An Archaeological Research Framework for the

GREATER THAMES ESTUARY

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The Thames estuary from the air at sunset. © Crown copyright NMR.

ENGLISH HERITAGE

Essex County Council
Planning

Kent County Council

Thames Estuary Partnership

FOREWORD

The Thames is one of the great European estuaries, a cultural, social and economic artery between the heart of England and the continental mainland since prehistoric times. Archaeological evidence for this rich past can be found above and below ground on either side of the estuary and within and below the waters of the Thames itself. Some very important work has been undertaken over the years yet until recently there was perhaps a lack of a coherent approach to archaeological research and investigation of the Thames region. A number of events have acted as catalysts, in particular the development of Estuary Management Plans and the inclusion within them of aspect reports on the cultural heritage, the need to consider the possible impact of the Thames Gateway proposals on the archaeological resource and English Heritage's promotion of Regional Research Frameworks.

As a result archaeologists and those involved with land use planning on either side of the estuary have come together, drawing in the university, and more recently the voluntary sector, to take forward the concept of *An Archaeological Research Framework for the Greater Thames Estuary* as presented in this volume. The drawing together of the overview of existing knowledge and the formulation of strategies for the future has been a demanding task for members of the Steering Group and those who have contributed from outside the Group. It is also pleasing to acknowledge the many constructive comments received when the Framework was widely circulated for comment in 1998.

The publication of the Framework, however, is just the first step. It is important now to move forward and define more clearly the archaeological resource, to seek to conserve it where appropriate and to develop its potential for research, education, leisure and tourism.

John Williams
Chairman, Thames Archaeological Steering Committee

An Archaeological Research Framework for the

GREATER THAMES ESTUARY

edited by John Williams and Nigel Brown

'It was not so much an estuary as a broad sea gulf, thirty miles from jaw to jaw, with the ebb tide turning it to an expanding archipelago as whaleback islands of mud and sand began to ease themselves out into the hazy sunshine. I'd seen the mouth of the Thames from aircraft before - a delta of smooth and gleaming flats, with wrinkled fans of water spilling out from the tiny brooks which divided the islands. ...I wished that I'd concentrated a little harder .... This thin, pale water didn't look like sea, and nor did the land around it look like land. It was wide-open, flat and boggy...'

'Coasting' Jonathan Raban

'Research frameworks are needed urgently at a regional as well as a national level, so that archaeologists working with local authorities have a framework within which recommendations can be made regarding the protection and recording of archaeological sites.'

G J Wainwright

Essex County Council Planning Division
Kent County Council Strategic Planning Directorate
English Heritage Greater London Archaeological Advisory Service
Thames Estuary Partnership

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Front cover: *The cover shows recording of the peat and 'forest beds' at Purfleet, Essex during the Hullbridge Survey. Crayford Ness on the Kent side in the background with the twin towers of the Dartford Creek flood barrier at the mouth of the Darent to the left.*

Back Cover: *This painting (by Frank Gardiner) represents a scene at the Pool of London about 1920, showing the tug 'Badia' (built 1909) towing a typical three-masted barque. The tug 'Gusty' (built 1913) is seen towing lighters. Thames barges, typical craft of the region, are also busy. In the background are Meritons Wharf, St Saviour's Dock and Butlers Wharf. Courage's Anchor Brewery (Built 1895) can also be seen.*

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CONTENTS

Abbreviations used in the text

DoE	Department of the Environment
ECC	Essex County Council
EH	English Heritage
ERO	Essex Record Office
EMP	Estuary Management Plan
FLAG	Fluvial Archive Group
GIS	Geographical Information System
INQUA	International Union for Quaternary Research
KCC	Kent County Council
MAPII	Management of Archaeological Projects, 2nd edition
NKMI	North Kent Marshes Initiative
NMR	National Monuments Record
PPG	Planning Policy Guidance
PPS	Proceedings of the Prehistoric Society
QRA	Quaternary Research Association
RCHME	Royal Commission on Historical Monuments England
RSPB	Royal Society for the Protection of Birds
SMR	Sites and Monuments Record
SSBR	Society for Sailing Barge Research

1

Introduction

1.1 Introduction

Research Frameworks have long been recognised as being a vital part of any archaeological endeavour (Peers 1929; Wheeler 1955), and recently the need for such frameworks has been underlined (Wainwright 1996; Olivier 1996). The present document aims to provide a Framework for the Greater Thames. It was prepared by a working group comprising representatives of the two County Councils of Essex and Kent, the Greater London Archaeology Advisory Service, English Heritage and the Royal Commission on Historical Monuments (England), which developed from the Cultural and Historic Resources Topic Groups for the Thames Estuary and Medway/Swale Management Plans (TEMP 1, 2; NKMI 1, 2). The background to, purpose and format of the Framework are set out below.

1.2 Definition of Area

1.2.1 For the purposes of this document The Greater Thames estuary is defined as a zone from Clacton in Essex to Whitstable in Kent, and upstream to Tower Bridge (Fig. 1). Tower Bridge is an appropriate western boundary since a research framework for the Thames estuary needs to recognise the importance of the influence of London as a key node within the estuary system but avoid the total domination of London in the framework. It will, however, be important to cross-relate the Thames estuary framework with that being separately developed for London. The Greater Thames estuary, Raban's 'broad sea gulf' (1986), a complex of creeks and estuaries, which includes the Blackwater and Crouch to the north, and the Swale and Medway to the south, needs to be considered and understood as a whole (English Nature 1996, 15); this is certainly how the Thames estuary is perceived by seafarers (Fig. 2, ERO 1970, 24-5; Raban 1986)). It may be envisaged as a rough triangle, with Colchester and Canterbury at the angles and London at the apex, or as a broad funnel shape facing the Continent and opening on to the Southern North Sea Basin at its junction with the Channel (Raban 1986, 220). The whole area has for millennia been a major zone of contact between Britain and the Continent (Schama 1995, 3-5). The main focus of this framework is on the modern

Fig 1: Location map showing selected towns and rivers

intertidal zone, the present and former marshland and the Holocene floodplain. The archaeology of these areas, however, relates to that further inland, and needs to be understood in that wider context (Brown 1997, 5; Champion and O'Regan 1997, 22). Moreover, Pleistocene sediments of the Thames and associated lower palaeolithic sites are of national importance (section 2.2)

1.2.2 The Greater Thames estuary lies within the London Basin, which is bounded by outcrops of chalk on the North Downs and the Chiltern hills. The basin has been filled by river-borne sediments from the west and marine deposits from the east. The glacial period had a profound impact on the region. The Thames, originally flowing through what is now the Clacton area, was forced progressively south into its present course (Bridgland 1994, 292-5). The successive deposits of the Thames and its tributaries, rich in archaeological and environmental data, make the Greater Thames area one of the key zones for study of the British palaeolithic, and this is amply demonstrated by the work of the Southern Rivers and English Rivers surveys (Wessex Archaeology 1991; 1994). Since the end of the last glaciation, sea level has risen considerably, and continues to do so today (Haggart 1995; Long 1995; Long and Roberts 1997; Wilkinson and Murphy 1995). This complex and fluctuating process, which has been neither continuous nor uniform, has also produced a sequence of deposits containing a wide variety of archaeological and environmental data (Wilkinson and Murphy 1995; Meddens 1996; Bates and Barham 1995).

1.2.3 The study area as defined here, is coincident with the concept of the Greater Thames estuary as defined by the Royal Society for the Protection of Birds (1992). This is no accident since the geographical position and the diverse resources, which have made the Greater Thames attractive to wildlife, have also attracted human exploitation and settlement. In the Greater Thames, as is frequently the case in what may be broadly defined as 'wetland' areas, the concerns of archaeology and nature conservation are largely complementary (Cox *et al*. 1994; Coles and Coles 1996, 157). Furthermore, the Greater Thames has a common cultural background, deeply influenced by its littoral location, and discernible in its economy, patterns of landuse, settlement and material culture. This broad cultural unity, whilst not generally coincident with political or administrative boundaries, is clearly apparent in the archaeological record from at least the bronze age (Wymer and Brown 1995, 152-170; Cunliffe 1982; Thompson 1982; Haselgrove 1987; Tyler 1996), and can be documented in the medieval period (Nichols 1932; Ward 1987; Wymer and Brown 1995, 166-170). Perhaps only in the last two hundred years has this general pattern been distorted by the overwhelming industrial and urban growth along the Thames estuary itself, which has produced its own distinctive series of built structures and other remains (RCHME 1995a).

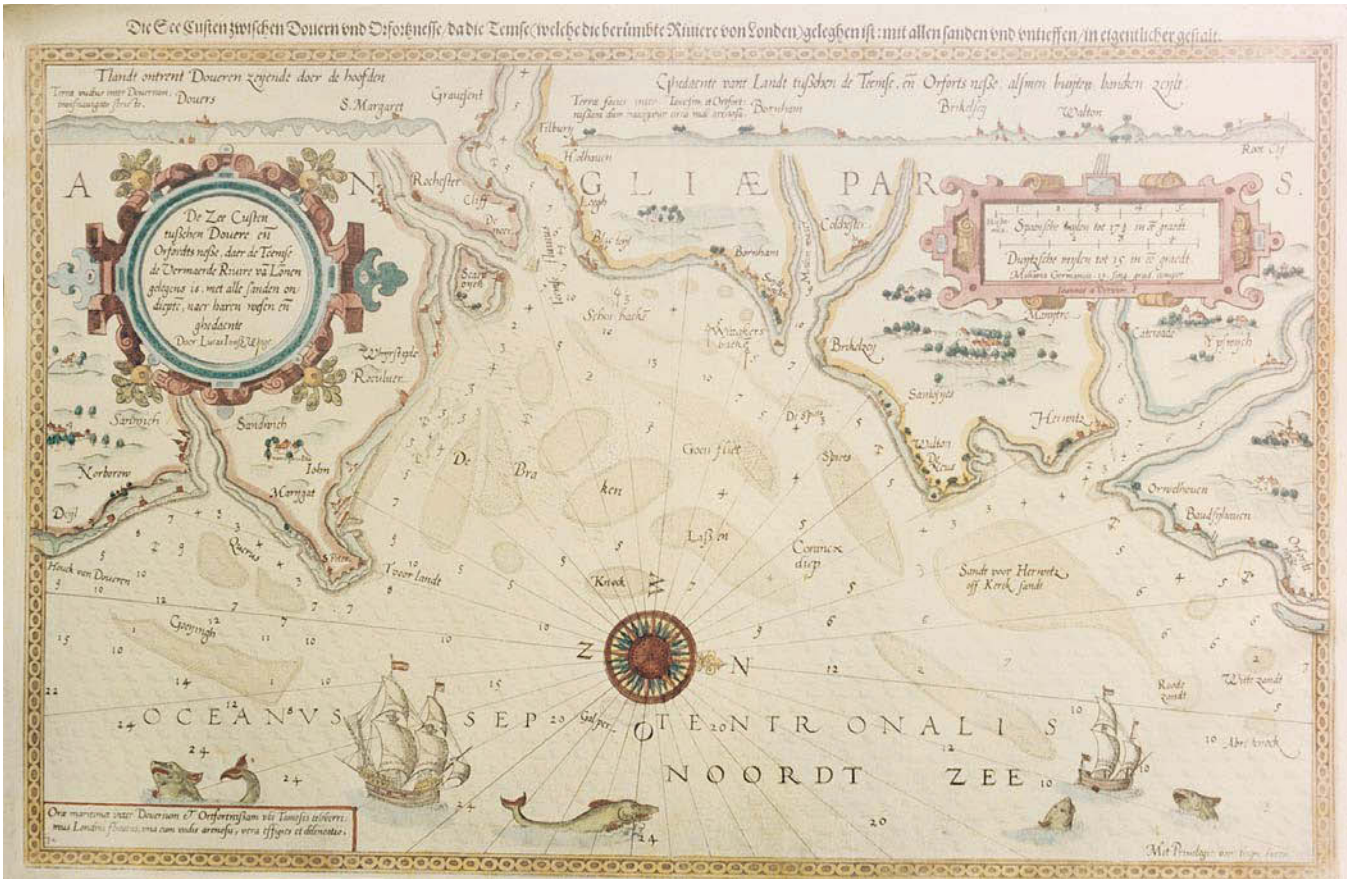

Fig. 2: Chart of the mouth of the Thames by the famous Dutch pilot Lucas Wagenhaar, 1586

1.2.4 A factor which formerly united the Greater Thames region and played a key role in defining its character was the prevalence of malaria. The effects of this are described, often anecdotally, by many authors writing about the area in the 16th, 17th and 18th centuries (Emmison 1976; Ward 1987; Wymer and Brown 1995) but whether it occurred earlier is uncertain. The affected areas (Dobson 1980, figs 7 and 8) neatly coincide with the Greater Thames estuary as defined here. It appears likely that the malaria concerned was a particular form caused by the *Plasmodium vivax* parasite, carried by a particular mosquito species *Anopheles atroparvus* (Dobson 1980). The relevant mosquito population must have been infected by the parasite, and the upsurge of trade with the Indies and elsewhere at the start of the post-medieval period may have provided the mechanism for this. The incidence of the disease declined sharply in the 19th century for complex social and environmental reasons (Dobson 1980).

1.3 History of Research in the Greater Thames

1.3.1 Archaeological remains in the Greater Thames area have attracted sporadic attention for centuries. Ralph of Coggeshall recorded the discovery of 'giants bones' on the Essex coast, presumably the remains of hippopotamus, elephant etc, which are a feature of many geological deposits in the region (Bridgland 1994, 251-62, 347-57). During the 19th century, antiquarian collecting focused on Roman remains, in the intertidal zone on the Essex side of the Thames estuary, and at Upchurch in Kent. In the late 19th and early 20th centuries more systematic work was undertaken, notably by Spurrell (1885;1889) and Warren (1911; Warren *et al*. 1936). In the mid 20th century, Evans (1953) undertook pioneering work in the Medway estuary.

1.3.2 Extensive rescue excavations took place along the terraces adjacent to the estuaries of the Greater Thames from the late 1960s to the late 1980s: in Essex, at Lofts Farm (Brown 1988), Slough House and Chigborough Farms (Wallis and Waughman 1998), North Shoebury (Wymer and Brown 1995), along the Grays Bypass (Wilkinson 1988), Orsett Cock (Carter 1999), and most famously at Mucking (Bond 1988; Clark 1993); in Greater London, notably north of the Thames, at Barking (MacGowan 1987), Rainham and elsewhere (eg Greenwood 1982; Meddens 1996), and south of the Thames at Bermondsey (Thomas and Rackham 1996). Excavation of these sites emphasised the importance of their proximity to the Greater Thames estuarine complex. Concurrent with, and complementary to, this work, has been the creation and development of the Sites and Monuments Records for Essex, Kent and Greater London. Together these now provide the most comprehensive computerised databases for the Greater Thames area (Gilman 1996).

1.3.3 Prior to the 1980s, with a few exceptions such as that at the Orsett neolithic enclosure (Hedges and Buckley 1978), projects tended to be rescue driven, with research, management, conservation, or SMR enhancement as secondary considerations. In the late 1980s the Hullbridge Survey investigated much of the intertidal zone within the Essex portion of the Greater Thames estuary (Wilkinson and Murphy 1995), and recently similar work has been undertaken along the foreshore in Greater London. Campaigns of aerial photography, specifically along the coast, have extended the range of sites and structures recorded (Strachan 1995). This work not only revealed the full archaeological potential of the intertidal zone itself, but also the need to integrate this evidence with that from the adjacent 'dryland' areas (Murphy and Brown forthcoming). It was also instrumental in indicating the general importance of the archaeology of the Greater Thames estuary at a national level (Fulford *et al*. 1997). Recently a range of survey and recording work has been carried out on the distinctive and extensive industrial and defence structures which are a feature of the Greater Thames area, particularly along the Thames Estuary itself (Coad 1989; Nash 1994; RCHME 1995a, b, c and d; Smith 1994).

1.3.4 The present framework aims to provide the basis for building on the work already undertaken and to facilitate a common purpose and co-ordinated approach while not straitjacketing individual initiative.

1.4 Threats to the Archaeological Resource

1.4.1 The need for a research framework for the Greater Thames is highlighted by the variety and intensity of various threats to the archaeological resource. It is essential to ensure that effective decisions are taken about what it is important to protect, investigate or let go. The various threats to the archaeological resource within the Greater Thames are briefly described here and considered more fully elsewhere (TEMP 1, 2, 1966).

1.4.2 The area has been increasingly subject to development pressure, particularly through the expansion of London eastwards. Infrastructure, industrial and residential development, especially along the waterfront in the London area, have had, and continue to have, a great impact. In the present decade an effective means of dealing with many of these threats has been provided through the planning process, by the application of PPGs 15 and 16 (DOE 1994; 1990a). A number of other threats, however, lie beyond the scope of these provisions (section 1.3.3-5) and are likely to have a particularly severe effect on archaeological deposits within the Greater Thames.

1.4.3 Agriculture is an ongoing threat to buried archaeological deposits through the continuing erosion and denudation of subsurface deposits by ploughing and subsoiling. This is more a threat where features are to be found immediately below the surface; agriculture will potentially have less impact where deposits are deeply buried. Earthwork remains such as salt-working sites are vulnerable, and ploughing of former grazing marsh can also be particularly damaging to archaeological deposits; English Nature has quoted a figure of the loss of 73% of the coastal grazing marshes in the period between 1935 and 1989. Drainage schemes affecting

low-lying and former intertidal areas reclaimed for agriculture can have a significant impact in drying out subsurface waterlogged deposits.

1.4.4 Coastal erosion over recent years has highlighted the archaeological and palaeo-environmental potential of the intertidal and offshore areas, whilst simultaneously destroying this valuable resource, and many salt-working sites have been lost to coastal erosion. This situation may, in fact, deteriorate as a result of global warming, given that current relative sea-level rise on the Kent coast is estimated to be between one and two millimetres per year. The impact of future sea-level rise will, however, depend on the interaction of local and regional factors (Long and Roberts 1997) and could include increased erosion or changes in chemical or biological environments. Loss of saltmarsh has been considerable over the last fifty years, and this important and characteristic landform is still being destroyed at a rapid rate. For instance, at a number of locations within the Greater Thames, estimates of saltmarsh lost to erosion from 1985 to 1993 range from 5% to 17% (Cook *et al*. 1994, table 7). Denudation of the mudflats also continues, and archaeological features will consequently continue to be exposed and subsequently destroyed. Patterns of erosion can be affected both by changes in the natural environment and the effects of man-made sea defences. Construction or strengthening of coastal defences in one area may lead to greater erosion in adjacent parts of an estuary. Sites exposed on the mudflats are vulnerable to vessels grounding or anchoring, and may also be vulnerable to commercial fishing activity such as trawling and shellfish harvesting, and even extensive bait digging.

1.4.5 Maintenance dredging is largely restricted to existing navigational channels, where there is likely to have been a degree of continuity of use over a long period of time, and archaeological deposits in the channels may already have been destroyed. The creation, however, of new channels and/or the widening of existing channels pose a major threat, while smaller-scale works cause constant attrition. Changes in water quality may also affect preservation of certain buried materials. Research concerning the relationship between water-borne pollution and the integrity of archaeological material is ongoing.

1.4.6 Another threat to archaeology which needs to be considered is a function of the rising water-table in the London area. If this rise continues into zones of heavy industrial contamination there is the possibility that areas of archaeological importance may be contaminated by flux of ground waters from polluted sites

1.5 Estuary Management Plans

1.5.1 Planning Policy Guidance Note 20: Coastal Planning (DoE 1990b), supported the need for estuary users and managers to produce estuary plans, and as a result English Nature initiated production of a Thames Estuary Management Plan. Management plans for the other main estuaries of the Greater Thames complex, namely the Blackwater, Crouch, Medway and Swale, have also been prepared or are in preparation.

1.5.2 In order to inform the Thames Estuary Management Plan, a number of working parties were established to prepare papers on particular topics of interest, including a Historic and Cultural Resources Topic Paper (TEMP 1, 1996), to guide the Thames Estuary Partnership, formerly the Thames Estuary Project, in its preparation of an estuary management framework for the Thames. The working party which produced this comprised representatives from Essex and Kent County Councils, Gravesham Borough Council, the London Planning Advisory Committee, the RCHME and English Heritage and an independent defence heritage historian. The topic paper summarised current knowledge of the resource and set out a number of principles on issues that are fundamental to the historical and cultural resource of the Thames estuary (TEMP 2, 1996, HC1-12). The updated principles incorporated in the Thames Estuary Partnership: Draft Principles for Action are listed below and may be considered to apply to the Greater Thames estuary.

- Encourage the enhancement of databases through survey and research across the whole range of the heritage resource to increase understanding for management, research, educational, leisure and tourism purposes.
- Promote the development of policies with local government and other relevant bodies, to seek the long-term preservation of important heritage sites within the estuary
- Seek to ensure that central government, local authorities and other organisations with ‘planning’ powers give due weight to the historic environment in reaching any decision which may have an impact on the heritage resource.
- Encourage developers to consider fully the impact of their proposals on the historic environment and formulate appropriate measures for mitigation.
- Encourage regeneration projects to retain and re-utilise historical industrial structures for new purposes, as appropriate.

- Encourage agricultural regimes that are compatible with preservation and sensitive management of archaeological and historic landscape features.
- Encourage the consideration of heritage issues in relation to impacts from coastal erosion and sea defence.
- Promote the recording of archaeological information where loss or destruction of a resource is unavoidable.
- Promote greater liaison between the Environment Agency and archaeologists to reduce the impact on archaeological deposits from poor water quality, pollution and fluctuating water tables.
- Encourage public access in a manner consistent with the safeguarding of the cultural heritage resource.
- Promote greater public awareness of all aspects of the heritage resource within the estuary so as to encourage a greater sensitivity for its longer term management
- Develop the heritage resource of the estuary as an educational resource.
- Encourage co-operation to identify policies and management regimes beneficial to the long term management of the heritage resource and the needs of interested groups.

1.5.3 The topic paper was well received by the main management group taking forward the Thames Estuary Management Plan and by English Heritage. The suggestion arose that the working group continue to consider ways in which at least some of the recommendations of the topic paper could be progressed and a first meeting was held in July 1996. The convening of this group also enabled the region to prepare a response to a call for regional archaeological frameworks initiated by English Heritage (below 1.7), and led to the preparation of this Research Framework. The present document draws heavily on the work undertaken for the Thames Estuary Management Plan. The Historic and Cultural Resources Topic Paper (NKMI 1) produced to inform the Medway/Swale Management Plan, follows a similar approach to the Thames document, and provides a comprehensive summary for the southern part of the Greater Thames.

