4 m OD, uncertain thickness of overlying made ground
Palaeolithic artefacts	Flint artefacts (Levalloisian) from slopewash silts/sands/gravels, basal fluvial gravel and Coombe Rock
Palaeo-environmental remains	Molluscs and ostracods in tufa
Age/correlation	MIS 7 through to MIS 2 (Devensian)
Palaeolithic potential	HIGH

Likelihood of Palaeolithic remains	High
Likely importance of Palaeolithic remains	High
Priorities for evaluation	Establish where (and at what depth) natural deposits survive, and assess their nature and Palaeolithic potential
Approaches to evaluation	Test pits
Any other comments	Uncertain how HS1 works have affected this area; probable that natural sediments are now buried by increased thickness of made-up ground

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	1.4
Summary description	Area to east of PP14a, which used to be Blue Circle sports ground football pitches
Sediment sequence	This area is presumed to be mostly made ground, infilling a 19th century brick pit, then levelled for the football pitches, and then topped with a substantial thickness of made ground as part of the HS1 works. However it is possible that important Pleistocene deposits still survive in places, deeply buried by modern overburden
Sediment depth	Ground surface is c. 12m OD, and there is probably 3-5m of modern made ground across the zone, before reaching the surface of any Pleistocene deposits that may survive
Palaeolithic artefacts	None known
Palaeo-environmental remains	None known
Age/correlation	If any Pleistocene deposits survive, they would be a continuation of the MIS 7 Ebbsfleet Channel deposits of area PP14
Palaeolithic potential	LOW
Likelihood of Palaeolithic remains	Very low
Likely importance of Palaeolithic remains	Moderate
Priorities for evaluation	Establish depth of made ground, and if any Pleistocene deposits survive underneath
Approaches to evaluation	Test pits, boreholes

Any other comments	It may be hard to distinguish between made ground and natural deposits in this area, and from a practical point of view very difficult to carry out any useful work. Some geotechnical investigations were done for HS1 here, and monitored by Oxford Archaeology [Rob Early]. If either the original geotechnical report or a report on the archaeological monitoring could be tracked down, these would have useful data.

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	1.5
Summary description	Used to be the northern side of Blue Circle sports ground football pitches, with a track passing under the Kent railway line, but now built up at the southern end of this zone for the HS1 Ebbsfleet International station car park
Sediment sequence	The southern part of this area is made ground, infilling the southern flank of a dry valley that descends from Swanscombe to the Ebbsfleet alluvial floodplain, after passing through area PP 08. There may be remnants of Holocene alluvium at the east side of the zone, towards the HS 1 track.
Sediment depth	Ground surface is c. 12m OD in the southern part of this zone, with at least 5m of modern made ground, before reaching the surface of any Pleistocene or Holocene deposits that may survive. However the ground surface is lower in the northern part of the zone, and natural deposits may be close beneath the surface.
Palaeolithic artefacts	1 - A very low possibility of reworked Lower/Middle Palaeolithic artefacts from upslope Boyn Hill terrace 2 - A low possibility of relatively undisturbed Upper Palaeolithic artefacts
Palaeo-environmental remains	1 - A very low possibility of reworked Middle Pleistocene fossils from upslope Boyn Hill terrace 2 - A low possibility of relatively undisturbed Upper Palaeolithic faunal remains
Age/correlation	If any Pleistocene deposits survive, they would be a continuation of the MIS 5d-2 dry valley fill sequence
Palaeolithic potential	1 - VERY LOW (Lower/Middle Palaeolithic) 2 - MODERATE (Upper Palaeolithic)
Likelihood of Palaeolithic remains	1 - Moderate 2 - Low
Likely importance of Palaeolithic remains	1 - Very low 2 - Very high
Priorities for evaluation	1 - None 2 - Investigate presence/nature of Quaternary sediments, and for presence of Upper Palaeolithic remains
Approaches to evaluation	-
Any other comments	-

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	1.6 [= PP 07 east side]
Summary description	Unquarried ground [old Northfleet allotments] to west of HS1 and south of Swanscombe-Northfleet footpath; includes part of the Baker's Hole Scheduled Monument and SSSI complex.
Sediment sequence (from base)	• Fluvial/alluvial silts, sands & gravels (maybe two phases of terrace deposition) • Marsh deposits (clayey sands and silts) • Colluvial/aeolian deposits (sands/silts)
Sediment depth	Base of Pleistocene sequence probably below 0m OD. Key horizons mostly buried by at least 2m of post MIS5d colluvial sand/silt - except at east side of area, where truncated by sloping west side of HS1 cutting
Palaeolithic artefacts	Few artefacts known, but records of a handaxe and flake from fine-grained loam towards the base of the sequence
Palaeo-environmental remains	Very abundant and well-preserved vertebrate, molluscan and ostracod remains
Age/correlation	MIS 7 interglacial deposits, overlain/abutted by Ipswichian MIS5e deposits, with both these sets of deposits overlain by younger (MIS 5d - MIS 2) slopewash deposits
Palaeolithic potential	VERY HIGH
Likelihood of Palaeolithic remains	Very high
Likely importance of Palaeolithic remains	Very high
Priorities for evaluation	Establish how ZR4 and adjacent 3790 TT sequences relate, what lithostratigraphic variations there are within the zone, and overall Palaeolithic/Pleistocene importance of different deposits present
Approaches to evaluation	Boreholes and test-pits, with a significant degree of palaeo-environmental assessment; geo-physics
Any other comments	This zone is part of the Baker's Hole Scheduled Monument and Site of Special Scientific Interest. It contains palaeo-environmental evidence of different sub-stages of MIS 7, as well MIS 5e and other subsequent periods, which makes it of national importance.

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	1.7
Summary description	Footpath across north end of PP 07, with old chalk pit further north
Sediment sequence	Natural sediments under/beside old footpath, probably a very thin veneer of slopewash deposits, directly overlying chalk bedrock
Sediment depth	Ground-surface is probably about 10-12m OD, slopewash deposits are probably about 50cm thick.
Palaeolithic artefacts	None known
Palaeo-environmental remains	None known
Age/correlation	Slopewash is probably Last Glacial (MIS 5d-2) or early Holocene
Palaeolithic potential	VERY LOW
Likelihood of Palaeolithic remains	Low
Likely importance of Palaeolithic remains	Very low
Priorities for evaluation	-
Approaches to evaluation	-
Any other comments	This footpath, which continues uphill west into PP 04, provides a valuable transect of the original deposit sequence and surface topography of the west side of the Ebbsfleet Valley, before any quarrying

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Appendix 4. Zones of Palaeolithic potential along the people-mover corridor (Option D)

Contents

Page	*Details*	*Notes, comments*
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2	Table structure, and entry explanations	Tabular overview
3	Attribute grades for *Likelihood* and *Importance* of Palaeolithic remains	Tabular overview
3	Attribute grades for *Palaeolithic potential*	Tabular overview
4-12	Attribute tables for zones along People-mover Option D	Separate tables for zones 3.1 through to 3.9

Attribute table structure, and field entry explanations

Attribute	*Field entry*
Zone #	Zone along route
Summary description	Short summary text of geomorphological and topographic situation
Sediment sequence	Description of the Quaternary deposits that may be, or are likely to be, present
Sediment depth	Likely elevation OD of natural sediments, and depth of burial, if known
Palaeolithic artefacts	Description of Palaeolithic artefactual remains that may be, or are likely to be, present
Palaeo-environmental remains	Description of faunal (and other palaeo-environmental) remains that may be, or are likely to be, present
Age/correlation	Presumed/possible age of deposits, and regional correlations to significant deposits, if known
Palaeolithic potential	Attribution based on matrix of likelihood and importance, and supported by brief explanatory text *
Likelihood of Palaeolithic remains	Attribution based on likely type/s of deposit present and previous artefact and palaeo-environmental find records, supported by brief explanatory text *
Likely importance of Palaeolithic remains	Attribution based on likely type/s of deposit present, and supported by brief explanatory text *
Priorities for evaluation	Key questions that need answering, to allow fully-informed consideration of the Palaeolithic potential/importance of the area
Approaches to evaluation	Suitable methods and approaches that could be applied to address the priority evaluation questions specified above
Any other comments	Any particular points not covered by other fields

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Attribute grades for Likelihood and Importance of Palaeolithic remains

Attribution	*Likelihood*	*Importance*

VERY HIGH	Certain knowledge of Pleistocene deposits with lithic or palaeo-environmental remains	Nationally important remains: undisturbed occupation surfaces or minimally disturbed artefact concentrations; abundant faunal /palaeo-environmental remains, deposits with key sequences and lithostratigraphic relationships
HIGH	High likelihood of Pleistocene deposits with lithic or palaeo-environmental remains	Undisturbed occupation surfaces or minimally disturbed concentrations; abundant remains from deposits of good stratigraphic and chronological integrity, biological associations; deposits with important lithostratigraphic sequences and relationships
MODERATE	Reasonable likelihood of deposits with remains	Less abundant disturbed artefactual and/or faunal remains from units of reasonable stratigraphic and chronological integrity; deposits with moderate lithostratigraphic sequences and relationship
LOW	Remains are known to occur, but rare	Disturbed remains from deposits of low stratigraphic and chronological integrity; deposits with minimal lithostratigraphic sequences and relationships
VERY LOW	Remains very unlikely to occur	Thought extremely unlikely for there to be any Pleistocene deposits containing remains, any remains found will be residual and reworked
NONE	No possibility of remains	Not applicable
UNCERTAIN	Insufficient information on which to assess likelihood	Insufficient information on which to assess importance

Matrix for assessment of Palaeolithic potential

Palaeolithic potential	*Likelihood*	*Likely importance*
VERY HIGH	Very high	High
	High	Very high
HIGH	High	High, Moderate
	Moderate	High
MODERATE	High	Low
	Moderate	Moderate
	Low	Very high, High
LOW	Moderate	Low
	Low	Moderate
	Very low	Very high, High, Moderate,
VERY LOW	Moderate	Very low
	Low, Very low	Low, Very low
NONE	None	na
UNCERTAIN	Uncertain	High, moderate, low or very low
	High, moderate, low or very low	Uncertain

Zone #	3.1 [= PP 13, =1.1]
Summary description	In waste ground (Made ground? Under new landfill mound?) to north and west of station access road
Sediment sequence	Chalk-rich solifluction deposits (Coombe Rock) under between 1 and 2 metres of brickearth along most of the length of the zone; this sequence may be overlain (or truncated) by sand/silt slopewash deposits in places, especially at the eastern end
Sediment depth	Very uncertain; the top surface of the natural sequence probably slopes gently up to the west from c. 10 to 15 m OD; natural deposits may now have been buried by a substantial thickness of made ground (including remediated landfill) during the HS1 development programme.
Palaeolithic artefacts	None known from this zone, although laterally equivalent Coombe Rock deposits have produced Levalloisian material, including the material from RA Smith's original "Baker's Hole" Levalloisian site
Palaeo-environmental remains	The "Baker's Hole" Coombe Rock also contained mammoth, horse, red deer and rhinoceros remains.
Age/correlation	MIS 8 - 6
Palaeolithic potential	MODERATE
Likelihood of Palaeolithic remains	Moderate
Likely importance of Palaeolithic remains	Moderate
Priorities for evaluation	Establish where natural sediments survive; establish their nature and Palaeolithic potential
Approaches to evaluation	Test pit, boreholes
Any other comments	This section was preserved under a conveyor belt, while chalk quarrying took place all around

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.2 [=1.2]
Summary description	Old chalk pit, filled with landfill (mixed domestic waste) in 1980s, and then this removed and replaced with sterile made ground ("Jayflex remediation") as part of HS1 works
Sediment sequence	Made ground over chalk bedrock, which contains basal remnants of dry valley channels filled with Pleistocene slopewash/solifluction deposits
Sediment depth	At least 5m of made ground
Palaeolithic artefacts	A few flint artefacts were found in the basal Pleistocene slopewash/solifluction deposits during a Watching Brief for the Jayflex remediation work in 2002

Palaeo-environmental remains	None known
Age/correlation	Pleistocene channels probably formed MIS 8 - MIS 2
Palaeolithic potential	VERY LOW
Likelihood of Palaeolithic remains	Low
Likely importance of Palaeolithic remains	Low
Priorities for evaluation	-
Approaches to evaluation	-
Any other comments	-

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.3 [=PP 15a]
Summary description	Small patch of unquarried ground preserved under old quarry road and Ebbsfleet International access road
Sediment sequence	Made ground of varying thickness (1-2 m thick) overlying Pleistocene deposits that continue towards Site B [PP14d-f] from west end of Jayflex remediation area, from base: Coombe Rock, gravel (thought to be fluviatile), sand/silt that could be alluvial and/or colluvial
Sediment depth	Pleistocene deposits between c. 9 and 4 m OD
Palaeolithic artefacts	Flint artefacts (Levalloisian) from historic (Burchell) investigations in generally equivalent deposits in this general area
Palaeo-environmental remains	Mammalian fossils from historic (Burchell) investigations in generally equivalent deposits in this general area
Age/correlation	MIS 7 through to MIS 2 (Devensian)
Palaeolithic potential	HIGH
Likelihood of Palaeolithic remains	High
Likely importance of Palaeolithic remains	High

Priorities for evaluation	Establish where (and at what depth) natural deposits survive, and assess their nature and Palaeolithic potential
Approaches to evaluation	Test pits
Any other comments	This is probably one of the highest potential areas for the possibility of relocating any surviving trace of Burchell's in situ Levallois "floors"

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.4 [=1.4]
Summary description	Area to east of PP14a, which used to be Blue Circle sports ground football pitches
Sediment sequence	This area is presumed to be mostly made ground, infilling a 19th century brick pit, then levelled for the football pitches, and then topped with a substantial thickness of made ground as part of the HS1 works. However it is possible that important Pleistocene deposits still survive in places, deeply buried by modern overburden
Sediment depth	Ground surface is c. 12m OD, and there is probably 3-5m of modern made ground across the zone, before reaching the surface of any Pleistocene deposits that may survive
Palaeolithic artefacts	None known
Palaeo-environmental remains	None known
Age/correlation	If any Pleistocene deposits survive, they would be a continuation of the MIS 7 Ebbsfleet Channel deposits of area PP14
Palaeolithic potential	LOW
Likelihood of Palaeolithic remains	Very low
Likely importance of Palaeolithic remains	Moderate
Priorities for evaluation	Establish depth of made ground, and if any Pleistocene deposits survive underneath
Approaches to evaluation	Test pits, boreholes
Any other comments	It may be hard to distinguish between made ground and natural deposits in this area, and from a practical point of view very difficult to carry out any useful work. Some geotechnical investigations were done for HS1 here, and monitored by Oxford Archaeology [Rob Early]. If either the original geotechnical report or a report on the archaeological monitoring could be tracked down, these would have useful data.

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.5
Summary description	Used to be the northern side of Blue Circle sports ground football pitches, with a track passing under the Kent railway line, but now built up at the southern end of this zone for the HS1 Ebbsfleet International station car park
Sediment sequence	The southern part of this area is made ground, infilling the southern flank of a dry valley that descends from Swanscombe to the Ebbsfleet alluvial floodplain, after passing through area PP 08.
Sediment depth	Ground surface is c. 12m OD in the southern part of this zone, with at least 5m of modern made ground, before reaching the surface of any Pleistocene or Holocene deposits that may survive. However the ground surface is lower in the northern part of the zone, and natural deposits may be close beneath the surface.
Palaeolithic artefacts	None known
Palaeo-environmental remains	None known
Age/correlation	If any Pleistocene deposits survive, they would be a continuation of the MIS 5d-2 dry valley fill sequence
Palaeolithic potential	VERY LOW
Likelihood of Palaeolithic remains	Very low
Likely importance of Palaeolithic remains	Very low
Priorities for evaluation	-
Approaches to evaluation	-
Any other comments	-

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.6 [= PP 07 west side, south end of]
Summary description	South-west corner of unquarried ground [old Northfleet allotments] to west of HS1 and south of Swanscombe-Northfleet footpath; includes part of the Baker's Hole Scheduled Monument and SSSI complex.

Sediment sequence (from base)	• Fluvial/alluvial silts, sands & gravels (maybe later MIS 7 phase of terrace deposition) • Marsh deposits (clayey sands and silts) • Colluvial/aeolian deposits (sands/silts)
Sediment depth	Pleistocene sequence between c. 8m and 11m OD. Key horizons mostly buried by 1-2m of post MIS5d colluvial sand/silt
Palaeolithic artefacts	None specifically known from this part of the area A deposit sequence
Palaeo-environmental remains	None specifically known from this part of the area A deposit sequence
Age/correlation	Presumed MIS 7 interglacial deposits, overlain by younger (MIS 5d - MIS 2) slopewash deposits - it is possible that the deposits in this zone are equivalent to the later MIS 7 deposits in the ZR4 sequence
Palaeolithic potential	VERY HIGH
Likelihood of Palaeolithic remains	High
Likely importance of Palaeolithic remains	Very high
Priorities for evaluation	- Investigate how deposit character compares with Site A and ZR4 sequences - assess presence/quality/potential of palaeo-environmental remains
Approaches to evaluation	Test pits, with a significant degree of palaeo-environmental assessment
Any other comments	This zone is part of the Baker's Hole Scheduled Monument and Site of Special Scientific Interest. It is uncertain how the deposits here relate to those at Site A and ZR4; resolving this is a key objective of further investigation at the site, which will contribute to improving our overall understanding of the site, and of the MIS 7 interglacial

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.7 [= PP 07 west side, main part of]
Summary description	Unquarried ground [old Northfleet allotments] to west of HS1 and south of Swanscombe-Northfleet footpath; includes part of the Baker's Hole Scheduled Monument and SSSI complex.
Sediment sequence (from base)	• Fluvial/alluvial silts, sands & gravels (maybe earlier MIS 7 phase of terrace deposition) • Marsh deposits (clayey sands and silts) • Colluvial/aeolian deposits (sands/silts)
Sediment depth	Pleistocene sequence between c. 9m and 15m OD. Key horizons mostly buried by 2-3m of post MIS5d colluvial sand/silt

Palaeolithic artefacts	Few artefacts known, but records of a handaxe and flake from fine-grained loam towards the base of the sequence
Palaeo-environmental remains	Very abundant and well-preserved vertebrate, molluscan and ostracod remains
Age/correlation	MIS 7 interglacial deposits, from the early peak interglacial sub-stage MIS 7e, overlain by younger (MIS 5d - MIS 2) slopewash deposits
Palaeolithic potential	VERY HIGH
Likelihood of Palaeolithic remains	Very high
Likely importance of Palaeolithic remains	Very high
Priorities for evaluation	- confirm nature/depth of Pleistocene sequence - assess presence/quality/potential of palaeo-environmental remains from different horizons
Approaches to evaluation	- Test-pits, with a significant degree of palaeo-environmental assessment - boreholes, to establish full deposit sequence and palaeo-environmental investigation
Any other comments	This zone is part of the Baker's Hole Scheduled Monument and Site of Special Scientific Interest. It is uncertain how the deposits here relate to those further south along the west side of Area A in zone 3.6; resolving this is a key objective of further investigation at the site, which will contribute to improving our overall understanding of the site, and of the MIS 7 interglacial

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.8 [= PP 07 west side, north end of]
Summary description	North-west corner of Area A Scheduled Monument (beyond north bank of MIS 7 channel-fill), up to and including the footpath from Swanscombe, with the ground-surface probably rising northward within this zone from c. 12 to 15 m OD
Sediment sequence	Natural slopewash sediments, directly overlying chalk bedrock
Sediment depth	Uncertain thickness of slopewash sediments, probably 1-3m
Palaeolithic artefacts	None known
Palaeo-environmental remains	None known
Age/correlation	Slopewash is probably Last Glacial (MIS 5d-2) or early Holocene
Palaeolithic potential	VERY LOW

Likelihood of Palaeolithic remains	Low
Likely importance of Palaeolithic remains	Very low
Priorities for evaluation	Confirm absence of MIS 7 channel-fill deposits, and establish their edge in plan view
Approaches to evaluation	Test pits
Any other comments	- It is important to establish the location of the northern bank of the MIS 7 channel, to help reconstruct the wider palaeo-landscape - The footpath, which continues uphill west into PP 04, provides a valuable transect of the original deposit sequence and surface topography of the west side of the Ebbsfleet Valley, before any quarrying.

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Zone #	3.9
Summary description	Old chalk pit, partly backfilled with landfill and made ground
Sediment sequence	Landfill and made ground
Sediment depth	Ground-surface dips to around 10m OD beyond the footpath, and there is probably at least5-10m, possibly considerably more, of landfill and made ground before solid chalk at the base of the old chalk quarry is reached
Palaeolithic artefacts	None known
Palaeo-environmental remains	None known
Age/correlation	-
Palaeolithic potential	NONE
Likelihood of Palaeolithic remains	None
Likely importance of Palaeolithic remains	na
Priorities for evaluation	-
Approaches to evaluation	-

Any other comments	-

* See page 3 for criteria for different categories of likelihood and importance, and then these are combined in a matrix to arrive at an overall assessment of potential

Appendix 5. Kent County Council's Specification for Detailed Evaluation of Quaternary Deposits and Palaeolithic Potential

SPECIFICATION FOR DETAILED EVALUATION OF QUATERNARY DEPOSITS AND PALAEOLITHIC POTENTIAL

1. Introduction

1.1 Detailed evaluation for Quaternary deposits and Palaeolithic potential involves targeted intrusive investigation of a site to determine in more detail the distribution of Quaternary deposits, and the nature and Palaeolithic potential of Quaternary deposits that are known (or thought very likely) to be present.

1.2 Detailed evaluation will typically use any, or a combination of, four methods of investigation: (a) windowless-samples, (b) cable/percussion boreholes, (c) cleaning/recording of standing sections and (d) machine-excavated test pits.

1.3 The approach, or approaches, required are specified in the site-specific Part A of the Kent County Council project specification.