1.6 The Need for Research Frameworks

1.6.1 The need for research frameworks is a matter much discussed by archaeologists, and there is a well established belief that any archaeological work should be carried out within a defined research context. An early attempt to achieve this on a national scale was undertaken in the 1940s by the Council for British Archaeology in a wide ranging statement of present achievement and future needs (Hawkes and Piggott 1948). This document was largely forgotten during the frantic archaeological rescue and salvage of the 1960s and 70s which only served to emphasise the need for direction for future work. The various period societies gave much thought to this issue during the 1970s, resulting in the production of working documents which addressed contemporary issues and attempted to define priorities for future research (eg Prehistoric Society 1984). The CBA also considered the issue further, producing a theme-based research statement in 1983 (Thomas 1983).

1.6.2 The 1970s and 80s also saw the appearance of County Council-based archaeological staff. During this period, despite limitations of funding, these local authority units endeavoured to develop their work with regard to national academic frameworks and locally identified research needs. Whilst not always formally defined in print, county level local strategies are implicit in the work of County Archaeologists (Williams 1997). At both county and regional level comprehensive summaries with priorities for certain areas, periods or site types have been produced (eg Champion and Overy 1989). The proceedings of conferences held on the archaeology of Essex and Kent set out potential and pointed to research priorities for their counties (Buckley 1980; Leach 1982). The proceedings of a second conference for Essex (Bedwin 1996) revised priorities for that county in the light of knowledge accumulated over the previous 15 years.

1.6.3 While failing to meet the need fully, all these documents provided some direction for the expanding profession during the 1970s and 80s. The publication, however, of PPG 16 (DoE 1990), and subsequently PPG 15 (DoE 1994), has established new patterns of working and emphasised the need for clear research priorities at national, regional and local level. There has also been criticism about some of the approaches being developed for the implementation of PPG 16. Articles and letters in British Archaeological News (Biddle 1994a; Carver 1994) and discussion at IFA conferences (Biddle 1994b; Barrett 1995) raised these concerns in print, and fuelled a debate about the need for archaeological research to be conducted within clearly defined frameworks. These concerns within the profession were reflected in an English Heritage initiative seeking opinion on these matters described below (section 1.7.2).

1.7 Recent Framework Initiatives

1.7.1 English Heritage first addressed the issue of national research needs with the publication of "*Exploring Our Past*" (1991a). This contained a statement of the achievements of the past decade of DoE/EH funding and presented a strategy "*born of the experiences of the 1980s, for dealing with the problems and opportunities which will be encountered during the next decade*". Included within this was a broad framework of academic priorities at national level, aimed at

assisting the process of effective targeting and maximisation of limited resources. Cross-reference to the document has become a standard practice for any project research design produced in support of a grant bid to English Heritage over the past five years. The publication of *Management of Archaeological Projects* (MAP II) also provided a standardised approach to the presentation of specific research projects (English Heritage 1991b).

1.7.2 Whilst *Exploring Our Past* primarily sets out priorities at national level, it was recognised that there was also a strong argument for similarly defined policies at regional level, related to, and working within, an appropriate national policy. It was this feeling which in March 1994 prompted the Chief Archaeologist at English Heritage, Dr G J Wainwright, to send a letter to a wide range of relevant organisations and other interested parties, including all County Archaeologists. This raised the concern of a perceived general lack of academic focus and content to some areas of work being carried out post-PPG 16. He suggested that a structure of national and regional policies would provide appropriate frameworks within which decisions could be taken on the protection, management and recording of the archaeological resource at local level and relate national strategies to those needs. This approach produced hundreds of responses detailing many individual initiatives, which were already available to guide future work. These provided an assessment of the situation at that time, and a basis for further consultation and discussion within the profession about agreed regional and national frameworks in the future (Olivier 1996).

1.7.3 A number of regions of England, most notably the Eastern Counties (Glazebrook 1997; Brown and Glazebrook forthcoming), have responded to the challenge and have set out to produce appropriate regional frameworks and specialist groups have also begun to prepare frameworks (MSRG 1996; Wills 1997). In the meantime, at a national level the Archaeology Division of English Heritage has produced and circulated for comment its own draft Research Agenda (English Heritage 1997). The Greater Thames Research Framework is a further contribution to this process.

1.8 Aims, Format and Terminology

1.8.1 The archaeological resource (Chapter 2), both as a whole and in its individual parts, is finite and irreplaceable. Decisions likely to cause damage to the resource must only be taken after full consideration of all the issues, and it is hoped that the Research Framework will help facilitate this process. It is intended that the framework will help underpin local authority curatorial decisions, and provide the basis for programmes of research for which local, national and international funding will be sought. In addition to the promotion of academic research, it is hoped that the framework will provide impetus to develop school and higher level educational use of the archaeological resources of the Greater Thames, and encourage informed tourism and leisure use. The challenge for this document is to provide, as the title suggests, a Framework within which research programmes, utilising existing knowledge in combination with new fieldwork, can be developed to enhance our understanding of the region's archaeology. It is intended that this will be pursued both at an academic level and through programmes of public information and education. Encouragement of tourism and enhanced understanding of the educational potential of the region's archaeology (Jones 1997) are important components of this framework (section 3.7). The three key concepts for 'Advancing Understanding of England's Archaeology' (English Heritage 1997b, 16), namely accessibility of information, targeted data collection and synthesis, are endorsed as central to these aims.

1.8.2 Considerable debate took place within the working group. Initially the proposal was to formulate a Greater Thames Archaeological Project to further the aims of the Thames Estuary Partnership, but it was soon accepted that the first step should be the creation of a Regional Research Framework for the Greater Thames in line with recent initiatives (section 1.7). Debate then centred on the best format for the Framework and it was agreed to adopt that presented by Olivier (1996, 5 fig.1; below Fig. 3) which comprises three parts :-

Resource assessment: summary of the current state of knowledge and understanding.

Research agenda: summary of gaps in current knowledge, topics for further research.

Research strategy: prioritised research topics, drawn from the agenda, for which specific research projects can be drawn up.

It could be argued that, strictly speaking, the present document is a universal framework in that a management strategy is incorporated, but the emphasis within this document is in establishing directions for future research activity (section 4.1.2)

1.8.3 Once the overall format of the Framework was agreed, the form and content of the Resource Assessment and Research Agenda were discussed. This focused on whether they should be ordered chronologically, thematically or by geographical sub-division within the region. It was recognised that each approach had advantages but none was ideal (Glazebrook 1997, 2). The working group recognised that the importance of the archaeology of the Greater Thames merited fairly rapid production of a Framework document, and that the work undertaken in preparation of the TEMP, which was organised thematically, was a sound starting point. It was also felt that a key aspect of any estuarine strategy would concern the potential afforded by waterlogged and damp conditions along the estuary margins. Here the thematic approach, concentrating on landscape zone management and exploitation across the centuries, would be particularly

relevant, as would the need to develop methodologies specific to dealing with wetland. The core of the TEMP Topic Paper was adopted as the basis of the Resource Assessment and this imposed a thematic approach. As successive drafts of the Framework were discussed the structure was amended and reordered but it still preserves a thematic format (Chapter 2).

1.8.4 There is some overlap between the various themes selected but it is felt that this would have been the case whatever divisions were chosen. It is important to emphasise the seamlessness of the archaeological resource between the dryland and the waters of the estuary, but, on the other hand, it is essential to highlight key themes and areas of research so as to provide points of focus and direction, whether these relate to landscape zones or particular aspects of archaeology, such as defences.

1.8.5 While, however, a thematic approach has been followed in this framework, it is recognised that the development of an understanding of human action and the historical process in the estuary within a period-based framework is central to this strategy (section 3.1.3), and indeed some would argue that a chronological framework is preferable to a thematic one. These concerns have been recognised and, in particular within the sections on settlement patterns, attention is paid, for example, to the impact of the arrival of the Romans, the Anglo-Saxons and the Normans. Nonetheless it was felt that the nature of the archaeology of the estuary lent itself best to a thematic approach.

1.8.6 The account presented in this framework makes no pretence to be a full and detailed description of every aspect of the archaeology of the Greater Thames. Rather it presents a highly condensed summary, which can be further pursued through the accompanying bibliography, and identifies the salient points of the region's archaeology and research potential. It is very much a statement at a particular point in time, which will need to be reviewed and updated periodically.

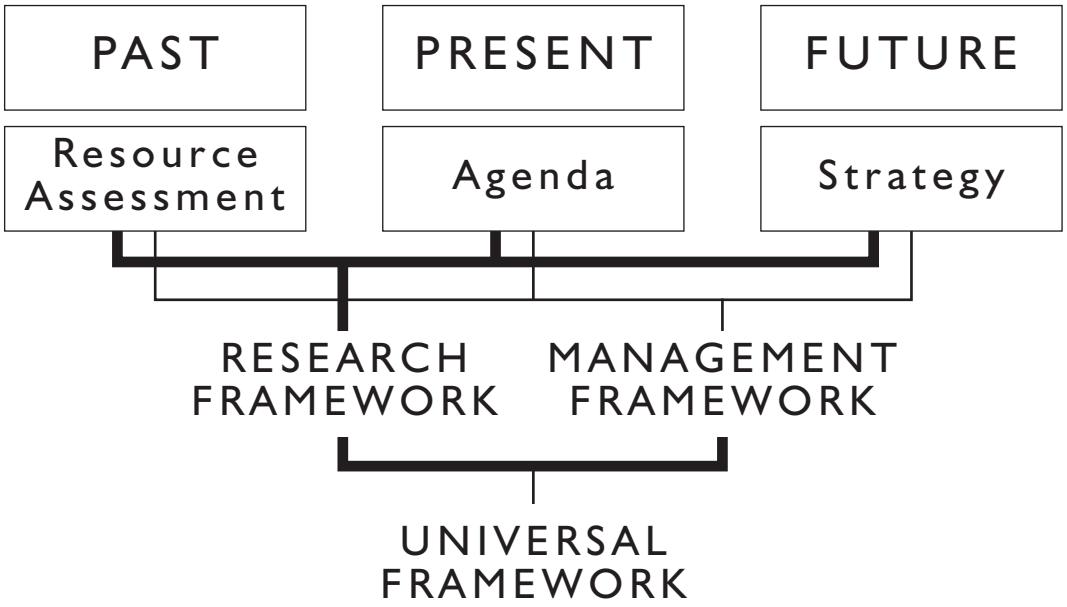

Fig. 3: Diagram showing the structure of a Research Framework

2

Resource Assessment

2.1 Introduction

2.1.1 The archaeological resource is, by its very nature, diverse and, in relation to the themes and headings outlined below, embraces both buried, and therefore hidden, archaeological materials, and also the often visually dramatic remains of the relatively recent past (Fig. 3). It is perhaps inevitable in the outline of the resource which follows that earlier periods are dealt with more generally and the more recent heritage, especially that related to industrial and defence sites, is more precisely delineated. In the following sections brief reference will be made to many individual sites across the region. Further information may be obtained from the relevant SMR and/or bibliographic references. In considering information regarding site types and individual specific sites, reference can profitably be made to the Monument Protection Programme's Monument Class Descriptions and the Step 1 reports for industrial archaeology (English Heritage web-site, www.eng-h.gov.uk/mpp/mcd).

2.1.2 The archaeological resource is described below under the following headings:

- *2.2* Pleistocene environment and palaeolithic archaeology
- *2.3* Holocene palaeoenvironment
- *2.4* Maritime archaeology
- *2.5* Intertidal and related archaeology
  - *2.5.1* Intertidal archaeology
  - *2.5.2* Sea walls and flood defences
- *2.6* Archaeology of the floodplain and terraces
  - *2.6.1* Settlement patterns
  - *2.6.2* Historic built environment
  - *2.6.3* Historic defences and other military installations
  - *2.6.4* Industry and transport

2.1.3 There is a continuum between the middle of the estuary and dry land, and it is difficult to define the edges of individual zones precisely in archaeological terms. For instance buried landscapes may be preserved today on dry land, in the intertidal zone, or in the estuary proper (TEMP 1; Champion and O'Regan 1997), although for the purposes of this document, they are largely dealt with in section 2.5 *Intertidal zone and related archaeology*. This kind of overlap emphasises the need to regard the Greater Thames as an historic landscape comprising a range of interlocking elements, both spatially and chronologically.

2.1.4 It is important to recognise that organic materials, both man-made, such as wooden or leather artefacts, or environmental indicators, such as plant and insect remains, survive best in anaerobic conditions. A waterlogged environment, such as that found in and adjacent to an estuary, is thus likely to aid the survival of a greater range of archaeological materials than on the majority of dry-land sites (Coles and Coles 1996; Brown 1997). In respect of the Greater Thames estuary this situation is enhanced by the rise of sea-level since the end of the last glaciation. Thus in mesolithic times the coastline was very different from today (Fig.4), and even over the last 2000 years change in sea-level has been considerable. One of the results of this sea level change is that many formerly dry-land sites along the coastline have now become submerged. In such situations microbial degradation of organic materials may have occurred before submergence, so that, even though deposits may now be waterlogged, only durable biological residues such as bone, and plant macrofossils preserved by charring, survive. These macrofossils, however, are of great significance for reconstructing early economies; moreover the sedimentary cover often seals palaeosols (providing opportunities for soil micromorphological and palynological studies) and preserves spatial patterning of artefacts.

2.1.5 As noted (section 1.8.1), improved understanding of the relevance of the archaeology of Greater Thames for education and tourism, is a prime aim of this Framework. Such is the diversity of the organisations and programmes already operating in these fields within the region, it would not be appropriate to summarise the present situation in the Resource Assessment. These matters are, however, considered in the Agenda (section 3.7).

2.2 Pleistocene Environment and Palaeolithic Archaeology

2.2.1 The Greater Thames estuary offers immense potential for the study of environmental change and its relationship with human activity. The resource includes the physical, biological and chemical environment, providing data on the geometry of the present river system and its previous forms, excellent preservation of the remains of past plant and animal communities and other indicators of climatic change and human activity. Pleistocene deposits within the Lower Thames area are particularly significant; they provide opportunities to relate the fluvial sequence of the Lower Thames to the glacial sequence of the area to the north and, further, to relate sites in the London Basin to those in the North Sea Basin and the surrounding parts of continental Europe (Bridgland 1994; Bridgland *et al*. 1995). These Pleistocene sediments in some cases continue off-shore

(Bridgland and D'Olier 1995) where they are under threat from the extraction of aggregate.

2.2.2 For a long time British Pleistocene studies have used a 'climato-stratigraphical' model which is primarily based on pollen evidence (Bridgland 1994), with well-documented interglacial sites at Swanscombe and Trafalgar Square. More recently, however, studies of mammal fauna have indicated additional climatic cycles to those shown in the pollen record: Bridgland (1994) has identified four post-Anglian interglacials, although Gibbard (1995) supports the case for only recognising two interglacials between the Anglian and Devensian glaciations. An alternative to the pollen-based model is being sought and the amino-acid stratigraphy may provide such an alternative, although conflicts with other dating methods are known at the older end of the date range (Bowen *et al.* 1995). The oxygen isotope record from the relatively uninterrupted ocean-bed sediments may in the future offer a truly global chronological framework, though correlation with land-based deposits is still problematic (Bridgland 1994).

2.2.3 Until the Anglian glaciation, the Thames flowed to the north of London through the Vale of St Albans but, when ice blocked this route, the Thames was diverted into its present valley (Bridgland 1994). Prior to its diversion the Thames had migrated progressively southwards across East Anglia so that in the Clacton area the final pre-diversion floodplain lies close to post-diversion Thames deposits. The river Medway also used to flow northwards across eastern Essex and the newly diverted Thames took over the route of this early Medway (Bridgland 1994). During the later Anglian and following its diversion, the Lower Thames migrated southwards towards its present position and rivers such as the Crouch and Blackwater were initiated as left bank tributaries of the Thames (Bridgland 1994; 1995). From a wider perspective it would seem that, during periods of low sea-level from the time of the Anglian glaciation onwards, the Thames and the Rhine met in the area of the southern North Sea and together flowed south-westwards through the English Channel to the Atlantic Ocean (Gibbard 1988).

2.2.4 The Pleistocene deposits associated with the River Thames and its tributaries are of great importance as a long and relatively uninterrupted geological sequence, formed in an area which was marginal to the maximum extent of glaciation during the cold stages of the Pleistocene epoch (Bridgland 1994; Austin 1997 and forthcoming). They have been found to be extremely rich in palaeolithic evidence, with large collections of artefacts and fossils from many sites, including Purfleet and Grays among others on the north bank, and Crayford, Swanscombe and the Ebbsfleet valley on the south side (Wessex Archaeology 1991; 1994). At Swanscombe pieces of an early human skull dating from

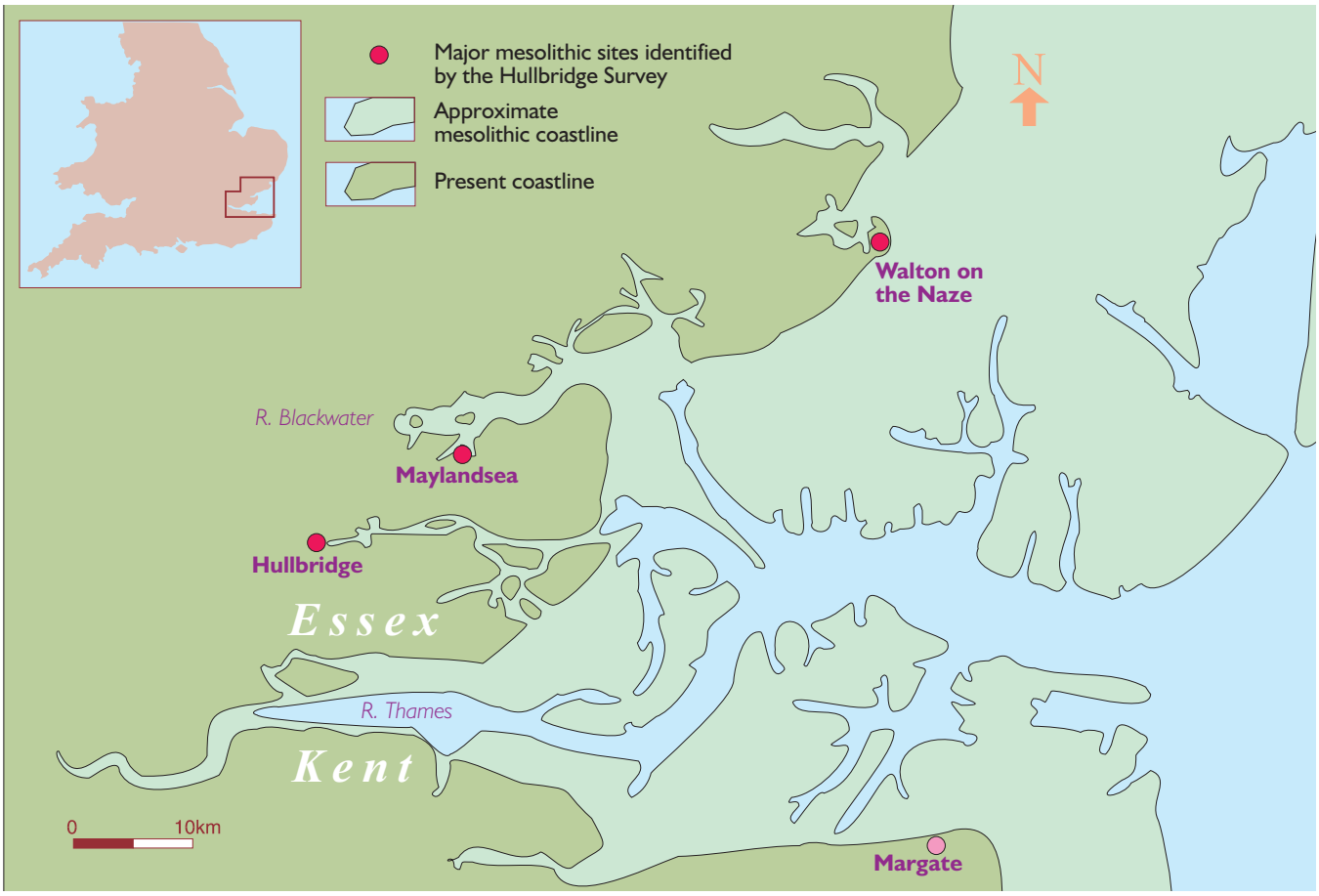

Fig. 4: Approximate location of the late mesolithic coastline

around 400,000 years ago are among the earliest such remains in Europe.

2.2.5 The lower palaeolithic lies at the frontier between archaeology and geology (Bridgland 1996), where research interests are shared, and the two disciplines form part of the multidisciplinary subject of Quaternary studies. Records of lower palaeolithic finds within the study area have recently been reconsidered through the *Southern Rivers and English Rivers Projects* sponsored by English Heritage and undertaken by Wessex Archaeology (1991 and 1994). The study area includes a small number of well-preserved, thoroughly investigated sites, such as the Swanscombe Lower Loam, but much of the information gathered and artefacts recorded to date have been the result of casual or chance investigations during gravel extraction. In these instances the English Rivers and Southern Rivers Projects can be usefully supported by more detailed localised studies, such as the Crayford Silt Complex Archaeological Deposit survey, again sponsored by English Heritage and undertaken by Wessex Archaeology (1998). This reviewed extant borehole information and museum collections to show that in situ working floors may occur at the interface of the fine grained deposits and terrace gravels within commercially exhausted quarries and the study was also able to present a local landscape context for early hominid activity.

2.2.6 The majority of palaeolithic sites recorded within the Thames estuary area can be assigned to the lower palaeolithic. A few upper palaeolithic sites are known within the area (Jacobi 1980;1982) and important remains exist in the Lea valley (Jacobi 1996). An upper palaeolithic/early mesolithic site was found at Three Ways Wharf, Uxbridge, to the west of the study area, during redevelopment of the site (Lewis forthcoming).

2.2.7 Dating methods applicable to the palaeolithic period are sometimes problematic, and sites are often assigned to date ranges on the basis of their geological context. In the long term, careful correlation of terrestrial deposits with oxygen isotope records derived from deep sea cores could provide a better framework for dating the palaeolithic. The Thames terraces seem particularly suited to correlation with the deep ocean record since they provide a wealth of biostratigraphic information and represent the most complete record of the post-Anglian Pleistocene in Britain (Bridgland 1996).