2. General requirements

2.1 Detailed evaluation will be carried out by archaeological organisations (from here on referred to as 'the Archaeological Contractor'), with recognised experience and expertise in the specified type of work to be undertaken. Registration with the Chartered Institute for Archaeologists (CIfA) as a Registered Organisation (RO) will normally be considered as an indicator, but not a prerequisite, of such expertise and experience. A good working knowledge of the archaeology of Kent will also be considered highly desirable.

2.2 The work will be supervised on site at all times for the Contractor by a member of staff with the required level of experience and who will be responsible for the conduct of on-site work.

2.3 A designated specialist (or specialists) with Palaeolithic and Quaternary geological expertise should be engaged to supervise the work in the field in conjunction with the Contractor, and to carry out subsequent reporting of the results. A relevant PhD or equivalent research experience and a suitable body of previous work and practical experience, including a good working knowledge of the Quaternary deposits of the study region, would normally be considered a pre-requisite to demonstrate suitable expertise. CVs should be provided for any specialists.

2.4 The identity of the specialist (or specialists) and the scope of their work should be agreed with the County Archaeologist and planning authority before the work commences, and then the named specialist/s should carry out the agreed work. If it then becomes necessary for the agreed specialist/s to be replaced or for parts of the agreed work to be carried

out by anyone other than the agreed specialist/s, then these variations should also be agreed in advance with the planning authority.

2.5 Prior to any work being undertaken the Archaeological Contractor will inform the County Archaeologist and communicate details of the proposed team, including (if required) CVs for senior staff and specialists. Senior staff and specialists will need to demonstrate an appropriate level of experience and expertise and should preferably be, where appropriate, Members of the Chartered Institute for Archaeologists (MCIfA).

2.6 Prior to undertaking the evaluation the Archaeological Contractor will need to demonstrate that the necessary resources are in place to undertake the work, through to reporting. The Archaeological Contractor will have available appropriate specialists necessary to support the successful completion of the archaeological fieldwork and post-excavation work.

3. Pre-site requirements

3.1 Prior to undertaking the evaluation the Archaeological Contractor will have gathered and considered the following information:

- relevant information on the Kent Historic Environment Record (HER) held by Kent County Council and maintained by the Heritage Conservation group
- any earlier reports of fieldwork relevant to the site
- Solid and Drift geology
- geotechnical site investigation data (if available)
- British Geological Survey on-line borehole data
- any desk-based studies of the site

3.2 In certain circumstances the following will also be considered:

- relevant published secondary sources
- relevant historic maps held at the Centre for Kentish Studies
- aerial photographs where cropmarks are considered to indicate archaeology on or close to the site

3.3 The Archaeological Contractor will ensure that all reasonable measures have been taken to identify any constraints to undertaking the evaluation work. The Archaeological Contractor will seek information on the presence of services, any ecological constraints, the presence of Public Rights of Way, the presence of contaminated land or any other risks to health and safety. Attention will be paid to avoiding any trees, protected or otherwise, that are to be retained or to avoid damage to the roots thereof. Prior to the commencement of fieldwork the Archaeological Contractor shall agree with the developer, or their agent, any fencing required during the works and requirements

for reinstatement at completion. The Archaeological Contractor shall ensure that arrangements are in place for appropriate reinstatement prior to the commencement of any excavations.

3.4 The Archaeological Contractor will make provisional arrangements for the deposition of the site archive with an appropriate museum or suitable repository agreed with the County Archaeologist. The Archaeological Contractor will obtain a provisional accession number for the site archive from the recipient museum (except where the museum prefers to issue an accession number following completion of fieldwork) and any guidelines from the recipient museum regarding deposition of the site archive.

3.5 Full copies of the Specification must be issued to the field officer responsible for on-site work and a copy of the agreed Specification and any additional method statements must be available on site at all times. The team carrying out the evaluation must be familiar with the Specification and have access on site to any previous evaluation or survey reports.

3.6 The Archaeological Contractor will inform the County Archaeologist of the start date of the work (at least five working days before) and arrange for monitoring visits to be undertaken, using the Fieldwork Notification & HER Summary Form (see Appendix 1). The Archaeological Contractor will continue to keep the County Archaeologist informed of the progress of work and will notify the County Archaeologist immediately if particularly important archaeological remains are encountered.

4. Aims and objectives

4.1 The general aims of the detailed evaluation are to:

- establish with a high degree of confidence the nature, character, distribution, extent and depth of Quaternary deposits across the site
- assess the Palaeolithic potential of the site, and establish its importance and significance in the context of national and regional research priorities
- establish a robust model for the site's Palaeolithic archaeological remains, by identifying Historic Environment Areas (HEAs) of different character and potential (see section 9.7 below)

4.2 More-specific objectives of the detailed evaluation are thus to:

- ascertain (where Quaternary deposits are encountered) their extent, depth below ground surface, character, date and Palaeolithic potential
- establish the extent to which previous development and/or other processes have affected Quaternary deposits at the site

- establish the likely impact on any surviving Quaternary deposits of the proposed development
- determine the presence and potential of lithic artefact evidence and faunal remains in the sediments encountered
- determine the presence and potential of palaeoenvironmental evidence in the sediments encountered
- determine the presence of, or potential for, undisturbed primary context Palaeolithic occupation surfaces in the sediments encountered
- interpret the depositional and post-depositional history of any artefactual or biological evidence found
- establish correlations of any Pleistocene deposits found with reference to adjacent and regional sequences and to national frameworks
- assess in local, regional and national terms, the archaeological and geological significance of any Pleistocene deposits encountered, and their potential to fulfil current research objectives
- establish the likely impact of the proposed development upon any Palaeolithic remains, to identify priorities for further investigation, and to make recommendations on suitable methods and approaches for possible mitigation work

4.3 Further site-specific aims and objectives may be specified in Part A.

5. Scope and methods

5.1 The detailed evaluation will involve any, or a combination of, the following four methods of investigation: (a) windowless-samples, (b) cable/percussion boreholes, (c) cleaning/recording of standing sections and (d) machine-excavated test pits. The site-specific specification (Part A) will determine which of these methods is applicable for the current site, and the number and location of interventions.

5.2 Generic specifications for the application of these methods are given below, but only those specified for this specific site (see Part A) need be followed in carrying out the evaluation work.

5.3 Windowless samples

5.3.1 The layout and number of windowless samples will be in accordance with the site-specific specification (see Part A). Windowless sample locations may on occasion need to be slightly moved at discretion of the on-site field supervisor and Palaeolithic specialist to avoid post-Palaeolithic remains or for other circumstances such as the presence of services or features such as trees, overhead cables, etc.

5.3.2 Windowless sample locations will be laid out initially following the locations previously determined (Part A), and the NGR and ground-surface height accurately located with a differential GPS system or Total Station. Augering will not take place where there is a risk of contaminating groundwater.

5.3.3 Windowless sampling will be carried out by an experienced contractor using a tracked terrier rig under primary supervision of the Archaeological Contractor with the Palaeolithic/Quaternary specialist/s also in attendance.

5.3.4 Windowless samples will be dug to 5m deep, unless otherwise specified. The first metre at each window sample location will be hand-dug to verify that natural sediments are present and there is no risk of encountering services, and the revealed sequence logged. If a starter pit larger than 20cm width is required it will be treated as a test pit (see section 5.6 below). If significant archaeology is encountered within the starter pit excavation will cease, the exposed features or deposits carefully cleaned and recorded and the County Archaeologist informed. The subsequent 4 m will be recovered as 4 x 1 m plastic tubes, which will be slit open on site, cleaned, digitally photographed and logged by the Palaeolithic/Quaternary specialist/s following standard sedimentary recording procedures.

5.3.5 Photographs of windowless samples will include one image with all four 1m tubes aligned parallel with a hand-tape (or other tape) with 1cm scale divisions laid along the length of the tube with 0 at the top, the top of each tube facing in the same direction, and with a board or other label giving the windowless sample unique identifier. Close-up views should also be taken of important sedimentary features and junctions.

5.3.6 Any archaeological and/or faunal remains encountered will be recovered. Samples may also be taken to evaluate for palaeo-environmental biological remains, if thought appropriate.

5.3.7 The ground surface at all window sample locations will be independently surveyed, and tied in with the OS Grid and Ordnance Datum with horizontal and vertical accuracy of ±2cm.

5.3.8 Voids left by sampling will be backfilled to the client/landowners requirements. Where required a bentonite grout will be used to fill the void left through augering, otherwise clean material will be used to backfill the void left by the sampling to ground level

5.4 Cable percussion boreholes

5.4.1 The layout and number of cable percussion boreholes will be in accordance with the site-specific specification (see Part A). Boreholes may on occasion need to be slightly moved at discretion of the on-site

field supervisor and Palaeolithic specialist to avoid post-Palaeolithic remains or for other circumstances such as the presence of services or features such as trees, overhead cables, etc.

5.4.2 Cable percussion drilling will be carried out by an experienced contractor using an A-Frame rig under the primary supervision of the drilling operative as advised by the Archaeological Contractor with the Palaeolithic/Quaternary specialist/s also in attendance.

5.4.3 Cable percussion boreholes will be drilled to a depth agreed with the County Archaeologist. Ideally this will span the full depth of Quaternary deposits at the borehole location, proving the underlying pre-Quaternary geology to a depth of at least 1m. The first 1.2m, or other depth based on an assessment of the ground conditions by a competent person, at each borehole location will be hand-dug to verify that natural sediments are present and there is no risk of encountering services, and the revealed sequence in this inspection pit will be logged, and where necessary, sampled. If significant archaeology is encountered within the starter pit excavation will cease, the exposed features or deposits carefully cleaned and recorded and the County Archaeologist informed. To minimise the risk of contaminating groundwater no drilling will take place within any area of standing water. If required the starter pit will be supported, stepped or battered as appropriate. To avoid contamination or collapse, all cable percussion holes should be cased as they progress.

5.4.4 Regular, accurate depth measurement should be made by the driller and communicated to the Palaeolithic/Quaternary specialist. These should be made whenever arisings are logged and sampled, and at each recorded interface between two sedimentary deposits. The log should include details of deposit colour, matrix, coarse component descriptions (clast size-range, degree of angularity roundedness, material and percentage of deposits) as well as any observed sedimentary structures. A series of working shots will also be maintained during the course of the fieldwork.

5.4.5 Subsequent drilling methodology will depend on the nature of the deposits encountered. Where deposits containing gravels within otherwise cohesive sediments, of low archaeological potential, are encountered, a clay cutter may be most appropriate to use. This will provide bulk samples which should be logged and retained where appropriate at 0.25-0.5m intervals. Wet gravels are best drilled using a shell bailer; these can similarly be logged and sub-sampled at agreed intervals (e.g. 0.25-0.5m).

5.4.6 Where fine-grained deposits with apparent or demonstrated palaeoenvironmental or archaeological potential are encountered, sealed U100 samples should be taken. These will provide both the sealed 45cm long U100 tube and a further 0.1m long bulk sample from the cutter attachment. Logs should be made on the basis of the observed sediments in either of the U100 tube and the bulk sample. The U100

core should be carefully labelled, indicating the uppermost end of the core. Where continuous U100 samples are to be taken, extra care must be given during the subsequent cleaning phase not to over-cut into undisturbed sediments. Sleeves will be labelled appropriately and handled with care, voids will be packed, splits taped, and cores will be stacked and carried horizontally.

5.4.7 Where agreed, U100 tubes should be opened off-site immediately after field work to provide detailed logs of their contents. Photographs of the U100 cores using an appropriate scale with 1cm scale divisions and with a board or other label giving the U100 sample's unique should be made.

5.4.8 Any archaeological and/or faunal remains encountered will be recovered and recorded as small finds.

5.4.9 Voids left by sampling will be backfilled to the client/landowners requirements. Where required a bentonite grout will be used to fill the void left through augering, otherwise clean material will be used to backfill the void left by the sampling to ground level.

5.5 Recording of standing sections

5.5.1 Standing sections will be cleaned, recorded and sampled if appropriate at the locations given in the site-specific specification (see Part A).

5.5.2 Prior to recording and sampling sections will be cleaned using hand tools to create clear, vertical exposures through the sedimentary sequence. Where sections are deep, stepped sections should be used where practical to allow for safe access and recording.

5.5.3 The section should be photographed with the inclusion of appropriate photographic scales and a marked-up board indicating the site code, position and orientation of the section. Large sections should be photographed both in their entirely and as composite sections using a high resolution camera.

5.5.4 Sections should be drawn at a scale appropriate to their size and complexity. For example, small sections or exposures should be drawn at 1:10 or 1:20, larger running sections at 1:50 or greater. All plans and sections are to be levelled with respect to OD and are to be drawn on polyester based drafting film and clearly labelled.

5.5.5 Drawings should show surveyed section lines and nail positions, the upper and lower surface of the section as well as all major sedimentary boundaries and associated archaeological features. The section should also indicate the position of exposed archaeological finds and faunal material; the position of clasts should be added as appropriate.

5.5.6 Drawings should be annotated with unit numbers and, where appropriate, sedimentary descriptions. Unit/Context, find and sample numbers should correlate to the appropriate records in the site archive.

5.5.7 Sampling from the section should be undertaken once the first drawn and photographic records are complete. A further photographic record should be made after sampling and the sample locations added to the drawn record of the section.

5.6 Machine-excavated test pits

5.6.1 The layout and number of test pits will be in accordance with the site-specific specification (see Part A). Test pits may on occasion need to be slightly moved at discretion of the on-site field supervisor and Palaeolithic specialist to avoid post-Palaeolithic remains or for other circumstances such as the presence of services or features such as trees, overhead cables, etc.

5.6.2 Each test pit will be dug by a tracked 10-20 tonne 360^{o} mechanical excavator (or other suitable type to be agreed with the County Archaeologist) with a toothless bucket of approximately 2m width unless otherwise agreed. Each test pit will be one bucket-width wide, 3-4m long and up to 5m deep. If sediments are too tough for excavation to be achieved with a toothless bucket, then it is acceptable to switch to a toothed bucket, although the toothless bucket must be reverted to whenever possible. Excavation will cease at a shallower depth if it is clear that Quaternary deposits are not present, and that pre-Quaternary deposits have been reached; care will be taken to ensure that the presence of Quaternary deposits has not been masked by pre-Quaternary deposits having been redeposited on top of in situ Quaternary deposits. Excavation will cease if primary context Palaeolithic evidence is encountered, and the County Archaeologist informed.

5.6.3 Each test pit will be taken down in horizontal spits of 5-10cm, respecting the interface between sedimentary units when unit changes are encountered. The work will be directed by a recognised Palaeolithic specialist with experience of recording and interpreting Pleistocene sediments, who will record and number the sequence of sedimentary units as excavation progresses following standard descriptive practices. The textural characteristics (grain-size, consolidation, colour, material and sedimentary structures) of sedimentary units will be recorded, and the shape and nature of their lithostratigraphic contacts (dip, conformity and overall geometry). Test pits will be entered at the maximum safe depth (based on an assessment of the ground conditions by a competent person) to record the upper stratigraphy. After excavation has progressed beyond this depth, recording will typically take place without entering the test pit. It may however be occasionally necessary to widen and step out the upper part of a test pit to allow direct access to its lower part, for instance for controlled artefact/fossil recovery, to investigate for

the presence of an undisturbed landsurface, or for controlled sediment sampling.

5.6.4 *On-site spit/sieve sampling.* Spit-samples of at least 150 litres will be numbered, their position in the stratigraphic sequence recorded, and set aside at regular *c.* 25cm intervals as excavation progresses. At least 100 litres from each spit-sample will be dry-sieved on site through a *c.* 1cm mesh for recovery of lithic artefacts and faunal remains. If the sediment encountered is not suitable for dry-sieving (ie. too clayey), excavation will proceed in shallower spits of *c.* 5cm, looking carefully for the presence of any archaeological evidence, and the spit samples will also be carefully investigated by hand (using archaeological trowels) for any archaeological evidence. The remainder of the spit-sample may be sampled for palaeo-environmental biological remains (see details below) or clast lithology, if appropriate.

5.6.5 *Palaeo-environmental sampling.* The presence/potential for palaeo-environmental micro-biological evidence such as pollen, insects, molluscs and small vertebrates will be assessed for each sediment unit by field inspection by the Palaeolithic/Quaternary specialist. He/she will consider the potential of the sediments encountered, and guide sampling as appropriate (including specifying any special needs for off-site processing methods). Provision should be built into the archaeological programme for processing any samples taken and reporting on the results at the evaluation stage.

5.6.6 *Chronometric dating.* Consideration will be given to the suitability of any sediment units encountered for optically stimulated luminescence dating (OSL). Samples for analysis should ideally be taken with *in situ* dosimetry readings using a portable gamma ray spectrometer. This can be done under the guidance of the Palaeolithic specialist in the field at the evaluation stage if the appropriate equipment is available, or carried out subsequently. If suitable sediment is encountered it is advisable to take an OSL sample anyway, even without *in situ* dosimetry measurement, as this sample can still provide a date, in case there is no future opportunity for renewed investigation.

5.6.7 *Section drawing and photography.* A representative section from each test pit will be drawn at a scale of 1:20 and photographed in colour (digital) once excavation has reached its full depth, and at appropriate stages in the course of excavation if features of interest are revealed. Other sections will also be drawn and/or photographed as appropriate, particularly where more complex stratigraphy is encountered. A series of working shots will also be maintained during the course of the fieldwork.

5.6.8 *Backfilling.* Each test pit will be dug in turn, and backfilled as soon as possible following excavation and the completion of recording. No test-pits will be left open untended or overnight. In exceptional circumstances (for instance by special request of the County Archaeologist) Palaeolithic

test pits may be left open for longer periods if deemed safe to do so, but these will then have be fenced off and marked with clear warning signs. The Archaeological Contractor shall ensure that arrangements are in place for appropriate reinstatement prior to the commencement of any excavations.

5.6.9 *Post-Palaeolithic features.* Careful attention will be paid to the presence of any post-Palaeolithic features or remains in the upper part of natural deposits. If post-Palaeolithic archaeological remains are encountered excavation will cease, the exposed features or deposits carefully cleaned and recorded; the County Archaeologist will be informed if significant remains are encountered. Where vulnerable archaeological deposits have been identified these will be appropriately protected from damage prior to backfilling. Consideration will be given to providing a marker in backfilled trenches to highlight vulnerable archaeological deposits should re-excavation be necessary. The Palaeolithic test pit will then be located in a different place to avoid affecting more recent remains.

5.6.10 *Service avoidance.* Before excavation begins the statutory authorities will be consulted, where this has not already been done, for information regarding the presence of any below/above ground services. The site will be walked over and inspected to visually identify, where possible, the location of above and below ground services. Test pit locations will be scanned before excavation commences with a Cable Avoidance Tool (CAT) to verify the absence of any live underground services. Any site procedures concerning permissions to dig will be followed.

6. Finds recovery, processing and treatment

6.1 All artefacts recovered during the excavations on the site are the property of the Landowner. They are to be suitably bagged, boxed and marked in accordance with the United Kingdom Institute for Conservation, *Conservation Guidelines no.2* and on completion of the archaeological post-excavation programme the landowner will arrange for them to be deposited in a museum or similar repository agreed with the County Archaeologist and the Local Planning Authority.

6.2 Artefacts will be excavated carefully by hand. The Archaeological Contractor will use an appropriately qualified and experienced archaeological conservator to assist in the lifting of fragile finds of significance and / or value.

6.3 Artefacts will be collected and bagged by archaeological context. The location of special finds will be recorded in three dimensions. Three-dimensional recording of in-situ flint working deposits will be carried out.

6.4 Where appropriate to address the research objectives of the archaeological evaluation, sieving of deposits through a fine mesh will

be undertaken to maximise recovery of small artefacts. A strategy for such sieving will be agreed in advance with the County Archaeologist.

6.5 Records of artefact assemblages will clearly state how they have been recovered, sub-sampled and processed.

6.6 Excavated artefacts will be bagged upon recovery or placed in finds trays. They must not be left loose on site.

6.7 All metal objects, other than late post medieval objects, will be X-rayed unless otherwise agreed with the County Archaeologist.

6.8 *Treatment of treasure*. Finds falling under the statutory definition of Treasure (as defined by the Treasure Act of 1996 and its revision of 2002) will be reported immediately to the relevant Coroner's Office, the Kent Finds Liaison Officer (FLO) who is the designated treasure co-ordinator for Kent, the landowner and the County Archaeologist. A Treasure Receipt (obtainable from either the FLO or the DCMS website) must be completed and a report submitted to the Coroner's Office and the FLO within 14 days of understanding the find is Treasure. Failure to report within 14 days is a criminal offence. The Treasure Receipt and Report must include the date and circumstances of the discovery, the identity of the finder (put as unit/contractor) and (as exactly as possible) the location of the find.

6.9 *Scientific dating.* The Archaeological Contractor will make appropriate provision for the application of scientific dating techniques such as radiocarbon, dendrochronology, palaeomagnetic dating, OSL and thermoluminescence dating. The advice of the Historic England regional Scientific Advisor will be sought in advance of the application of these techniques. The Archaeological Contractor will agree with the County Archaeologist any necessary delay in completion of the reporting of the evaluation to enable provisional results to be included.

6.10 Where appropriate the guidance in the following Historic England papers will be followed:

- "Guidelines on the recording, sampling, conservation, and curation of waterlogged wood" (1996)
- "Dendrochronology – guidelines on producing and interpreting dendrochronological dates" (1998)
- "Centre for Archaeology Guidelines: Archaeometallurgy" (2015)
- "Environmental Archaeology: A guide to the theory and practice of methods, from sampling and recovery to post-excavation (second edition)" (2011)
- "Animal Bones and Archaeology" (2014)
- "Guidelines for the Curation of Waterlogged Macroscopic Plant and Invertebrate Remains" (2008)

- "Human bones from Archaeological Sites: Guidelines for Producing Assessment Documents and Analytical Reports" (2004)
- "Geoarchaeology" (2015)
- "Archaeomagnetic Dating: Guidelines on producing and interpreting archaeomagnetic dates" (2006)
- "Luminescence Dating" (2008)
- "Guidelines on the X-radiography of archaeological metalwork" (2006)
- "Waterlogged Organic Artefacts: Guidelines on their Recovery, Analysis and Conservation" (2012)

7. Surveying and recording

7.1 All interventions (test pits, boreholes, window samples and/or cleaned sections), deposits and finds will be recorded according to accepted professional standards. Sufficient data must be recorded to allow the required level of assessment and reporting (see section 9).