2.3 Holocene Palaeoenvironment

2.3.1 The waterlogged conditions prevalent in much of the Greater Thames region are particularly beneficial for the preservation of organic materials such as wood, plant and insect remains, which are important indicators of palaeoenvironmental change. The Hullbridge Survey (Wilkinson and Murphy 1995) combined environmental and stratigraphic studies with archaeological survey to provide further dating evidence for recorded features and new sites, enabling archaeological sites to be related to environmental changes in the estuary. Despite the great success of this project, difficulties have arisen in using some of the data recovered in wider studies of sea-level change (Long and Roberts 1997). This will need to be borne in mind in designing future studies (Chapter 3).

2.3.2 Holocene sediment sequences in the Thames estuary were extensively investigated by Devoy (1979), who developed the first model for relative sea level changes in the area. During the Holocene, south-east England has experienced a net rise in relative sea-level. This rise is largely a result of glacio-eustatic factors following the melting of continental ice at the end of the Devensian, though crustal movements, due to ice or water loading and sediment compaction, may also be involved. There is a complex interplay between global, regional and local factors (such as the rate and focus of sedimentation) affecting sea-level; the rate of sea-level rise has not been uniform and there are also important spatial differences within the Greater Thames (Fig. 4). Such variations have complex causes (Long and Roberts 1997; Haggart 1995; Wilkinson and Murphy 1995), and are the subject of ongoing research. The general pattern of vertical changes in sea-level in England is well known but knowledge of the spatial response of the coastline to these changes is poor, and there is little agreement in the chronology of sea-level tendencies between different parts of south-east England (Long and Roberts 1997). Long (1992) has suggested that regional processes have controlled the altitude of sea-level index points but more local factors have influenced patterns of shoreline advance and retreat, and also sea-level tendency. In subsiding zones only negative tendencies of sea-level movement will be of more than local significance because positive tendencies may be the result of subsidence (Shennan *et al*. 1983).

2.3.3 Terminological difficulties have led to some confusion, and more precise definitions of such terms as transgressive and regressive overlap, sea-level index points, and tendency of sea-level movement are needed. Shennan *et al.* (1983) note that a rise or fall in sea-level will be registered by changes in lithology and vegetation but that the precise nature and character of the changes will be local and site dependent. The dominant direction of sea-level change, however, will be constant and recorded over a much wider area; the expression of this is defined as a tendency of sea-level movement (Shennan *et al.* 1983). Shennan (1983) advocates that sea-level index points should be assessed jointly to identify this wider scale process. Detailed interpretation of regional phenomena cannot be made solely from an evaluation of sea-level index points on a time-altitude diagram because errors in estimating altitudes allow only the identification of a broad sea-level band. Correlation schemes based on the sea-level tendency concept as used in the Fenlands and north-west England (Shennan *et al.* 1983) offer an alternative approach.

2.3.4 Vegetation changes are directly linked to coastal change (and to other factors such as increased run-off and

Fig. 5: A neolithic tree trunk eroded from the forest bed at Purfleet, Essex

ground water level changes), with the evidence being provided by the relative frequency of plant and animal species present as organic remains or microfossils within the sedimentary sequence. Recent work has indicated that previously established pollen sequences require review (Wilkinson and Murphy 1995; Fulford *et al*. 1997).

2.3.5 Organic remains can be used to reconstruct the economy and subsistence patterns both for specific archaeological sites (Wilkinson and Murphy forthcoming) and the wider context of past human use of the landscape (Wilkinson and Murphy 1995; Murphy and Brown forthcoming). This can facilitate a better understanding of human interaction with the environment (Brown 1997), in ways which are not always possible away from the estuarine zone.

2.3.6 Wood peat, with forest remains of ash, alder, yew, elm and holly was recorded at Purfleet during the Hullbridge Survey (Wilkinson and Murphy 1995). At the same site, though not *in situ*, drifted trunks of elm, hazel, alder, willow/poplar and ash are present in subjacent sediments of the Thames II transgression. Similar remains have been recorded to the east in Greater London during recent archaeological survey and in boreholes. These deposits represent remains of what was once an extensive peat bed in the Thames estuary which extended between Purfleet and Crossness (Fig. 5). In the Blackwater estuary, root systems of oak are widespread, at Clements Green Creek in the Crouch estuary woodland of oak and alder is present, and other sites with remains of woodland are known from elsewhere in the Crouch (Wilkinson and Murphy 1995). At all these sites there is evidence of human presence; they do not represent untouched woodland. Similar forest remains and peat deposits have been revealed within deep alluvial sequences across east London (Meddens 1995; 1996).

2.3.7 Samples from sections cut in the Mar Dyke as part of the work along the A 13 (Wilkinson 1988) have provided a chronological sequence of vegetational change spanning the mid-Flandrian to c.1500 BP, embracing nearly all the major phases of human impact on the forest and agricultural activity from the neolithic to the Saxon period. As more of these kinds of sequences have been revealed within the Greater Thames region, it has become increasingly apparent that the previously widely correlated and relatively simple stratigraphic sequences should be reviewed. Correlations between peat units at different sites should be made with caution.

2.3.8 These kinds of environmental and archaeological resources are present in the estuaries themselves and the intertidal zone, the reclaimed marshland and also within the river valleys, with deposits extending at times to several metres in depth. The potential for palaeoenvironmental study is well demonstrated in a composite section, *c*. 14 metres thick, through Holocene deposits, recorded in 1994 in connection with the construction of the Medway Tunnel (Barham 1993) and by current work at Aveley. Similar

potential is present throughout the region, for instance in the Ebbsfleet valley, where over 7 metres of fine-grained sediments and extensive peat deposits have been recorded in preliminary studies (Barham and Bates 1995).

2.4 Maritime Archaeology

2.4.1 Earlier prehistoric maritime activity in the Greater Thames estuary can be inferred from circumstantial evidence, notably the wide variety of imported metal and ceramic objects found in the region (O'Connor 1980; Champion 1982; Cunliffe 1982; Brown 1996; Sealey 1996). Interestingly, these objects not only demonstrate contacts with continental Europe but also with the west of England, in the case of Glastonbury Ware from Heybridge (Brown 1987) and the Trevisker Urn from Thanet just outside the region (Bennett and Williams 1997; Gibson *et al.* 1997). A little further away a bronze age shipwreck is inferred off Dover (Muckelroy 1981), and at Dover itself a bronze age boat was excavated in the silted up estuary of the Dour, some six metres below the modern street level (Parfitt 1993). A paddle broadly contemporary with the Dover boat has been recovered from the Crouch estuary in Essex (Wilkinson and Murphy 1995).

2.4.2 A Roman port flourished at London where riverside excavations have found evidence of quays, bridges and warehouses on both north and south banks of the River Thames (Milne 1985). Goods of all kinds, including building stone (Marsden 1994, 82-3; Crummy 1997, 61; Williams 1971) were carried to and from not only London, but also the other major Roman towns of Colchester, Rochester and Canterbury, which fringed the Greater Thames estuary. A number of known or suspected Roman wreck sites lie within the Greater Thames, notably at Pan Sands, Pudding Pan Rock and Ooze Deep (Rhodes 1989; Sealey and Tyers 1989). Actual boat remains have been recovered in London immediately west of the Greater Thames area (Marsden 1994).

2.4.3 Considerable Saxon seaborne activity was focused on the East Saxon kingdom's '... capital city of London, which stands on the banks of the Thames, and is a trading centre for many nations...' (Bede), proved by excavations to be centred along the Strand in the City of Westminster (Cowie and Whytehead 1989). A major trading centre existed at Ipswich, serving the kingdom of East Anglia north of the Greater Thames estuary, and it is likely that Fordwich and Sandwich fulfilled similar roles in Kent. Lesser trading centres no doubt existed within the Greater Thames estuary, and amongst the best candidates for such sites are Canvey (Crowe 1996; Fulford and Champion 1997), Greenwich, Woolwich and Faversham. The Greater Thames estuary was a focus of military/maritime activity throughout the Viking period, most famously demonstrated by the Battle of Maldon poem (Cooper 1993). At various times, Mersea, Shoebury, Benfleet and Sheppey were all used as Viking bases. Boat remains of this period, including the famous Graveney boat (Fenwick 1978), have been found sealed within alluvial sequences.

2.4.4 Major construction projects undertaken subsequent to the Norman Conquest saw a large amount of stone being ferried from Kent, Caen in Normandy and elsewhere into London and the other major towns of the Greater Thames. The continued importance of this waterborne trade is demonstrated by the extensive use of Kentish Rag and Reigate stone in the churches of south and east Essex. Such material, however, represents only part of the trade in which the estuary was involved, with movement back and forth between Kent and Essex and across the North Sea and English Channel (Ward 1987). Actual shipwrecks or reused fragments of vessels are known from London (Marsden 1996) and some sites within the Greater Thames area (Jackson 1987). Documentary evidence indicates the importance of waterborne transport throughout the Greater Thames. Ship and boat building was conducted on or very close to the foreshore along the waterfront east of Tower Bridge and at many other locations within the Greater Thames, although surviving physical evidence is likely to be slight.

2.4.5 The East India Company was founded in 1599 and the establishment of the East India yard at Blackwall (Robey 1995) and Deptford (Phillpotts 1997) was the beginning of large-scale commercial shipbuilding on the Thames. Shipbuilding for military purposes had commenced earlier and the Naval Dockyards were established in the 16th century. While Portsmouth and Plymouth eventually became the principal naval dockyards, the Thames and Medway played a key role in the earlier years of the standing navy. Again shipwrecks and reused fragments of vessels are known from many locations in London (Marsden 1996) and elsewhere within the Greater Thames region.

2.4.6 By the early 18th century, London was reckoned to handle 77% of the value of all Britain's foreign trade. Expansion of the Empire and strategic and defence needs associated with two World Wars ensured that the Thames estuary continued to see a high level of commercial and military traffic.

2.4.7 It seems reasonable to assume that shipwreck has been a constant factor throughout this long history of sea and water-borne activity. Navigational hazards abound in the river and estuary, and wartime losses have also occurred. It is evident that the study area potentially contains important archaeological evidence associated with key aspects of Britain's development as a maritime nation and world power.

2.4.8 In addition to boat remains in the maritime zone of the estuary itself both substantially complete hulks and more fragmentary remains occur widely within the creeks of the marshes or in the intertidal zone. Numerous boat remains are recorded from the east London/west Essex marshes (Marsden 1996, appendix 9). Hulks and wrecks, in particular of barges, were also incorporated into sea defences or simply abandoned (Fulford *et al*. 1997, 88-9; Strachan

1995). Recent work along the Thames foreshore in London has included the recording of many barge beds and 'wrecks' left to rot. A group of forty Thames barges was recorded in advance of construction of the Medway tunnel. Much of the evidence for early ship building, repair and breaking is found on the foreshore and is rather more fragile and vulnerable than remains associated with more recent ship building (Milne 1995).

2.4.9 During periods where reliance was placed on wind or manpower for propulsion and safety depended on basic navigational aids allied to the expertise of local pilots, it is likely that the proportion of vessels lost through accident would have been at least as great as during more recent times. The current archaeological record, however, is dominated by the remains of relatively modern craft with very little evidence available for vessels from the medieval and early post-medieval periods.

2.4.10 Despite this, the potential for significant discoveries of earlier material exists: for example, the *La Custance,* a vessel which sailed from Bordeaux in 1343, is recorded as having been lost 'at the mouth of the Thames' but the remains of this craft are yet to be located. Equally, some potentially significant sites require further investigation: an unidentified wreck near the Nore anchorage, from which cannon have been raised, may represent the remains of a 17th century warship, the *London*. Nearly 500 records of sites or features of potential archaeological interest are held in local and national inventories. More than half of these comprise documentary references to losses of vessels, ranging from the medieval period to 1945, for which no physical remains have yet been located. Again, while the study area contains no wrecks designated under the Protection of Wrecks Act 1973, this is as much a reflection of the lack of systematic archaeological survey as an indication of the surviving resource.

2.4.11 Such is the extent of sea level change that it must be emphasised that extensive tracts of what was once dry land now lie below low-water mark. Important submerged land surfaces of the palaeolithic and mesolithic exist in the estuary and indeed far out beneath the North Sea. These sites are vulnerable to dredging, and increasingly to offshore mineral extraction, but their full extent and character are not well understood. Such sites are considered more under *Intertidal and related archaeology* and *Archaeology of the floodplain and terraces.*

2.5 Intertidal and Related Archaeology

2.5.1 Intertidal Archaeology

2.5.1.1 The intertidal zone comprises the area lying between high and low water marks which consequently is, for part of the time, submerged and at other times exposed. This zone within the Greater Thames estuary is extensive, and contains archaeological features both on its surface and stratified to considerable depths. Rise in relative sea-level during the Holocene has meant that there has been a natural inland movement of the intertidal zone, although land reclamation and other factors have had a reverse effect. Thus sites now landward of the seawall, which were once intertidal, lie buried below alluvium, while sites once on dry land now lie buried and exposed within the intertidal zone. This section, therefore, deals primarily with landscapes and sites which have been or are presently within the intertidal zone, the historical and current interfaces between the waters of the estuary and dry land. Sea defences prominent at this interface have a separate sub-section.

2.5.1.2 As they are often sealed below later alluvial sequences, the nature, depth and importance of archaeological deposits within any given area can often be uncertain. The flat surface of the present estuarine flood plain masks a complex stratigraphy which records the regression and transgression of the sea during the later Holocene. The sequence will normally only be established as a result of exposures in the estuaries themselves, in cutting down through the overburden, or in more general terms through the interpretation of borehole logs taken for commercial or research purposes (Chapter 3 below).

2.5.1.3 Ancient ground surfaces may emerge from the mudflats as a result of erosion, notably in the Blackwater, Crouch, and Thames estuaries (Wilkinson and Murphy 1995), around the Hoo peninsula, and in the Upchurch marshes. These surfaces, often dating to the neolithic and bronze ages, have preserved soil profiles which on inland sites have generally been removed by ploughing. Their importance is amply demonstrated by work at The Stumble in the Blackwater (Wilkinson and Murphy 1995 and forthcoming). While representing a major threat, continued erosion offers an opportunity for both investigation and recording.

2.5.1.4 Environmental evidence for the past vegetational history of the region can survive well in organic levels buried within the alluvium, and indeed within the silts themselves. These buried landscapes, comprising former ground surfaces and soil profiles, peat deposits and forest remains can occur at almost any point from below the tidal limit, through the intertidal zone, to inland areas. Well preserved peats containing extensive remains of forests have been recorded within the intertidal zone throughout the Greater Thames.

2.5.1.5 A range of individual sites is being revealed on these surfaces. These may be deeply sealed within alluvial sequences or exposed in the intertidal zone. Discoveries at Beckton in east London and at Southwark highlight locations on the extensive floodplain where small-scale late prehistoric activity is commonly associated with buried localised topographic features, such as gravel eyots and sand bars (eg Prince Regent Lane, East Ham, MoLAS *pers. comm*.). A significant surviving feature is the evidence for ard cultivation, and a number of sites have revealed the

criss-cross scarring characteristic of this method of cultivation (Merriman 1992).

The various different types of site are treated thematically in the following paragraphs:

2.5.1.6 ***Trackways***: Trackways would have provided access to the salt marshes and/or the rivers/estuaries beyond (Wilkinson and Murphy 1995; Meddens 1996; Thomas and Rackham 1996). Numerous short lengths have been recorded in the intertidal zone of the Essex coast (Wilkinson and Murphy 1995) dating from the bronze and iron ages. Bronze age trackways are known in the marshes north of Gillingham (Jackson pers. comm.) and in London (Merriman 1992; Philp and Garrod 1994). Similar sites exist away from the present intertidal zone deeply buried within alluvium (Meddens 1996; Thomas and Rackham 1996).

2.5.1.7 ***Settlement sites:*** Many such sites may well be located on the substantial areas of preserved land surface, similar to that of neolithic date at the Stumble in the Blackwater estuary (Wilkinson and Murphy 1995; Wilkinson and Murphy forthcoming). Elsewhere they may be preserved beneath alluvial deposits, as at East Ham and Rainham. An isolated Roman marsh settlement was recently re-discovered close to the Thames at Thamesmead (Lakin 1997).

2.5.1.8 ***Boat remains:*** Boat remains may be preserved in alluvial sequences. These are treated more fully in section 2.4.

2.5.1.9 ***Fish traps and ponds:*** Numerous fish traps/weirs are known within the Greater Thames including the extraordinary complex in Whitstable Bay (Fulford *et al.* 1997, Fig. 44). Many sites have come to light during recent aerial survey of the Essex coast (Crump and Wallis 1992). Extensive documentary evidence is available for the use and construction of fish weirs/traps during the medieval and post-medieval periods (Emmison 1976; Ward 1987). Wicker fish traps have been recovered from later medieval drainage ditches at Ferguson's Wharf; trapping of eels in drainage ditches was a widespread practice until relatively recently (Wymer and Brown 1995, 160). A programme of radiocarbon dating on sites in the Blackwater estuary has, however, demonstrated that many elements of the huge complex at Collins Creek and the very large traps at Sales Point, Bradwell and the Nass, Tollesbury, are of middle Saxon date (Strachan 1995; 1998). Ponds constructed possibly for fish storage prior to sale in London markets (Bride 1930) have been recorded on Leigh Marsh. Morphologically similar features have been identified at Fobbing and at Oare.

2.5.1.10 ***Oyster pits:*** The cultivation of oysters seems to have occurred in the Roman period (Milne 1985; Murphy 1995) and appears to have been continuous from at least the early medieval period (Wymer and Brown 1995). It was subsequently a very important industry on the Essex and Kent coasts (Benham 1993; Goodsall 1965; Wren and Harrison 1995). Oyster pits occur throughout the Greater Thames, notably around the Blackwater, Crouch and Roach estuaries, Holehaven Creek, Canvey Island, Fowley Island and Sheppey. Unusual, circular examples occur in Hadleigh Ray. Oyster beds have been recorded at Seasalter (Wren and Harrison 1995).

2.5.1.11 ***Decoy ponds:*** While wild-fowling has no doubt been an important activity since earliest times, it has left little evidence in the archaeological record. Notable exceptions are the duck decoy ponds of post-medieval date; these often exploited existing creeks, and are common on the Essex coast (Strachan 1995) and along the Swale.

2.5.1.12 ***Saltworking sites:*** The earliest salt-production site within the Greater Thames estuary is at Fenn Creek in the Crouch estuary (Wilkinson and Murphy 1995), and salt-making equipment is known from a number of later bronze age sites outside the intertidal zone. The later importance of salt production is indicated by the large number of salt-working sites of late iron age/Roman and medieval periods which occur throughout the Greater Thames. In Essex the late iron age/Roman sites are known as Red Hills because of their distinctive red soil, a feature almost unique to the county. They occur widely throughout the Essex portion of the Greater Thames (Fawn *et al.* 1990). Domesday Book records numerous salt-production sites along the north shore of the Blackwater estuary in Essex (Hart 1993), and at Whitstable and Graveney in Kent (Tatton-Brown 1984). At Graveney there is a group of 13th-century mounds derived from saltworking (Thompson 1956). Many salt-working sites are known from the Hoo peninsula, for example at Cooling and around the Medway and Swale (Miles 1975; Philp and Willson 1983; Detsicas 1984; Topping and Swan 1995). A large-scale 17th-century salt working site is recorded on the Isle of Grain, whilst salt production still continues at Maldon.

2.5.1.13 ***Pottery production:*** The Thames estuary was the home of a flourishing Roman pottery industry (Swan 1984), particularly concentrated on the marshlands of north Kent. At least 24 kiln sites have been located in the Upchurch marshes with further sites along the Medway estuary, on the Cliffe peninsula, Isle of Grain and further west along the floodplain of the Thames (Monaghan 1987; Pollard 1988; Swan 1984.)

2.5.2 Sea Walls and Flood Defences

2.5.2.1 Sea walls are a characteristic feature of the landscape of the Greater Thames Estuary, and run almost continuously around the coast, dividing land from water. In addition to those sea walls still in use, abandoned eroding examples exist in the intertidal zone, while others survive as relict earthworks or cropmarks inside the present sea wall. These structures taken as a whole offer an important, if somewhat neglected, field of research (Allen 1997).

2.5.2.2 The marshes appear to have been used for grazing, at least as early as the Roman period (Wymer and Brown 1995,160; Sealey 1995), and quite possibly very much earlier (Brown 1988; Meddens 1996; Murphy and Brown forthcoming). Sea walls and flood defences have been built since the Roman period to prevent inundation of land by flooding, or alternatively to reclaim wetlands (Rippon 1996a). Worsening climatic conditions from the late eleventh century onwards led to the development of a series of sea walls within the Greater Thames estuary. This process continued through the medieval and post-medieval periods, primarily to create pasture. This was of great economic importance, and inland manors often held detached marshland enclaves (Wymer and Brown 1995, 166). This practice appears to be reflected in the old parish boundaries of south-east Essex, with Canvey and the islands of the marshland archipelago east of Southend divided up between distant parishes (Round 1903; Darby 1971).

2.5.2.3 The seawalls generally take the form of an earth bank, often with a rear ditch. Eroded abandoned seawalls occur within the intertidal zone (Wilkinson and Murphy 1995), most notably at Tollesbury (Murphy and Brown forthcoming). Little archaeological investigation of seawalls and their sluice systems has been carried out within the Greater Thames area. A section, however, of the medieval sea bank on Foulness revealed a timber framework of the late 15th century (Crump 1981), a medieval embankment has been found at Locke's Wharf, Westferry Road and late medieval drainage ditches at Ferguson's Wharf contained wicker eel traps and leather artefacts, revealing secondary marsh dyke functions, including fishing and rubbish disposal (Lawson Price 1996).

2.5.2.4 By contrast, documentary evidence is plentiful and there are references relating to the maintenance of sea walls at Rainham marsh (1210), West Ham (1280), Limehouse (1298), Wapping (1324), Stratford-Barking (1384) and Dagenham (1321). Leases of chalk cliffs at Purfleet in 1574 and 1594 carried an obligation for the supply of a stated amount of chalk between April and June for the walls at West Thurrock (Grieve 1959). London examples include banks around the Isle of Dogs, and along the South Bank in central London. The Greenwich peninsula was protected by a floodbank and drained through sluices no later than the 14th century; subsequently it was used for grazing and then market gardening through to the 19th century. In the post-medieval period the walling and reclamation of marsh intensified. Severe flooding in the mid-16th century overwhelmed the defences in Kent and elsewhere (Powell 1982, 155-7); a Commission was set up in 1570 to reclaim the lost land and new defences were built between 1570 and 1630. In the mid-17th century, workers from Holland were brought to south Essex to construct a sea wall around Canvey Island.