7.2 As a minimum, the locations and ground-surface level of all interventions need to be surveyed to 1cm accuracy.

7.3 All interventions should be recorded individually on separate record sheets, with each record sheet including details of the location co-ordinates (NGR to 0.01m) and ground surface height (OD), the sediment sequence encountered and any finds made and/or sampling carried out. A further more general record of the work, comprising a description and discussion of the archaeology, is to be maintained as appropriate.

7.4 A plan to indicate the location of the boundaries of the evaluated area and the site grid is to be drawn at a scale of 1:1250 (or a similar appropriate scale). Plans indicating the locations of the interventions are to be drawn at an appropriate scale. Sections will typically be drawn at a scale of 1:20, although can also be drawn at 1:10 or 1:50 if appropriate.

7.5 All section drawings will include a horizontal datum line, with both ends (and intervening points along the line if appropriate) tied in with the OS grid to 0.01m accuracy, and with its height above OD surveyed to the same level of accuracy. All plans and sections are to be levelled with respect to OD.

7.6 All plans and sections are to be drawn on polyester based drafting film and clearly labelled.

7.7 A full colour digital photographic record of the work is to be kept, including general shots of work in progress and a day-to-day digital photographic record of the investigation. The photographic record is to be regarded as part of the site archive.

7.8 The Archaeological Contractor will ensure that the complete site archive including finds and environmental samples are kept in a secure place throughout the period of evaluation and post excavation works.

7.9 The site archive is to be consolidated after completion of the evaluation work, with all records and finds collated and ordered as a permanent record.

8. Reinstatement and completion of fieldwork

8.1 On completion, all interventions will be backfilled or otherwise reinstated and left in a safe state to the requirements of the landowner / client.

8.2 Palaeolithic test pits should by default be backfilled directly after excavation of each has been completed, and before excavation of further test pits commences. In exceptional circumstances (for instance by special request of the County Archaeologist) Palaeolithic test pits may be left open for longer periods if deemed safe to do so, but these will then be fenced off and marked with clear warning signs.

8.3 Where vulnerable archaeological deposits remain in the ground these will be appropriately protected from damage as part of the reinstatement. Consideration will be given to providing a marker to highlight vulnerable archaeological deposits should re-excavation be necessary.

8.4 On completion of fieldwork the Archaeological Contractor will complete the relevant section of the Fieldwork Notification Form and submit it to the County Archaeologist.

9. Reporting

9.1 Within three weeks of completion of the fieldwork (or longer in case of complex sites as agreed with the County Archaeologist) the Archaeological Contractor and specialist/s will produce a report, copies of which (as a minimum) are to be provided to:

- the Developer
- the County Archaeologist
- the Local Planning Authority
- the Local Archaeological Society

9.2 When submitting the report to the County Archaeologist the Archaeological Contractor will provide written confirmation that the report has been submitted to the above parties.

9.3 If the Archaeological Contractor is required, contractually, only to submit reports directly to the developer or their agent, the Archaeological

Contractor must inform the County Archaeologist in writing that they have completed the report and whom it has been forwarded to. The Archaeological Contractor must ensure that the developer is made aware of the need to circulate the report as in 9.1 above.

9.4 The Archaeological Contractor may determine the general style and format of the evaluation report but it must be completed in accordance with this specification. The report must provide sufficient information and assessment to enable the County Archaeologist and the Local Planning Authority to reach an informed decision regarding any further mitigation measures that may be required and to stand as an appropriately detailed report on the archaeological fieldwork for future research.

9.5 Reports that do not provide sufficient information or that have not been compiled in accordance with the relevant sections of this specification will be returned to the Archaeological Contractor for revision and resubmission.

9.6 The report will be submitted to the County Archaeologist in a heat-bound hard-copy and in digital format. The digital copy will be supplied in .pdf format and will contain all text, images and plans present in the hard-copy report in a single .pdf file.

9.7 **Report Format** - The final evaluation report will include as a minimum:

9.7.1 An **Abstract** summarising the scope and results of the detailed evaluation.

9.7.2 An **Introduction** including:

- a map showing the site location, with OS grid lines and a linear scale
- the location of the site with National Grid Reference for the centre sufficient to locate the site to 1m accuracy (eg. TQ 44444 77777, or 12-figure NGR 544444 177777)
- an account of the background and circumstances of the work
- a description of the development proposals, planning history and planning reference together with the archaeological condition (where appropriate)
- the nature of potential impacts arising from the proposals
- the scope and date of the fieldwork, the personnel involved and who commissioned it

9.7.3 An account of the **Archaeological Background** of the development site including:

- geology, soils and topography, including a description of the likely pre-Quaternary and Quaternary geology of the proposed

development site and the surrounding area up to 3km from the site boundary, so far as could be interpreted prior to the evaluation work

- any known existing disturbances on the site
- background archaeological potential of the site for (a) Lower/Middle Palaeolithic, and (b) Upper Palaeolithic. This will include a review of known Historic Environment Record (HER) entries and other relevant records within the site, and for up to 3km from the site boundary. The HER entries will be quoted with their full KHER identifier (e.g. TR 36 NW 12)
- summary of any previous phases of archaeological investigation at the development site

9.7.4 A review of the **Aims and objectives** of the evaluation as specified in the site-specific (Part A) and generic (Part B) specifications must be detailed in the report, together with any further objectives identified during the course of the evaluation.

9.7.5 The **Methodology** employed during the detailed evaluation must be detailed in the report, including a description of the range and quantity of different interventions and a site layout plan showing all interventions. Any constraints on the evaluation will also be described. Simply referring to the methodology outlined in the specification is not acceptable.

9.7.6 The **Results** of the evaluation field work will be described for each trench/test-pit, borehole or standing section, including location, dimensions, nature of deposit encountered. The report will include, as appropriate, a detailed description of each intervention, tables summarising environmental samples taken, together with the results of processing and assessment.

9.7.7 Any results from the application of archaeological scientific techniques e.g. specialist dating will be included in the evaluation report.

9.7.8 An integrated **Quaternary stratigraphic framework** and deposit phases across the site, with interpretation of formation processes and deposit date, supported by (a) fence diagrams showing representative stratigraphic cross-sections across the site and (b) an appendix with full sedimentary descriptions of the sequence in each test pit, the ground surface height (mOD) at each test pit, the depth and thickness of each sedimentary unit identified during excavation, the sampling of each sedimentary unit, the finds and palaeo-environmental evidence recovered from each sedimentary unit, and a representative photo of the full sequence in each test pit.

9.7.9 **Finds recovery**, including lithic artefacts and any larger mammalian fossils, including sub-sections (supported by tables as appropriate) covering:

- on-site sieve sampling for, and recovery of, artefacts tied in with the integrated Quaternary stratigraphic framework
- a summary report on any lithic artefacts recovered, describing their technology and typology, assessing their condition and degree of disturbance, their importance, significance and relevance to Palaeolithic research priorities, and their potential for further analysis
- summary reports on any mammalian bones and other palaeoenvironmental remains recovered, assessing their condition and degree of disturbance, their importance, significance and relevance to Palaeolithic/Quaternary research priorities, and their potential for further analysis, supported by any relevant specialist reports as appendices

9.7.10 A **Quaternary dating and stratigraphic framework**, tied in with the global MIS framework and any key site-specific regional horizons and nearby sites.

9.7.11 A **Site model of deposit character and Palaeolithic potential**, dividing the site into Palaeolithic Historic Environment Areas (HEAs) of differing character and potential, supported by an appendix giving attribute details for each separate Palaeolithic HEA of its characteristic Quaternary deposits, its potential significance for Palaeolithic remains (including palaeo-environmental remains) and suitable approaches to further investigation.

9.7.12 The area covered by the HEA model should include a buffer zone of 50m around the site boundary, although it is recognised that modelling of the buffer zone may be based on less substantive data than within the site.

9.7.13 An **Impact Assessment** will consider the potential effects of the development on the sub-surface Quaternary deposits and any likely remains. The report will highlight any areas of sensitivity within the site. Particular note will be made of any variations in the depth of overburden covering any Quaternary deposits.

9.7.14 The **Conclusion** will summarises the method, results, interpretation and impact assessment.

9.7.15 The conclusion will assess the potential of the site for preservation of Palaeolithic remains at the site, and the likely importance of any remains with reference to regional and national research priorities. It will then identify any priorities for further investigation, and make recommendations for suitable approaches and methods for any further mitigating work

9.7.16 The evaluation report will include comments on the effectiveness of the methodology employed and the confidence of the results and interpretation.

9.7.17 The report will include a quantification of the project archive contents, their state and future location.

9.7.18 **Figures / illustrations** – The report will include sufficient illustrations to support descriptions and interpretations within the report text. Figures are to be fully cross-referenced within the document text. As a minimum the evaluation report will include the following figures:

- a site location plan tied into the Ordnance Survey at 1:1250 and showing the site boundary. The plan will also include at least two National Grid points to 1m accuracy, north arrow and a linear scale
- a site layout plan showing all intervention locations at an appropriate scale and the distribution of Palaeolithic HEAs. A copy of the plan will be overlain on the proposed development plan where this is known. Projections of HEAs for 50m beyond the site boundary will be shown on the plan. This plan will also include two National Grid points, north arrow and a linear scale
- relevant section drawings as appropriate
- illustrations and/or photographs of significant finds

9.7.19 All report illustrations must be fully captioned and scale drawings must include a linear scale. Standard archaeological drawing conventions must be used. North must be included on all plans and will be consistent. Sections must indicate the orientation of the section and the Ordnance Datum height of the section datum.

9.7.20 Black & White or Colour photographs will be included to illustrate key archaeological features, interventions and site operations. All photographs will be appropriately captioned.

10. Archive preparation & deposition

10.1 The site archive, to include all project records and cultural material produced by the project, is to be prepared in accordance with *Guidelines for the preparation of excavation archives for long-term storage (UKIC 1990)*. On completion of the project the Archaeological Contractor will arrange for the archive to be deposited in accordance with the provisional arrangements made with a suitable museum or repository at the onset of fieldwork. Any alternative arrangements will be agreed with the County Archaeologist and the Local Planning Authority.

11. Monitoring and liaison

11.1 The Archaeological Contractor is to allow the site records to be inspected and examined at any reasonable time, during or after the evaluation fieldwork, by the client/developer, the County Archaeologist or any designated representative of the Local Planning Authority

11.2 Once the detailed evaluation fieldwork has been carried out, there will be an on-site meeting with the Archaeological Contractor, the specialist/s and the County Archaeologist to determine if further work is appropriate in order to meet the objectives.

11.3 The Archaeological Contractor will liaise closely with the County Archaeologist throughout the course of the evaluation and will arrange for on-site meetings at key decision points.

11.4 The Archaeological Contractor is to make contact with the local archaeological society and keep them informed on the progress of the evaluation. Subject to health and safety constraints the Archaeological Contractor will afford opportunity to the local archaeological society to visit the evaluation site. Copies of all reports will be provided to the local archaeological society.

11.5 The Archaeological Contractor is to circulate a completed Fieldwork Notification & HER Summary Form (Appendix 1) at the start and completion of fieldwork and at the completion of post excavation reporting stages.

12. Copyright and data protection

12.1 Information submitted to the County Archaeologist in conjunction with planning applications automatically becomes publicly accessible and can be viewed by anyone at any time. In addition, the Local Planning Authority and Kent County Council are subject to the requirements of the Freedom of Information Act (2000) and Environmental Information Regulations (2004). Information may be subject to FoI or EIR requests and any documentation submitted in connection with the project may be made publicly available unless doing so contravenes the Data Protection Act (1998).

12.2 While copyright of reports and other information arising from the fieldwork remains with the originator, the Archaeological Contractor will undertake to make this information available to interested parties. The Archaeological Contractor will agree to allow reports of the fieldwork to be copied electronically and made available to interested parties for archaeological research. The reports may be made available on the Internet no sooner than three months after the submission of the report. Archaeological Contractors who believe that there are special reasons for not publishing the report on the Internet should reach a separate agreement with the County Archaeologist.

13. Health and Safety

13.1 The Archaeological Contractor will conduct the work in compliance with the Health and Safety at Work etc Act 1974. The Archaeological Contractor will also follow the guidance set out in “Health and Safety in Field Archaeology” Standing Conference of Archaeological Unit Managers (now Federation of Archaeological Managers & Employers) 1997.

13.2 The Archaeological Contractor is expected to maintain a Health and Safety Policy and a procedures manual and have available appropriate expertise in Health and Safety advice. Site staff will have an appropriate level of training to enable them to carry out fieldwork safely.

13.3 The Archaeological Contractor will maintain the site in a safe condition. All hazards will be appropriately identified and managed. Deep excavations will never be left open untended, and will typically be backfilled shortly after excavation. If not backfilled, they will be appropriately fenced and signed.

13.4 The Archaeological Contractor will carry out a risk assessment prior to commencement of fieldwork and where appropriate a COSHH assessment. Risks and measures to reduce risk will be communicated to all working on and visiting the site.

13.5 The Archaeological Contractor will have available suitable site accommodation, welfare and toilet facilities.

14. KCC Historic Environment Record

14.1 The Archaeological Contractor is to provide the Kent Historic Environment Record (HER) with copies of all reports in both heat-bound hard-copy and digital format (see 9.6 above).

14.2 Upon completion of the excavation the Archaeological Contractor will supply the Kent Historic Environment Record with a completed Fieldwork Notification & HER Summary form (see Appendix 1)

14.3 The Archaeological Contractor will supply the Kent Historic Environment Record with the following digital datasets:

- A .dxf file containing polygon data that describes in detail all excavated/monitored area boundaries, whether trenches, test pits, excavated areas or areas examined by watching brief. This .dxf file must be internally geo-referenced (i.e. the co-ordinate system used in the file must be the Ordnance Survey co-ordinate system).
- A separate .dxf file that contains a number of Layers. Each Layer should represent a different phase of the archaeological remains on site. The name of each Layer must be the phase number used on the site accompanied by a date range (e.g. “2, from –2000 to –

800", "7A, from 410 to 700" etc). Each layer must contain only the features relevant to that phase digitized as polylines. Where the dating is based on scientific dating methods such as radiocarbon, the dates must be calibrated calendar dates.

14.4 A guidance document has been produced for Kent County Council that will inform contractors as to how this information can be produced within AutoCad. This document is available from the County Archaeologist and Kent County Council Historic Environment Record.

14.5 The Archaeological Contractor should also provide a representative selection of digital site photographs illustrating the archaeology of the site and the operations of the investigation. These will be in .jpg format at a minimum 300dpi. These will be deposited with the County HER and will be used for presentations on aspects of the archaeology of Kent.

14.6 It is to be understood that photographs and notes taken by KCC Archaeological Officers in connection with the work that do not identify individuals or site locations may be used by KCC for outreach and publicity purposes, including on social media sites such as Facebook, Twitter etc. The Archaeological Contractor should**, preferably in advance** of the works, raise with the KCC Archaeological Officer any concerns that they or their client may have over the use and dissemination of images or information for outreach purposes. In such cases the Archaeological Contractor and their client will agree a protocol with the KCC Archaeological Officer for the appropriate dissemination and use of images and information which balances the concerns of the contractor and/or client with the objective of ensuring that the people of Kent are kept informed of the archaeological discoveries in the county.'

15. General

15.1 In carrying out the work the Archaeological Contractor is to abide by:

- all statutory provisions and by-laws relating to the work in question,
- the Chartered Institute of Field Archaeologists *Code of Conduct,*
- the Chartered Institute of Field Archaeologists *Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology*.

APPENDIX 1. KENT COUNTY COUNCIL HER SUMMARY AND FIELDWORK NOTIFICATION FORM

HER & Fieldwork Notification Form

Sections **A** and **B** to be sent digitally to KCC Heritage Conservation Group **in advance of the start of fieldwork**.
Section **C** to be completed and sent **at end of fieldwork**.
Section **D** to be filled in and sent with completed report.

SECTION A - PROJECT DETAILS			
Site/Project Name:		**NGR:**	
Site Address:			
Archaeological Contractor (inc name and address of project contact):			
Commissioning Body/Client:			
Development Proposals/Reason for Fieldwork:		**Planning Reference:**	

SECTION B - COMMENCEMENT OF FIELDWORK					
Type of Archaeological Fieldwork:		**Site Supervisor:**			
		Site Contact Details:			
Specification for Works?:					
Local Museum Notified:			**Site Code:**		
	Date:				
Local Arch Soc Notified:					
	Date:				
START DATE:		**ANTICIPATED DURATION:**		days/weeks	

I (archaeological contractor) confirm that all necessary provision has been made for the resources to complete the archaeological fieldwork, post-excavation analysis and reporting in accordance with the agreed specification.			
Name:			
On behalf of:			
Signed:		**Date:**	
SECTION C - COMPLETION OF FIELDWORK			
Date Fieldwork Completed:		**Was fieldwork monitored by KCC/EH/Other?**	
Further Fieldwork Anticipated:		**Who?**	
Map attached showing site location and extent of intervention?			
Summary of results (Continue on separate sheet if necessary):			
Agreed Reporting Stages and Program:			

Name:			
On behalf of:			
Signed:		**Date:**	

SECTION D - COMPLETION OF POST-EXCAVATION ANALYSIS & REPORTING

Reports Submitted (Titles)	Copies to: (Number)						
	KCC	LPA	Arch Soc	Client	EH	Other	Digital Copies

HER Data:

Digital Mapping Data?		Notes:

Location and Destination of Archive:

Name:			
On behalf of:			
Signed:		**Date:**	

Guidance for Completing the Kent Archaeological Fieldwork Notification Form

Purpose

The purpose of the form is to improve the notification, tracking and monitoring of archaeological fieldwork in Kent. Its primary purpose relates to archaeological work being undertaken for the purposes of planning and development but it is hoped that it will be also usable by archaeological societies and other bodies undertaking fieldwork in the county.

Approach

- The archaeological body undertaking the fieldwork should fill in the form. Sections A and B should be filled in before fieldwork starts and submitted to the County Archaeologist. This may be submitted in digital copy to speed things along but a signed copy should follow in the post.

- Section A contains details of the project while Section B refers specifically to the onset of the phase of fieldwork. In signing section B the Archaeological Contractor is confirming that the necessary funds and resources to complete the works to the specification have been made available.

- The form should not be filled in separately for each period of an intermittent watching brief but should be filled in for major stages of fieldwork, for example separate phases of evaluation and excavation.

- Section C should be submitted at the completion of the fieldwork stage and should if known indicate whether further work is anticipated. This section sets out a brief summary of findings and what reports are to be submitted. For excavations these will include interim, assessment and full reports. Again the form may be submitted digitally with a signed copy to follow in the post. (The details of Sections A and B should remain filled in on the same form).

- Section D should be submitted as reports are submitted to the County Archaeologist. For excavations the form need not be submitted with interim reports but should be submitted with assessment and full reports.

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Appendix 3: Draft Written Scheme of Investigation for Geoarchaeological Borehole Survey

London Resort
Swanscombe
Kent

Written Scheme of Investigation for Geoarchaeological Borehole Survey

Document Ref.: 106575.01
December 2020

wessexarchaeology

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

Document Information

Document title	London Resort, Swanscombe Peninsula, Kent
Document subtitle	Written Scheme of Investigation: Geoarchaeological Borehole Survey
Document reference	106575.01
Client name	London Resort Company Holdings
Site location	Swanscombe Peninsula
County	Kent
National grid reference	560379 175682 (TQ 60379 75682)
Statutory designations	None
Planning authority	Kent County Council
WA project code(s)	106575
Date(s) of fieldwork	tbc
Fieldwork directed by	tbc
Project management by	Dave Norcott
Document compiled by	Dr Alex Brown
Graphics by	Richard Milwain

Quality Assurance

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Figure 1 Proposed borehole locations

London Resort, Swanscombe Peninsula, Kent

Written Scheme of Investigation: Geoarchaeological Borehole Survey

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) has been commissioned by London Resort Company Holdings (hereafter referred to as 'the Client') to prepare a Written Scheme of Investigation (WSI) for a purposive borehole survey for the London Resort, a proposed new entertainment resort located on the banks of the River Thames in North Kent.

1.1.2 The scheme consists of two project Sites, principally located on the Swanscombe peninsula (Kent Project Site) with transport facilities proposed for the north side of the Thames to the east of the Tilbury Docks (Essex Project Site). This WSI concerns proposed geoarchaeological works at the Kent Project Site.

1.1.3 The Kent Project Site comprises an irregular parcel of land totally approximately 390ha, located predominantly on the Swanscombe peninsula and including a broadly north-south corridor of land between the Peninsula and the A2, and a 3.5km length of the A2 corridor between the current Bean and Pepper Hill junctions to the west and east respectively.

1.2 Scope of document

1.2.1 This WSI sets out the strategy and methodology by which the Archaeological Contractor will implement the geoarchaeological fieldwork, and subsequent office and laboratory-based works in support of the boreholes.

1.2.2 In format and content this report conforms with current best practice and to the guidance outlined in *Management of Research Projects in the Historic Environment* (MoRPHE) (Historic England 2009), *Geoarchaeology. Using Earth Sciences to Understand the Archaeological Record* (Historic England 2015) and the Chartered Institute for Archaeologists' *Standards and Guidance for Archaeological Watching Brief* (CIfA 2014a). It will be submitted and approved by the client prior to fieldwork commencing.