2.5.2.5 While former seawalls may survive as field monuments with the bank recognisable on the ground or from the air, they might, if levelled, only be traceable through the ditch surviving as a crop mark. Earthworks associated with livestock management may survive on the relatively few remaining areas of unploughed grazing marsh. An example may be an enclosure on Upper Horse Island in Holehaven Creek, which is recorded on the OS 6" sheet of 1880 but whose function is currently unknown.

2.6 Archaeology of the Floodplain and Terraces

2.6.1 Settlement Patterns

2.6.1.1 This section deals essentially with 'surface' elements of the archaeological resource, sites which have remained on dry land throughout the history of the estuary. The use of the estuarine environment as a source of food, and as a major zone of seaborne contact led to continuous occupation of the area . There is a wealth of archaeological material recorded from the lighter soils of the gravel terraces of the Greater Thames. Aerial photography has revealed extensive field systems, settlements, and other features to be widespread throughout the Greater Thames. The evidence has been plotted as part of the RCHME National Mapping Programme, although the results will need to be supplemented by more ground survey, to provide corroborative evidence of date and function. The following summary aims to draw attention to the main categories of archaeological sites by period. Pleistocene deposits containing evidence for palaeolithic occupation, of national and international significance, are considered separately (section 2.2). In addition there are important landscape elements which are not period specific; for instance, much of the landscape of south and east Essex preserves a rectilinear pattern of roads and fields (Drury and Rodwell 1980; Rackham 1986) of great antiquity, though possibly not reflecting a single planned event (Rippon 1991).

2.6.1.2 ***Mesolithic:*** Evidence for the mesolithic period comes from chance finds from 19th and 20th-century quarrying, together with some later collection and formal excavation. A seminal paper by Lacaille (1961) demonstrated the potential of the lower Thames with regard to mesolithic settlement. The central theme of his paper was the characterisation of the sedimentary, stratigraphic and technological associations of recorded lithic assemblages. He identified the 'backwaters of the Thames and the basins of tributaries' as a virtually untouched field of promise. The Lea valley is known to contain important organic sediments, and mesolithic sites sealed below peat (Jacobi 1996). The Hullbridge Survey located a number of mesolithic sites, including major flint concentrations at Maylandsea and Hullbridge itself (Wilkinson and Murphy 1995), which, although now within the intertidal zone, were originally on dry land. These sites offer unique opportunities to explore the interaction of the human economy and the natural environment. Extensive spreads of lithic debris of late mesolithic and early neolithic date are associated with the pre-transgressive landscape, sealed by substantial peat and clay deposits, across the Crayford, Erith and Plumstead marshes.

Mesolithic finds have also been made at Lower Halstow (Jacobi 1982), Milton Regis (Baxter 1977), Seasalter, Tankerton (T Allen, pers. comm.), Pye Hill and in the Ebbsfleet valley.

2.6.1.3 ***Neolithic:*** The Medway valley is notable for two groups of megalithic chambered tombs (Holgate 1981; Ashbee 1993). Otherwise neolithic features may survive as buried landscapes (section 2.5, Wilkinson and Murphy 1995) as crop-marks, for example the causewayed enclosure at Orsett (Hedges and Buckley 1978), as subsoil features as, for instance, at Chigborough and North Shoebury (Holgate 1996), Birchington and Grovehurst (Clarke 1982) or as surface artefact scatters (Holgate 1996).

2.6.1.4 ***Bronze Age:*** Settlement evidence is widespread and complex (Brown 1996; Brown and Murphy 1997), including sites at Lofts Farm (Brown 1988), Mucking (Clark 1993), North Shoebury (Wymer and Brown 1995), Minnis Bay (Worsfold 1943), St. Mildreds Bay (Perkins 1988) and Cliffe (Preston 1979). The concentration of hoards around the Greater Thames estuary is one of the largest in Britain (Rowlands 1976; O'Connor 1980). Imported metal and ceramics indicate an intricate network of exchange relations. Evidence of later bronze age saltworking exists within the region. Numerous cropmark ring-ditches are known around the Greater Thames estuary, and in some locations barrow mounds are still extant (Lawson *et al*. 1981; Grinsell 1992).

2.6.1.5 ***Iron Age:*** Iron age settlements, both enclosed and unenclosed, are widespread. A 'hill fort' is known on the River Roding at Uphall, Ilford, where recent excavations have revealed something of the internal layout, preserved under the modern street plan (Greenwood 1989). There is possibly another corresponding fort on the south bank of the river. Similar sites exist at Asheldham and possibly Maldon (Bedwin 1991 and 1992). Multi-ditched enclosures at Rainham and Orsett Cock are examples of a distinctive enclosure type apparently restricted to the Thames estuary (Carter 1999). Evidence for an iron age mint has been found at Rochester (Harrison 1991). There is a concentration of iron age activity along the Thames side of the Hoo peninsula and Isle of Grain, whilst extensive iron age settlement, including nucleated groups of roundhouses, has been recorded along the Blackwater estuary (Wallis and Waughman 1998).

2.6.1.6 ***Roman:*** During the Roman period the region was heavily populated, and recorded sites include settlements, roads, industrial sites and cemeteries (Going 1996; Wickenden 1996; Blagg 1982). London, the principal town of Roman Britain, Colchester its first capital and Canterbury, the tribal capital of the Cantiaci, lay immediately to the west, north and south, respectively. The main Roman road between London and the 'small town' at Rochester, which then continued on to Canterbury and Dover, ran just to the south of the study area, with settlements along the road, for example at Crayford, Dartford and Springhead. The Darent and Medway valleys and the north Kent plain around Faversham developed a rich villa economy (Detsicas 1983; Wilkinson pers. comm.). By contrast, the main Roman road from London to Colchester lay further back from the estuarine zone, roughly along the line of the present A12. South Essex and the Dengie peninsula was a densely occupied and productive agricultural zone, but one with a distinctive settlement pattern, largely lacking small towns and villas (Drury and Rodwell 1980, fig.22; Wymer and Brown 1995, 160-161). An unusual collection of imported ceramics, numerous red hills, cremation burials and a possible fish processing site indicate the importance of Canvey during the Roman period. Pottery and salt production was widespread throughout the Greater Thames, particularly in the Upchurch marshes in north Kent (Fulford *et al*. 1997,162; Topping and Swan 1995; Swan 1984; section 2.5.1.13). In the late Roman period forts were constructed at Bradwell, Reculver and Richborough (2.6.3 below).

2.6.1.7 ***Anglo-Saxon:*** The importance of the Kentish kingdom is well established by its particularly rich cemeteries (Hawkes 1982) while recent work has considerably advanced our understanding of the Anglo-Saxon period in Essex (Tyler 1996; Rippon 1996b); in particular Mucking, a major site of international importance, which lies in the heart of the Greater Thames area has been the subject of extensive excavation (Clark 1993; Hamerow 1993). Further west in the Greater London area there are a number of early Saxon cemeteries but few early Saxon settlements. Surviving evidence makes the Greater Thames a particularly important region for studying minster churches which grew up for the most part in the middle Saxon period. This group of sites, which includes Barking, Tilbury, South Benfleet, Hoo St. Werberg, and Minster in Sheppey, perhaps provides the best potential for studying the archaeology and history of the region from the 7th to the 9th centuries (Gem 1995, 41). The importance of the estuarine zone is again indicated by the clustering around the Blackwater estuary of minster sites, a royal vill and the Maldon burh; within the estuary itself are a number of major complexes of fish weirs and the causeway linking Mersea to the mainland, all radiocarbon dated to the middle Saxon period (Rippon 1996b; Strachan 1998; Murphy and Brown forthcoming). An important area for research for the Anglo-Saxon period as a whole must be settlement shift and the development of estates and other forms of territorial organisation. *Ludenwic*, a major trading settlement, was also established during the middle Saxon period along the Thames foreshore, extending into the area now known as Covent Garden (Cowie and Whytehead 1989). By the 9th century, pressure from raids by the Vikings led to the reoccupation of the abandoned Roman walled city of London under the aegis of King Alfred, who is credited with the reorganisation of the internal layout of the city.

2.6.1.8 ***Medieval:*** The direct impact of the Norman Conquest in archaeological terms is most clearly evidenced

by the appearance of castles, Norman churches and religious foundations and the development of manors. Extensive evidence, mostly documentary, relates to the expansion of settlements, ports, fishing, shellfish and agricultural production. The area embraces several local regions defined by Roberts and Wrathmell (1995), within which the settlement pattern was essentially dispersed although a number of foci developed. Dartford gradually emerged as a town and Gravesend evolved partly as a result of its monopoly of the 'long ferry' to London. Barking developed as a major fishing port, while Maldon, Faversham and numerous smaller settlements, for example Fobbing and Leigh, were centres of fishing and coastal trade. Trading and seaborne transport flourished both within the Greater Thames estuary and with the wider world. Medieval settlements, manorial sites and church/hall complexes throughout the region are sited to give access to the intricate network of creeks and estuaries of the Greater Thames. These developments are often linked to the estates of religious establishments; both Christchurch, Canterbury and St. Pauls, London, held extensive lands around the Greater Thames (Hallam 1981; Nichols 1932), but secular lords also played a significant role (Ward 1987). The period saw major schemes of sea wall construction and drainage works for reclamation, to protect and develop grazing marshes, which were of great economic importance (section 2.5.2). Archaeological evidence includes a fish-processing site of 13th-14th century date recorded on Canvey Island (Wilkinson and Murphy 1995). At present this site appears to be unique within the Greater Thames, although it seems reasonable to suppose that such sites were once common. Excavations within the moated site of Southchurch Hall have indicated how the owners were able to exploit their Thameside location to obtain a remarkable range of imported items (Jackson 1987; Gaimster pers. comm.).

2.6.1.9 London's growth throughout this period as a major administrative, trading and industrial centre had a major impact on the estuary as a whole and led to expansion outside the City; a number of smaller settlements were established, based on exploitation of the river or on industrial and manufacturing processes such as ship building. Medieval ecclesiatical and royal riverside palaces, such as Greenwich Palace, at locations accessible to London, were a prominent aspect of the Thames during the late medieval period. Similar locations were favoured by members of the Court , and excavations at Highbridge Wharf, immediately east of Greenwich Palace, have revealed the remains of the late medieval Compton House (Wessex Archaeology 1998).

2.6.1.10 ***Post-medieval:*** The Thames Estuary is probably one of the most important areas in Britain for studying suburban settlement, industry and trade on a global scale in the early modern period. As industry and commerce expanded, so the settlements in which people lived, worked and traded underwent prolific expansion during the 19th century. As a result, along the Thames and Medway the present landscape is a mosaic of dense urban development, commerce and industry, interspersed with tracts of undeveloped countryside and marshland.

2.6.1.11 Later patterns of land reclamation typical of the historic Port of London can be charted at historic dockland settlements on the north bank of the Thames, as at Limehouse. At Old Sun Wharf, Narrow Street, a timber revetment was constructed on the contemporary foreshore in 1584-5 and the frontage completely built up by 1658 (Lawson Price 1995). At Victoria Wharf, Narrow Street, material from behind a 17th-century timber wharf included ceramics and other artefacts which have western European, Persian Gulf and West Indian provenances (MoLAS 1997). Excavation at the former Deptford Power Station produced evidence of the East India Company Shipyard. These investigations indicate the archaeological potential for examining 17th and 18th-century maritime communities.

2.6.2 Historic Built Environment

2.6.2.1 The present Research Framework is concerned primarily with archaeological issues in a broad sense within the Greater Thames estuary. The modern built environment must be recognised, however, as the latest manifestation of the evolution of settlement and commercial and industrial activity within and alongside the estuary. Industrial archaeology is separately treated but an attempt is made here to draw attention to some key developments which bring forward to the more recent past themes having their origin in earlier times. The section is necessarily cursory and selective but hopefully will stimulate both appreciation of a perhaps under-recognised resource and promote further study.

2.6.2.2 With the expansion of commercial and industrial urban settlements, (as outlined in section 2.6.1), came dramatic urban residential growth and the need to address both social and health issues; problems which had previously been only of minor importance became paramount in maintaining the stability of an expanding industrial nation. Several themes emerge from this period that are characteristic of the Greater Thames estuary. At the same time industrialisation of south London, particularly during the 18th century, saw many former high status buildings re-used or demolished, as commerce gained ascendancy over social prestige as the dominant Thames-side cultural dynamic.

2.6.2.3 Rosherville New Town was created by H E Kendal (1830). The vision was for an area that would become to Gravesend what Broadstairs is to Margate and St Leonard's to Hastings. The Italianate houses in Lansdowne Square (now a conservation area) date from this period and the south-west corner of the square gave entrance to Rosherville Gardens, laid out by George Jones (1837). The gardens were a favourite resort of Londoners but with the expansion of the railway network the gardens declined in popularity and eventually became the site of factories and offices. Southend began to be developed as a bathing resort in the 18th century, with the construction of Royal Terrace at the top of Pier Hill. Development continued through the 19th century

with the development of Clifftown, now a conservation area (Pollitt 1957). The prominence and sheer size of Southend Pier are a graphic reminder of the town's success as a resort during the late 19th century and first half of the 20th. Clacton was developed as a seaside resort from the middle of the 19th century. Crucial to the success of these towns was the development of swift transport systems, steamers, railways and, in the 20th century, roads.

2.6.2.4 The issue of health was of ever increasing importance to the urban populations of the Greater Thames estuary and the capital itself during the 19th century. The establishment of asylums and hospitals ran parallel with the creation of other institutions such as prisons, workhouses and schools. Never before were such institutions conceived on such a large scale and their establishment was the result of various commissions by Parliament to consider increasing social problems. Joyce Green Hospital, Dartford is an example of such an institution. A great number of such buildings have been lost to development and it is vital that surviving examples are retained. Rochford Hospital, an extensive and important construction of the 1930s, has recently been recorded prior to redevelopment (Cooper-Reade 1998).

2.6.2.5 In the 19th and 20th centuries areas of industrial housing were developed, including cement workers' housing in Northfleet and that within the 1933 Bata complex at East Tilbury. Twentieth-century new towns and social housing include the works of the GLC Architect's Department, such as Thamesmead, an attempt in the 1960s to turn an area of marshland into a town for 60,000 people. Similarly Basildon was created as a London overspill town, to bring coherence to extensive plotland development of the inter-war years. Plotland development is itself a distinctive settlement type, highly characteristic of the Greater Thames estuary.

2.6.3 Historic Defences and Other Military Installations

2.6.3.1 The strategically important Greater Thames estuary has a rich variety of defence sites of regional and national significance. These illustrate the evolution of defensive systems in response to international tensions and developments in weapons technology from the later Roman period (Saunders 1995; Smith 1995; Smith and Crowdy 1994; Nash 1994).

2.6.3.2 Sections of the Roman town walls of Rochester can be seen incorporated in the medieval defences. Saxon shore fortifications of later Roman date include the forts at Bradwell and Reculver (Johnson 1976; 1989; Johnston 1977).

2.6.3.3 Rochester has one of the finest surviving Norman keeps in the country and the circuit of its medieval town walls is largely intact. Other medieval fortifications include Hadleigh castle (Drewett 1975), the evolutionary Cooling castle (1382) with its gun ports in towers and gates (Smith 1985b), the site of Queenborough castle, and possible traces of village defences at East Tilbury.

2.6.3.4 The earliest pure artillery defences were the rounded bastion blockhouses of Henry VIII (1539-40) at Gravesend, Tilbury (Fig. 6), East Tilbury and Higham (Thompson and Smith 1980; Smith 1974, 1980; Moore forthcoming; Wilkinson 1983). Earthwork forts of the 1540s were constructed at the mouth of the Colne estuary (Kent 1988; Priddy 1983). There was a large camp at West Tilbury the main base for the defending army during the Armada invasion scare of 1588 (Smith 1985b). In the Tudor period, royal dockyards were established at Deptford, Woolwich, Chatham and Sheerness. The Thames yards closed *c*. 1860 but those on the Medway continued in use until after the Second World War. Chatham is the most complete surviving example of a Georgian and early Victorian naval dockyard (Guillery 1995).

2.6.3.5 Possible archaeological traces of the Civil War defences of London at Rotherhithe (1642) have been noted (Smith and Kelsey 1996). Tilbury fort (1670) is a nationally important example of angular bastioned defences and is the best preserved example of the work of Sir Bernard de Gomme, sometimes considered the English Vauban (Saunders 1989). Other work by de Gomme may be seen at Sheerness and Cockham Wood fort on the Medway (Guillery 1995; Smith 1993).

2.6.3.6 An ordnance storage depot was established at Woolwich in 1671 which was to grow into the major complex of the Royal Arsenal which operated until the mid-twentieth century. Expansion of the Royal Arsenal during the 19th century allowed testing of munitions over extensive areas of Plumstead. In the general context of defence the magnificent former Royal Naval hospital at Greenwich and its park are significant.

2.6.3.7 The move to linear bastioned defences for the protection of naval dockyards against land attack is demonstrated in the Chatham Lines (1756) and the land front of Sheerness (1780s+) (Hamilton-Baille 1974; Guillery 1995; Gulvin undated). Within these defended areas major military complexes developed from the 18th century onwards, including barracks, ordnance and victualling yards and military hospitals. Other remains of later 18th century defences are present in the additions to Tilbury (1780) and New Tavern, Gravesend, forts (1795) (Saunders 1980; Smith, 1985b). The Royal Engineers' headquarters buildings at Chatham are important in their own right and their presence there for more than 200 years has meant that the area has been the hub of various Royal Engineers' developments, for example, in the 1800s, when part of the Chatham Lines was used for experimental purposes during the design of gun embrasures for Dover Western Heights.

2.6.3.8 The enhancement of defences during the invasion threat of the Napoleonic period is represented on the Medway at Fort Amherst, Fort Clarence, Fort Pitt and in traces of the Delce and Gibraltar towers, and by the string of Martello towers from St. Osyth to Walton on the Naze in

Fig. 6: Tilbury fort from the air, showing the close relationship to the estuary, and the modern industrial landscape in the background

Essex (Kent 1988). Grain tower was a late form of Martello tower.

2.6.3.9 The granite-faced and armour-plated Royal Commission forts of the 1860s are perhaps the most distinctive defence heritage features of the lower Thames marshscape: at Shornemead (Smith 1977), Cliffe, Coalhouse fort, East Tilbury, Allhallows, Sheerness, Darnet island and at Hoo (Smith 1985b). These sites powerfully express the transition to the advanced systems introduced during the mid 19th-century military revolution. Also from this period are the Queenborough Lines, an advanced land defence for Sheerness, and other defences at Grain (MacDougall 1980; Smith 1994).

2.6.3.10 The further transition from muzzle-loading to breech-loading guns and more scientific gunnery from the later 19th century is reflected in the addition of new-style low-profile emplacements to the roofs of the Royal Commission forts, and to Tilbury and New Tavern forts (Saunders 1960, 1980; Smith 1985b). There is an important example of the innovatory Twydall Profile for disappearing guns at East Tilbury (1891). Batteries of similar date are known at Allhallows, Lower Hope, Grain, Sheerness, and elsewhere on Sheppey. Boom defence batteries were built at South Grain and Burntwick Island. The experimental range for artillery was moved to Shoeburyness in the l9th century, the increased range of guns making Woolwich marshes too dangerous. Cliffe fort is the site of one of the most complete extant Brennan torpedo stations in the United Kingdom (*c*. 1890) and there are also traces of a similar station at Sheerness (Smith 1985b; 1994).

2.6.3.11 A new tactical doctrine for land defence was expressed in the form of a line of seven advanced works built in 1879-99 to protect Chatham dockyard (Smith 1976; 1985c).

2.6.3.12 The First World War produced a burst of new defence construction including anti-aircraft batteries and pillboxes (Smith 1985c; 1994; Kent 1988). A First World War airfield survives in a remarkable state of preservation at Stow Maries, as does a motor torpedo boat station on Osea island.

2.6.3.13 The Second World War presents a further and varied range of sites designed to meet new forms of attack, such as beach and paratroop landings, mechanised thrusts across the countryside and air bombardment. In particular Chatham was a nodal point, with successive layers of defence against

land attack (Smith 1994) and the region also contains part of the Eastern Command Line, GHQ Line and Outer London Defence Line. New radar technology is portrayed in a river-side radar tower at East Tilbury. Concrete control towers for river defence minefields survive at East Tilbury, on the Dengie peninsula, at Tollesbury Wick and at Shell Ness on the Swale (Smith 1985a; 1985b and 1994). New coastal defences have left traces throughout the Greater Thames area (Smith 1994; 1995). In the outer estuary, offshore forts were built, for defence against aircraft and E boats (Kent 1988). Examples of anti-aircraft batteries include Bowaters Farm, East Tilbury, Canvey Island, Chadwell Heath, Slade Green, and on Sheppey (Smith 1985a; 1994; 1995), as well as numerous 'Divers' sites. Many airfields throughout the Greater Thames have remains of Second World War structures. Decoy sites can also be noted.

2.6.3.14 Numerous civil defence and Cold War sites remain on both sides of the river including a good example of a control centre at Gravesend (1954), the Weapons Research Establishment at Foulness, several Royal Observer Corps posts and civil, military and naval command and communication centres at Chatham, Gillingham and Sheerness (1950s-80s) (Smith 1994; 1995).

2.6.3.15 The important training base and experimental range established at Shoeburyness in the 1850s (2.6.3.10 above) continues to be used, but a large part is now likely to be redeveloped.

2.6.4 Industry and Transport

2.6.4.1 The Thames has been critical to the establishment and success of industry and the area is a key one for the archaeology of industrialisation, technological innovation and the development of global trade networks. Many sites of interest front directly on to the water (RCHME 1993). Upstanding remains are overwhelmingly post-1800. Many traditional industries are in decline, resulting in numerous redundant buildings.

2.6.4.2 Post-medieval industrial activity in the Thames estuary area reflects London's place as the nation's principal population centre and base for imperial power. The capital served three vital roles: a manufacturing centre notable for technological innovation, a vast market and a source of raw materials and waste products. Industry and transport were central to the establishment of London as a "world city", making the resource one of international importance.

2.6.4.3 There is a late medieval and early modern proto-industrial period (Chalkin 1965), important in the region's development, which includes remains relating to salt, copperas and pottery, tile and glass making. The copperas industry (Allen and Pike 1997; Allen, Pike and Cotterill forthcoming) provided the foundation for the development of the modern chemical and pharmaceutical industries and was also the first heavily capitalised industry to be established in Britain. Many copperas works were established on the coasts of Essex and Kent, in particular in Harwich, Ramsey (near Walton on the Naze) and Brightlingsea in Essex and Deptford, Queenborough (Preston 1979) and Whitstable (Goodsall 1956) south of the Thames.

2.6.4.4 Boat, ship and barge building and repair, which were carried on throughout the Greater Thames estuary, for the most part without sophisticated dockyards, were mainstay industries throughout the 16th to 19th centuries, and crucial to the region's commercial success. Evidence of timber ship building, ship-breaking and related trades dating from the 17th century is widespread, particularly on the south bank at Bellamy's Wharf, Rotherhithe (Saxby and Goodburn 1998), Jacob's Island, Bermondsey (Goodburn forthcoming) and Adlard's Wharf, Bermondsey (1998). The East India Company dockyard at Deptford was producing ships from 1609, (PCA 1998) whilst the Blackwall Yard (Robey 1995), was established in 1614-18. Only fragmentary remains survive at the latter site, but shipyard buildings and docks can be seen, for example at Burrell's Wharf, and recent excavations at Deptford have shown that considerable archaeological remains may exist, including dockyard debris (tree nails, caulking, rope etc), timber slips and river walls. Associated trades were once widespread, but have virtually disappeared. On the north bank, investigations at Pierhead, South East India Dock Road, revealed a massive undocumented late 18th-century timber dock which produced large quantities of ship fittings and material associated with the work of shipwrights (MOLAS, pers. comm.). At Mast House Terrace, Isle of Dogs, the technological development of iron ship building was considered during the examination and conservation of the slipways used in the construction of Brunel's *Great Britain*. The barge-building industry reached its peak in the late 19th century at numerous sites on the Medway and Swale (Sattin 1990). Boat-building sites have survived longer, but these too are vanishing (Banbury 1971).

2.6.4.5 From about 1800, the area was a crucible in the adoption of steam engines for industrial power, at dock-related sites. In the 1850s hydraulic power spread quickly, particularly in the docks; the accumulator tower at Regent's Canal Dock of 1852 and the Wapping Pumping Station of 1889-92 are rare survivals.

2.6.4.6 The Thames estuary can claim to be the cradle of the electric power station. In 1888-90 Sebastian de Ferranti built, at Deptford, the world's first central station for the long-distance transmission of electricity, now demolished. Greenwich Generating Station (1902-10) is an important early survival (Fig. 7) while Gravesend is representative of the more modest stations. Notable later stations include Barking, Littlebrook, West Thurrock and Tilbury (RCHME 1995b).

2.6.4.7 The Thames estuary has been a natural focus for armourers since the middle ages, and in the post-medieval period for manufacture of gunpowder and other munitions

Fig. 7: Coaling jetty at Greenwich generating station

(Cocroft 1995). Important sites reflecting technological innovation include factories at Dartford, Faversham, Oare, Silvertown, Erith, Crayford, Pitsea Hall Farm, on the Cliffe Marshes, Armoury Mill at Lewisham and Woolwich Arsenal.

2.6.4.8 The area was important for the supply of chalk and brickearth from the 16th century and earlier evidence is provided in the form of deneholes, a large number of which are recorded in both Kent and Essex. Chalk quarries were widespread and remain visible, particularly in the Thurrock, Dartford, Northfleet and lower Medway areas. The Portland cement industry developed at Swanscombe and Northfleet in the 1830s, before spreading across the river to Purfleet and Grays in the 1870s (Brown 1916; Davies 1943). The Roman cement industry commenced in Northfleet in the late 18th century and in 1812 a factory was established at Faversham (MacDougall 1990; Francis 1977). The large-scale manufacture of bricks only developed in the 19th century, when modern kilns took over from clamp firing and the preparation of brick-earths in the Medway-Swale area, utilising chalk and river mud, was developed on an industrial scale (Hugh-Perks 1981). The use of large 'washbacks' developed as a peculiarly Thameside technique but, despite their often large size, few examples remain.

2.6.4.9 The ceramics industry is closely associated with the metropolitan Thames waterfront and early ventures include the medieval redwares produced at Woolwich and, in subsequent centuries, at Deptford. Later technological developments included the use of tin glazes to produce delftware at Southwark and Wapping, and porcelain, which was fired at Bow.

2.6.4.10 Traces of 19th-century gasworks are few but there are remains at Beckton (1868-70), Greenwich (1886) and at smaller works, such as Faversham. In the 17th and 18th century, calico-printing and dyeing were carried out in east London. Fertilisers were made at Queenborough and in east London in the 19th century, the latter also being a site for white-lead and other paint manufacture. The UK's first oil shipments were unloaded at Thames Haven in 1880. Oil refining has spread to dominate a large area from Stanford-le-Hope to Canvey Island.

2.6.4.11 The manufacture of telegraph cables became important in the 1850s to 1870s, notably at Enderby Wharf (East Greenwich), Millwall Docks, Woolwich and North Woolwich. Electrical engineering developed and diversified and continues at Erith, Greenwich and Gravesend.

2.6.4.12 Supply of water to, and removal of waste from London were important roles of the estuary, due to its position between London and the sea . Waste disposal was masterfully ordered for the Metropolitan Board of Works in London by Sir Joseph Bazalgette in the 1860s, with outfalls

at Crossness and Beckton. Water supply and sewerage facilities came later to many other centres in the region and examples can be found at Sheerness (Judge 1989), Chatham and Deptford.

2.6.4.13 Food processing has long been characteristic of the area, originally carried on in wind- and watermills (Fairclough 1992), and continued on a large scale until recently. Seed crushing (for oil and animal cake) was a once important industry, with mills on Thameside and in the Medway towns (Preston 1979). It still survives at Erith Oil Works, a factory of 1913-17, significant for its pioneering use of reinforced concrete. Large-scale sugar refining was established around Silvertown by Henry Tate in 1871 and Abram Lyle in 1881 and continues at Tate's site. The 20th century has seen a dramatic contraction of the industry but a good range of buildings can still be seen (eg RCHME 1995a).

2.6.4.14 Specialist metal processing, as for example by Murex at Rainham from 1917, has largely disappeared along with the chemical industries and military sites to which it related. London and the Medway towns were formerly a major location for engineering works, including Shorts Aircraft (Barnes 1967) and Aveling and Porter steam rollers (Preston 1979). Car making endures through the substantial presence since 1924 of the Ford works at Dagenham.

2.6.4.15 Paper making relied on London both as a market and source of raw material. A pioneering mill was established at Dartford and important 19th and 20th-century remains can be found elsewhere (Shorter 1971; Firrell 1995).

2.6.4.16 An unusual but important industrial site in the area is the Bata shoe factory at East Tilbury, founded in 1933 with a planned industrial town built around it. Bata brought Czech modernist architecture from Moravia to Essex.

2.6.4.17 The Greater Thames was also important in relation to the fishing industry. Deep-sea trawling at Barking goes back at least to Stuart times, and it was at one point during the l9th century the largest trawling station in the British Isles. Due to its speculative nature, whaling was a minor, but nevertheless significant aspect of the Thames fishing industry. Recently excavated remains of the Rainbow Quay whaling station at Greenland Dock demonstrate the commercial demand for whale oil products during the 18th century (Ponsford and Jackson 1998). After the mid-19th century, the increasing pollution of the Thames made it impossible to store live cod in chests at Gravesend and many Barking smack owners began the practice of landing fish at Harwich. With the coming of the railways there was a rapid decline in Barking and a development of the Humber fishing ports.

2.6.4.18 In addition to deep-sea fishing there has been a long tradition of inshore fisheries based along the shores of the Greater Thames at, for instance, Gravesend and Leigh on Sea (Schama 1995, 352). Pollution had wrecked the inshore fisheries and oyster beds by the middle of this century, although remains can be found at, for example, Whitstable (Collard 1902; Goodsall 1965).

2.6.4.19 Despite the obvious central role of the rivers and estuaries of the Greater Thames to water-borne transport, a number of canals have been dug within the area. The Grand Surrey Canal opened in 1807 and closed in 1971. Other surviving canal features include the Regent's Canal Dock (Limehouse Basin) formed in 1820 and later enlarged, and the river lock and western basin at Gravesend from the Thames and Medway Canal of 1824. Other engineering works include the creation of Dartford Creek and Heybridge Basin.

2.6.4.20 The first railway to be built within the region was the London and Greenwich line, opened as far as Deptford in 1836 and on to Greenwich by 1838. The first dock railway was opened in 1851 at Poplar Dock as the terminus of what soon became the North London line; railways formed a crucial part of all later new docks. The London, Tilbury and Southend line opened as far as Tilbury in 1854, and was subsequently extended to Southend. The corresponding route on the Kentish shore was established by the London, Chatham and Dover Railway from 1845. By the 20th century, complex networks of tramways served all the major sites for paper, brick, cement and explosives production, and many military sites, on both sides of the estuary.

2.6.4.21 Chief amongst the commercial port facilities of London are the enclosed docks. London's port was massively reformed at the beginning of the l9th century (Sargent 1995), creating a series of enormous enclosed wet docks. The l9th and 20th-century docks of note include the West India Docks (1800-02); St Katharine Docks (1828-9); the London Docks at Wapping (1803-5 and 1811-4); Surrey Commercial Docks (1807-11); Millwall Docks (1865-8); Poplar Dock (1850-2); East India Docks (1803-6); Royal Albert Dock (1875-80); the King George V Dock (1912-21) and Tilbury Docks (1882-6). Since the closure of the upriver docks between 1967 and 1980 much fabric has been swept away, but there are still historic structures of great value.

2.6.4.22 The pre-19th-century port included "sufferance wharves" downstream from the Tower of London of which, with the exception of Hope Wharf, Southwark, no standing fabric remains. Further downriver large wet docks had been built, for fitting out ships rather than for goods, at Rotherhithe c. 1700, and at Brunswick Dock in 1790.

2.6.4.23 The extension of bonding privileges to private wharves in 1853 led to the erection of many tall warehouses along the Thames, and notable survivors have been converted into luxury apartments. An earlier example is the 1790s East India Company riverside warehousing at Free Trade Wharf.

2.6.4.24 Despite possessing naval dockyards of great size, Chatham, Gillingham and Sheerness had relatively simple quayside facilities, mostly plain timber wharves. A series of river piers were constructed in the 19th century, enabling vessels to berth in deep water at various locations in the Medway. The commercial warehousing was also of a humble nature and intermingled with light industrial buildings. This type of development can be seen, for example, at Chatham, Maldon, Faversham and Gravesend.

2.6.4.25 The rural shores of the Greater Thames area were provided with a mixture of quays built by the brick and cement companies and by basic slipways and staithes from where agricultural produce would be dispatched to the capital. Out in the marshes even simpler stages were built for mud-digging crews and those tending oyster ponds.

3

Research Agenda

3.1 Introduction

3.1.1 From the time that England was separated from continental Europe the Thames estuary has been of major significance as a main artery for commercial and other contact between south-east England and the world beyond; even before then it was a vital component of the North Sea Basin. It is one of the great historical estuaries of western Europe and invites contrast and comparison with other estuarine zones such as the Rhine delta. Yet surprisingly the estuary has been the subject of little coherent study in archaeological and historical terms. There is a rich and relatively untapped archaeological resource and the intertidal zone and alluvial deposits of the present and former flood plain often provide excellent preservation conditions (Fig. 8).

3.1.2 Despite broad similarities in environment, material culture and economy (section 1.2.3), marked variations do sometimes occur within the Greater Thames. For instance in the Roman period, despite apparently similar economic concerns, settlement patterns, and presumably social structures, were markedly different to north and south of the estuary. Watling Street, which linked London to northern Gaul via Rochester, Canterbury and Dover, traversed the north Kent plain, may have provided an economic stimulus. Furthermore, political and administrative boundaries generally cut across the region (1.2.3 above). There is thus clear potential to consider the role of social action and human choices, as well as environmental and economic factors, in creating differing social structures. In this respect examination of the contrasting development of the Anglo-Saxon kingdoms of Kent and Essex from the perspective of the Thames estuary may be significant.

3.1.3 The area thus offers an opportunity to study the development of sometimes similar, sometimes varying, social, economic and political frameworks within an area with

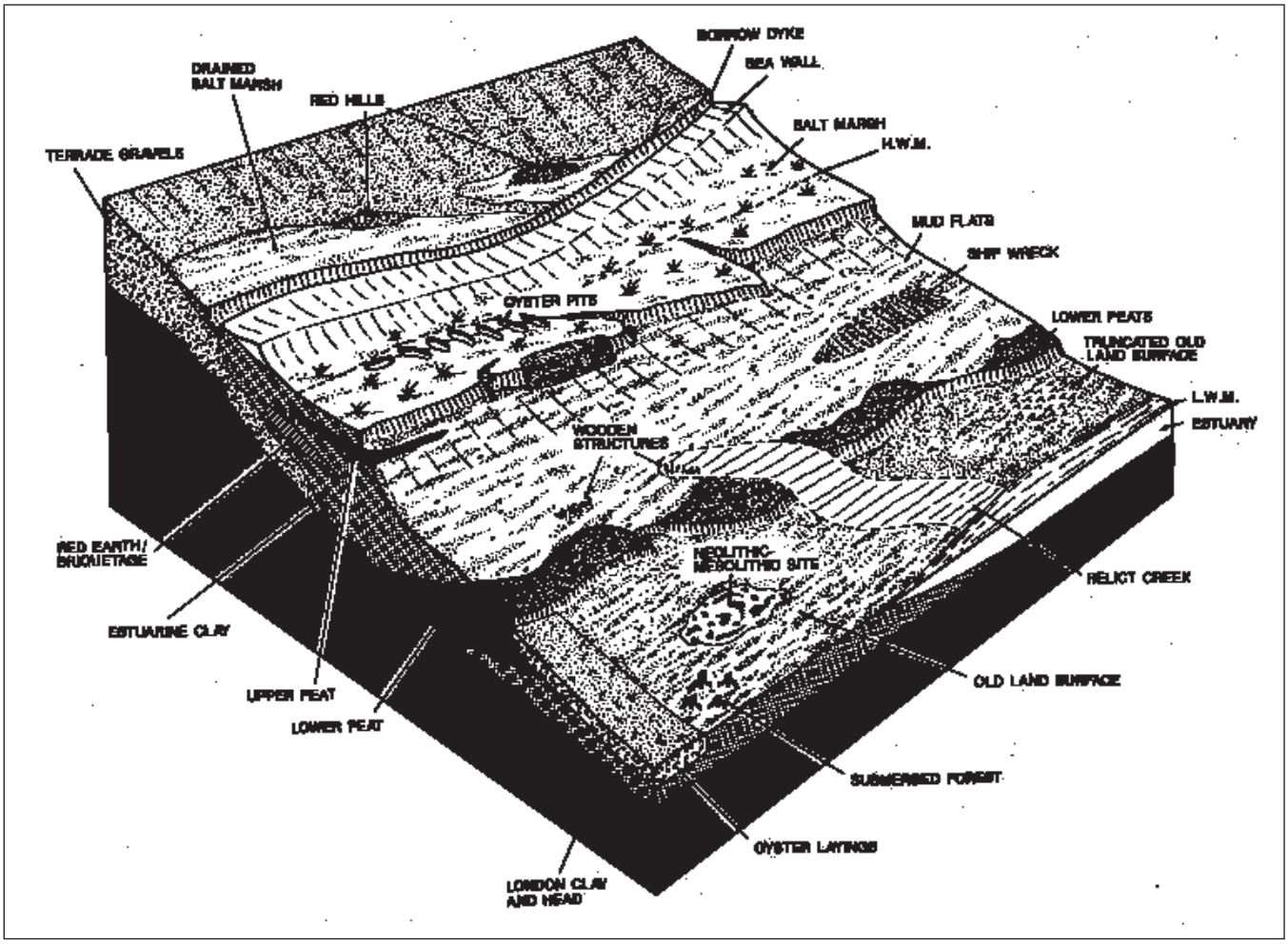

Fig. 8: Idealised section through the estuary edge (derived from Wilkinson and Murphy 1995)

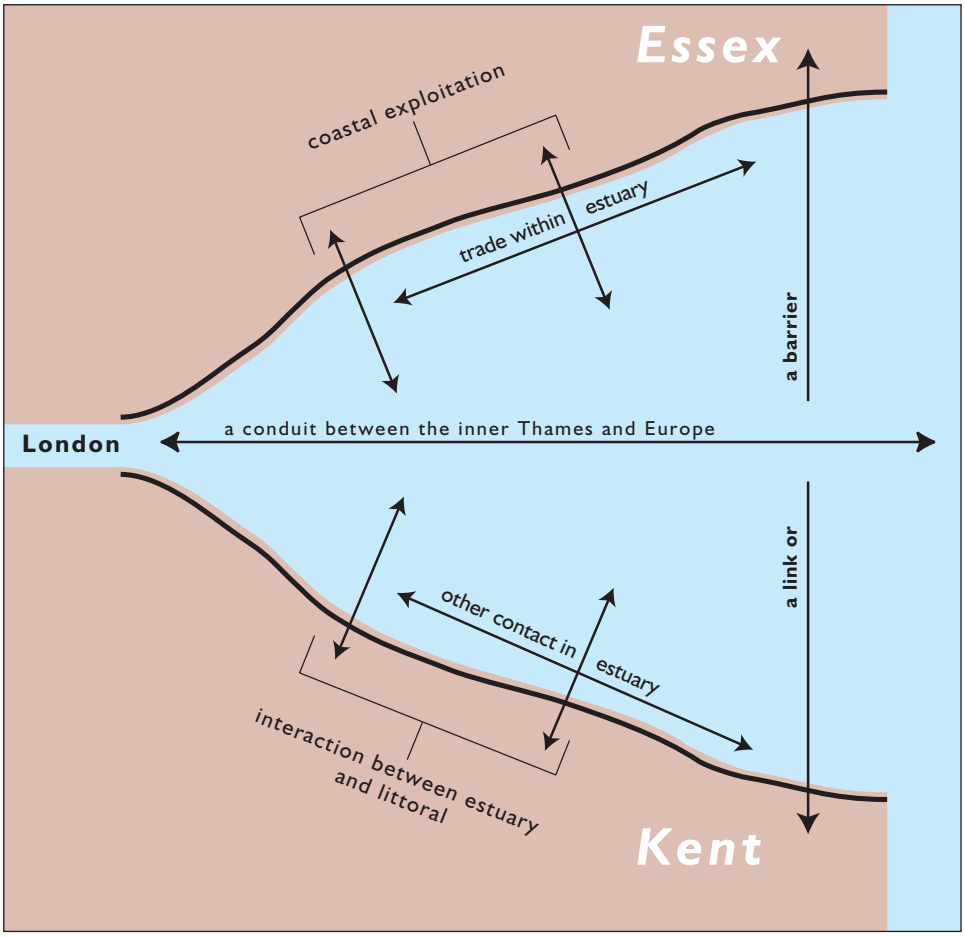

Fig. 9: Schematic model of interaction around the Greater Thames estuary

broadly uniform environmental conditions. The central aim of the Research Agenda must be to explore this intricate network of relationships, as they operated within the Greater Thames and between Britain, Europe and the wider world. It will also be important to compare the estuary with other estuaries in Britain and Europe and also non-estuarine areas.

3.1.4 In order to understand the influences and forces at play spatially a theoretical model can be constructed (Fig. 9). At the centre of the estuary system is the estuary itself. What are the interactions between the estuary itself and the estuary littoral to the north and south, and also to the west? Does the estuary provide a link or a barrier to communities on either side of the estuary? Is there contact by water along the estuary? How is the estuary exploited both at a subsistence level and as a generator of wealth? Does it promote or inhibit social, economic and political unity or diversity? What is the role of the estuary as a conduit for people, ideas and materials in relation to Europe and the wider world, both for London and for other settlements along the estuary? How do these questions relate to a chronological framework? Is the estuary a catalyst for change and does change occur here earlier than elsewhere?

3.1.5 It is also important, in trying to reach a greater understanding of the above estuary system in such spatial and chronological terms, to consider the evolving topographical geometry of the estuary and associated sea-level and environmental change. This provides the framework and context within which human activity takes place, but there is very much an interaction between the natural environment and man's exploitation of it.

3.1.6 In order to develop theoretical frameworks and to research the varied archaeological resource it is necessary to understand that resource in terms of its extent, character and importance. In this a fundamental tool must continue to be the Sites and Monuments Records for Essex, Kent and Greater London which form the most complete databases within the region. In developing such databases, which are important in their own right as basic archives, it must be remembered that they form the starting point not only for research and management regimes but are also important for the development of education and tourism (Jones 1997).

3.1.7 The considerable significance of the study area for early settlement is not well appreciated outside the archaeological profession, in part due to the lack of upstanding monuments. There is a need to increase awareness of and protect and conserve historic landscape character types, and for greater heritage interpretation. Archaeological and historical resources are underused for educational purposes and, alongside deeper academic study, secondary school level education is vital for broadening understanding of the importance of the past in the Thames Estuary area (Jones 1997).

3.1.8 The main gaps in knowledge and topics for further research for each of the themes covered in the Resource Assessment (Part 2 above) are discussed briefly below. The division utilised in Part 2 is followed but additional sections on Education and Presentation and Methodological and Management Research are added:

- 3.2 Pleistocene palaeoenvironment and archaeology
- 3.3 Holocene palaeoenvironment
- 3.4 Maritime archaeology
- 3.5 Intertidal and related archaeology
  - 3.5.1 Intertidal archaeology
  - 3.5.2 Sea walls and flood defences

3.6 The estuary litteral
  3.6.1 Settlement patterns
  3.6.2 Historic built environment
  3.6.3 Historic defences and other military installations
  3.6.4 Industry and transport
3.7 Education and presentation
3.8 Research into methodology and management

At the end of each section key points of the Research Agenda are set out hierarchically as Framework Objectives, Specific Objectives and Areas of Research.