2 GEOARCHAEOLOGICAL BACKGROUND

2.1.1 This section provides a background to the geoarchaeology within the proposed development area, drawing on relevant sites and studies within the wider landscape. The archaeological background to the Site is presented in the Archaeological Desk Based Assessment (Wessex Archaeology 2020).

2.1.2 Where age estimates are available these are expressed in millions of years (MA), thousands of years (Ka) and within the Holocene epoch as either years Before Present (BP), Before Christ (BC) and Anno Domini (AD). Depths of deposits are provided as metres below ground level (mbgl) and mOD (metres Ordnance Datum).

2.2 Topography

2.2.1 The Swanscombe peninsula is located on gently undulating low-lying ground between 1 to 6mOD (**Figure 1**). The majority of the peninsula is currently occupied by marshland, some improved agricultural land and extensive tracts of made ground consisting largely of built-up areas of cement kiln dust (CKD) from previous industrial activities. A flood defence barrier surroundings the peninsula, providing protection from high tides although regular flooding occurs as a result of high water tables across the peninsula.

2.3 Solid Geology

2.3.1 The solid geology underlying the peninsula is mapped by the British Geological Survey (BGS) as Lewes Nodular Chalk, Seaford Chalk and Newhaven Chalk Formations, formed during the Cretaceous Period between 72–94 MA.

2.4 Superficial Geology

2.4.1 The superficial geology underlying the peninsula comprises a sequence of Holocene and Pleistocene deposits.

2.4.2 An area of Pleistocene Head deposits is mapped in the southwest corner of the site, surrounding an infilled chalk pit. Head deposits in the area have produced Middle Palaeolithic (240-160 kya) archaeology (Wenban-Smith 1995, Scott 2010, 2011, Scott *et al*. 2011).

2.4.3 Geoarchaeological investigations were undertaken within the southern and central area of the peninsula in advance of construction of the Channel Tunnel Rail Linl (CTRL). These investigations identified a sequence of late Pleistocene Gravels belonging to the Shepperton Member, overlain by Holocene deposits (Bates and Stafford 2013).

2.4.4 The Holocene deposits comprise alluvial sediments forming part of the Thames floodplain sequence of deposits encountered widely across the Lower Thames Estuary. The Thames floodplain deposits comprise a range of sediments that have variously accumulated over the last approximately 11,500 years under the influence of rising post-glacial sea-levels, including:

- **Minerogenic alluvium** comprising variable sequences of clays, silts and sands that form the dominant component of the Holocene sequence, representing former mudflat and saltmarsh environments;
- **Peat**, often forming in relict channels (palaeochannels) or as distinct layers interbedded in alluvium, representing the partially decayed waterlogged remains of plants formed in a range of semi-terrestrial habitats (e.g. tall-herb swamp and wet carr-woodland).
- **Organic-rich muds**, typically present as dark-hued organic rich clays and silts formed in stagnant or slow moving backswamp environments or deactivated channels, and distinct from minerogenic alluvium that may contain in-washed organic matter.

2.4.5 Geoarchaeological work to the south of the peninsula along the line of the CTRL identified two peat horizons interbedded in alluvium, with radiocarbon dates producing a late Mesolithic date on the basal peat (6610-5520 cal. BC) and a Neolithic to early Bronze Age date for the upper peat (3970-1500 cal. BC) (Bates and Stafford 2013). Any peat deposits

present across the peninsula will be of a similar date extending across the Mesolithic to Iron Age.

2.4.6 A recent ERT survey across the peninsula (Wessex Archaeology 2017) detected a wide range of deposits across the Site. The aim of the geophysical survey was to provide information on the stratigraphic units across the Site, in particular regarding the locations of any raised sand and gravel islands, major channels, and alluvium/ peat deposits and, thus characterise the landscape in terms of archaeologically relevant topographic features.

2.4.7 Made Ground is present across the peninsula including two large mounds of cement kiln dust (CKD) with the centre of the peninsula. Between 4 – 6m of made ground is suggested within the centre of the peninsula.

2.4.8 The deposits of alluvium and peat vary significantly in thickness across the peninsula and are generally thinnest (<4m) towards the north-eastern and central-southern parts of the peninsula, with >6m recorded at the northernmost point of the peninsula.

2.4.9 Existing borehole data from the peninsula is spare and shallow, although a borehole on the eastern edge of the peninsula includes a 1.1m thick peat (-4.53 to -5.63mOD; 12.30-13.40mbgl) bedded in alluvium to a depth > -7mOD (15mbgl).

2.4.10 The ERT surveys suggest significant variation in the upper surface of the river terrace sands and gravels in the form of undulations that could represent the location of former channels. The surface of the gravels appears higher in the centre of the peninsula (c. -5mOD) compared to c. -10mOD elsewhere across the peninsula.

2.5 Geoarchaeological potential of deposits

2.5.1 The geoarchaeological and archaeological potential of the key deposits likely to encountered in boreholes across the peninsula can be summarised as follows and considered later in the context of the results of the deposit modelling.

Peat

2.5.2 Multiple peat beds stratified amongst significant depths of alluvium with the potential to date variously to the Mesolithic to Bronze/Iron Age. These peat deposits can vary in thickness from a few centimetres to over a metre or more, forming laterally and horizontally variable but extensive deposits within the alluvium. The peats also vary in composition, from structureless peats lacking visible plant remains to herbaceous (representing tall herb swamp habitats) and wood peats (representing alder-dominated wet carr-woodlands through to drier woodlands including oak and hazel).

2.5.3 The peats are geoarchaeologically significant, representing phases of reduced and/or stable sea-levels during which semi-terrestrial plant communities replaced mud flats and saltmarsh, providing a range of environmental niches for human and animal exploitation. Peat deposits contain a range of palaeoenvironmental remains and material suitable for scientific dating, providing evidence on past vegetation, environmental change and human land-use within the wetland and associated dry ground.

2.5.4 Where thicker peat layers are encountered, they have increased potential to contain archaeology, including waterlogged wooden structures and artefacts. Timber trackways have been unearthed in peat at a number of locations with the Thames floodplain of East London, in almost all cases during commercial developer-led investigations or eroding along the exposed foreshore (see Stafford et al. 2012, chapter 10 for a review). The nearest

examples to the Kent Project Site are exposed on the foreshore at Erith Marshes (Bennell 1998) and at Rainham Marshes to the north (Meddens 1996). In almost all cases these trackways date to the Late Neolithic and Early Bronze Age.

Alluvium

2.5.5 Alluvial clays, silts and sands volumetrically form the primary component of the Holocene alluvial sequences mapped and preserved along the floodplain of the Thames Estuary. These deposits represent sediment accumulating under the influence of rising post-glacial sea-levels, deposited within a range of settings from early Holocene channel systems through to mud flats and salt marsh environments within the succeeding extensive intertidal floodplains.

2.5.6 The geoarchaeological potential of the alluvium is low, although it still has the potential to contain or partially mask archaeology. Although alluvium contains palaeoenvironmental remains such as pollen and plant macrofossils, these are often poorly preserved and of uncertain source area, transported fluvially over potentially large areas. Alluvium also lacks suitable material of secure context for radiocarbon dating.

2.5.7 However, targeted investigation of microfaunal remains contained in alluvium (e.g. diatoms, foraminifera and ostracods) can be useful for understanding the balance between marine and freshwater environments, particularly in relation to alluvium contained in early Holocene channels and where peat deposits provide datable horizons

Organic rich muds

2.5.8 Organic rich muds have been recorded amongst alluvial deposits in the Thames Estuary and tributaries. These deposits, like peat, are highly variable in extent, forming at stages in low energy environments including slow-moving or deactivated channels and within freshwater back swamp environments

2.5.9 Where associated with peat, organic muds may represent part of a hydroseral succession from freshwater swamps through to peat-forming tall herb swamp and carr-woodland communities. Lenses or bands of organic muds within peat could also reflect the development of freshwater pools within floodplain woodland habitats, sporadic or short-term flooding and fluctuating water-levels or retrogressive hydroseral successions. Deposition of organic clays may therefore occur in response to both large-scale and local factors, reflecting the spatially and temporally dynamic nature of wetland environments.

2.5.10 The geoarchaeological potential of organic rich deposits is high and comparable to peat, containing a range of palaeoenvironmental remains and material suitable for radiocarbon dating.

3 AIMS AND OBJECTIVES

3.1.1 This WSI outlines the program of geoarchaeological evaluation and reporting. The purposive borehole survey is required to map and characterise the superficial geological deposits across the peninsula, identifying areas of geoarchaeological and archaeological potential, at a scale that can most effectively inform future decision making and mitigation of impact to the buried archaeological resource.

3.1.2 The specific aims and objectives of the borehole survey are as follows;

- Identify the presence of sequences of alluvium, peat and former land surfaces (e.g. soil or insipient soil horizons);
- Obtain representative samples through the deposits;
- Assess the geoarchaeological and archaeological significance of the deposits; and
- Make suitable, proportionate recommendations for further action
- Ground-truth the results of the ERT and EMI geophysical survey across the peninsula

3.1.3 The project aims will be addressed by achieving the following objectives

- Achieve a good coverage of boreholes across the Site (41 is the target, but we have built in redundancy);
- Obtain representative samples through the sedimentary sequences;
- Deposit modelling of borehole and GI data to map the extent and depth of deposits;
- Make specific recommendations for further work, with a commitment to undertake these works, taking into account key research questions. Further works might include palaeoenvironmental assessment and radiocarbon dating of retained sequences and targeted archaeological evaluations.

4 FIELDWORK METHODS

4.1.1 Significant deposits of made ground are distributed across the Site, in places contaminated with CKD and up to 4–6m thick. This presents a challenge for effective drilling and sampling. The borehole survey will be designed in close collaboration with geotechnical engineers to ensure that the most appropriate drilling techniques are employed to safely investigate and retrieve samples through the superficial deposits.

4.1.2 During the course of drilling all efforts will be taken to avoid mixing of contaminated ground and the water aquifer, and provision will be made for the suitable safe disposal of contaminated ground.

4.1.3 Drilling methods are likely to involve the use of a rotary rig with dynamic sampling head to extract sleeved cores one metre in length through superficial deposit (to refusal or solid geology) at 47 locations across the Site (**Figure 1**). Boreholes have been located to ground truth the geophysics and provide a wide coverage of geoarchaeological deposits for deposit modelling, maximising the value of the existing GI data from the Site.

4.1.4 The rig will be operated by experienced engineers under the supervision of a suitably experienced member of the Wessex Geoarchaeology team.

4.1.5 The cores will be split and described on-site by the geoarchaeologist as work proceeds. Where sequences are recorded that warrant further investigation, sequences will be resealed and returned to the Wessex Archaeology laboratory at Salisbury for further detailed geoarchaeological investigations.

4.1.6 Selected cores for further assessment will be sealed and marked within project number, site number, borehole number and sample depth before being returned to the Wessex Archaeology laboratory.

4.1.7 Before drilling commences, service plans will be consulted, and all locations scanned using a Cable Detection tool by a trained operative.

4.1.8 Boreholes described in the field or retrieved for later description will include the following information;

- Depth
- Texture
- Composition
- Colour
- Inclusions
- Structure (bedding, ped characteristics etc)
- Contacts between deposits

4.1.9 Interpretations will be made regarding the likely depositional environments and formation processes of the sampled deposits. The data will be tabulated by borehole and depth.

5 POST-FIELDWORK METHODS

5.1 Laboratory-based sediment description

5.1.1 Boreholes retrieved for laboratory-based description will include the following information;

- Depth
- Texture
- Composition
- Colour
- Inclusions
- Structure (bedding, ped characteristics etc)
- Contacts between deposits

5.2 Deposit modelling

5.2.1 Deposit models for the Site follow combining the results of the purposive boreholes surveys integrated with the results of GI works and geophysical surveys.

5.2.2 Deposit modelling enables the subsurface topography to the mapped accurately, locating deposits of archaeological and geoarchaeological potential in three-dimensions.

5.2.3 All available data points will be entered into industry standard software (Rockworks™ v17.0). Each lithological description (e.g., peat, clay, silt, sand etc.) will be given a colour and pattern allowing cross correlating and grouping of the different sediment and soil types. The grouping of these deposits is based on these lithological descriptions, which define distinct depositional environments referred to as 'stratigraphical units' (e.g. alluvium, peat, buried soils etc.).

5.2.4 Where suitable contexts are present, stratigraphical units representing certain depositional environments and/or landforms, will be reconstructed both laterally and horizontally, including where possible Digital Elevation Models (DEMs), thickness plots and linear transects.

5.3 Reporting

5.3.1 Following completion of each phase of fieldwork, and assessment of the stratigraphic evidence, a draft assessment report will be submitted for approval to the client and the KCC County Archaeologist, for comment. Once approved, a final version will be submitted.

5.3.2 The Phase One and Phase Two report will include;

- A summary sheet to be used to create an initial, basic HER event record, including the following information:
- A non-technical summary;
- Project background;
- Geoarchaeological and archaeological background;
- Project aims and objectives;
- Methods;
- Results, including:
    - detailed summary of the results of the purposive borehole survey, including description, deposit modelling and interpretation of results;
- A preliminary discussion of the likely archaeological and palaeoenvironmental potential and significance of the deposits, with reference to wider archaeological and landscape context;
- Proposals with specific details of further recommended archaeological evaluation, palaeoenvironment assessment and dating work to be undertaken (where relevant and appropriate), with a commitment to undertaking these;
- Appropriate illustrations, including sample locations and schematic transect diagrams where appropriate;
- Appendices containing all core log and trench data;

- References.

5.3.3 Once the report has been approved, the contractor will send a full colour copy of the report, along with surveyed spatial digital data (.dxf or shapefile format) relating to evaluation, to the client and the KCC Country Archaeologist. The contractor will also deposit a full colour paper copy of the report as part of the archive (see below).

6 ARCHIVE

6.1 Preparation and deposition

6.1.1 In an agreed timeframe of the completion of all aspects of the project, the complete project archive, which will include paper records, photographic records, graphics, and digital data, will be prepared, compiled and presented in accordance with nationally recommended guidelines (SMA 1995; Brown 2011; ADS 2013; CIfA 2014b). Archive deposition will be arranged in consultation with the Archaeology Data Service (ADS) and conform to their deposition requirements (ADS 2013 and online guidance). If necessary, the paper records of the Site archive will be security microfilmed prior to deposition.

6.1.2 All archive material will be marked with the site code, museum accession code and a full index included.

6.1.3 Prior to deposition, the archive will be retained at Wessex Archaeology for a period of up to one year from completion of fieldwork

6.1.4 Storage facilities will be provided to temporarily house the material archive, including small finds, bulk finds (e.g. animal bones) and environmental samples (e.g. boreholes). All finds will be recorded, cleaned, catalogued and placed in suitable secure storage.

6.2 Security copy

6.2.1 In line with current best practice (e.g. Brown 2011), on completion of the project a security copy of the written records will be prepared, in the form of a digital PDF/A file. PDF/A is an ISO-standardised version of the Portable Document Format (PDF) designed for the digital preservation of electronic documents through omission of features ill-suited to long-term archiving.

6.3 OASIS

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

6.4 Discard policy

6.4.1 Wessex Archaeology follows the guidelines set out in *Selection, Retention and Dispersal* (SMA 1993), which allows for the discard of selected artefact and ecofact categories which are not considered to warrant any future analysis. The discard of environmental remains and samples follows nationally recommended guidelines (SMA 1993; 1995; Historic England 2011).

6.4.2 Any discard of artefacts or environmental samples will be in agreement with the landowner, Environment Agency archaeologist, LPA archaeologist and museum curator and will be fully documented in the project archive.

7 COPYRIGHT

7.1 Archive and report copyright

7.1.1 The full copyright of the written/illustrative/digital archive relating to the project will be retained by Wessex Archaeology under the *Copyright, Designs and Patents Act* 1988 with all rights reserved. The client will be licenced to use each report for the purposes that it was produced in relation to the project as described in the specification. The museum, however, will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use conforms to the *Copyright and Related Rights Regulations* 2003.

7.1.2 Information relating to the project will be deposited with the ADS where it can be freely copied without reference to Wessex Archaeology for the purposes of archaeological research, or development control within the planning process.

8 QUALITY STANDARDS

8.1 External quality standards

8.1.1 Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its *Code of conduct* (CIfA 2014c) and *Regulations for professional conduct* (CIfA 2014d). All staff directly employed or subcontracted by Wessex Archaeology will be of a standard approved by Wessex Archaeology, and archaeological staff will be employed in line with the CIfA codes of practice and will normally be members of the CIfA.

8.2 Personnel

8.2.1 The team will be directed and supervised by experienced Geoarchaeologists from Wessex Archaeology's core staff, who will be on site at all times for the length of the fieldwork, as required. The overall responsibility for the conduct and management of the project will be held by one of Wessex Archaeology's project managers, who will visit the site, as appropriate, to monitor progress and to ensure that the scope of works is adhered to. The appointed manager, geoarchaeologists, archaeologists and geophysicists will be involved in the investigation through to its completion.

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

8.3 Internal quality standards

8.3.1 Wessex Archaeology is an ISO 9001 accredited organisation (certificate number FS 606559), confirming the operation of a Quality Management System which complies with the requirements of ISO 9001:2008 – covering professional archaeological and heritage advice and services. The award of the ISO 9001 certificate, independently audited by the British Standards Institution (BSI), demonstrates Wessex Archaeology's commitment to providing quality heritage services to our clients. ISO (the International Organisation for

Standardisation) is the most recognised standards body in the world, helping to drive excellence and continuous improvement within businesses.

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

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

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

8.4 Practice and Guidance

8.4.1 Wessex Archaeology fully endorses the Code of Conduct and the Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology of The Institute for Archaeologists. All staff would be of a standard approved by Wessex Archaeology, be employed in line with The Institute for Archaeologists Codes of Practice and be members of The Institute for Archaeologists.

9 INSURANCE AND HEALTH AND SAFETY

9.1 Policy and Risk Assessment

9.1.1 Health and Safety considerations will be of paramount importance in conducting all fieldwork. Safe working practises will override archaeological considerations at all times.

9.1.2 At the outset of archaeological works the Client's Contractor/Health & safety Co-ordinator will advise what procedures are in place to meet and comply with health and safety requirements. Wessex Archaeology will follow what requirements are made in this regard.

9.1.3 All work will be carried out in accordance with the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety Regulations 1992, and all other relevant Health and Safety legislation, regulations and codes of practice in force at the time.

9.1.4 Wessex Archaeology will supply a copy of their Health and Safety Policy and a Risk Assessment to the Client before the commencement of any fieldwork. It will be prepared by the nominated Project Manager to ensure that potential hazards have been identified and mitigation or control measures will be implemented before and during the archaeological works.

9.1.5 The Risk Assessment will have been read and understood by all staff attending the Site before any groundwork commences.

9.1.6 Wessex Archaeology has both public liability (£10,000,000) and employers liability insurance (£10,000,000).

9.1.7 Wessex Archaeology will ensure that all work is carried out in accordance with the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety Regulations 1992.

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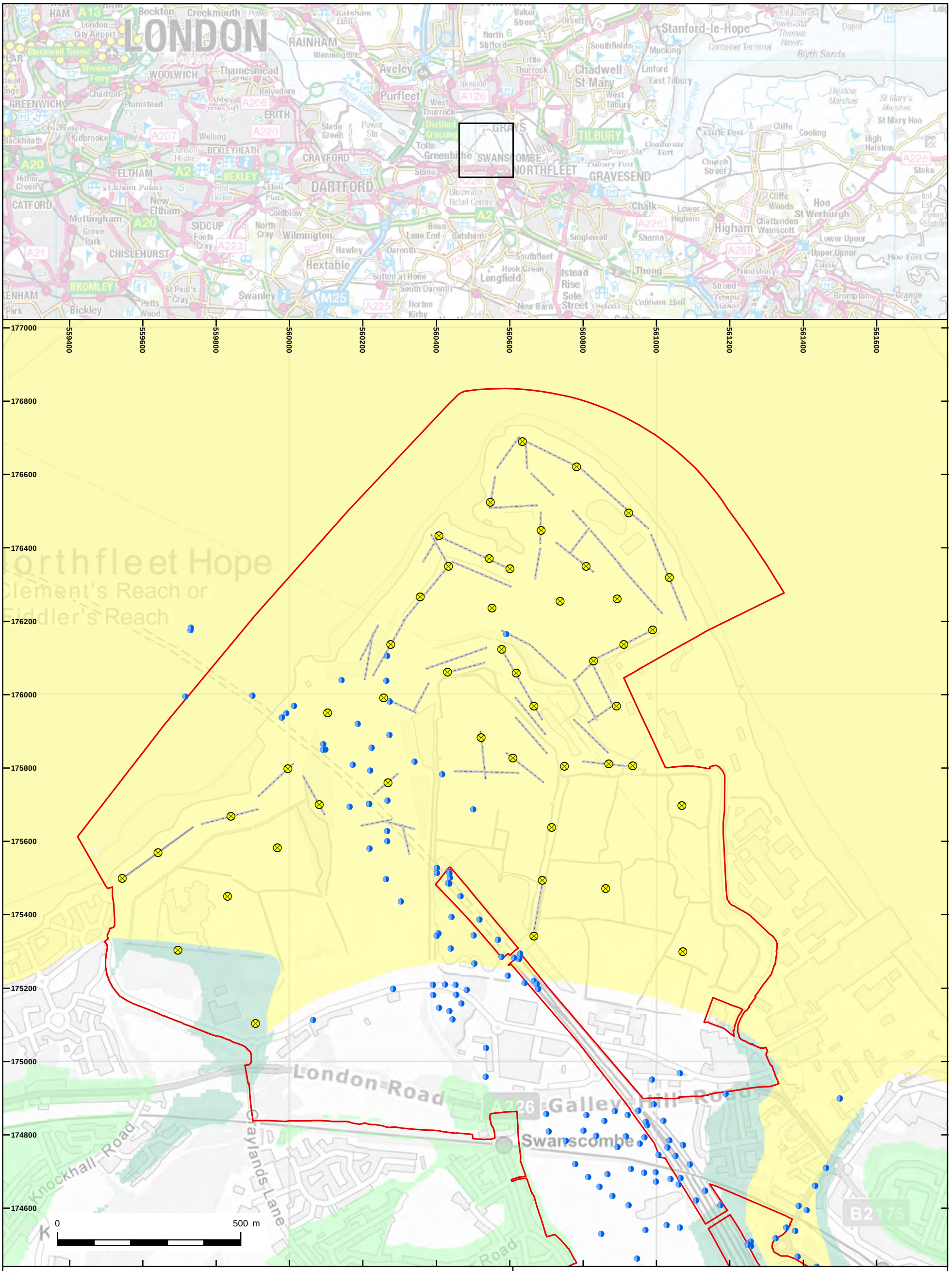

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Site location

Figure 1

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FS 606559

Appendix 4: Draft Written Scheme of Investigation for Archaeological Evaluation and Historic Landscape Survey at former Portland Cement Works

London Resort
Manor Way
Swanscombe
Kent

Written Scheme of Investigation for Archaeological Evaluation and Historic Landscape Survey

Document Ref.: 106574.05
December 2020

wessexarchaeology

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London Resort
Manor Way
Swanscombe
Kent

Written Scheme of Investigation for Archaeological Evaluation and Historic Landscape Survey

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) has been commissioned by London Resort Company Holdings (hereafter referred to as 'the Client') to prepare a Written Scheme of Investigation (WSI) for an archaeological evaluation and historic landscape survey of land at Manor Way, Swanscombe for the proposed London Resort, a new entertainment resort located on the banks of the River Thames in North Kent.

1.1.2 The scheme consists of two project Sites; the Kent Project Site principally located on the Swanscombe peninsula, with a transport corridor to the A2 to the south and the Essex Project Site proposed for transport facilities on the north side of the Thames to the east of the Tilbury Docks. The DCO order limits are shown on **Figure 1**. This WSI concerns proposed archaeological works at the Swanscombe peninsula at the Kent Project Site.

1.1.3 The Kent Project Site comprises an irregular parcel of land totally approximately 390ha, located predominantly on the Swanscombe Peninsula and including a broadly north-south corridor of land between the Peninsula and the A2, and a 3.5km length of the A2 corridor between the current Bean and Pepper Hill junctions to the west and east respectively (**Figure 1**).

1.1.4 The focus of the archaeological investigations is the former cement works and for the purposes of this work a 'Site' boundary has been created within which the works will take place. This Site boundary has been created using the largest extent of the former Portland Cement Works as shown on historic maps including the area of the tramlines which extended up to White's Jetty. Within this a trial trench evaluation area has been identified which focusses on the extent of the former built form associated with the cement works. These outlines along with the trench proposals are shown on **Figure 2**.

1.1.5 Prior to the commencement of the trial trench evaluation a historic landscape survey of the Site is proposed to identify and record any remains of the works that are upstanding or at ground level. The trial trench evaluation will comprise the excavation, investigation and recording of 20 trial trenches of varying lengths of 40m and 50m and 2m width (**Figure 2**). The archaeological evaluation is focussed upon the remains of the former Portland Cement Works and also involves a historic landscape survey of surviving industrial remains including tramlines and foundation pads that exist above/at ground level.

1.2 Scope of document

1.2.1 This WSI sets out the aims of the evaluation, and the methods and standards that will be employed. In format and content, it conforms to current best practice, as well as to the guidance in *Management of Research Projects in the Historic Environment* (MoRPHE,

Historic England 2015a) and the Chartered Institute for Archaeologists' (CIfA) *Standard and guidance for archaeological field evaluation* (CIfA 2014a) Kent County Council's (KCC) Manual of Specifications Part B: Evaluation-Trial Trenching requirements (**Appendix 2**) and Historic England's *Understanding the Archaeology of Landscapes; A Guide to Good Recording Practice* (Historic England 2017).

1.2.2 This document will be submitted to the County Archaeologist, archaeological advisor to the Local Planning Authority (LPA), for approval, prior to the start of the archaeological works.

1.3 Location, topography and geology

1.3.1 The peninsula is located on gently undulating low-lying ground between 1 to 6mOD. The majority of the Swanscombe peninsula is currently occupied by marshland, some improved agricultural land and extensive tracts of made ground consisting largely of built-up areas of cement kiln dust (CKD) from previous industrial activities. A flood defence barrier surrounds the peninsula, providing protection from high tides although regular flooding occurs as a result of high water tables across the peninsula.

1.3.2 The Site is currently occupied by a mixture of existing industrial business use (MJD Group) to the south of Manor Way and an area of tarmac, concrete and hardstanding to the north of manor way which has become overgrown with scrub in places. Further north a track leads through the former marshland towards White's Jetty.

1.3.3 The solid geology underlying the Site is mapped by the British Geological Survey (BGS) as Lewes Nodular Chalk, Seaford Chalk and Newhaven Chalk Formations, formed during the Cretaceous Period between 72–94 MA. The solid geology underlying the Site is mapped by the British Geological Survey (BGS) as Lewes Nodular Chalk, Seaford Chalk and Newhaven Chalk Formations, formed during the Cretaceous Period between 72–94 MA.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 Introduction

2.1.1 The archaeological and historical background was assessed in an Archaeological Desk-Based Assessment (Wessex Archaeology 2020), which considered the recorded historic environment resource within a 1km study area of the proposed development. Due to the size of the area considered for the DCO Order Limits and the rich archaeological resource in the surrounding area, only a very brief summary of the early periods is provided below. As this evaluation has been devised to target the remains of the former Portland Cement Works this is the focus of the archaeological and historical background here. Relevant entry numbers from the Kent Historic Environment Record (HER) and the National Heritage List for England (NHLE) are included below as appropriate and additional sources of information are also referenced.

2.1.2 The geoarchaeological background of the Swanscombe peninsula is presented within the Archaeological Desk-Based Assessment (WA 2020; 106574.01) and within the Written Scheme of Investigation for geoarchaeological borehole survey (WA 2020; 106575.01).

2.2 Archaeological and historical context

Prehistoric

2.2.1 The Kent Project Site (DCO Order Limits) contains two areas that are designated Scheduled Monuments known as Palaeolithic Sites near Bakers Hole which are located within the central corridor of the Site (1003557) and are also within the Site of Special Scientific Interest (SSSI) which is designated for its geological and archaeological value.

2.2.2 Quarrying and archaeological research have produced flint artefacts, faunal remains and other biological evidence relating to climate and environment at numerous locations. The sequence identified at Barnfield Pit to the south of Swanscombe Peninsula contained lithic and faunal remains incorporated in stratified fluvial sand and gravel units accompanied by biological palaeoenvironmental evidence. Undisturbed archaeological horizons preserving intact evidence of Lower Palaeolithic activity were present in one of the lower deposits and one horizon within the middle phase of the Barnfield Pit sequence produced an early human fossil skull (the Swanscombe skull), making it one of only two sites in England with Lower or Middle Palaeolithic hominid skeletal evidence.

2.2.3 Human remains interpreted as being of Neolithic date were discovered at Galley Hill, and later became known as Galley Hill Man (TQ 67 SW 41). Discoveries burials dating to the Neolithic period are relatively rare in Britain. A Neolithic polished axe was also found close by at Galley Hill (TQ 67 SW 69) within the Kent Project Site, close to the Swanscombe peninsula.

2.2.4 A well-preserved middle Bronze Age (1410-1220 cal. BC) trackway was recorded within waterlogged deposits at the edge of the peninsula within the Kent Project Site. Two rows of double parallel stakes within exposures of brushwood and probably a wattle track were aligned NE-SW (TQ 67 NW 1022; Goodburn and Stafford 2012).

Romano-British

2.2.5 The Kent Project Site contains the Roman town and ritual site at Springhead known as *Vagniacis* during the Roman period, located approximately 2.4km to the south of the Site. The name *Vagniacis* is mentioned in the Antonine Itinerary and is thought to have meant ‘estate of’ or ‘by the marshy place’ (Andrews et al 2011). Extensive remains of the Roman settlement and ritual complex were found within the Scheduled Area (NHLE 1005140) and further remains of equivalent significance were found to the north of the A2. The number and density of religious structures at Springhead is unparalleled in Roman Britain with the closest example being that of the temple complex at Bath. Large religious complexes are rare in Roman Britain and it is thought that Springhead was a regionally important public cult centre with its position on the Roman Road from London to Canterbury adding to its wider appeal. The settlement at Springhead owed its existence to the presence of this sacred Roman site and as such was not an ordinary civic centre but primarily a religious site. The presence of bakeries, smithy, and *mansio* existed to provide for visitors and travellers to the religious site.

2.2.6 During the excavations for CTRL the Northfleet Roman Villa was discovered within the Kent Project Site (TQ 67 SW 1505). A timber building constructed in the late 1st century preceded the villa. Associated features such as gullies and pits were interpreted as being used for malting and brewing. Other gullies and ditches are likely to have been used for the control of water and drainage. The western complex which lies to the west was agricultural in the early Roman period and a number of enclosure ditches were found relating to this. Linking the complex with the villa was an early Roman metalled surface (Andrews et al 2011; Chapter 3).

Anglo-Saxon

2.2.7 Within the Kent Project Site to the east of Ebbsfleet Station, a mid Saxon mill was discovered during the HS1 works. Timber remains of the mill and associated features such as a spillway, revetments, and sluice gates were uncovered thought to date to the late 7th century. The dual chuted construction of the mill and the size of the wheel-pit suggests that it was a horizontal wheeled mill (Andrews et al 2011; Chapter 6)

2.2.8 The Ebbsfleet Valley is key to understanding the early Anglo-Saxon settlement of the region, with excavations at Springhead revealing both burial and settlement evidence, and an early Anglo-Saxon cemetery near Northfleet church. The presence of the mill raises questions over the status of Northfleet villa in the Saxon period. Other examples of watermills have been found at middle to late Saxon manors with the mills sited close to the palace complex.

Medieval to Post-medieval

2.2.9 Swanscombe is mentioned in the Domesday Book of 1086 as being a large settlement of 47 households, containing 14 ploughlands, 40 acres of meadow, 6 fisheries and woodland. Swanscombe is thought to mean 'peasants field' and was first recorded as *Swanes Camp* in Old English. Subsequent to this, it was known as *Suanescamp* in 695, *Svinescamp* in 1086, Swanescampe in 1166, *Swanescombe* in 1292 and *Swanscomb* in 1610 (Glover 1976).

2.2.10 The rural character of the area continued into the post-medieval period, with the focus of settlement at Swanscombe, Northfleet and the surrounding isolated farmsteads. The beginnings of industry and the increased use and reliance on the river are evident from the post-medieval period, however the local economy would still have been reliant on agricultural practices at this time.

2.2.11 Swanscombe Manor was first mentioned in the Domesday Book, and there are many documentary references to the ownership of the manor throughout the medieval period. It is recorded that Henry VIII gifted the manor to Jane Seymour but it is not until the reign of Elizabeth I that a local family owned the manor. In the 1700s Hasted refers to a former mansion of the manor but states that much had been pulled down and that the remaining building was used as a farmhouse. The farmhouse is thought to be on the Site of the earlier manor. In 1872 the manor was bought by Thomas Bevan who also owned the Northfleet Cement Works by 1876. The remaining farmhouse was known to have been demolished by 1960 (Dartford District Archaeological Group 1988).

2.2.12 The 1810 map shows the Kent Project Site to be largely agricultural at this time. This map covers the central section of the Kent Project Site which can be seen to have been divided into agricultural fields. To the east of the Site Northfleet is shown and Swanscombe is shown to the west, both of which are depicted as small settlements at this time. Swanscombe Park Wood covers a large area to the west of the Project Site.

Development of the Cement Industry

2.2.13 Swanscombe and the Ebbsfleet valley have been subject to intensive 'brickearth' (sandy clay-silt suitable for brickmaking) and chalk quarrying since the later 19th century. By 1895 several lower lying areas of the western side of the valley had been cleared of the blanket of brickearth that originally covered it. After this time, quarrying became much more intensely focussed upon the chalk that formed most of the valley and the surrounding south side of the Thames Estuary. The area seems to have been located in an ideal spot from an industrial point of view, where extractable chalk was close to the navigable Thames estuary. As a result one of Britain's largest chalk extraction and cement making centres formed at Swanscombe and Northfleet and grew exponentially between 1895 and 1970. The surrounding landscape became dominated by chalk pits. The most desirable land for chalk extraction was where chalk outcropped closer to the ground surface. Such areas were rapidly exhausted and the economics of the chalk extraction became a matter of balancing the cost and difficulty of clearing and disposing of the overburden versus the profit to be made from the chalk itself. Developments in technology and machinery in the 20th century

led to areas that had been previously unviable being extracted in the second half of the 20th century.

2.2.14 Lime burning had been carried out in Kent since the Roman period and involved the heating of chalk and limestone to produced calcium oxide or 'quick lime' which could be mixed with water to form lime mortar for building or used as fertiliser in either form. James Parker's works at Northfleet made the first breakthrough in the development of Cement in 1786 by using 'cement stones' (natural nodules of argillaceous limestone) with chalk, to make a water resistant cement product patented as 'Roman Cement'. Proximity to the river was key in the production of Roman Cement as the 'cement stone' nodules were dredged from the River bed. 'Roman Cement' works were developed at Northfleet and along the Swale.

Portland Cement Works

2.2.15 In 1811 James Frost produced a type of cement (based on the Roman Cement) using chalks and clays (initially those from the estuary) ground together to form a wet mixture at his works in Swanscombe. By 1822 a patent for *British Cement* had been taken out which used a higher burning temperature and as such created a stronger product than the Roman Cement (Eve 1999). In 1824 Joseph Aspdin who had works in Northfleet patented 'Portland Cement' but used a lower burning temperature which not vitirify the slurry, a stage that was later recognised as crucial to the strength of the material. The Portland Cement was still superior in strength to the Roman Cement and did not rely on the cement stones to be dredged from the River bed. Aspdin's son set up the cement works at Northfleet and one of Aspdin's Kilns survives as a Scheduled Monument located 790m to the east of the Kent Project Site and is a distinctive beehive shape (List Entry 1004227).

2.2.16 In 1833 the Swanscombe works were bought by Francis and White and subsequently operated by JB White and Sons from 1838. From 1843 the Northfleet and Swanscombe works were both producing the true product of Portland Cement, although it was the Swanscombe works manager IC Johnson who discovered the importance of vitrification and was grinding cement from the resulting clinker by 1845. By the late 1840s rivalry had developed between the Swanscombe and the Northfleet works, both were producing Portland Cement but the Swanscombe works had begun to export it to the continent. By 1850 Portland Cement was recognised as the superior product but there were still only four works that were producing it by this time.

2.2.17 In 1854 a kiln developed at the Swanscombe site was patented by Robert Owen White. By 1962 the Swanscombe works were producing 30,000 tons of cement and employed 750 people. By 1890 there were 16 works between Dartford and Gravesend. In 1900 the Associated Portland Cement Manufacturers (ACPM) was established comprising of 31 firms. The introduction of a rotary kiln rather than the previous bottle, beehive and chamber kilns, meant that increased investment, raw materials and production led to the merger of the companys. It was at this time that the first rotary kiln was installed at the works in Swanscombe and by 1909 there were 16 rotary kilns at the works. A rival to ACPM was established in 1911 named British Portland Cement Manufacturers (BPCM). The cement industry was in decline during the early 1900s and with the event of the WWI many cement works were temporarily closed or reduced production including Aspdin's works at Northfleet. After WWI the many works were taken over by Blue Circle including JB White's works at Swanscombe (Eve 1999; Francis 1977).

2.2.18 The development of the cement works within the Kent Project Site can be seen on historic maps and through photographs of the works (viewed online; unavailable from KHLC). The earliest works are shown on the Tithe map of Swanscombe which shows a collection of buildings of varying sizes to the south of Manor Way. In 1864-1884 the Portland Cement

works occupied a triangular area between what is now Manor Way and the A228 and in the 18070s the works consisted of three widely spaced main buildings with four washbacks against manor way. Associated industry can be seen through the chalk pit to the south and the cement pits to the north. By the late 1890s the cement works had expanded considerably with larger square buildings comprising washbacks and ovens, covering the entirety of the previous triangular area and also expanding northwards and eastwards covering a much larger area. One of the former quarries to the north of the works was now used as a marshalling yard for the trams to connect to the wharf. The chalk pit to the south was disused by this time and cement works building constructed within the old quarry. Tramways can also be seen upon the Ordnance Survey mapping leading between the buildings and also to Bell Wharf and Barge Yard Wharf. At this time the cement works were building their own barges at Barge Yard Wharf, later referred to as Black Duck Barge Yard. The first barge built by JB Whites company was called the Black Duck and was launched from Black Duck Wharf in 1892 (Willmott 1977).

2.2.19 A tramway was established in the 19th century to link the Portland Cement works with its quarries and also to White's Wharf and Bell Wharf at the northern part of the Site. Over time the tramway adapted and expanded to include working extraction pits and the mainline railway. Some tram tunnels are recorded as still existing on the KHER and a number of derelict sections of tramline were noted on the Site visit. White's Jetty was the Jetty associated with J.B White's cement works and exists north of the former cement works.

2.2.20 By the late 1890s the quarrying had been relocated to the east of the Kent Project Site. A large chalk extraction site was located within the central part of the Kent Project Site close to Ebbsfleet Station which also supplied the Portland Cement Works. Extraction can be seen on a small scale on the 1st edition OS map and Gravel pit and Quarry are marked on the 2nd edition. It has extended both north and south by 1909 but had gone out of use by the 1930 and was partly replaced by a sports ground.

2.2.21 Along the western edge of the peninsula (beyond the Kent Project Site boundary) were the Tower Cement Works established in 1873 by William Goreham and the Onward Cement Works thought to have been established by Lawrence and Wimble from 1880. The Globe Cement works were established at Greenhithe around 1869 and was formally called The Globe Portland Cement and Whiting Company when it first started operating.

2.2.22 A number of quarries for the extraction of chalk, clay and gravel are recorded within the Study Area. The quarry at Barnfield pit was opened in the late 19th century to supply the Portland Cement Works located to the north east. The quarry was closed by the end of the 19th century and largely backfilled. The remainder of the quarry pit was then used as an extension to the main processing plant to the north including washmills and kilns, connected by three tram tunnels. By 1999 the buildings had all been demolished and the pit had been cleared of any structural remains. To the west of the Kent Project Site is the site of a small quarry used for the extraction of clay. At the edge of the Kent Project Site a tramway tunnel under Craylands Lane led to Barnfield Pit.

2.2.23 By 1909 the Swanscombe works had extended further still to the east with a large square building within what was the previous quarry to the east. The quarry was also extended further east. The works to the north of Manor Way had also been expanded north and the works south of manor way had also extended to the west. There was some expansion south of London Road towards the North Kent Line. Excavations for quarrying can also be seen to have taken place to the east of the tramline upon the peninsula. By 1934 the cement works consisted of a fewer larger buildings and a larger number of smaller buildings and an aerial ropeway had been installed from the works to Bell Wharf. Four large washmills were

built to the east of the main works and two to the south of London Road within the old quarry (Craylands Lane pit). Three tunnels were installed from Craylands Lane pit to the south of London Road, through the chalk spine to the Swanscombe works. Black Duck Barge Wharf appears to be out of use by 1934 with the focus shifted to Bell Wharf at the northern part of the peninsula. Travelling cranes, rectangular buildings and circular tanks can all be seen inland of the pier. The railway/tramway associated with the cement works is labelled 'Mineral Railway' by 1954. Little development or change had taken place within the layout of the cement works buildings.

2.2.24 By the 1970s a small amount of expansion had taken place to the west of the existing works to the north of Manor Way. In the 1980s the Cement works was around same size as it had been in the 1970s however by the 1990s some buildings to the south of Manor Way on the eastern side can be seen to have been removed.

3 AIMS AND OBJECTIVES

3.1 General aims

3.1.1 The general aims (or purpose) of the evaluation, in compliance with the CIfA *Standard and guidance for archaeological field evaluation* (CIfA 2014a), are to:

- provide information about the survival of archaeological remains within the site; and
- inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

3.2 General objectives

3.2.1 In order to achieve the above aims, the general objectives of the archaeological works are to:

- determine the presence or absence of archaeological features, deposits, structures, artefacts or ecofacts within the specified area;
- establish, within the constraints of the evaluation, the extent, character, date, condition and quality of any surviving archaeological remains;
- place any identified archaeological remains within a wider historical and archaeological context in order to assess their significance; and
- make available information about the archaeological resource within the site by reporting on the results of the evaluation.

3.3 Site-specific objectives

3.3.1 Following consideration of the archaeological potential of the site and the regional research framework (South East Regional Research Framework.), the site-specific objectives of the archaeological work are to:

- Record extant and at ground level elements of the Portland Cement Works such as tramlines and extant foundation pads, through photographic and survey techniques;
- Identify, excavate, record and analyse any structural elements of the Portland Cement Works within the trial trenches. Structural elements have been identified from historic mapping but the survival of these remains below ground at the Site has not been investigated to date;

- Gain an understanding of the development of the Portland Cement Works from its beginnings in the early 19th century to its demolition in 1990s;
- Identify, excavate, record and analyse any surviving remains of industrial processes, buildings or activities, including washmills, grinding mills, boiler houses, locomotive sheds and tramways;
- Depending upon the nature of the remains, examine the site layout as a whole to understand the relationship between the use of the buildings and the operation of the works;
- Examine the transport links within the Site (tramlines and connection to the Jetty) and potential wider distribution of products (by rail or by river).