3.2 Pleistocene Palaeoenvironment and Archaeology

3.2.1 The Greater Thames is probably the most important region in Britain for the study of the palaeolithic. The development of a detailed chronological framework is of fundamental importance to an understanding of this period and the Greater Thames region has much to contribute in this respect. The Lower Thames terraces have been noted as particularly suited to correlation with the deep ocean record and sequences on the present European mainland. The resource has been greatly depleted by past mineral extraction and development activity, which raises further the importance of the surviving deposits.

3.2.2 The work of the Southern Rivers Project and subsequent English Rivers Project has provided an important baseline assessment of the palaeolithic resource. Recent work to establish a research framework for the Eastern Counties has identified key areas of research potential, many of which are applicable to the Greater Thames estuary (Austin 1997 and forthcoming). Broad themes for further research include the chronological framework, hominid behaviour and physical evolution, the landscape context, site formation processes, palaeoecology, deposit modelling and the development of predictive models for the location of significant remains.

3.2.3 Palaeolithic research is undertaken on a multidisciplinary basis and requires collaboration with geologists and other specialists working in the field of Quaternary science. As such, there is great potential for joint projects and contribution to ongoing research themes. In particular the recently established INTIMATE (INtegration of Ice core, MArine, and TErrestrial Records) project which deals with the period from the last glacial maximum until the early Holocene (organised by INQUA), and the QRA Research Group on Long Terrestrial Records: The Fluvial Archive Group (FLAG) offer opportunities for joint working.

Framework Objective

To increase understanding of the physical evolution of the Thames estuary during the Pleistocene and of the social and cultural strategies of early human populations in relation to changes in environment and climate.

This would be taken forward by **specific objectives**

- developing further the framework for, and our understanding of, environmental and climatic change during the Pleistocene

- developing knowledge of the evolution of the Thames and Medway drainage systems at a local and regional level initially, then placing their development within a national and international context, with a view ultimately to correlating the Thames sequences with glacial sequences to the north, the record from continental Europe and the Oxygen Isotope record from ocean cores.

- developing appreciation of human interaction with this environment through identifying key areas where primary context sites might be preserved and where evidence relating to current research objectives might be located.

Specific **areas of research** would include

- developing a targeted programme of recording and sampling of geological exposures to improve knowledge of geological sequences and their environmental and chronological context, to assess the artefactual content of the deposits and to identify specific sites

- utilising borehole and associated data for the same objectives

- compilation of palaeogeographic maps illustrating the physical evolution of the study area

- systematic compilation of environmental data to agreed standards to provide palaeoenvironmental frameworks

- assessment of historic maps and antiquarian records relating to earlier quarrying to locate more accurately known artefact collections and assess the extent of significant geological deposits

- developing effective assessment techniques for palaeolithic deposits.

3.3 Holocene Palaeoenvironment

3.3.1 The Greater Thames estuary is a key area for the study of past environmental change and its relationship with human activity. As is discussed elsewhere in this document, changes in relative sea level and the form of the estuary have profoundly influenced the types and locations of human activity in the study area. The resource includes extensive and deep floodplain deposits overlying late Pleistocene sands and gravels, providing a range of data on the geometry of the river system, excellent preservation of past plant and animal communities and other indicators of climatic change and human activity. There are overlaps with other themes and topics and this section should be read in conjunction with that on the Intertidal Zone.

3.3.2 Work in the Severn estuary has demonstrated that the sediment sequence in large estuarine systems can be mapped as discrete lithostratigraphic units and assigned formation status; no such model for the Holocene lithostratigraphic sequence and associated palaeolandsurfaces has yet been proposed for the Greater Thames (Barham and Bates 1995). Intertidal sediment units, however, have recently been shown to have a complex three-dimensional architecture and cannot be correlated simplistically or without well controlled radiocarbon dates.

3.3.3 Research in the lower Thames (Barham and Bates 1995) has suggested the following points (among others) which indicate a need to reconsider the nature of the stratigraphic sequence:

1. Holocene sediments accumulated on top of a complex pre-Holocene topography, the shape of which will have affected the first points transgressed by rising Holocene sea-levels.

2. The Holocene stratigraphic sequence is complex and does not always form the broadly subhorizontal sequences predicted by previous work.

3. Complex trends and cycles within clay-silt/peat units have been noted and imply complex shifts in environments of depositions, possibly over short timescales.

3.3.4 Work is also being undertaken on crustal movements in relation to sea-level change (Long 1995), and on a re-examination of environmental changes within Devoy's Tilbury III peat (Haggart 1995), suggesting it mainly formed under a rising relative sea level which was followed by a fall in relative sea level. Such a fall (if correctly identified) in a subsiding area would be of regional significance. Other falls in relative sea level in the Roman and Saxo-Norman periods have been suggested from analysis and dating of archaeological structures in the City of London and at Bull Wharf (Sidell 1998).

3.3.5 In order to provide a context for understanding human action in the Greater Thames there is a need to create a lithostratigraphic framework for the area combined with a controlled dating programme and palaeoenvironmental studies, to enable a chronostratigraphic model of the Holocene development of the estuary to be formulated. Stratigraphic sequences need to be first built up at a local level and further developed into regional stratigraphies (Barham and Bates 1995). This work should include rigorous consideration of changing relative sea level. Sea-level index points should be collected as part of a controlled programme of research and assessed on a regional basis to determine wider scale processes such as changes in sea-level tendency. Obtaining sea-level index points from uncompactable horizons (i.e. thin basal peats above the pre-Holocene surface) is of particular importance, for there are grounds for thinking that existing age/altitude graphs of relative sea-level change are contaminated by the effects of compaction. Data on relative sea level for the last 2000 years are particularly sparse, and new techniques will be required to enhance the available information, particularly in respect of high resolution stratigraphic and palaeoecological studies of spatially restricted marsh sequences. Sidell (submitted) has also demonstrated the potential of archaeological sites and structures as sea-level index points in the study area.

3.3.6 Previous work has suggested differences in relative sea level between the mid- and outer estuary and between the north and south of the study area. These variations require more investigation by targeting specific time/altitude horizons. The possible implications of changes in tidal range on relative sea level reconstructions also require consideration.

Framework Objective

To increase understanding of the physical evolution of the Thames estuary and associated climatic and environmental change and their relationship with human activity during the Holocene.

This would be taken forward by **specific objectives**

- characterising key stratigraphic units and establishing the vertical sequence of buried landsurfaces and other deposits throughout the estuary

- developing understanding of coastline and sea level change in the estuary through time

- developing models for environmental change related to the evolution of the estuary's geometry

- developing appreciation of human interaction with this environment, particularly with regard to the exploitation and management of woodland and marshes

- exploring the potential of submerged woodland for dendrochronology, woodland structure, composition and exploitation, and evidence of environmental change.

Specific **areas of research** would include

- compilation of palaeogeographic maps illustrating the physical evolution of the coastline in relation to sea level change

- systematic compilation of environmental data to agreed standards to provide palaeoenvironmental frameworks for the estuary

- compilation and analysis of existing borehole data and the undertaking of new surveys

- development of non-intrusive techniques such as geophysics for the location of sub-surface deposits and features

- detailed investigation of selected areas by means of palynological, soil micromorphological, molluscan and plant macrofossil analyses

- exploring the potential of submerged woodland for dendrochronology, evidence of climate change and woodland exploitation.

3.4 Maritime Archaeology

3.4.1 The waterways of the Thames estuary itself and its associated tributaries and creeks constitute the essential element of the study area and one of the key bases for the development of this strategy. For millennia these waterways have furnished access to continental Europe and, in the last few centuries, the world beyond. They have also provided the means of communication which links the region together, facilitating the development of the shared material culture and economic interests of the Greater Thames. The maritime archaeology of the study area provides some of the most direct evidence of this socio-economic role.

3.4.2 Key objectives for further research must involve reaching a greater understanding of this role of the estuary as a conduit for ideas, material culture and trade. This will involve carefully targeted archaeological and documentary research relating to ships and their cargoes (where they were made, where they were coming from and going to, what was the intensity of this activity) and also the relationship of this seaborne trade and contact to dry-land settlement, commercial and industrial sites.

3.4.3 In order to take forward our understanding of the maritime role of the estuary research will be necessary at a variety of levels and involving both archaeological and documentary research. Indeed, for the historic period it is important to recognise the contribution which specific and more general social and economic studies, focusing on the place of London in a regional, national and international context, will bring to this understanding.

3.4.4 In respect of maritime archaeology in the estuary, the enhancement of basic databases is a primary need. In 1992 RCHME was given the task of compiling an inventory of archaeological material in the coastal waters of England. Information relating to known shipwreck sites, submerged land sites and isolated finds are included, as are records indicating the archaeological potential of an area. Development of the inventory in close co-operation with local authority Sites and Monuments Records (SMRs) is essential. In spite of useful studies, such as that by the Society for Sailing Barge Research which lists known barge wrecks and hulks, including those in the Greater Thames area (SSBR 1996), preliminary analysis has revealed particular weaknesses in the medieval and early post-medieval periods. Enhancement of the NMR, SMRs and other databases across the whole field of maritime archaeology is required.

3.4.5 A joint project between the RCHME and Kent County Council, directed *inter alia* at enhancement of the record for the late 16th and early 17th centuries, has provided important information about the sources of data and resource implications: further work should be directed at including within the SMR data collected from aerial survey, remote sensing surveys for purposes other than archaeology, casual finds reporting and documentary survey, in addition to targeted archaeological survey.

3.4.6 Many sites of abandoned Thames barges are situated in the high energy intertidal zone where they are prone to erosion, and in some cases they have been specifically sited so as to absorb wave impact and deflect coastal erosion (Fulford *et al*. 1997, fig. 42). Consequently there is an urgent need for survey and recording.

3.4.7 Understanding of the resource will also be improved through better reporting, recording and study of archaeological material discovered in or removed from the estuary as a result of commercial (dredging, fishing) and recreational (sport diving) activity. The Merchant Shipping Act of 1894 requires that wreck recovered from the sea is reported to the Receiver of Wrecks. Although recent initiatives from the Receivership have resulted in a marked increase in the number of reports, a considerable amount of material is still removed without record. Local contact points are likely to be an essential element in any effort to capture more of this important data, and also more general information from fishermen about features on the seabed.

3.4.8 Within and just beyond the study area finds such as the Graveney and Dover boats and Canewdon paddle, indicate the potential of the Greater Thames to yield individual finds of great importance (section 2.4). Monitoring of relevant exposures may well detect boat remains and an awareness of this potential should inform archaeological decisions relating to the disturbance of alluvial sequences. Targeted examination of particular sites where boat remains may reasonably be anticipated (Marsden 1996, 220-1) may provide opportunities for investigating boat remains outside a rescue context.

Framework Objective

To examine the role of the estuary in providing internal coherence through trading and other maritime contacts and as a major artery of communication between England and continental Europe.

This would be taken forward by **specific objectives**

- developing an understanding of the social and economic role of sea-borne trade and other maritime activity within and beyond the estuary

- developing an understanding of the role of maritime activity in relation to settlement and land use around the estuary

- researching documentary sources to increase knowledge of surviving and no longer extant sites and vessels and trade and communication patterns.

Specific **areas of research** would include

- locating and recording ship remains and associated structures within the subtidal and intertidal zone and synthesizing and assessing the quality of this resource

- investigating the role of the estuary as a ship-building area

- undertaking research on the nature of cargoes and their movements in relation to local and more distant trade

- selecting areas and sites for detailed study and recording

- opportunistic recording of wreck sites.

3.5 Intertidal and Related Archaeology

3.5.1 *Intertidal Archaeology*

3.5.1.1 The intertidal zone, past and present, has special significance when considering Research Agenda for the Thames estuary. It is the interface between settlement and other activity around the estuary and the waterways of the Thames and its tributaries which both promote and at the same time inhibit linkages across and along the estuary region. Furthermore the waterlogged conditions within the zone have greatly aided the survival of organic ecofacts and artefacts, thereby providing the potential for an enhanced understanding of human interaction with this landscape through history, while at the same time being rather more accessible than subtidal deposits.

3.5.1.2 The need to develop programmes of work for the zone is underlined by the fact that its archaeological remains are subject to continuing erosion (see 1.4.4), but without the funding mechanism provided on *terra firma* by PPG 16.

3.5.1.3 There are important overlaps here with agenda relating to Pleistocene palaeo-environment and archaeology and Holocene palaeoenvironment, in that a key objective of work in the intertidal zone must be to attempt to refine understanding of the evolution of the estuary's topography and sea level and environmental change through time. Additionally, however, it is important to examine the management and exploitation of the intertidal resource itself.

3.5.1.4 Baseline survey of the kind carried out by the Hullbridge Survey in Essex (Fulford *et al.* 1997, 232) is of the utmost importance in Kent. By comparison with Essex, Kent has received little detailed attention, yet the potential is equally good, perhaps better. Even in Essex, however, survey of the Hullbridge type is not comprehensive and important stretches of estuary (e.g. Benfleet Creek, Canvey and Mersea Islands, Old Hall Marshes) remain unexamined (Wilkinson and Murphy 1995). Moreover, the constant dynamic pattern of exposure and destruction within the intertidal zone makes regular monitoring vital if important discoveries are not to go unrecorded (Coles and Coles 1996, 157, no. 2). A number of locations within the area of the Hullbridge Survey where this kind of work is required have already been identified (Wilkinson and Murphy 1995). As with the publication of the famous account of the submerged landsurface off north-east Essex (Warren et al. 1936) there is a danger that, following the publication of a major synthetic paper, the impression is created that there is little left for further research (Wilkinson and Murphy 1995, 223); it is important that this false impression is resisted.

3.5.1.5 Extensive exposures of old land surface are known within the estuary and a number of prehistoric, particularly neolithic, occupation and activity areas have been noted (Fig. 10). Bronze age trackways have been recorded in the marshes north of Gillingham and later trackways, platforms and landing stages are known elsewhere. Sites are frequently accompanied by extensive palaeosols and may be associated with submerged forests and peat deposits. Only one site, the Stumble, has yet, however, been examined in any detail (Fig. 11). Similar sites, deposits and structures exist within alluvial sequences, away from the present intertidal zone, as for example in east London and Southwark (Meddens 1996; Thomas and Rackham 1996). Opportunities are provided both for understanding the intertidal zone and also for assisting interpretation of similar sites on dry land where the preservation of organic remains is less good.

3.5.1.6 The exploitation of the intertidal resource is represented in a number of ways in the archaeological record and considerable opportunities are provided for further study.

3.5.1.7 Oyster storage pits and larger ponds have been recorded effectively both by aerial survey and from cartographic sources but geographical coverage is incomplete. Variation in form, size, chronological development and clustering in the vicinity of fishing ports has as yet received little attention and may require elements of ground-based survey.

3.5.1.8 Timber fishtraps have also proved conducive to aerial survey, but their distribution within the region is by no means fully understood and continued air survey is essential. Ground-based survey is also required for a full understanding of these often complex structures and it should be possible to produce a more precise chronology utilising radiocarbon and dendrochronology. Sonar survey, given the recent successful results of the Blackwater Estuary in developing plans of known sites, needs to be pursued further. The structures may also provide details of carpentry and/or woodland management which rarely, if ever, survive elsewhere. Dating and sampling of associated fish bone

Fig. 10: Prehistoric trackway preserved within a deep alluvial sequence at Becton

deposits, such as at Sales Point, Bradwell, should be a high priority for future research. Complex middle Saxon fish-traps, such as those in the Blackwater estuary (Strachan 1998) which employed considerable amounts of timber, can also contribute to our understanding more generally the organisation of estates associated with *villae regales* and minsters.

3.5.1. Saltmaking equipment on certain later bronze age sites within the estuary indicates the importance of salt production at the time. The only saltern, however, so far identified within the region is that at Fenn Creek (Wilkinson and Murphy 1995) and it is likely that additional sites will only be revealed by further survey of the intertidal zone. Red Hills and other salt-production sites of the iron age and Roman periods are widespread within the estuary area, but, despite recent collation of the evidence relating to these sites (2.2.6; Fawn *et al*. 1990; Topping and Swan 1995), the full extent of their distribution, chronological development and functional detail remains ill-defined.

3.5.1.10 Similarly, further work could be profitably undertaken on the Romano-British pottery industry concentrated on the marshlands of north Kent.

3.5.1.11 In taking forward any programme of work connected with the intertidal zone the development of appropriate methodologies will be essential. Any opportunity for access to geophysics, scientific dating techniques and palaeoenvironmental analyses should be seized but, equally, there is considerable scope for building on traditional fieldwork techniques and approaches to site monitoring.

3.5.1.12 Another important aspect of work in the intertidal zone will be to assess the ongoing impact of erosional and other destructive forces, both short and long term, on the exposed and buried archaeological resource.

Framework Objective

To develop a full appreciation of the range and context of remains within the intertidal zone as evidence of environmental change and the exploitation and management of the intertidal resource.

This would be taken forward by **specific objectives**

- undertaking baseline survey to provide a framework for defining further research priorities in the intertidal zone
- increasing understanding of the remains associated with fishing, saltworking etc, and their function and relationship to the intertidal zone
- integrating the often specialised sites and structures within the intertidal zone into wider patterns of interpretation and explanation
- selecting sites for further examination where the preservation of organic materials will contribute to archaeological understanding beyond the wetland zone.

Specific **areas of research** would include

- collating information derived from existing collections of aerial photographs and commissioning new surveys as appropriate as a means of rapid data gathering
- systematic field survey of areas of potential identified by rapid survey
- monitoring and recording of known sites and structures
- surface survey of areas landward of the seawall, augmented by borehole survey
- developing techniques for recording in the intertidal zone
- monitoring the effect of erosion on individual sites and the estuary system as a whole
- assessing the impact of dredging and the erosional effect of other estuary management regimes on sub-tidal and intertidal archaeological deposits
- utilising sonar survey for the investigation of sites.

3.5.2 *Sea Walls and Flood Defences*

3.5.2.1 Despite them being amongst the most striking and omnipresent features of the landscape of the Greater Thames Estuary, seawalls have received little detailed study (Fulford and Champion 1997, 215). They are constantly at threat from erosion, improvement and managed setback. Former seawalls survive on some areas of grazing marsh and in the intertidal zone whilst documentary references are plentiful.

3.5.2.2 Such structures have been of great economic importance in protecting grazing marsh since at least the early medieval period. The role of religious houses and others in systematic land reclamation through the construction of counter walls and drainage ditches has been recognised, yet there is considerable scope for more detailed study of the historical framework for such work. Roman marshland reclamation and seawall construction within the study area requires further more systematic research (Rippon pers. comm.).

3.5.2.3 Seawalls are not only the largest earthwork structures in Kent and Essex, but, since they often have internal timber frameworks, they are also perhaps the largest archaeological wooden structures in these counties. There is potential for dating by dendrochronology, which would greatly assist the establishment of firm temporal frameworks for climatic and sea-level change, land reclamation and the development of marshland estates.

Framework Objective

To develop a holistic approach to the study of sea walls and flood defences in the estuary landscape as evidence of climatic change, and reclamation, management and exploitation of the marshland resource.

This would be taken forward by **specific objectives**

- developing an overview of the evolution of sea defences in relation to sea level and climatic change
- developing an understanding of the historical context of sea defences in terms of secular and ecclesiastical land ownership and exploitation
- developing an understanding of the construction methods of sea walls and their water control mechanisms.

Specific **areas of research** would include

- plotting the extent of earthworks and cropmark sites and relating them to cartographic and documentary evidence
- establishing a chronological framework for the development of sea defences.

3.6 The Estuary Littoral

3.6.1 *Settlement Patterns*

3.6.1.1 Prehistoric settlement is widespread throughout the region and, from the later bronze age, can often be related, at least in part, to exploitation of the estuarine system (Brown 1988). Few sites, however, seem to have been

Fig. 11: The neolithic settlement site at the Stumble, now within the inter-tidal zone of the Blackwater estuary, during excavation

specifically located to exploit the advantages for fishing, trade and other activities offered by the coast. Mesolithic sites adjacent to the present coast, or now in the intertidal zone, were originally well inland (Fulford *et al*. 1997). During the neolithic, sites like the Stumble were located close to the contemporary coast but appear to have had an economy based largely on the exploitation of 'dryland' resources; from the later bronze age, sites specifically related to exploitation of the estuary zone are well known (cf Wilkinson and Murphy 1995 and forthcoming; Murphy and Brown forthcoming). Few have been studied in any detail and, where recording has taken place, it has tended to be on a site-specific basis. Examination of such sites in relation to their wider context will advance our understanding of prehistoric settlement patterns in the area. Particular attention will need to be paid to the role of the estuary and its tributaries.

3.6.1.2 For the iron age and Roman periods, widespread settlement is again known within the region, which can in some respects be linked to exploitation of the coastal zone (Wymer and Brown 1995, 160-1). Most obvious are the ports of London, Colchester and Rochester and the Saxon Shore forts of the later Roman period at Bradwell and Reculver. Red Hills and other salterns and pottery workshops are the most common class of site intimately related to the coast, although in north Kent a number of villa estates lie between Watling Street and the coast. Work should be directed towards understanding the hierarchy and distribution of Roman settlement in relation to the estuary, communications, centres of administration and the utilisation of the rural landscape.

3.6.1.3 During the Saxon period, London and Rochester were the seats of bishops and important administrative centres. Other sites such as Barking, Tilbury, Minster in Sheppey and Hoo were the centres of minster estates. Canvey is a likely candidate for a landing place or port facility and other trading centres probably existed within the study area. Our knowledge of the overall settlement pattern at this time is, however, woefully lacking. Of particular interest would be a greater understanding of the articulation of the landscape in relation to estates based on *villae regales* and minsters.

3.6.1.4 Following the Norman Conquest the landscape was subject to reorganisation under new lordships and *manorialisation* spread. In the medieval and post-medieval period London increasingly extended its influence as a major market for food, raw materials and other goods and the Thames Estuary hinterland became increasingly important for metropolitan food and raw material supply. A series of smaller towns, such as Dartford, Gravesend, Barking and Maldon developed around the estuary and a wide variety of settlements was intimately connected with the coastal zone, often to take advantage of or directly linked to creeks and estuaries. These sites range from manorial centres, church and village complexes to small ports. The importance of the Greater Thames estuarine complex for trade, transport, grazing, fish and shellfish, is less well known from documentary and cartographic sources, but this has yet to receive systematic archaeological study. Attention should be paid to the evolving hierarchy of settlement along the estuary and the role of London and the estuary, both as a resource and as a conduit, in influencing the settlement pattern. The Extensive Urban Surveys currently being undertaken in Essex and Kent, together with the Urban Archaeological Databases being developed for Colchester and Canterbury, should provide valuable input to such research. An opportunity is also provided for considering further the characterisation of medieval rural settlement developed by Roberts and Wrathmell (1995), the area appearing to embrace parts of three sub-provinces and several local regions.