4 HISTORIC LANDSCAPE SURVEY

4.1 Introduction

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

4.1.2 Previous Site visits for the purpose of the Desk-Based Assessment identified that evidence of the former industrial landscape including parts of the tramlines associated with the cement works to exist at various points across the Site and some foundation pads to the north of Manor Way which are also likely to relate to the former cement works. These features and any other remnants of the former industrial landscape associated with the Portland Cement Works will be subject to a historic landscape survey.

4.1.3 Prior to the commencement of the archaeological evaluation a record of the historic landscape commensurate with the requirements of a Historic England Level 3 record (Historic England 2017). The Level 3 survey will involve a detailed descriptive and analytical approach complemented by an accurate measured survey.

4.2 Written Account

4.2.1 A written record will be made of remains of the extant features associated with the Portland Cement works that will be affected by the development proposals with the Site boundary shown on **Figure 2**. This will include;

- The type of monument/asset
- The Site location (NGR and address)
- Name of compiler, date of investigation and reasons for the survey including details of the landownership (if known) and present land use;
- A summary of features and brief description of the Site (including area, function and past land use);
- Detailed description of the Site including its topographical setting and relationship to other sites/remains of associated cement works;
- A summary of the sequence of development of key dates in the history of the works, details of owners/architects/patrons if known
- Description of surviving industrial landscape features and interpretation of their former function;

- Contextual analysis and interpretation of the industrial landscape and placing them in their wider context
- Relevant information from other sources including published or unpublished material and specialist involvement as required
- Assessment of the significance of the Site/landscape.

4.3 Survey and Drawn Record

4.3.1 A measured and drawn record will be made of any industrial landscape features associated with the Portland Cement Works identified within the Site (shown on Figure 2), commensurate with the requirements of a Historic England Level 3 record (Historic England 2017). The survey and drawn record will comprise

- Site location plan
- Accurate site plan showing the identified industrial landscape features, related to topographical features and modern detail (either 1:1,000 or 1:2,500)
- Other drawings as appropriate (items 15-21; Historic England 2017: p38)

4.3.2 The survey will be carried out using a Leica GNSS connected to Leica SmartNet service. All survey data will be recorded in OS National Grid coordinates and heights above OD (newlyn), as defined by OSGM15 and OSTN15, with a three-dimensional accuracy of at least 50mm, however where necessary hand measurements will be used. The resultant measured survey will be enhanced to appropriate standards (in line with Historic England 2017 guidelines) and presented in the report and project archive at an appropriate scale (at 1:1250 or larger).

4.4 Photographic Record

4.4.1 A photographic record will be compiled of the identified industrial landscape features and their wider industrial landscape context.

4.4.2 A photographic record will be made using digital cameras equipped with an image sensor of not less than 10 megapixels. This will record both the detail and the general context of the principle features and the site as a whole. Digital images will be subject to managed quality control and curation processes which will embed appropriate metadata within the image and ensure long term accessibility of the image set.

5 ARCHAEOLOGICAL EVALUATION METHODS

5.1 Introduction

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

5.1.2 The evaluation will comprise the excavation, investigation and recording of 20 trial trenches measuring 2m in width and of varying lengths of 40m and 50m. The trenches have been targeted on the buildings shown on the historic maps of the Portland Cement Works.

5.2 Setting out of the trenches

5.2.1 All trenches will be set out using a Global Navigation Satellite System (GNSS) in the approximate positions shown in **Figure 2**. Minor adjustments to the layout may be required to take account of constraints such as vegetation or located services, and to allow for

machine manoeuvring. The trench locations will be tied in to the Ordnance Survey (OS) National Grid and Ordnance Datum (OD) (Newlyn), as defined by OSTN15 and OSGM15.

5.3 Service location and other constraints

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

5.3.2 Before excavation begins, the evaluation area will be walked over and visually inspected to identify, where possible, the location of any below/above-ground services. All trial trench locations will be scanned before and during excavation with a Cable Avoidance Tool (CAT) to verify the absence of any live underground services.

5.4 Excavation methods

5.4.1 The trenches will be excavated using a 360º tracked excavator equipped with a toothless bucket. Due to the presence of hardstanding and tarmac surface across the Site a breaker may be required to break out the surface area of the trench. Machine excavation will be under the constant supervision and instruction of the monitoring archaeologist. Machine excavation will proceed in level spits of approximately 50–200 mm until either the archaeological horizon or the natural geology is exposed. Where necessary, the base of the trench/surface of archaeological deposits will be cleaned by hand.

5.4.2 A sample of the archaeological features and deposits identified will be hand-excavated, sufficient to address the aims of the evaluation. Spoil derived from machine stripping and hand-excavation will be visually scanned for the purposes of finds retrieval. Artefacts and other finds will be collected and bagged by context.

5.4.3 If an exceptional number and/or complexity of archaeological deposits are identified, sample excavation will aim to be minimally intrusive, but sufficient to resolve the principal aims of the evaluation, to a level agreed with the County Archaeologist and the client.

5.4.4 If human remains are uncovered, the specific methods outlined below (section 4.9.2) will be followed.

5.4.5 Where complex archaeological stratification is encountered, deposits will be left *in situ* and alternative measures taken to assess their depth, as agreed with the County Archaeologist. Where modern features are seen to truncate the archaeological stratification, these may be removed, where practicable, in a manner that does not damage the surrounding deposits to enable the depth of stratification to be assessed.

5.5 Recording

5.5.1 All exposed archaeological deposits and features will be recorded using Wessex Archaeology's pro forma recording system.

5.5.2 A complete record of excavated archaeological features and deposits will be made. This will include plans and sections, drawn to appropriate scales (generally 1:20 or 1:50 for plans, 1:10 for sections) and tied to the OS National Grid.

5.5.3 A full photographic record will be made using digital cameras equipped with an image sensor of not less than 16 megapixels. This will record both the detail and the general context of the principal features and the site. Digital images will be subject to managed quality control and curation processes, which will embed appropriate metadata within the image and ensure long term accessibility of the image set. Photographs will also be taken

of all areas, including access routes, to provide a record of conditions prior to and on completion of the evaluation.

5.6 Survey

5.6.1 The real time kinematic (RTK) survey of all trenches and features will be carried out using a Leica GNSS connected to Leica's SmartNet service. All survey data will be recorded in OS National Grid coordinates and heights above OD (Newlyn), as defined by OSTN15and OSGM15, with a three-dimensional accuracy of at least 50 mm.

5.7 Monitoring

5.7.1 The client will inform the County Archaeologist of the start of the evaluation and its progress. Reasonable access will be arranged for the County Archaeologist to make site visits to inspect and monitor the progress of the evaluation. Any variations to the WSI, if required to better address the project aims, will be agreed in advance with the client and the County Archaeologist.

5.8 Reinstatement

5.8.1 Trenches completed to the satisfaction of the client and the County Archaeologist will be backfilled using excavated materials in the order in which they were excavated, and left level on completion. No other reinstatement or surface treatment will be undertaken.

5.9 Finds

General

5.9.1 All archaeological finds from excavated contexts will be retained, although those from features of modern date (19th century or later) may be recorded on site and not retained. Where appropriate, soil samples may be taken and sieved to aid in finds recovery. Any finds requiring conservation or specific storage conditions will be dealt with immediately in line with *First Aid for Finds* (Watkinson and Neal 1998).

Human remains

5.9.2 In the event of discovery of any human remains (articulated or disarticulated, cremated or unburnt), all excavation of the deposit(s) will cease pending Wessex Archaeology obtaining a Ministry of Justice licence (this includes cases where remains are to be left *in situ*).

5.9.3 Initially the remains will be left *in situ,* covered and protected, pending discussions between the client, Wessex Archaeology's osteoarchaeologist and the County Archaeologist regarding the need for excavation/removal or sampling. Where this is deemed appropriate, the human remains will be fully recorded, excavated and removed from site in compliance with the Ministry of Justice licence.

5.9.4 Excavation and post-excavation processing of human remains will be in accordance with Wessex Archaeology protocols and in-line with current guidance documents (eg, McKinley 2013) and the standards set out in CIfA Technical Paper 13 *Excavation and post-excavation treatment of cremated and inhumed remains*. Appropriate specialist guidance/site visits will be undertaken if required.

5.9.5 The final deposition of human remains subsequent to the appropriate level of osteological analysis and other specialist sampling/examinations will follow the requirements set out in the Ministry of Justice licence.

Treasure

5.9.6 Wessex Archaeology will immediately notify the client and the County Archaeologist on discovery of any material covered, or potentially covered, by the *Treasure Act 1996*. All information required by the Treasure Act (ie, finder, location, material, date, associated items etc.) will be reported to the Coroner within 14 days.

5.10 Environmental sampling

5.10.1 All sampling will be undertaken following Wessex Archaeology's in-house guidance, which adheres to the principles outlined in Historic England's guidance (English Heritage 2011 and Historic England 2015b).

5.10.2 Bulk environmental soil samples, for the recovery of plant macrofossils, wood charcoal, small animal bones and other small artefacts, will be taken as appropriate from well-sealed and dateable contexts. In general, features directly associated with particular activities (eg, pits, latrines, cesspits, hearths, ovens, kilns, and corn driers) should be prioritised for sampling over features, such as ditches or postholes, which are likely to contain reworked and residual material.

5.10.3 If waterlogged or mineralised deposits are encountered, an environmental sampling strategy will be devised and agreed with the County Archaeologist as appropriate. Specialist guidance will be provided by a member of Wessex Archaeology's geoarchaeological and environmental team, with site visits undertaken if required.

5.10.4 Any samples will be of an appropriate size – typically 40 litres for the recovery of environmental evidence from dry contexts, and 10 litres from waterlogged deposits.

5.10.5 Following specialist advice, other sampling methods such as monolith, Kubiena or contiguous small bulk (column) samples may be employed to enable investigation of deposits with regard to microfossils (eg, pollen, diatoms) and macrofossils (eg, molluscs, insects), soil micromorphological or soil chemical analyses.

6 POST-EXCAVATION METHODS AND REPORTING

6.1 Stratigraphic evidence

6.1.1 All written and drawn records from the evaluation will be collated, checked for consistency and stratigraphic relationships. Key data will be transcribed into a database, which can be updated during any future analyses. The preliminary phasing of archaeological features and deposits will be undertaken using stratigraphic relationships and the spot dating from finds, particularly pottery.

6.1.2 A written description will be made of all archaeologically significant features and deposits that were exposed and excavated, ordered either by trench or by period as appropriate. Detail of all contexts will be provided in trench tables in the appendix of the report.

6.2 Finds evidence

6.2.1 All retained finds will, as a minimum, be washed, weighed, counted and identified. They will then be recorded to a level appropriate to the aims and objectives of the evaluation. The report will include a table of finds by feature/context or trench.

6.2.2 Metalwork from stratified contexts will be X-rayed and, along with other fragile and delicate materials, stored in a stable environment. The X-raying of objects and other conservation

needs will be undertaken by Wessex Archaeology in-house conservation staff, or by another approved conservation centre.

6.2.3 Finds will be suitably bagged and boxed in accordance with the guidance given by the relevant museum and generally in accordance with the standards of the CIfA (2014b).

6.3 Environmental evidence

6.3.1 Bulk environmental soil samples will be processed by standard flotation methods. The residues will be fractionated into 5.6/4 mm and 1 mm and dried if necessary. The coarse fraction (>5.6/4 mm) will be sorted, weighed and discarded, with any finds recovered given to the appropriate specialist. The flot, and fine residue fraction when appropriate, will be retained on a 0.25 mm mesh and scanned to assess the environmental potential of deposits. Unsorted fine residues will be retained until after any analyses, and discarded following final reporting (in accordance with the Selection policy, below).

6.3.2 In the case of samples from cremation-related deposits the flots will be retained on a 0.25 mm mesh, with residues fractionated into 4 mm, 2 mm and 1 mm. In the case of samples from inhumation burial deposits, the sample will be artefact sieved through 9.5 mm and 1 mm mesh sizes. The coarse fractions (9.5 mm) will be sorted with any finds recovered given to the appropriate specialist together with the finer residues.

6.3.3 Any waterlogged or mineralised samples will be processed by standard waterlogged flotation methods.

6.4 Reporting

General

6.4.1 Following completion of the fieldwork and the evaluation of the stratigraphic, artefactual and ecofactual evidence, a draft report will be submitted for approval to the client and the County Archaeologist, for comment. Once approved, a final version will be submitted. Appropriate industrial specialist involvement will be used within the interpretation of the remains of the cement works to put the finds within their local and regional context.

6.4.2 The report will include the following elements:

- Non-technical summary;
- Project background;
- Archaeological and historical context;
- Aims and objectives;
- Methods;
- Results – stratigraphic, finds and environmental;
- Conclusions in relation to the project aims and objectives, and discussion in relation to the wider local, regional or other archaeological contexts and research frameworks etc;
- Archive preparation and deposition arrangements;
- Appendices, including trench summary tables;
- Illustrations; and
- References.

6.4.3 A copy of the final report will be deposited with the HER, along with surveyed spatial digital data (.dxf or shapefile format) relating to evaluation.

Publication

6.4.4 If no further mitigation works are undertaken, a short report on the results of the evaluation will be prepared for publication in a suitable journal, if considered appropriate and agreed with the client and the County Archaeologist.

OASIS

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

7 ARCHIVE STORAGE AND CURATION

7.1 Museum

7.1.1 The site falls within the collecting area of Dartford Borough Museum. The museum is not currently accepting archaeological archives. Every effort will be made to identify a suitable repository for the archive resulting from the fieldwork, and if this is not possible, Wessex Archaeology will initiate discussions with the local planning authority in an attempt to resolve the issue. If no suitable repository is identified, Wessex Archaeology will continue to store the archive, but may institute a charge to the client for ongoing storage beyond a set period.

7.2 Transfer of title

7.2.1 On completion of the evaluation (or extended fieldwork programme), every effort will be made to persuade the legal owner of any finds recovered (ie, the landowner), with the exception of human remains and any objects covered by the *Treasure Act 1996*, to transfer their ownership to the museum in a written agreement.

7.3 Preparation of archive

7.3.1 The complete project archive, which may include paper records, graphics, artefacts, ecofacts and digital data, will be prepared following the standard conditions for the acceptance of excavated archaeological material by Dartford Borough Museum, and in general following nationally recommended guidelines (SMA 1995; CIfA 2014c; Brown 2011; ADS 2013). The archive will usually be deposited within one year of the completion of the project, with the agreement of the client.

7.4 Selection policy

7.4.1 Wessex Archaeology follows national guidelines on selection and retention (SMA 1993; Brown 2011, section 4). In accordance with these, and any specific guidance prepared by the museum, a process of selection and retention will be followed so that only those artefacts or ecofacts that are considered to have potential for future study will be retained. The selection policy will be agreed with the museum, and fully documented in the project archive. Material not selected for retention may be used for teaching or reference collections by the museum, or by Wessex Archaeology.

7.5 Security copy

7.5.1 In line with current best practice (eg, Brown 2011), on completion of the project a security copy of the written records will be prepared in the form of a digital PDF/A file. PDF/A is an ISO-standardised version of the Portable Document Format (PDF) designed for the digital preservation of electronic documents through omission of features ill-suited to long-term archiving.

8 OUTREACH AND SOCIAL MEDIA

8.1.1 In line with its charitable aims, Wessex Archaeology will, where possible and in consultation with the client, seek opportunities to disseminate the results of the evaluation and engage with the local community through social media, press releases, open days and volunteer involvement, while taking into account issues such as health and safety, confidentiality and vandalism.

9 COPYRIGHT

9.1 Archive and report copyright

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

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

9.2 Third party data copyright

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

10 WESSEX ARCHAEOLOGY PROCEDURES

10.1 External quality standards

10.1.1 Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its *Code of conduct* (CIfA 2014d) and *Regulations for professional conduct* (CIfA 2014e). All staff directly employed or subcontracted by Wessex Archaeology will be of a standard approved by Wessex Archaeology, and archaeological staff will be employed in line with the CIfA codes of practice, and will normally be members of the CIfA.

10.2 Personnel

10.2.1 The fieldwork will be directed and supervised by an experienced archaeologist from Wessex Archaeology's core staff. The overall responsibility for the conduct and management of the project will be held by one of Wessex Archaeology's project managers, who will visit the fieldwork as appropriate to monitor progress and to ensure that the scope of works is adhered to. Where required, monitoring visits may also be undertaken by Wessex Archaeology's Health and Safety manager. The appointed project manager will be involved in all phases of the investigation through to its completion.

10.2.2 The analysis of any finds and environmental data will be undertaken by Wessex Archaeology core staff or external specialists, using Wessex Archaeology's standard methods, under the supervision of the departmental managers and the overall direction of the project manager. A complete list of specialists is provided in **Appendix 1**.

10.2.3 The following key staff are proposed:

- Project Manager- Mark Williams
- Fieldwork Director -TBC

10.2.4 Wessex Archaeology reserves the right, where necessary due to unforeseen circumstances, to replace nominated personnel with alternative members of staff of comparable expertise and experience.

10.3 Internal quality standards

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

10.3.2 Wessex Archaeology assigns responsibility to individual managers for the successful completion of all aspects of a project including reporting. This includes monitoring progress and quality; controlling the budget from inception to completion; and all aspects of health and safety for the project. At all stages, the project manager will carefully assess and monitor performance of staff and adherence to objectives, timetables and budgets, while the manager's own performance is monitored by the team leader or regional director. The technical managers in the Graphics, Research, GeoServices and IT sections provide additional assistance and advice.

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

10.4 Health and Safety

10.4.1 Health and safety considerations are of paramount importance when conducting all fieldwork. Safe working practices override archaeological considerations at all times. Wessex Archaeology supply trained, competent and suitably qualified staff to perform the

tasks and operate the equipment used on site. All work will be carried out in accordance with the *Health and Safety at Work Act 1974* and the *Management of Health and Safety at Work Regulations 1999*, all other applicable health and safety legislation, regulations and codes of practice in force at the time.

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

10.4.3 All fieldwork staff are certified through the Construction Skills Certification Scheme (CSCS), and have undergone UKATA Asbestos Awareness Training. Staff who carry out specific tasks are suitably trained and competent to do so through training accredited by the Construction Industry Training Board (CITB), Institute of Occupational Safety (IOSH), and the National Plant Operators Recognitions Scheme (NPORS).

10.5 Insurance

10.5.1 Wessex Archaeology holds Employers Liability (£10,000,000), Public Liability (£5,000,000) and Professional Indemnity (£5,000,000) policies.

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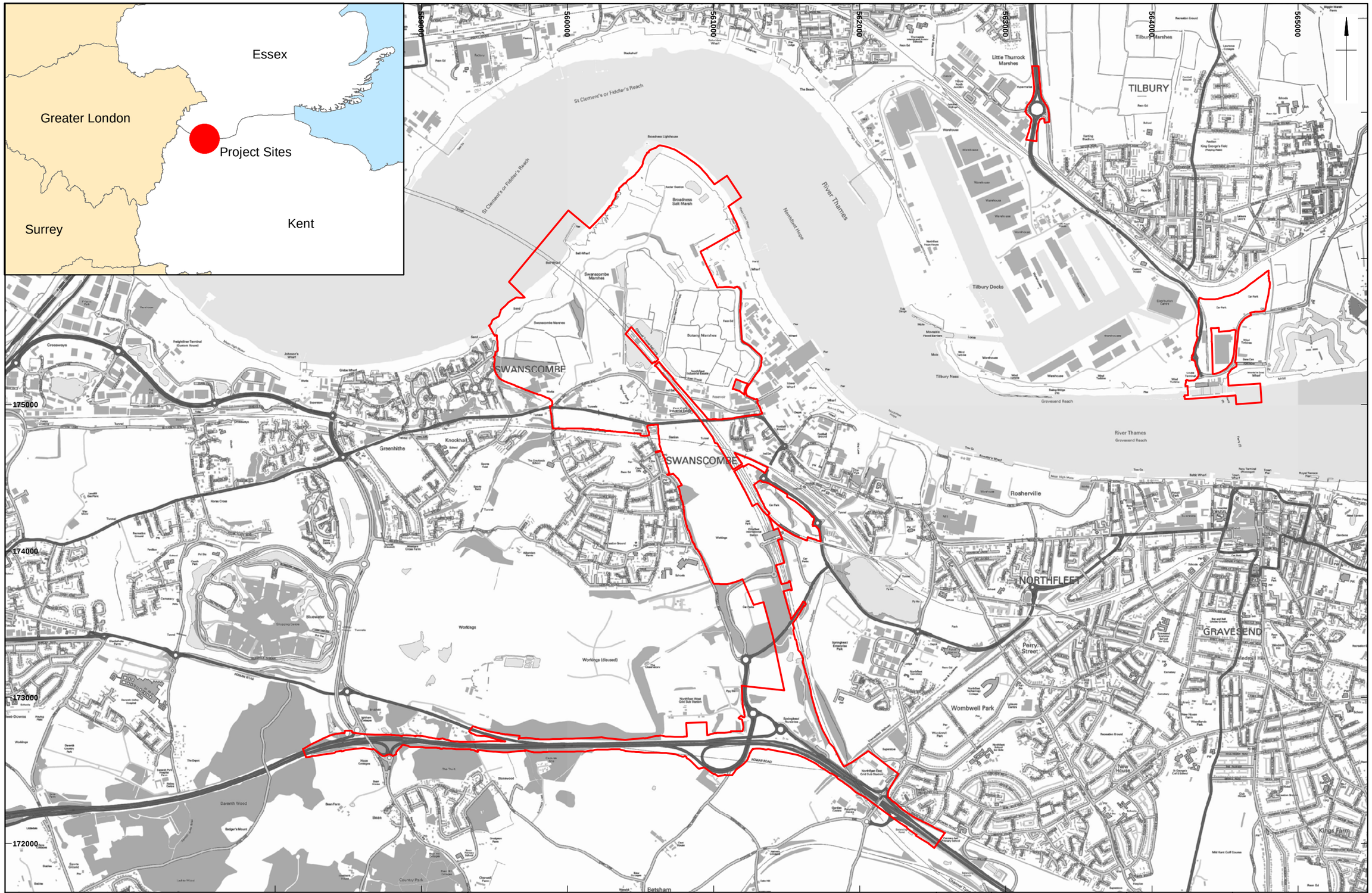

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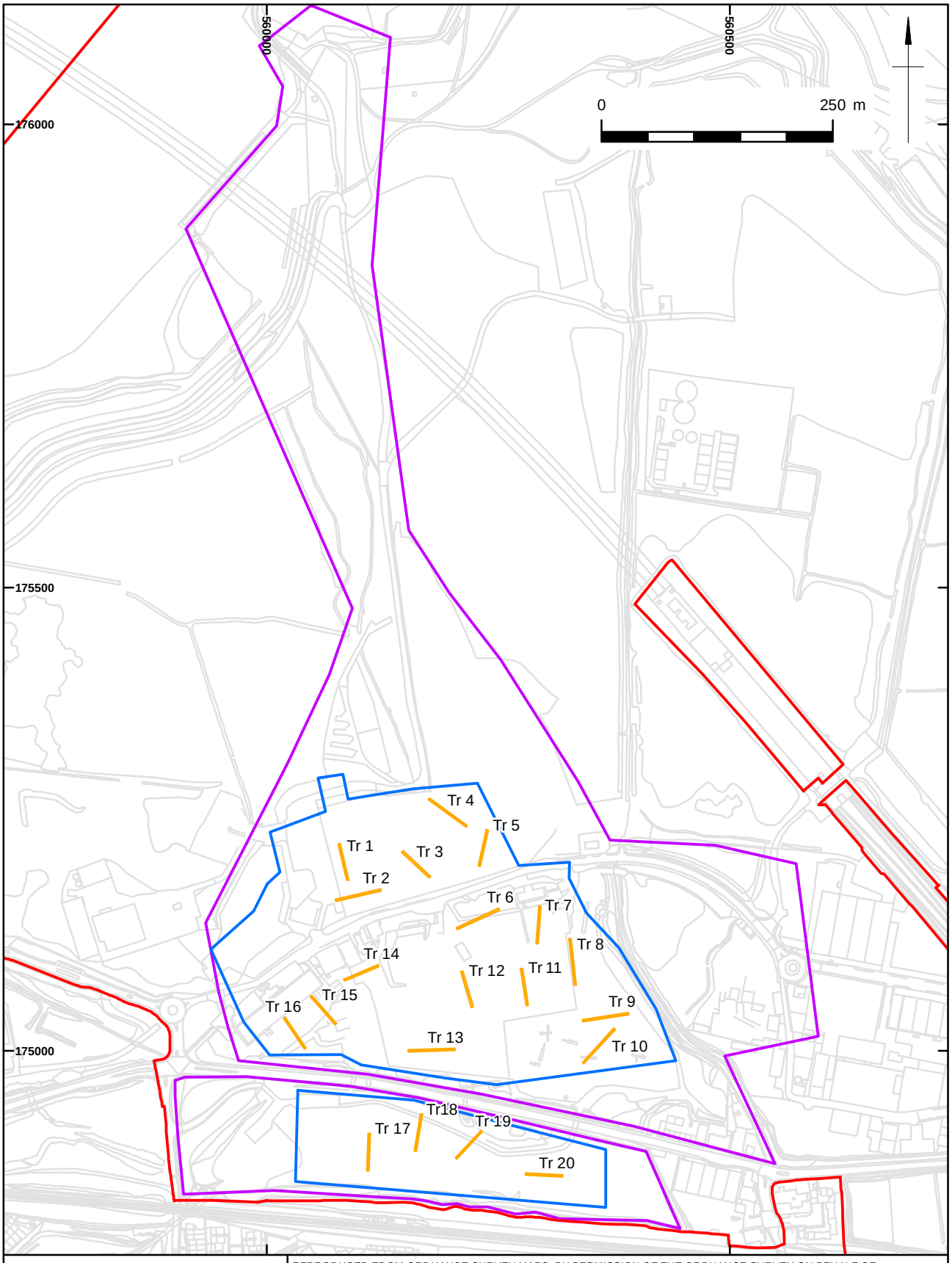
Site Location Plan (Kent and Essex Project Sites)

Figure 1



DCO Order Limits
Site
Evaluation Area
Proposed Trenches

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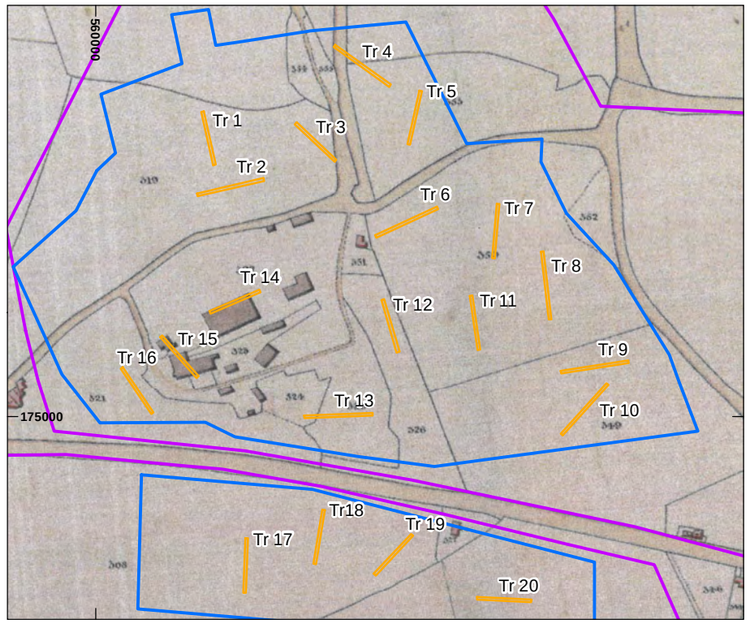
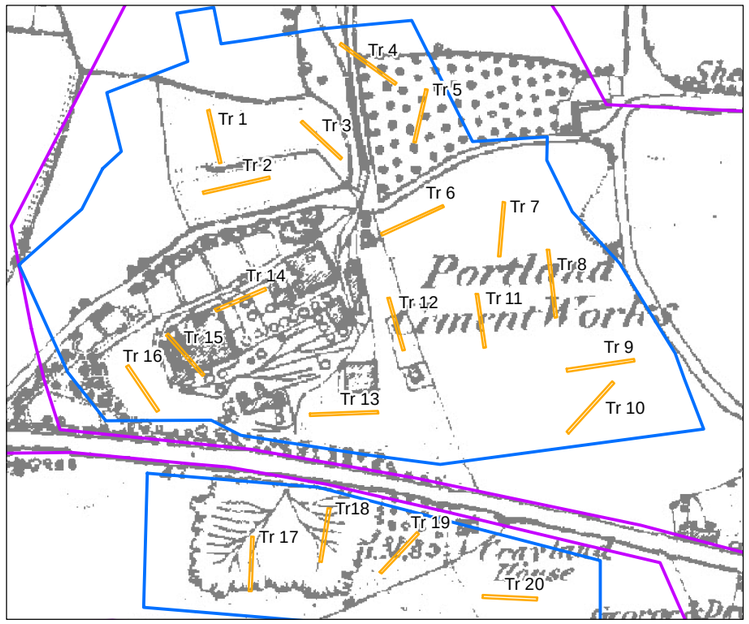
DCO Order Limits, Cement Works Site boundary and Evaluation Area with Proposed Trenches Figure 2

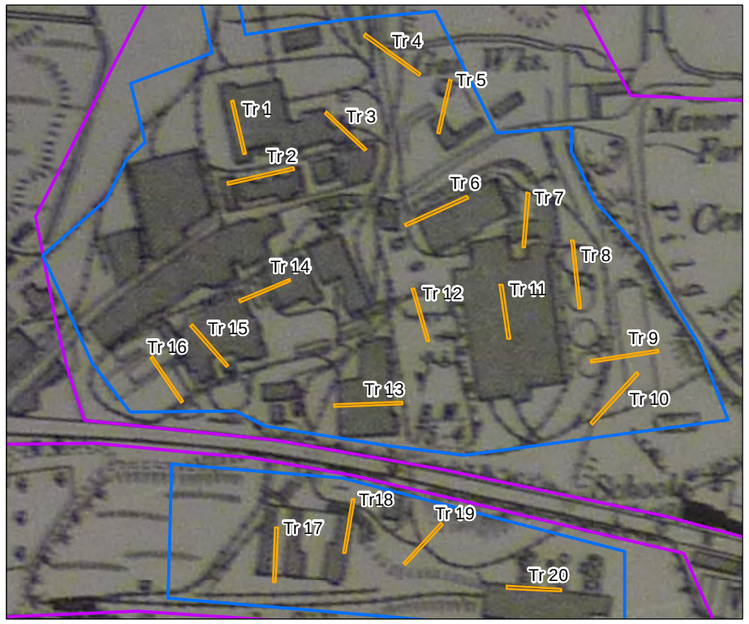


A) 1842 Swanscombe Parish Tithe map overlaid with Proposed Trench locations



B) 1872 Ordnance Survey map overlaid with Proposed Trench locations

C) 1898 Ordnance Survey map overlaid with Proposed Trench locations



D) 1909 Ordnance Survey map overlaid with Proposed Trench locations

E) 1937 Ordnance Survey Map overlaid with Proposed Trench locations

Site
Evaluation Area
Proposed Trenches

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Historic Mapping overlaid with Proposed Trench Locations

Figure 3

APPENDICES

Appendix 1: Finds and environmental specialists

Name	Qualifications	Specialism
Phil Andrews	BSc; FSA; MCIfA	Slag and metal working debris
Pippa Bradley	BA; MPhil; Dip Post Ex; FSA; MCIfA	Prehistoric flint and worked stone, shale and jet
Elina Brook	BA; MA; PCIfA	Later prehistoric and Romano-British pottery, and small finds
Alex Brown	BA; MSc; PhD	Geoarchaeology, palynology
Ceridwen Boston	B.Soc.Sc.; MA; MSc.; D.Phil.	Osteoarchaeology; funerary archaeology
Andrew Shaw	BA; MA; PhD	Palaeolithic lithic artefacts and Pleistocene geoarchaeology
Kirsten Egging Dinwiddy	BA; MA; MCIfA	Human remains (inhumations)
Inés López-Dóriga	BA; MA; PhD	Archaeobotanical remains
Erica Gittins	BA; MA; PhD	Prehistoric flint
Phil Harding	PhD	Prehistoric flint, particularly Palaeolithic flint
Lorrain Higbee	BSc; MSc; MCIfA	Animal bone
Grace Jones	BA; MA; PhD; MCIfA	Prehistoric and Roman pottery, ceramic building material, fired clay, and small finds
Matt Leivers	BA; PhD; ACIfA	Prehistoric pottery and flint
Jacqueline McKinley	BTech; FSA	Human remains (inhumations and cremations)
Erica Macey-Bracken	BA; ACIfA	Post-medieval finds, ceramic building material and worked wood
Katie Marsden	BSc	Pottery from prehistoric to post-medieval/modern. Metalwork of all periods, including coins. Small and bulk finds including fired clay, ceramic building material, worked bone
Nicki Mulhall		Geoarchaeology and archaeobotanical remains
David Norcott	BA; MSc; MCIfA	Geoarchaeology
Richard Payne	BSC; MSc; MPhil	Geoarchaeology
Holly Rodgers	BA; MSc	Geoarchaeology
Lorraine Mepham	BA; MCIfA	Pottery and other ceramic finds of all dates, concentrating on later prehistoric and post-Roman;
Sue Nelson	BA; MA; ACIfA	Prehistoric and Romano-British pottery, small finds, glass, and tile
Emma Robertson	BA; MSc	Human remains (inhumations)
Rachael Seager Smith	BA; MCIfA	Pottery with particular emphasis on Roman ceramics; and metalwork, fired clay, ceramic building material, stone, worked bone, shale, glass, and wall plaster
Amy Thorp	BA; MA	Pottery with emphasis on Roman ceramics, small finds
Lynn Wooten	BSc; ICON; MIoC	Archaeological conservator

Appendix 2: Manual of Specifications Part B: Trial Trenching Requirements (Kent County Council)

EVALUATION – TRIAL TRENCHING REQUIREMENTS

1. Introduction

1.1 Archaeological trial trenching involves the sampling of a site to determine whether archaeological remains are present and if so, to assess their character, extent, date, condition and potential importance. Trial trenching will aim to determine, as far as is practicable and without comprising the integrity of important archaeological deposits, the full stratigraphic sequence at the site, including information on the 'natural' substrate and soil conditions.

2. General Requirements

2.1 Trial trenching will be carried out by archaeological organisations (from here on referred to as 'the Archaeological Contractor') acceptable to the relevant Local Planning Authority, with recognised experience and expertise in the specified type of work to be undertaken. Registration with the Institute of Field Archaeologists (IFA) as a Registered Archaeological Organisation (RAO) will normally be considered as an indicator, but not a prerequisite, of such expertise and experience. A good working knowledge of the archaeology of Kent will also be considered highly desirable.

2.2 Prior to any work being undertaken the Archaeological Contractor will inform the County Archaeologist and communicate details of the proposed team, including (if required) CVs for senior staff and specialists. Senior staff and specialists will need to demonstrate an appropriate level of experience and expertise and should preferably be, where appropriate, Members of the Institute of Field Archaeologists (IFA).

2.3 Prior to undertaking the trial trenching the Archaeological Contractor will need to demonstrate that the necessary resources are in place to undertake the work, through to reporting. The Archaeological Contractor will have available appropriate specialists necessary to support the successful completion of the archaeological fieldwork and post-excavation work.

2.4 The work will be supervised on site at all times by a member of staff with the required level of experience and who will be responsible for the conduct of on-site work.

3. Pre-site Requirements

3.1 Prior to undertaking trial trenching the Archaeological Contractor will have gathered and considered the following information:

- Relevant information on the County Historic Environment Record (HER) held by Kent County Council and maintained by the Heritage Conservation Team;
- Any earlier reports of fieldwork relevant to the site;
- Solid and drift geology;
- Geotechnical site investigation data (if available);
- Any desk-based studies of the site.

3.2 In certain circumstances the following will also be considered:

- Relevant published secondary sources
- Relevant historic maps held at the Centre for Kentish Studies
- Aerial photographs where cropmarks are considered to indicate archaeology on or close to the site.

3.3 The Archaeological Contractor will ensure that all reasonable measures have been taken to identify any constraints to undertaking the evaluation trenching. The Archaeological Contractor will seek information on the presence of services, any ecological constraints, the presence of Public Rights of Way, the presence of contaminated land or any other risks to health and safety.

3.4 The Archaeological Contractor will make provisional arrangements for the deposition of the site archive with an appropriate museum or suitable repository agreed with the County Archaeologist. The Archaeological Contractor will obtain a provisional accession number for the site archive from the recipient museum (except where the museum prefers to issue an accession number following completion of fieldwork) and any guidelines from the recipient museum regarding deposition of the site archive.

3.5 Full copies of the Specification must be issued to the field officer responsible for on-site work and a copy of the agreed Specification and any additional method statements must be available on site at all times. The team carrying out the trial trenching must be familiar with the Specification and have access on site to any previous evaluation or survey reports.

3.6 The Archaeological Contractor will inform the County Archaeologist of the start date of the work (at least five working days before) and arrange for monitoring visits to be undertaken, using the Site Fieldwork Notification Form (see Appendix II). The Archaeological Contractor will continue to keep the County Archaeologist informed of the progress of work and will notify the County Archaeologist immediately if particularly important archaeological remains are encountered.

4. Objectives

4.1 The purpose of the evaluation is to establish whether there are any significant archaeological deposits at the site that may be affected by the proposed development.

4.2 The evaluation is thus to

a) ascertain the extent, depth below ground surface, depth of deposit, character, date, significance and condition of any archaeological remains on site;

b) establish the extent to which previous development and/or other processes have affected archaeological deposits at the site; and

c) establish the likely impact on archaeological deposits of the proposed development.

5. Scope of trial trenching

5.1 The layout and number of trenches excavated will be in accordance with the

Specification, details of which are given in Part A. Any amendment to trench design due to on-site constraints will be agreed with the County Archaeologist in advance of the work being undertaken.

5.2 Particular issues that will be addressed by the evaluation are set out in part A of this specification.

6. Machine and Hand Excavations

6.1 All machine excavation of trial trenches will be carried out under constant archaeological direction by a suitably experienced archaeologist familiar with the ground conditions anticipated on the investigation site.

6.2 Machine excavation of trial trenches will be undertaken by a mechanical excavator using a flat-bladed bucket. No mechanical excavators, earthmoving or other vehicles will travel within any excavated trench until it has been signed off by the County Archaeologist or specific agreement has been reached to enable re-stripping.

6.3 The Archaeological Contractor will maintain a constant watch and closely inspect on an ongoing basis surfaces exposed during the course of machining. Surfaces will be maintained clear of loose spoil.

6.4 Subject to additional requirements of the landowner or client, turf, topsoil and other distinct deposits will be stored separately and at least 1 metre from the edge of the evaluation trench.

6.5 Machine-excavated deposits and the exposed surface will be regularly scanned for the presence and collection of artefacts. Exposed surfaces and excavated spoil will be scanned by metal detector.

6.6 The excavation by machine is to be taken down to the top of any significant archaeological level or to the top of ‘natural’ subsoil where no archaeological deposits have been found at a higher level. In the event of significant archaeological deposits being encountered the County Archaeologist is to be informed immediately. Some further limited excavation may be required to clarify the nature, character and date of the archaeological deposits but the primary objective is to establish the presence/absence of archaeological deposits, their depth and extent.

6.7 Where complex archaeological stratification is encountered, deposits will be left in situ and measures to assess the depth of this stratification agreed with the County Archaeologist. Where modern features are seen to truncate the archaeological stratification, then these will be carefully removed without damage to surrounding deposits to enable the depth of stratification to be assessed.

6.8 If archaeological remains of limited significance are found to be present cutting through or overlying soils (e.g. colluvium) which conceal lower archaeological horizons then these will need to be recorded and investigated prior to removal of the

underlying soil with the agreement of the County Archaeologist.

6.9 Machine excavation from the surface must be taken down in spits of no more than 100mm thickness to ensure that deposits and features are not over-excavated and that any artefacts/biological evidence in the soil are recorded.

6.10 Test sondages may need to be excavated through 'natural' subsoil in trial trenches to confirm that the solid geology has been reached. Such sondages will be positioned to avoid damage to archaeological remains.

7. Investigation and Sampling Strategy

7.1 Archaeological features will generally only be sampled sufficiently to characterise and date them. Full excavation of features will not be undertaken at this stage unless otherwise agreed with the County Archaeologist. Care will be taken not to damage archaeological deposits through excessive use of mechanical excavation.

7.2 Where necessary the surface and sections of trenches will be hand cleaned to define archaeological deposits and features clearly.

7.3 Measures will be taken to protect particularly significant, valuable or sensitive archaeological remains from exposure, accidental damage and / or theft.

7.4 Exposed surfaces will be left for a minimum of 48 hours to allow weathering-out of features to occur. No trenches will be backfilled until agreed with the County Archaeologist.

Burial Remains

7.5 Inhumation and cremation burials will normally be left in-situ for the purposes of evaluation. Subject to agreement with the County Archaeologist, graves may be partially excavated to confirm the presence of human remains and their state of preservation but skeletal remains will be left in situ. Graves will be scanned by metal detector to assess whether any grave objects are likely to be present.

7.6 Inhumation and cremation burials which are in a fragile state and are likely to be damaged by the reinstatement of evaluation trenches will be excavated and lifted subject to agreement with the County Archaeologist.

7.7 The Archaeological Contractor will put in place arrangements to ensure the security, protection from deterioration and damage, and the respectful treatment of human remains and burial goods.

7.8 On sites where burial remains are expected the Archaeological Contractor will submit to and agree with the County Archaeologist detailed procedures for the assessment, recording and, where necessary, the excavation of inhumation and cremation burials.

7.9 The Archaeological Contractor will have available within the team or on call an appropriately qualified and experienced osteoarchaeologist to supervise the excavation and removal of any human remains (where this is necessary) from the site. The Archaeological Contractor will use an appropriately qualified and experienced archaeological conservator to assist, where appropriate, the lifting of human remains and grave goods / cremation vessels.

7.10 In the event that human burials are discovered, a Ministry of Justice Licence will be required (in accordance with Section 25 of the Burial Act 1857) before the remains can be lifted. The need for a Ministry of Justice Licence applies to both inhumation and cremated remains. Application for a Licence will be made by the Archaeological Contractor. The Archaeological Contractor is to comply with the conditions of the Licence and discuss any requirements of that Licence which conflict with the agreed method of investigation with the County Archaeologist.

8. Finds recovery processing and treatment

8.1 All artefacts recovered during the excavations on the site are the property of the Landowner. They are to be suitably bagged, boxed and marked in accordance with the United Kingdom Institute for Conservation, *Conservation Guidelines no.2* and on completion of the archaeological post-excavation programme the landowner will arrange for them to be deposited in a museum or similar repository agreed with the County Archaeologist and the Local Planning Authority.

8.2 Artefacts will be excavated carefully by hand. The Archaeological Contractor will use an appropriately qualified and experienced archaeological conservator to assist in the lifting of fragile finds of significance and / or value.

8.3 Artefacts will be collected and bagged by archaeological context. The location of special finds will be recorded in three dimensions. Three-dimensional recording of in-situ flint working deposits will be carried out.

8.4 Where appropriate to address the research objectives of the archaeological evaluation, sieving of deposits will be undertaken to maximise recovery of small artefacts. A strategy for such sieving will be agreed in advance with the County Archaeologist.