Framework Objective
To further understanding of the evolution of settlement, other land-use patterns and structural remains around the estuary in terms of their social, economic and political development.

This would be taken forward by **specific objectives**

- analysing the pattern of settlements of all types through time as evidence of the social, economic and political evolution of the study area
- analysing the adaptation and evolution of settlement patterns in response to coastal change.
- developing interpretation and explanation of sites along the coast of the estuary which integrate such sites with data from the intertidal zone and buried landscapes
- developing an understanding of early agriculture and land use on terrace gravels and brickearth.
- examining the impact of the Roman Conquest on settlement patterns and the social, economic and political articulations of the landscape.
- examining the chronology of the Anglo-Saxon migrations into the areas surrounding the Thames Estuary and the impact on existing settlement and material culture.
- examining the development in the Anglo-Saxon period of new organisational and administrative frameworks based on secular and ecclesiastical estates and "territories".
- examining the impact of the Norman Conquest on settlement patterns and estate organisation in the countryside.
- examining the role of the town from the Roman period onwards.
- examining the impact of the church on the historic landscape in medieval times.

Specific **areas of research** would include

- testing current hypotheses concerning the characterisation of medieval rural settlement in relation to sub-provinces and local regions and exploring social, economic and political evolution against this framework
- identifying sites specifically related to exploitation of the coast, such as fish processing, landing places etc
- studying field systems and bioarchaeological evidence from associated wells/watering holes and settlement features
- selecting sites for further examination and investigation which specifically contribute to the understanding of the role of the estuary through time.

3.6.2 ***Historic Built Environment***

3.6.2.1 The influence of the estuary and its associated activities is very much reflected in the historic built environment, whether that influence is in terms of commerce, industry, leisure or agriculture. There are invariably overlaps with other themes and topics, notably historic defences and industry, and this section should be read in conjunction with those sections. Here, however, it is important to highlight, not aspects of industrial or defensive technology, but the ways in which the wider historic built environment has responded to the various influences in terms of architectural form and settlement evolution. For example the architectural development and history of seaside towns have received relatively little study, despite them being amongst the most striking features of the built environment of the Greater Thames, nor has the regional character of the built heritage of the area been fully explored.

Framework Objective

To further the understanding of the evolution of the historic built environment along the estuary with special reference to structural form and function, the aspirations of the associated individuals and communities and the use of local building materials.

This would be taken forward by **specific objectives**

- considering the growth of seaside towns and resorts along the Thames
- considering the growth of industrial communities
- examining the impact of London on settlement character and form
- examining the character of agricultural building.

Specific **areas of research** would include:

- undertaking a programme of documentary research to establish patterns of development in leisure resorts and industrial communities and aid the development of models to interpret such development
- undertaking rapid survey of selected areas to assess the evidence of standing structures for understanding urban growth and the development of industrial communities
- establishing the extent and nature of 'plotland' communities on both sides of the Thames during the inter-war period through a programme of documentary research followed by rapid field assessment of selected areas
- establishing the distribution of farmsteads through a programme of documentary research, assessing the effect of urban and industrial development on them, and creating an inventory of sites.

3.6.3 Historic Defences and Other Military Installations

3.6.3.1 The proximity of south-east England to continental Europe and the strategic importance of London and the Thames has resulted in an outstanding defence heritage resource in the Thames Estuary area. While individual sites are well known, and several are managed as heritage attractions, there is considerable scope for further work.

3.6.3.2 A basic survey of defence sites, produced as a response to the Thames Gateway initiative (Smith and Crowdy 1994), covers much of the area within the southern part of the Greater Thames region and sets out some of the main measures for conservation and management, on a site by site basis. As part of an Interreg 2 programme with Nord-Pas de Calais, defence sites in Kent form the subject of a study looking at strategic conservation and management needs and opportunities for interpretation, access and tourism. Information on World War 2 sites throughout the region is being assembled through two related projects: the Defence of Britain project is using field evidence to provide information mainly on anti-invasion defences and the Monument Protection Programme's Twentieth Century Fortifications in England project is utilising documentary sources, combined with aerial photographs, to establish, for nine monument classes, what was built and what survives (Dobinson *et al*. 1997). A detailed survey of sites in Essex is being provided by the Essex County Survey.

3.6.3.3 Research should also be directed to relating individual sites to defensive systems and placing them within a historical framework linked to the evolution of military technology. Attention should be paid to examining how defence sites and systems link in with the basic grain of the estuary landscape and to investigating the impact of such sites and systems on the social and economic history of the region.

3.6.3.4 Many of the surviving remains of post-medieval defences are highly vulnerable to erosion and other threats. Monitoring, survey and, where possible, protective

measures should be pursued. In particular, efforts should be made to identify those sites which have intrinsic merit, both individually and as part of wider systems, are worthy of conservation and have the potential for beneficial reuse and/or tourism.

Framework Objective
To develop an understanding of defensive systems around the estuary and their role in relation to the estuary, London and south-east England.

This would be taken forward by **specific objectives**

- examining the impact of changes in military technology and tactical and strategic approaches on individual defence sites and defence systems
- developing understanding of the evolution of the estuary's defences in relation to political change
- developing interpretations of these defences integrated with wider patterns of settlement, commerce and landscape.

Specific **areas of research** would include

- establishing a basic inventory of defence sites related to changing defensive systems within the estuary integrated into the region's SMRs
- undertaking more detailed study of selected sites which illustrate technological development or are key to the understanding of defensive systems
- developing an understanding of the distribution of specific building types
- analysing variations between fortifications as planned and as built.

3.6.4 ***Industry and Transport***
3.6.4.1 The regeneration of the most important sites should follow the example of the recent work at the Royal Arsenal at Woolwich, and link research and conservation to new development. All efforts should be made to find beneficial uses for and incorporate significant heritage structures, of all types, within proposals for the future. More generally, sympathetic understanding of an area's past vitality may help to overcome traditional negative images of the industrial waterfront, thereby helping to maintain continuity between past and future and contributing towards better community links. There is also a risk that industrial sites of less obvious or profound interest are being redeveloped without pause even to record industrial survivals. For example, most of the upriver docks were redeveloped in the 1980s at great speed. When the Royal Docks are developed lessons should be drawn, in particular as regards the need for recording.

3.6.4.2 The industrial archaeology of the region is neither documented nor preserved to the same extent as is that of, for instance, the Midlands or the North. In most branches of the wider subject the Greater Thames estuary has significance in a national context. In particular the history of London as an industrial centre and imperial port of global significance in the 19th and 20th centuries has not been adequately related to surviving physical evidence.

3.6.4.3 Many industries within the region have received little or no systematic study. Such studies as are currently available are often historical narratives largely based on documentation. It is necessary to explore physical remains which can augment and extend our understanding of the region's industrial past. Where buildings have not already been demolished or adapted to other uses, they are often of specialised form and construction, making them ill-suited to adaptive re-use. Whilst there is considerable potential for buildings survey, at many sites there are either no upstanding remains or only fragments. Such structures will be unintelligible or uninteresting unless integrated with landscape survey and/or investigation of below-ground remains. It is important that the public and private sectors should co-operate in identifying and preserving important documentation and physical remains. Key principles for further study of the industrial remains within the Greater Thames estuary are set out below.

Framework Objective
To develop an understanding of the estuary's industrial archaeology remains and their relationship to the history of industrialisation in the estuary.

This would be taken forward by **specific objectives**

- formulating a systematic approach to the study of industrial archaeology and relating it to existing historical studies
- identifying important sectors of industrial activity for research and recording
- identifying important or representative sites for research and recording
- developing a strategy for the beneficial reuse and/or interpretation of selected sites.

Specific **areas of research** would include

- establishing, as a sub-set of the region's SMRs, an inventory of industrial sites and monuments related to the estuary
- identifying industries and/or areas to be targeted for detailed research and/or recording
- undertaking baseline research to ensure a platform for comparative studies within and beyond the estuary

- developing methodologies for research and recording.

3.7 Education and Presentation

3.7.1 The archaeological significance of the Greater Thames is not well appreciated and its archaeology is underused for educational purposes. The Sites and Monuments Records of the region are a key resource for developing education and presentation. Public access is to be encouraged in an environment which is interesting and a source of enjoyment to local residents and visitors. Museums need to be fully involved in efforts to promote awareness of the historic environment of the Greater Thames. Within the region there are a number of good examples of the effective development of sites for education and tourism, notable examples being Coalhouse and New Tavern forts.

3.7.2 If archaeological materials are to continue to be made available for study, research and education, archaeological archives will need effective management. While the development of the London Archaeological Resource Centre by the Museum of London will satisfy a large part of the capital's needs for the foreseeable future, archive storage provision is increasingly becoming a problem, a situation reflected elsewhere in England (Swain 1998)

Framework Objective

To promote understanding of the archaeology of the Greater Thames and utilise the resource for general educational purposes and informed tourism, alongside academic study, primary and secondary level education so as to broaden understanding and appreciation of the region's past.

This would be taken forward by **specific objectives**

- linking education with regard to the archaeology of the Greater Thames to a range of National Curriculum subjects
- involving museums, which play a key role within the region, in efforts to promote understanding and appreciation of the region's past
- enhancing the use of SMRs for educational purposes
- creating education packs dealing with various aspects of the region's past
- developing interpretative publications, heritage trails and displays to increase use and appreciation of the archaeological resource in the Greater Thames
- securing effective archaeological archive provision for the region's archaeological collections.

3.8 Research into Methodology and Management

3.8.1 The Greater Thames Estuary is an ideal area for developing and evaluating new techniques, and establishing new data standards, which may have wider application in comparable situations elsewhere. There is a great depth of Holocene sediments, some landwards of the sea walls and therefore partly de-watered; extensive exposures of sediments are visible within the present intertidal zone and numerous archaeological sites, both buried and exposed, are known to exist. There is scope for methodological innovation in five main areas:

3.8.2 Data Standards: Such is the variety of archaeology within the region and the number of different organisations either actually or potentially involved in recording it, that clear data standards are essential to underpin all work. These will ensure compatibility of recording throughout the region. The integration of engineering logs with stratigraphic analysis of core sediments, test-pit prospection and targeted trench excavation provides a hierarchy of assessment and evaluation methods which can address questions of local cultural landscape development. Through emphasis on data standards, these local studies can be combined into extensive stratigraphic correlations and ultimately provide a regional picture.

3.8.3 Stratigraphic studies: Applications of borehole/trial pit and other geotechnical data for stratigraphic studies are considered by Barham *et al.* (1995). The work of Evans in the Medway (1953) provides the first such examination in the region: borehole logs were used to correlate the eroding intertidal Roman pottery production sites with the wider pattern of alluvial stratigraphy New techniques such as ground penetrating radar [GPR] and cone penetration should be investigated.

3.8.4 Site prospection: Prediction of sites with archaeological potential is considered possible on the basis of established topographic/archaeological associations. However, there are a number of problems, such as lack of standard description and poor data resolution, limited examination of deeply buried alluvial deposits, inadequate curation of borehole logs and lack of dating material. Due to these difficulties, progress on strategic deposit modelling has been limited. GIS (Geographical Information Systems) and other computer mapping techniques, however, offer the opportunity to develop palaeogeographical modelling if these difficulties can be overcome.

3.8.5 Site recording and interpretation: Some ground-based intertidal survey and excavation techniques have been outlined by Murphy and Wilkinson (1991). Considerable possibilities are offered by the global positioning system (GPS) and the digitising of data from vertical and oblique photographs in order to provide basic plans for complex wooden and other structures. Opportunities may be provided for sonar survey. Again the study of assemblages of macrofossils (eg plant remains and molluscs) and microfossils (e.g. pollen, foraminifera, diatoms) in modern estuarine situations would aid the interpretation of sub-fossil assemblages.

3.8.6 Site monitoring and management: Relatively little attention has been given to intertidal site management,

except in the Blackwater Estuary (Strachan 1996). At present there are insufficient data from monitoring to indicate the rates at which newly exposed intertidal sites (wooden structures and palaeosurfaces) are destroyed by sub-aerial exposure and erosion or to predict the risk to as yet unthreatened areas. Hence it is not known how rapid an archaeological intervention must be if a new site is not to be lost without record.

Framework Objective
To exploit the potential of the Thames estuary as a study area for methodological innovation pertinent to the detection, recording, monitoring and management of estuarine sediments and sites.

This would be taken forward by **specific objectives**, under the five headings distinguished above:

Data standards

- establishment of standards for all kinds of archaeological investigation within the region.

Stratigraphic studies

- extending the use of geotechnical/geophysical techniques to supplement conventional borehole/test pit data
- developing the use of GIS to model palaeosurfaces in three dimensions
- exploring techniques for detecting 'ripened' horizons representing incipient pedogenesis within minerogenic sequences (e.g. micromorphology)
- extending the use of X-radiography to examine bedding structures and discontinuities.

Site prospection

- developing a continuing systematic programme of aerial photography
- establishing an agreed data standard for ground-based survey of the intertidal zone
- testing the relevance of magnetic susceptibility, microcharcoal density and phosphate concentrations from core samples as indicators of nearby human activity.

Site recording and interpretation

- developing techniques permitting rapid recording within low-tide 'windows'
- studying the taphonomy and composition of assemblages of macrofossils and microfossils in modern estuarine situations to aid interpretation of sub-fossil assemblages
- assessing the value of three-dimensional sampling of 'submerged forests' and associated peats for dividing data on vegetation structure, composition and change.

Site monitoring and management

- monitoring erosion rates of exposed palaeosurfaces in the intertidal zone at several contrasting locations
- monitoring the effects of desiccation at low tide, microbial activity and physical erosion on intertidal wooden structures
- assessing the efficacy of sand-bagging and other physical erosion rates at critical intertidal sites
- monitoring the effects of re-watering on de-watered sites following Managed Retreat.

4

Developing a Research Strategy

4.1 Introduction

4.1.1. Representatives of Essex and Kent County Councils, the Greater London Archaeology Advisory Service, English Heritage and the Royal Commission on Historical Monuments (England) formed the Steering Group which produced this Research Framework; each of these organisations has been closely involved with research in the Greater Thames estuary. The production of the Framework was driven by a desire to provide a firm foundation for archaeological research in the Greater Thames, both with regard to PPG 16 work and to specific research projects. Once the Resource Assessment had established the extensive nature of the resource and the Research Agenda had demonstrated the scale and potential for future research within the Greater Thames, the need for a wide ranging explicit and coherent Research Strategy, the third element of a Research Framework, was clearly confirmed. The Project Strategy embraces the formulation, implementation and promotion of future projects drawn from the *framework objectives* and *research areas* set out in the Research Agenda. The Strategy is not comprehensive, but rather selects topics where a priority can be demonstrated, in large measure because of the vulnerability of the associated resource. It is hoped that other projects will emerge related to the *objectives* and *areas of research* and that these can be incorporated within the evolving Strategy.

4.1.2. It is clear that there are issues of co-ordination, consistency and the quality of future archaeological work in the estuary. The production of the present document has highlighted some of the issues and in particular the need to work together, not just as a one-off arrangement to produce a Research Framework, but on an ongoing basis so as to be able to build on the foundations laid by the Framework, both at an academic level and in developing a common purpose to technical problems and approaches to heritage management. It may be suggested (c.f. Fig. 3) that the present document is in fact a 'universal framework', but perhaps the project and the management strategies here outlined need further refinement and development before we have a truly 'universal framework'. The management strategy, for its part, is intended to facilitate rather than be restrictive, bringing organisations and individuals into contact and possible partnership. Personal initiative should not be stifled but it is hoped that those proposing any work within the estuary will, at an early stage, consider the Assessment and Agenda as key reference points.

4.1.3 Elements of a Project Strategy are developed here, in section 4.2, and related to what might be achievable in the short-term and medium-term. It is anticipated that, out of these, long-term projects will develop. An outline Management Strategy is set out in section 4.3.

4.2 Project Strategy

4.2.1 The Resource Assessment and Research Agenda indicate the main areas of research potential within the Greater Thames Estuary. The Project Strategy set out below concentrates on those areas considered to be particularly important, focusing on deposits and remains which are often highly vulnerable and frequently lack funding mechanisms for recording. It makes no pretence to be all-embracing, but it does identify priorities and set out research which it is considered will be particularly fruitful in the short and medium term. It recognises that research cannot rely solely on 'gap filling' and new data collection, although collection of certain baseline information will be necessary for some areas within the Greater Thames estuary. The Steering Group endorses the three key concepts for 'Advancing Understanding of England's Archaeology' (English Heritage 1997): accessibility of information, targeted data collection and synthesis, and it is hoped that any project proposal arising from this Framework document will be constructed with synthesis and interpretation, both popular and academic, in mind.

4.2.2 It is also recognised that development-led work will continue to produce results which will form an important contribution to archaeological and historical understanding, and future archaeological survey/investigation of this nature in the area will need to be related to the Research Framework. Similarly, synthesis of the results of such PPG 15/16 work and integration with other specific research projects will be essential.

4.2.3 While forming a firm basis for much of the Research Strategy proposed, the County SMRs at present include very little palaeoenvironmental information, although this is essential to the development of an understanding of the archaeology of the estuary. An environmental database component for SMRs of the region will therefore be developed.

4.2.4 ***Overall Priorities***

4.2.4.1 Five areas of research are identified by the Steering Group below for which they will seek to initiate projects in the near future. These have been selected from the Agenda both because of their potential and because they are affected by factors outside the planning process or difficult to accommodate within it. Of significance are sites and landscapes threatened by coastal erosion or industrial/defence structures lacking a suitable context for preservation or

reuse. Other organisations may wish to pursue other themes highlighted in the Research Agenda, for instance maritime archaeology, and the Steering Group would encourage and seek to facilitate such work.

4.2.4.2 Deposit modelling: An understanding of the natural processes presently operating within the Greater Thames estuary and represented in the Pleistocene and Holocene geological record, together with a clear perception of the consequent three-dimensional stratigraphy, are central to both future research and management, and indeed not only for archaeology but also for a range of other interests related to the Greater Thames.

4.2.4.3 Intertidal zone survey: This is one aspect for which baseline information is needed for Kent and parts of Essex, to bring the basic data level up to that established through the carrying out of the Hullbridge Survey (Wilkinson and Murphy 1995) and the Thames Archaeological Survey in London. Pilot surveys in these areas would enable development of the methodology, building on experience gained from earlier work. Survey should include analysis of existing aerial photographs and new aerial reconnaissance. It should also examine the likely presence and extent of deposits and sites similar to those in the intertidal zone, located 'inside' the seawall in areas of present and former grazing marsh.

4.2.4.4 Industrial archaeology survey: The importance of the Thames in the development of a wide range of industries is acknowledged in the Resource Assessment (2.6.4) as is the decline and redevelopment of many industrial sites. A basic assessment of the resource and identification of features and areas most under threat is a high priority. In the immediate term this would consist of a low-level survey to identify the nature, location, quality and importance of existing features in order to establish priorities for both extensive and intensive survey.

4.2.4.5 Defence heritage survey: Defence heritage sites are similarly vulnerable and require the development of a co-ordinated management strategy. A number of initiatives are currently in progress and it will be important to ensure that appropriate coverage is achieved while avoiding overlap.

4.2.4.6 Data standards, IT and integration of record systems: The integration and synthesis of results from numerous projects will be essential for continued revision of the framework, development of future projects and interpretation for, and use by, both the academic and public sectors. Agreed standards for the recording of information will be a key factor in this process, and it is therefore a high priority to establish agreed data standards, building on existing guidance and experience from work already underway in the area and with reference to national overviews such as those provided for the Monument Protection Programme's Class Descriptions. In order to ensure the appropriate integration of records from all projects there is a need for an audit/assessment of current record provision for the study area. This would build on existing and ongoing studies, such as MPP, RCHME audits of SMRs and the SMR Assessment Consultancy, commissioned by ALGAO with RCHME support. It should identify envisaged developments for records, including progress of implementation of data standards, and the ability to modify records, e.g. for integration of palaeoenvironmental data (see also below).

4.2.4.7 It is intended to prepare project proposals for these five areas in the immediate future. In each case presentation of results to enhance public appreciation of the archaeology of the Greater Thames will be considered a prime aim of the project. The kind of work it is hoped to pursue in the short-term, beginning in the current year, is set out below (4.2.5). It is intended that this will be developed and augmented by further work in the medium term (4.2.6).

4.2.5 ***Short-term Priorities***

4.2.5.1 Deposit modelling and survey in the intertidal zone

Research here is intended to further understanding of the archaeological resource described in the Resource Assessment and Research Agenda primarily under three themes: intertidal zone (2.5 and 3.5), palaeoenvironment (2.2, 2.3, 3.2 and 3.3) and buried landscapes (2.5.1, 2.6.1, 3.5.1 and 3.6.1), although it will of course touch upon many of the other themes.

4.2.5.2 Completion of a baseline survey for the whole area is a clear priority, and a pilot to develop the methodology has already been identified above as an immediate priority. In addition to Kent, there remain gaps in the Hullbridge Survey of the Essex coast that need to be considered.

4.2.5.3 It is important to build on the work of the Hullbridge and Thames Archaeological Surveys. The constant dynamic pattern of exposure and destruction of archaeological deposits within the intertidal zone makes regular monitoring vital if important information and discoveries are not to go unrecorded (Coles and Coles 1996, 158, no. 7). Furthermore, the intertidal zone is one in which dramatic individual finds of great importance may reasonably be anticipated. Wilkinson and Murphy (1995, 222-5) emphasised the need for further work and have identified six areas requiring detailed monitoring and further recording. It is now ten years since the end of the Hullbridge Survey and it is imperative (Coles and Coles 1996, 257, no. 2) that these areas receive renewed and particular attention. The Thames Archaeological Survey has similarly revealed a range of sites and deposits which merit further study.

4.2.5.4 The importance of borehole and other data derived from the exposure of deep deposits has been repeatedly stressed above and elsewhere (e.g. Merriman 1992; Bates 1995). There is a need for a concerted programme of evaluation of existing data to establish a clear perception of the three-dimensional stratigraphy of the estuary.

4.2.5.5 A summary proposed programme is presented below:

1. Aerial photography provides an essential preliminary in investigations of the intertidal zone (Fulford et al. 1997, 100-1). Existing aerial photographic coverage (particularly Environment Agency cover) will be collated to NMP standards.

2. Historic cartographic, and other selected documentary sources will be analysed for evidence of coastal evolution, and coastal settlement and industry.

3. Existing borehole data will be collated and synthesised, although this task is likely to be a long and complex one. The work of the LOCUS team at the British Geological Survey has provided a major resource for London and a project has been initiated for selected Pleistocene and Holocene deposits within the London area by the Greater London Archaeological Advisory Service of English Heritage. In the first instance it may be best to evaluate the available data and evolving methodologies before establishing a pilot project for the Greater Thames estuary.

4. Following on from the results of 1, a new aerial photographic survey will be commissioned.

5. On the basis of 1-4 above, trial areas will be selected in Kent for rapid walkover survey, modelled on the Hullbridge stage one surveys.

6. Key Essex sites, particularly those highlighted by the Hullbridge Survey, will be revisited and monitored, together with selected sites in London recorded by the Thames Archaeological Survey.

7. Results will be reviewed, integrated and synthesised.

4.2.5.6 Industrial archaeology survey
The potential for further study of the industrial heritage of the study area is considerable, particularly with regard to industrial landscapes directly linked to the estuary. A recommended programme, to be pursued in relation to MPP, comprises:

1. Enhancement of existing SMR and NMR databases with information from 'Greenbacks', map regression and published surveys.

2. Low-level extensive survey identified as an immediate priority through the above enhancement.

3. Review of data to establish priorities for survey.

4.2.5.7 Defence and related sites
A basic overview is provided in the Resource Assessment. Much preliminary survey has been carried out, although more work is required, and there is scope for further data enhancement. Particular attention needs to be given to 19th and 20th-century defence structures. Until recently these were not considered as heritage sites, and were perhaps under the greatest threat, through a lack of understanding of the presence and importance of surviving remains. There may also be a need to access, and, in some cases, check on the ground, 'Defence of Britain' data.

4.2.5.8 IT and integrated record systems
Appropriate data standards and subsequent accessibility of information will be crucial to the initiation of new projects and ensuring the usefulness of results for the wider community. Key areas are:

- The creation of a metadata directory for records in the study area.

- Identification of methods for linking/networking

- Development of a strategy for networking information including:

    1. Core data on monuments

    2. Full and compatible data in SMRs

    3. Digitally archived data

- Links to external records (e.g. SEAX in Essex).

4.2.6 ***Medium-term Priorities***
4.2.6.1 Deposit modelling and survey in the intertidal zone
On the basis of the strategy set out under 4.2.5.5. the programme of work will be taken forward in the following areas, subject of course to feasibility:

1. Reviewing how to extend survey areas in Kent and investigate previously unsurveyed areas in Essex.

2. Developing a synthesis of borehole data and reviewing results of all work carried out to date.

3. Commissioning detailed borehole surveys.

4. Undertaking palaeogeographic mapping off the coast by means of CHIRP and related means.

5. Carrying out detailed recording of selected sites and continued monitoring of others.

4.2.6.2 Industrial archaeology
Following on from the results of the extensive low-level survey areas and individual sites will be selected for:

1. Extensive and intensive thematic survey.

2. Detailed studies.

Results will be integrated into an appreciation of industrial landscapes and wider patterns of interpretation and explanation.

4.2.6.3 Defence and related sites
In the medium-term it will be necessary to complete the survey work set out in 4.2.5.8, develop syntheses and establish priorities for research and management of sites.

4.2.6.4 Data standards, IT and integrated record systems
The programme set out in 4.2.5.9 will be taken forward as required.

4.2.7 ***Review***
This Research Framework is not envisaged as a static document, and mechanisms for review will need to be established. This will include assessment of the results of projects carried out in the area, the updating of project designs and instigation of further work.

4.3 Management Strategy
4.3.1 If a truly integrated approach to future research in the Greater Thames estuary is to be achieved, all organisations carrying out projects in the regions will need to be in broad agreement about how work is to be enabled and co-ordinated. This includes consensus about:

Organisation of future co-ordination
Communication
Approaches to project design
Partnerships
Resources
IT and networking
Science-based archaeology
Education

4.3.2 Organisation of future co-ordination: The Steering Group for the Greater Thames Estuary will have achieved its objective upon publication of the Regional Research framework document. However, the members of the Steering Group, who have a fundamental curatorial role in the area, firmly believe that a continuing arrangement is necessary to enable interested parties to continue to meet and to help guide future research. Experience in the Severn estuary suggests that the existence of a research committee there has been particularly helpful. It is therefore suggested that there should be a permanent Thames Archaeological Steering Committee (TASC) made up of existing Steering Group representatives and representatives of universities, other bodies and disciplines and the voluntary sector. This Committee would meet regularly to discuss and progress matters of relevance ranging from policy formulation through to project implementation and promotion. It would also organise at least one day conference a year to present and discuss current work. The Steering Group would be closely linked to the Thames Estuary Partnership which is now responsible for taking forward the Thames Estuary Management Plan.

4.3.3 Communication: There would be a need to raise general awareness of archaeological projects taking place in the greater Thames region, and promote and publicise these activities. In the immediate term a launch for *An Archaeological Research Framework for the Greater Thames Estuary* can be considered within the context of an inaugural conference day. This would aim to:

- bring together interested parties
- include presentations of recent and current work
- promote discussion of future developments

In the longer-term the inaugural conference day would become an annual event providing a forum for all interested parties to report results, hear and see presentations about current projects and suggest directions for future work. As the body of work carried out grows, press releases, popular articles, academic articles in appropriate journals and other forms of publication would be produced. A house-style for work presented in print, computerised or other means, exhibitions and attendance at conferences could all be issues for future consideration.

4.3.4 Approaches to project design: There is an urgent need to initiate new research projects within the Greater Thames and this is considered further in sections 4.2.5 and 4.2.6. It is important, however, while in no way discouraging individual initiative, that from the beginning a consistent approach is established to the organisation and development of these projects. This needs to be acceptable to, and developed with, the various contributing partners. It is suggested that an approach incorporating PPG 16-style briefs and specifications and English Heritage MAP II research design procedures should be developed. The approach embraces:

- identification and defining of a single specific research area from the agenda
- production of a research project brief
- commissioning of response(s) to the brief
- agreement to a research design/specification
- project implementation
- monitoring procedures
- progress reports depending on length or scale of project
- production of full project report(s)
- synthesis and communication of results

This suggested preliminary structure would be tested and modified through experience gained through initial projects

and would be recommended as guidance to other organisations proposing to work in the region as being appropriate in research proposals. The adoption of good practices in the approach to projects would be welcomed, while it is anticipated that the principal funding bodies would see the benefit of such a consistent approach.

4.3.5 Partnerships: While TASC would in itself represent a major partnership for the organisation of future research in the Greater Thames estuary, it is recognised that many groupings will need to be developed to progress a wide-ranging programme of research. Local groups and individuals have made and will continue to make a significant contribution. In particular the Thames Foreshore Survey provides a model where local groups have made a major contribution to work, and have often been revitalised by the experience. Many links with agencies, societies and academic institutions representing specialist fields of interest, will need to be established. This would extend beyond the regional and national boundaries to the level of European and even world-wide partnerships.

4.3.6 Resources: This will also be a major issue if there is to be a successful future programme of archaeological research in the Greater Thames estuary which is to produce significant results. Current practice is that most archaeological projects are resourced by a range of organisations who contribute a mix of direct funding and/or resources in kind. It is envisaged that this kind of arrangement will continue for many new projects, particularly smaller ones. However, larger more complex, integrated projects will need significant levels of support requiring 'new' sources of funding. This will involve discussions with organisations in a position to grant aid archaeological projects like the Heritage Lottery Fund, period societies, Trusts, NERC, and other sponsors such as English Nature and the Environment Agency. There is also a major opportunity through the development of European partnerships to seek EC funding.

4.3.7 IT and networking: It will be essential to ensure that the results from the diverse range of projects envisaged are readily accessible to all levels of users; this will be crucial to the creation and execution of projects. Accordingly, the TASC would work to ensure that information is integrated with the appropriate existing national (NMR) and local (SMRs) databases. Networking of information systems would enable access to and analysis of data for the entire Thames region, regardless of the coverage of an individual local SMR. This area will need its own strategy and this is included above in section 4.2.5.8 (Project Strategy).

4.3.8 Science-based archaeology: The Resource Assessment has established the complex nature of the archaeology of the Greater Thames and many parts of the Research Agenda will only be progressed through a wide range of integrated projects. These will call upon many other disciplines, particularly in the fields of geomorphology, biology, geophysics and maritime studies. This will involve both the application of existing techniques and the development of new ones. There will be a need to establish links, facilitate project development with appropriate partners and assist in the preparation of applications for projects in the Greater Thames to the Science-based Archaeology Strategy Group for NERC grants and support.

4.3.9 Education: Developing the vast education potential of the archaeology of the Greater Thames will be a primary task. Initially this is likely to be low key and linked to specific projects where there can be either site visits or lectures to selected groups. In the long-term this will be broadened, along with other general communication initiatives in order to reach a much wider audience. Funding bodies, especially the Heritage Lottery Fund, must see public benefit demonstrated within any project which it supports. It will therefore be necessary to ensure development of the full educational potential of archaeological projects. The long-term vision might include the establishment of an Institute of Greater Thames Estuary Archaeological and Historical Studies. This could be based at an important historic site within the region for which beneficial use is sought, or alternatively located with an existing organisation working in the region. It would provide a focus for a wide range of education initiatives (lectures, exhibitions, displays, virtual reality presentations, hands-on activities, etc) while also providing a contact and base point for organisations carrying out, developing, or visiting in order to acquire knowledge about projects in the region.

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Appendix 1: Greater Thames Estuary Project: Initiatives Relating to Archaeology

The Government's Thames Gateway proposals and other initiatives for change in the Thames Valley have led to widespread consideration of the effect that new developments will have upon the environment. In particular concern about further destruction of important archaeological sites has caused both local and national archaeological organisations to launch a range of initiatives, or provide input to surveys by other bodies, aimed at combating the threat. The following (updated from the proceedings of the Thames Gateway conference held in 1995 ('Thames Gateway', RCHME, 1995) aims to provide a summary of the situation at the end of 1998.

Abbreviations used in the table:

TG: Thames Gateway
NMR: National Monuments Record
SMR: Sites and Monuments Record
CTRL: Channel Tunnel Rail Link
TEMP: Thames Estuary Management Plan
RCHME: Royal Commission on the Historical Monuments of England
GLASS: Greater London Archaeological Advisory Service
MPP: Monuments Protection Programme
OAU: Oxford Archaeological Unit
RSPB: Royal Society for the Protection of Birds
Essex CC: Essex County Council
Kent CC: Kent County Council
LDDC:London Docklands Development Corporation
EH: English Heritage

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
(i) Thames Estuary Project	RCHME	(i)To identify records and other sources of information within the TG, and to identify priorities for future recording. Survey of selected important Thames-side buildings and landscapes within the TG which may be at risk.	A preliminary report completed in 1995 identified NMR and other sources of information on the TG. Survey work has been completed, archived and disseminated as separate site reports.	Liaison with EH and Local authorities throughout, particularly regarding selection of sites for recording.
(i) Production of a 'baseline' archaeological assessment of the TG (ii) Monuments Protection Programme	English Heritage	(i) To locate areas of known archaeological importance which would be affected by TG and to identify areas where further survey is required. (ii) To review our understanding of the resource within the TG through research and evaluation projects, and to afford it adequate and appropriate protection.	(i) The Oxford Archaeological Unit produced a draft report in March 1995 to a brief prepared by Kent CC. (ii) Ongoing	(i) Kent CC, Essex CC and EH (London SMR) are involved in joint discussions (ii) Assistance with MPP, including provision of information to its strategic reviews and evaluation projects, and advice to archaeologists on a case by case basis.
Rivers of England Project	English Heritage/ Wessex Archaeology	National assessment of Palaeolithic Deposits.	The Southern Rivers Project included Kent. It has been extended north of the Thames where fieldwork for the North Thames area has been completed and a report produced.	Liaison and provision of information.

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
Thames Estuary Partnership, formerly the Thames Estuary Project	Partnership of organisations within the Thames Estuary	To work to balance the competing demands on the Thames Estuary through the preparation of a Strategy of guiding management principles and an Action Plan detailing projects to address the strategic management principles	An archaeological Steering Group produced an Historical and Cultural Resources Topic Paper in February 1996 to provide input to the TEMP.	Kent CC co-ordinated Historical Resources Topic paper; contributions by Essex CC, EN, ECHME and others.
Medway-Swale Estuary Project	Partnership of organisations within the Medway and Swale Estuary	To work to balance the competing demands on the Medway and Swale Estuary through the preparation of an estuary management plan to guide future management	A topic group produced an Historical and Cultural Resources Topic Paper in Spring 1996 to provide input to the EMP.	Historic and Cultural Resources Topic Paper co-ordinated by Kent CC. Contributions from RCHME and others.
Greater Thames Initiative	Royal Society for the Protection of Birds	To secure an integrated approach to land-use and coastal zone planning.	RSPB is promoting the concept of a 'Greater Thames' which comprises a larger suite of estuaries, an area identified due to its contiguity and interdependence for flora and fauna.	Counties involved in consultation process.
Essex Shoreline Management Plan	National Rivers Authority/Essex CC/ Essex Coastal Districts	To produce a plan for the management of Essex Coastal Defences.	An environmental assessment was produced which incorporates an archaeological assessment. A draft plan has been circulated.	The archaeological assessment was prepared by Essex CC which is now working to improve the archaeological content of the draft plan.
SMR Enhancement	Essex CC	The objective is to improve the database for TG, especially industrial sites. It involves checking 1st Edition OS 6" maps, particularly for industrial monuments in area of TG.	The project is ongoing and will be progressed depending on funds.	Organised by Essex CC.
Survey of World War II defences	Essex CC	To locate and record Second World War defences throughout Essex, both those surviving and also the sites of demolished structures.	A substantial part of the county has been surveyed by a specialist military historian. A significant proportion of the coast, including the Blackwater Estuary has been completed.	Organised by Essex CC. Additional funding has been received from Maldon DC

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
Essex Historic Towns Survey	Essex CC/ EH	To produce research and management strategies for the historic towns in Essex. This will update the existing supplementary planning guidance document "*Historic Towns in Essex*" which includes south Essex.	Work commenced in 1995 with funding from EH, with a specialist urban Project Officer appointed for the survey. Databases and reports have now been produced for all historic towns in Essex, including several within the Greater Thames region. Draft supplementary planning guidance is being circulated for comment	Organised by Essex CC.
Essex Mapping Project (part of the RCHME National Mapping Programme)	Essex CC/RCHME	The project aims to map archaeological information from all available oblique and selected vertical aerial photographs. Information is being mapped to national standards and recorded on the RCHME 'MORPH' database system.	The project is in progress. The coastal areas within the Greater Thames Estuary Project area have been completed	Essex CC is carrying out the contract for RCHME
Blackwater Estuary Archaeological Project	Essex CC	Pilot project to survey and assess archaeological remains in the Blackwater Estuary. This includes assessment of documentary sources by Alison Gale (specialist consultant); radiocarbon dates for fish traps; recording of foreshore wrecks; and monitoring of sites recorded by the Hullbridge Survey.	Documentary assessment is complete. Visits are being made to 'Hullbridge' sites; discussions are on-going with local amateur archaeologists to arrange recording of wrecks. Many of the major fish traps have been radiocarbon dated and are of Middle Saxon date.	Funded by Maldon District Council, ECC and RCHME.
Sonar Survey, Blackwater Estuary	University of Southampton, RCHME, ECC	Pilot surveys targetting inter/sub-tidal wooden structures to test methodoligies.	Survey carried out in 1998, report expected during 1999	ECC providing advice.
Swale Archaeological Survey	P Wilkinson	Archaeological Survey of Swale District	Ongoing	Some funding by Swale Borough Council
Upchurch Marshes Survey	Upchurch Marshes Research Group	Monitoring and survey of Upchurch Marshes intertidal zone.	Ongoing, report in preparation.	Some grant aid from Kent CC.

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
Kent Oyster Coast Environmental Survey Project	Whitstable Fossil Society; Canterbury Archaeological Trust; Royal Holloway College, London.	Monitoring and survey of the Whitstable coast.		
Step 1 report for Salt Industry	Essex CC/ EH	To produce a Step 1 report for the Salt Industry for country as a whole. It will include coastal salt industry, remains of which are known from the TG area.	The draft Step 1 report was submitted to EH in 1995. A revised version will be submitted shortly.	Co-ordinated by Essex CC.
Kent Maritime SMR development	Kent CC/ RCHME	Includes examination of AP and documentary sources for boat remains in the north Kent marshes.	The first phase of the project, now completed, resulted in many sites being added to the SMR.	Organised by Kent CC.
Kent Historic Towns Survey	Kent CC/EH	To produce research and management strategies for historic towns in Kent.	Work commenced in 1992 and a further year is needed to complete the work.	Organised by Kent CC.
Survey of Kent post-1500 defence sites in TG.	Kent CC	Identification of sites for safeguarding in TG framework.	The overview is complete and more detailed records are being compiled for the SMR.	Organised by Kent CC.
Thames Strategy	Ove Arup (for Government Office, London)	To assess opportunities to enhance the role of the Thames as an amenity and development resource.	A statement was published in 1995. Subsequently, GoL issued a draft strategic planning statement in which archaeology is addressed, but not in line with PPG 16.	GLAAS were consulted and advised on archaeological implications. Kent CC has commented.
Thames Northern Tributaries Project	Hertfordshire CC	To assess the archaeological potential of Holocene deposits in the Colne, Lea and Roding valleys, through mapping, dating and predictive modelling.	A provisional proposal has been submitted to EH.	

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
Greenwich Project	RCHME	An architectural and archaeological survey of the buildings and landscapes of the former royal estate at Greenwich, to produce and publish an overall synoptic historical account. Reports on Greenwich Park have	been produced and, jointly with EH and the DNH, a report (*Maritime Greenwich*) has been published to support the nomination of Greenwich for World Heritage Site status. Research will be completed in 1997 for publication in 1998. There has been close liaison with English	Heritage, the National Maritime Museum, the Department of National Heritage and the Ministry of Defence.
Royal Arsenal Survey, Woolwich Archaeological Survey	London Borough of Greenwich	Carried out as part of a larger programme of historical study. It comprises a review of primary historical documents, deposit survey and industrial archaeology survey to inform regeneration proposals	A final report has been submitted. There has been limited uptake of the recommendations to date, but the potential of educational and tourism opportunities has been further considered by the Local Authority	
Barking Reach Project	London Borough of Barking and Dagenham/Bellway Homes	To carry out a 3D geotechnical profile of the alluvial stratigraphy.	Quantity and quality of information to be defined.	EH to advise on planning constraints informed from results
Deptford Creekside	Lawson-Price (consultants to Fairview New Homes) London Borough of Lewisham and London Borough of Greenwich	SRB funds for environmental improvements have been made available for archaeological assessment of the amenity potential of the tidal creek, through desk-based study and foreshore survey. Detailed investigations are proposed in advance of individual developments.	In addition, a major development proposal for the former Deptford Power Station site has resulted in field evaluation according to a GLAAS brief, and a proposal for major investigation of the site of a former East India Company shipyard.	GLAAS has provided briefs for SRB related work, and will attend the monitoring committee

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
Crayford Brickearth Survey	Wessex Archaeology	To accurately map the extent of surviving deposits associated with Middle Palaeolithic sites, including *in situ* Levallois knapping site. This is a local development of a specific issue arising from the 'Southern Rivers Project'.	Data collection has been completed and analysis is in preparation.	Jointly funded through GLAAS and London Borough of Bexley to assist in development control.
River crossings in East London	Halcrow Fox	To produce an appraisal framework to assess proposals for up to three new river crossings - Blackwall, Gallion's Reach and Woolwich.	Historic cultural remains were included in the consultants brief for the appraisal, and EH provided a detailed brief to establish the appropriate desk-based archaeological appraisal method.	
Ebbsfleet Valley Development	Kent CC working with Districts	To formulate archaeological mitigation strategy for Ebbsfleet Valley development.	OAU are presently developing a framework for approval	Districts and Kent CC re planning process.
Union Railway Channel Tunnel Rail Link (CTRL)	Department of Transport/Union Railways Ltd	To ensure adequate provision for archaeology prior to and during construction of the Channel Tunnel Rail Link	The overall route has been agreed by the government. An archaeological assessment has been carried out by Oxford Archaeological Unit and an Environmental Assessment produced. Further evaluation is required to determine the level of field programme. Evaluations have been largely undertaken and reports produced.	Discussions with Union Railways on the archaeological impact along the whole route including important Paleaeolithic sites in the Medway and at Purfleet. Other sites include later prehistoric High House, Purfleet and areas of potential at the Tunnel portal

Initiative	Organisation	Purpose	Summary of Progress	Local Authority/EH London SMR Involvement
Development briefs for all LDDC property	London Docklands Development Corporation/EH	To assess archaeological deposits within the alluvial sequence by use of geotechnical mapping, and evaluation of SMR archives.	Consultant to be appointed.	EH to advise on planning constraints informed from results
Thames Foreshore Survey	Institute of Archaeology	To assess the archaeological remains under threat of erosion along the Thames foreshore.	Successful pilot study has been followed by a broadening of the survey remit and support. Partnership includes various institutions, including EH and the Environment Agency. The main area of survey is upstream from Tower Bridge, but additional areas are being examined at Greenwich and Rainham.	Funded by EH London. EH provided the brief and sought a detailed project design
Blackwall Peninsula: Greenwich Millennium site	Port Greenwich (British Gas development subsidiary); MoLAS; London Borough of Greenwich		GLAAS is leading on-going discussion to establish what can be achieved at this badly contaminated site.	
Dockland Light Railway Lewisham extension	MoLAS		Implementation of works agreed in the Wessex Archaeology tender proposal is underway. Further discussions are in progress on the Greenwich Cutty Sark Station.	GLAAS is monitoring the work.
Tidal Thames: landscape assessment and design guidelines	Environment Agency	Part of a wider programme to assess and record the environmental resources that the the EA seeks to protect.	A final report was published in early 1996. It provides an overview of the tidal Thames landscape, including the definition of eight landscape character reaches, and a section on landscape design guidelines which contains an analysis of the key issues affecting the river landscape and offers guidance on how to overcome problems.	

ENGLISH HERITAGE

Essex County Council
Planning

Kent
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Thames Estuary Partnership