8.5 Records of artefact assemblages will clearly state how they have been recovered, sub-sampled and processed.

8.6 Excavated artefacts will be bagged upon recovery or placed in finds trays. They must not be left loose on site.

8.7 **Treatment of treasure -** Finds, discovered by the Archaeological Contractor, falling under the statutory definition of Treasure (as defined by the Treasure Act of 1996 and its revision of 2002) will be reported immediately to the relevant Coroner's Office, the Kent Finds Liaison Officer (FLO) who is the designated treasure co-ordinator for Kent, the landowner and the County Archaeologist. A Treasure Receipt (obtainable from either the

FLO or the DCMS website) must be completed and a report submitted to the Coroner's Office and the FLO within 14 days of understanding the find is Treasure. Failure to report within 14 days is a criminal offence. The Treasure Receipt and Report must include the date and circumstances of the discovery, the identity of the finder (put as unit/contractor) and (as exactly as possible) the location of the find.

8.8 All metal objects, other than late post medieval objects, will be X-rayed unless otherwise agreed with the County Archaeologist.

9. Archaeological Science and Environmental Sampling

9.1 A structured programme of environmental sampling appropriate to the aims of the evaluation will be implemented. The strategy and methodology for the sampling, recording, processing, assessment, analysis and reporting of deposits with environmental archaeology potential will be in accordance with English Heritage Centre for Archaeology Guidelines "Environmental Archaeology – A guide to the theory and practice of methods, from sampling and recovery to post-excavation" (March 2002). Any variation to this guidance will be agreed in advance with both the County Archaeologist and the English Heritage Regional Scientific Advisor. Particular note will be taken of the following requirements.

9.2 The Archaeological Contractor will use an appropriately qualified and experienced geo-archaeologist to record any deposits of particular significance such as buried soils or advise on depositional processes.

9.3 An appropriately qualified and experienced environmental archaeologist will devise and supervise the implementation of the environmental sampling strategy.

9.4 The advice of the English Heritage Regional Scientific Advisor is to be sought regarding specialist sampling requirements and any scientific applications relevant to the archaeological evaluation of this site.

9.5 Where deposits are dry, bulk samples for the recovery of charred plant remains, small bones and finds, will be taken from sealed and datable features such as pits, ditches, hearths and floors. Each context will normally be sampled. The size of the sample is expected to be in the range of 40-60 litres per context or 100% of smaller contexts. Samples will not be taken from the intersection of features.

9.6 For large features / spreads appropriate consideration will be given to sampling on a grid system if this fits in with the aims of the evaluation.

9.7 Where good conditions for the preservation of bone have been identified, all large bones will be collected by hand and sieving of bulk samples up to 100 litres will be undertaken as appropriate.

9.8 Mollusc samples of 2 litres each will be taken vertically from appropriate sections to investigate the changes of vegetation through time.

9.9 Where deposits are wet, waterlogged or peaty, monoliths will be taken along cleaned vertical surfaces for the retrieval of pollen, diatoms, ostracods and foraminifera. The numbers to be taken will be agreed with the County Archaeologist.

9.10 For wet, waterlogged or peaty deposits, bulk samples of 20 litres will be taken from visible layers or spits for the retrieval of plant macro-remains and insects.

9.11 Environmental samples from dry deposits will normally be processed by flotation following the evaluation fieldwork and the residues will be sorted to retrieve small bones, small finds and charcoal that has not floated. Environmental samples from wet deposits will normally be sent to specialists for processing in laboratory conditions. The Archaeological Contractor will agree with the County Archaeologist any necessary delay in completion of the reporting of the evaluation to enable provisional results to be included.

9.12 The Archaeological Contractor will make appropriate provision for the application of scientific dating techniques such as radiocarbon, dendrochronology, archaeomagnetic dating, OSL and thermoluminescence dating. The advice of the English heritage regional Scientific Advisor will be sought in advance of the application of these techniques. The Archaeological Contractor will agree with the County Archaeologist any necessary delay in completion of the reporting of the evaluation to enable provisional results to be included.

9.13 Where appropriate the guidance in the following English Heritage papers will be followed:

- "Guidelines on the recording, sampling, conservation, and curation of waterlogged wood" 1996
- "Dendrochronology – guidelines on producing and interpreting dendrochronological dates" 1997
- "Archaeometallurgy" 2001
- "Environmental Archaeology: A guide to the theory and practice of methods, from sampling and recovery to post-excavation" 2002
- "Human bones from Archaeological Sites: Guidelines for Producing Assessment Documents and Analytical Reports" 2004
- "Geoarchaeology" 2004
- "Wet Wood and Leather"
- "Archaeomagnetic Dating: Guidelines on producing and interpreting archaeomagnetic dates" 2006
- "Guidelines on the X-radiography of archaeological metalwork" 2006

10. Recording

10.1 All trenches, structures, deposits and finds will be recorded according to accepted professional standards. Sufficient data must be recorded to allow the required level of assessment and reporting (see section 11).

10.2 Recording must be carried out to a sufficiently high standard to provide a full record of the deposits evaluated, including in trenches where no archaeology is identified.

10.3 All features, deposits and finds are to be recorded according to accepted professional standards.

10.4 All archaeological contexts are to be recorded individually on context record sheets. A further more general record of the work, comprising a description and discussion of the archaeology, is to be maintained as appropriate. Context sheets are to be primarily filled in by the archaeologist excavating the feature or deposit.

10.5 A plan to indicate the location of the boundaries of the evaluated area and the site grid is to be drawn at a scale of 1:1250 (or a similar appropriate scale). Plans indicating the location of the excavated trenches and the location of all archaeological features encountered are to be drawn at an appropriate scale. An overall site plan is to be maintained at a scale of 1:100 or larger scale where appropriate. Sections will be drawn at a scale of 1:10. Significant archaeological features will normally be drawn in plan at a scale of 1:20 or 1:10 if appropriate. All detailed plans and sections are to be related to the 1:100 or 1:1250 plans. The 1:1250 and 1:100 plans are to be accurately related to the National Grid.

10.6 Long Sections indicating the full stratigraphic sequence will be drawn for all trenches. Where a very simple sequence is revealed representative sections (minimum 1m wide) at each end of the trench will be sufficient, but where more complex stratigraphy is encountered, complete trench sections will be drawn. In the case of complex stratigraphy, all four sections will be drawn.

10.7 All plans and sections are to be levelled with respect to OD.

10.8 All plans and sections are to be drawn on polyester based drafting film and clearly labelled.

10.9 A full black and white and colour (35mm transparency) photographic record of the work is to be kept. The photographic record is to be regarded as part of the site archive.

10.10 The Archaeological Contractor will keep a day to day digital photographic record of the investigation.

10.11 The Archaeological Contractor will ensure that the complete site archive including finds and environmental samples are kept in a secure place throughout the period of evaluation and post excavation works.

10.12 The site archive is to be consolidated after completion of the evaluation, with all site drawings inked-in, and records and finds collated and ordered as a permanent record.

11. Reinstatement and completion of fieldwork

11.1 On completion, trenches will be backfilled, reinstated and left in a safe state to the requirements of the landowner / client.

11.2 Where vulnerable archaeological deposits remain within trial trenches these will be appropriately protected from damage as part of the reinstatement. Consideration will be given to providing a marker in backfilled trenches to highlight vulnerable archaeological deposits should re-excavation be necessary.

11.3 On completion of fieldwork the Archaeological Contractor will complete the relevant section of the Fieldwork Notification Form and submit it to the County Archaeologist.

12. Reporting

12.1 Within three weeks of completion of the evaluation fieldwork (or longer in case of complex sites as agreed with the County Archaeologist) the Archaeological Contractor will produce a report, copies of which (as a minimum) are to be provided to:

- the Developer
- the County Archaeologist
- the Local Planning Authority
- the Local Archaeological Society

12.2 When submitting the report to the County Archaeologist the Archaeological Contractor will provide written confirmation that the report has been submitted to the above parties.

12.3 If the Archaeological Contractor is required, contractually, only to submit reports directly to the developer or their agent, the Archaeological Contractor must inform the County Archaeologist in writing that they have completed the report and whom it has been forwarded to. The Archaeological Contractor must ensure that the developer is made aware of the need to circulate the report as in 12.1 above.

12.4 The Archaeological Contractor may determine the general style and format of the evaluation report but it must be completed in accordance with this specification. The report must provide sufficient information and assessment to enable the County Archaeologist and the Local Planning Authority to reach an informed decision regarding any further mitigation measures that may be required and to stand as an appropriately detailed report on the archaeological fieldwork for future research.

12.5 Reports that do not provide sufficient information or that have not been compiled in accordance with the relevant sections of this specification will be returned to the Archaeological Contractor for revision and resubmission.

12.6 The report will be submitted to the County Archaeologist in a heat-bound hard-copy and in digital format. The digital copy will be supplied in .pdf format and will contain all text, images and plans present in the hard-copy report in a single .pdf file. The medium will be a CD-ROM formatted according to ISO 9660:1999.

12.7 **Report Format** - The final evaluation report will include as a minimum:

12.7.1 An **Abstract** summarising the scope and results of the archaeological evaluation.

12.7.2 An **Introduction** including:

- the location of the site with a National Grid Reference for the centre sufficient to locate the site to 1m accuracy (e.g. TQ 55555 77777 or easting: 555555, northing: 177777);
- an account of the background and circumstances of the work;
- a description of the development proposals, planning history and planning reference together with the archaeological condition (where appropriate);
- the nature of potential impacts arising from the proposals;
- the scope and date of the fieldwork, the personnel involved and who commissioned it;

12.7.3 An account of the **Archaeological Background** of the development site including:

- geology, soils and topography;
- any known existing disturbances on the site;
- background archaeological potential of the site. This will include a summary of the known Historic Environment Record entries within 500m of the boundaries of the site (or wider where appropriate). The HER entries will be quoted with their full KHER identifier (e.g. TR 36 NW 12);
- summary of any previous phases of archaeological investigation at the development site;

12.7.4 The **Methodology** employed during the evaluation must be detailed in the report. Any aims and objectives specified in the specification will be included as will any further objectives identified during the course of the evaluation. Constraints on the evaluation will also be described.

12.7.5 The report will include a quantification of the project archive contents, their state and future location.

12.7.6 The **Results** of the evaluation field work will be described trench by trench. This description must include for each trench:

- the dimensions of the trench;
- the nature and depth of overburden soils encountered;
- description of all archaeological features and finds encountered in each trench, their dimensions, states of preservation and interpretation;
- a description of the geological subsoil encountered in each trench;
- heights related to Ordnance Datum for a sufficient number of features and deposits. Where the trench results are complex a table showing the dimensions and heights of features and deposits will be included for each trench.
- for complex stratigraphy a Harris Matrix diagram.

12.7.7 The **Finds** recovered during the course of the evaluation will be described, quantified and assessed by artefact type within the evaluation report. The report will also provide an indication of the potential of each category of artefact for further analysis and

research. For each category of artefact the report will describe the method of processing, any sub-sampling, conservation and assessment undertaken. Where appropriate local reference collections will be referred to for descriptive and analytical consistency. Any implications for future archive, conservation or discard of the artefacts will also be set out.

12.7.8 The report will include a table showing, per trench, the contexts, classes and quantity of artefacts recovered, together with their date and interpretation.

12.7.9 The evaluation report will include an assessment of the **Environmental** potential of the site. Details will be provided of any environmental sampling undertaken in connection with the fieldwork and the results of any processing and assessment of the samples. The report will describe the method of processing, any sub-sampling and assessment. Any potential for future analysis of the samples or environmental remains recovered from the evaluation will be described. Implications for future archive, conservation or discard of environmental samples or remains will be detailed.

12.7.10 The report will include, as appropriate, tables summarising environmental samples taken, together with the results of processing and assessment.

12.7.11 Any results from the application of archaeological scientific techniques e.g. specialist dating will be included in the evaluation report.

12.7.12 An **Interpretation** of the archaeology of the site will be provided, including its location, extent, date, condition, significance and importance. This will be a synthesis of the stratigraphic, finds and environmental results of the investigation and will include, even if no archaeology is identified as present on the site, description of areas of disturbance, non-archaeological deposits and changes in geological subsoil where appropriate. This section of the report will be supported by a phased interpretative plan of the site, clearly showing the major areas and periods of archaeological activity.

12.7.13 An **Impact Assessment** will consider the potential effects of the development on the archaeological remains. This will summarise the archaeological results, describe how any identified archaeological potential identified relates to the site and how the development proposals will affect that archaeology. The report will highlight any areas of sensitivity within the site. Particular note will be made of any variations in the depth of overburden covering any archaeological deposits revealed.

12.7.14 The **Conclusion** will summarises the method, results, interpretation and impact assessment.

12.7.15 The evaluation report will assess the potential for preservation at the site to inform decisions about mitigation strategies. It will not include any recommendations on preservation measures or further work unless otherwise agreed with the County Archaeologist.

12.7.16 The evaluation report will include comments on the effectiveness of the methodology employed and the confidence of the results and interpretation.

12.7.17 **Figures / illustrations** – The report will include sufficient illustrations to support descriptions and interpretations within the report text. Figures are to be fully cross-referenced within the document text. As a minimum the evaluation report will include the following figures:

- a site location plan tied into the Ordnance Survey at 1:1250. The plan will also include at least two National Grid points to 1m accuracy and show the site boundary;
- trench location plans at an appropriate scale showing the layout of archaeological features, coloured by phases or period. The plan will show the location of all trenches and features. A copy of the plan will be overlain on the proposed development plan where this is known. Where possible, projection of archaeological features outside of the trench areas will be included on the plan. This plan will also include two National Grid points;
- plans of the features revealed in each of the trenches at a larger scale e.g. 1:20 or 1:50; such plans are to also illustrate areas of disturbance, change in subsoil and location of sections; The location of significant finds and samples taken will also be indicated;
- relevant section drawings and trench soil profiles as appropriate;
- illustrations and/or photographs of significant finds.

12.7.18 All report illustrations must be fully captioned and scale drawings must include a bar scale. Standard archaeological drawing conventions must be used. Plan and section illustrations must include the numbers of all contexts illustrated. North must be included on all plans and will be consistent. Sections must indicate the orientation of the section and the Ordnance Datum height of the section datum.

12.7.19 Black & White or Colour photographs will be included to illustrate key archaeological features, trenches and site operations. All photographs will be appropriately captioned.

13. Archive Preparation & Deposition

13.1 The site archive, to include all project records and cultural material produced by the project, is to be prepared in accordance with *Guidelines for the preparation of excavation archives for long-term storage (UKIC 1990)*. On completion of the project the Archaeological Contractor will arrange for the archive to be deposited in accordance with the provisional arrangements made with a suitable museum or repository at the onset of fieldwork. Any alternative arrangements will be agreed with the County Archaeologist and the Local Planning Authority.

14 Monitoring and Liaison

14.1 The Archaeological Contractor is to allow the site records to be inspected and examined at any reasonable time, during or after the evaluation fieldwork, by the client/developer, the County Archaeologist or any designated representative of the Local Planning Authority

14.2 Once the trenches have been evaluated and an initial assessment of the archaeology carried out, there will be an on-site meeting with the County Archaeologist to determine if further evaluation work is appropriate in order to meet the objectives.

14.3 The Archaeological Contractor will liaise closely with the County Archaeologist throughout the course of the evaluation and will arrange for on-site meetings at key decision points.

14.4 The Archaeological Contractor is to make contact with the local archaeological society and keep them informed on the progress of the evaluation. Subject to health and safety constraints the Archaeological Contractor will afford opportunity to the local archaeological society to visit the evaluation site. Copies of all reports will be provided to the local archaeological society.

14.5 The Archaeological Contractor is to circulate a completed Fieldwork Notification Form (Appendix 2) at the start and completion of fieldwork and at the completion of post excavation reporting stages.

15. Copyright and data protection

15.1 Information submitted to the County Archaeologist in conjunction with planning applications automatically becomes publicly accessible and can be viewed by anyone at any time. In addition, the Local Planning Authority and Kent County Council are subject to the requirements of the Freedom of Information Act (2000) and Environmental Information Regulations (2004). Information may be subject to FoI or EIR requests and any documentation submitted in connection with the project may be made publicly available unless doing so contravenes the Data Protection Act (1998).

15.2 While copyright of reports and other information arising from the fieldwork remains with the originator, the Archaeological Contractor will undertake to make this information available to interested parties. The Archaeological Contractor will agree to allow reports of the fieldwork to be copied and made available to interested parties for archaeological research. The reports may be made available on the Internet no sooner than three months after the submission of the report. Archaeological Contractors who believe that there are special reasons for not publishing the report on the Internet should reach a separate agreement with the County Archaeologist.

16. Health and Safety

16.1 The Archaeological Contractor will conduct the work in compliance with the Health and Safety at Work etc Act 1974. The Archaeological Contractor will also follow the guidance set out in “Health and Safety in Field Archaeology” Standing Conference of Archaeological Unit Managers 1997.

16.2 The Archaeological Contractor is expected to maintain a Health and Safety Policy and a

procedures manual and have available appropriate expertise in Health and Safety advice. Site staff will have an appropriate level of training to enable them to carry out fieldwork safely.

16.3 The Archaeological Contractor will maintain the site in a safe condition. All hazards will be appropriately identified and managed. Deep excavations will be appropriately fenced.

16.4 The Archaeological Contractor will carry out a risk assessment prior to commencement of fieldwork and where appropriate a COSHH assessment. Risks and measures to reduce risk will be communicated to all working on and visiting the site.

16.5 The Archaeological Contractor will have available suitable site accommodation, welfare and toilet facilities.

17. KCC HER

17.1 The Archaeological Contractor is to provide the Kent Historic Environment Record with copies of all reports in both heat-bound hard-copy and digital format (see 12.6 above).

17.2 Upon completion of the excavation the Archaeological Contractor will supply the Kent Historic Environment Record with a completed HER form (see Appendix 1)

17.3 The Archaeological Contractor will supply the Kent Historic Environment Record with the following digital datasets:

- A .dxf file containing polygon data that describes in detail all excavated/ watched area boundaries, whether trenches, test pits, excavated areas or areas examined by watching brief. This .dxf file must be internally geo-referenced (i.e. the co-ordinate system used in the file must be the Ordnance Survey co-ordinate system).
- A separate .dxf file that contains a number of Layers. Each Layer should represent a different phase of the archaeological remains on site. The name of each Layer must be the phase number used on the site accompanied by a date range (e.g. “2, from –2000 to –800”, “7A, from 410 to 700” etc). Each layer must contain only the features relevant to that phase digitized as polylines. Where the dating is based on scientific dating methods such as radiocarbon, the dates must be calibrated calendar dates.

17.4 A guidance document has been produced for Kent County Council that will inform contractors as to how this information can be produced within AutoCad. This document is available from the County Archaeologist and Kent County Council Historic Environment Record.

17.5 The Archaeological Contractor should also provide a representative selection of digital site photographs illustrating the archaeology of the site and the operations of the investigation. These will be in .jpg format at a minimum 300dpi. These will be deposited with the County HER and will be used for presentations on aspects of the archaeology of Kent.

17.6 It is to be understood that photographs and notes taken by KCC Archaeological Officers in connection with the work that do not identify individuals or site locations may be used by KCC for outreach and publicity purposes, including on social media sites such as Facebook, Twitter etc. The Archaeological Contractor should**, preferably in advance** of the works, raise with the KCC Archaeological Officer any concerns that they or their client may have over the use and dissemination of images or information for outreach purposes. In such cases the Archaeological Contractor and their client will agree a protocol with the KCC Archaeological Officer for the appropriate dissemination and use of images and information which balances the concerns of the contractor and/or client with the objective of ensuring that the people of Kent are kept informed of the archaeological discoveries in the county.'

18 General

18.1 In carrying out the work the Archaeological Contractor is to abide by:

- all statutory provisions and by-laws relating to the work in question,
- the Institute of Field Archaeologists *Code of Conduct*,
- the Institute of Field Archaeologists *Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology*.

APPENDIX 1 Kent County Council HER summary form

Site Name:	
Site Address:	
Summary: (50 words max)	
District/Unitary:	Parish:
Period(s):	
NGR (centre of site : 8 figures): (NB if large or linear site give multiple NGRs)	
Type of archaeological work (underline) Evaluation: Watching Brief Field Walking Documentary study Building recording Earthwork survey Excavation: Geophysical Survey Field Survey Geoarchaeological investigation	
Date of Recording:	
Unit undertaking recording:	
Geology:	
Title and author of accompanying report:	
Summary of fieldwork results (begin with earliest period first, add NGRs where appropriate) (200 words max) (cont on attached sheet)	
Location of archive/finds:	
Contact at Unit:	Date:

APPENDIX 2 - FIELDWORK NOTIFICATION FORM

Guidance for Completing the Kent Archaeological Fieldwork Notification Form

Purpose

The purpose of the form is to improve the notification, tracking and monitoring of archaeological fieldwork in Kent. Its primary purpose relates to archaeological work being undertaken for the purposes of planning and development but it is hoped that it will be also usable by archaeological societies and other bodies undertaking fieldwork in the county.

Approach

- The archaeological body undertaking the fieldwork should fill in the form. Sections A and B should be filled in before fieldwork starts and submitted to the County Archaeologist. This may be submitted in digital copy to speed things along but a signed copy should follow in the post.

- Section A contains details of the project while Section B refers specifically to the onset of the phase of fieldwork. In signing section B the Archaeological Contractor is confirming that the necessary funds and resources to complete the works to the specification have been made available.

- The form should not be filled in separately for each period of an intermittent watching brief but should be filled in for major stages of fieldwork, for example separate phases of evaluation and excavation.

- Section C should be submitted at the completion of the fieldwork stage and should if known indicate whether further work is anticipated. This section sets out a brief summary of findings and what reports are to be submitted. For excavations these will include interim, assessment and full reports. Again the form may be submitted digitally with a signed copy to follow in the post. (The details of Sections A and B should remain filled in on the same form).

- Section D should be submitted as reports are submitted to the County Archaeologist. For excavations the form need not be submitted with interim reports but should be submitted with assessment and full reports.

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