MARSH LANE PLAYING FIELDS
Leyton
E10

London Borough of Waltham Forest

An archaeological assessment
and geotechnical watching brief report

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REGISTERED ORGANISATION IFA

MUSEUM OF LONDON Archaeology Service
PRE-CONSTRUCT ARCHAEOLOGY

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London Borough of Waltham Forest

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and geotechnical watching brief report

National Grid Reference: 536975 186750

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SUMMARY (NON-TECHNICAL)

This document reports on the results of an archaeological desk based assessment and a phase of geotechnical borehole monitoring carried out at Marsh Lane playing fields, Leyton. Capita Symonds Ltd commissioned this report from the Museum of London Archaeology Service and Pre-Construct Archaeology Ltd (MoLAS-PCA).

The site is entirely located within an Archaeological Priority Area as defined by the London Borough of Waltham Forest

The geotechnical monitoring involved the geoarchaeological observation of 11 boreholes and 45 window samplers. These interventions were distributed across two development zones known as Zone 1 and 2. For the purpose of this report both zones have been considered together. The monitoring identified two landscape zones (LZ's) across the site where a similar sequence of deposits with differing levels of palaeoenvironmental and archaeological potential exist. In general the site occupies an area of higher ground adjacent to the lower lying floodplain further towards the west. The majority of the site formed a dry terrestrial soil above the Pleistocene gravels (LZ2), although evidence of a tributary channel of a Holocene date (LZ1) was also evident.

LZ 1 occurs towards the northern periphery of the site and consists of a sequence of Pleistocene gravels overlain by a series of fine gravels, clays and sands indicative of a Holocene channel. The sands and gravels represent the formation of channel bars, point bars and riffles and pools within the streambed. The channel appears to form a tributary of the Lea flowing roughly along an east to west orientation, and may represent a former course of the Dagenham brook. Radiocarbon dating of organic material within these deposits produced two dates from the Neolithic period (c. 2800 BC). This suggested that the channel was active during the early Neolithic period, but may have become abandon by the Bronze Age due to a high sediment load obstructing the flow of the channel.

The channel deposits within this zone were found to contain plant and mollusc remains that could be utilised to reconstruct the surrounding contemporary environment and inform on changes in the river regime. This zone may also contain peat filled hollows of the abandoned channel, which may provide good pollen sequences from the early Holocene onwards. Although dry land occupation is unlikely to occur within this zone, exposed vegetated channel bars adjacent to the active channel, may have provided suitable locations for Mesolithic hunter gatherer activity.

Once the channel ceased to flow, alluvial clays deposited through overbank flooding inundated the site. These alluvial clays essentially formed a seasonally dry soil horizon. However, with rising river levels alluvial accumulation continued into the historic period with conditions becoming predominately wetter, with the development of a grass meadow environment across the site. Deposits of made ground measuring up to 3m in thickness buried the alluvial clays.

Within LZ 2 the Pleistocene gravels were overlain by a fine grained deposit of a possible Pleistocene date. The deposit was probably deposited by fluvially processes with some input of wind blown material in a periglacial landscape. During the Holocene period this deposit formed a dry landsurface suitable for occupation. Prehistoric features may be found to cut through this horizon down into the

underlying gravels. The buried landsurface was sealed by a sequence of alluvial clays contemporary and of the same nature as those identified within LZ 1.

The natural deposits in this zone are sealed below 3m of made ground. However, towards the south-eastern part of the site a large embankment has buried the natural horizons below 5m of modern made ground.

Although this zone has a high potential for occupation due to its location near to the floodplain and its associated resources, the area is unlikely to provide good palaeoenvironmental information. The oxidised nature of the dry soil horizon is unlikely to preserve good palaeoenvironmental remains.

This assessment concludes that there is low to moderate potential for remains from prehistoric and later periods within the site and historically the site was located in a favourable dryland position adjacent to the River Lea suitable for prehistoric and later exploitation. The archaeological deposits are proven to lie beneath (and thus preserved by) several metres of modern made ground across the majority of the site. The proposed development of the site includes provision of 81 allotment plots. The proposed allotments will have attendant shed units, access routes and water supply. Landscaping and preparation of the site presently includes removal and replacement of 500mm of topsoil. Service trenches and landscaping are considered to have only a superficial depth of disturbance.

The assessment recommends that no further work is required as the present scheme of redevelopment does not present any impact to underlying archaeological deposits, as informed by the results of the recent geotechnical survey and the latest proposal plans.

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1 Introduction

1.1 Site location

The site is within the London Borough of Waltham Forest on the south side of Marsh Lane, Leyton, London E10 (Fig 1). The site is bounded by Marsh Lane to the north, by Temple Mills marshalling yard and railway track to the west and south. Dagenham Brook forms the eastern boundary to the site, and is a broadly triangular tract of open field to the south of Marsh Lane.

The National Grid Reference (NGR) for the centre of the site is 536975 186750

1.2 Site status

This document has been prepared as a statement of archaeological potential of the of the site, prior to an application for planning consent. This assessment has been carried out prior to any proposed development design or construction schedule, thus no archaeological implication for the proposed development has been made.

The site lies within an Area of Archaeological Importance as defined by the London Borough of Waltham Forest, APZ1: Lea Valley and tributaries.

The site does not contain any nationally or locally designated (protected) archaeological sites, such as Scheduled Ancient Monuments, Listed Buildings or Registered Parks and Gardens. No previous archaeological work has been carried out within the site.

1.3 Origin and scope of the report

Capita Symonds Ltd. has commissioned the Museum of London Archaeology Service / Pre-Construct Archaeology (MoLAS-PCA) to carry out an archaeological desk-based assessment of the site prior to development to undertake geoarchaeological monitoring of site investigation at the site.

This desk-based assessment and analysis of/reporting on the site investigation together form an initial stage of archaeological investigation of the area of proposed development (hereafter also referred to as the 'site'), and may be required at a future date in relation to the planning process in order that the local authority can formulate appropriate responses in the light of any identified archaeological resource.

The desk-based assessment and monitoring have been carried out in accordance with the standards specified by the Institute of Field Archaeologists (IFA 2001) and the Association of Local Government Archaeological Officers. Under the 'Copyright, Designs and Patents Act' 1988 MoLAS-PCA retains the copyright to this document.

1.4 Aims and objectives

A desk-based assessment (*Archaeological assessment*) as defined by the Institute of Field Archaeologists (IFA 2001) will

> determine, as far as is reasonably possible from existing records, the nature of the archaeological resource within a specified area. It will be undertaken using appropriate methods and practices which satisfy the stated aims of the project, and which comply with the Code of Conduct, Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology, and other relevant by-laws of the Institute of Field Archaeologists.

A desk-based assessment represents

> a programme of assessment of the known or potential archaeological resource within a specified area or site on land, inter-tidal zone or underwater. It consists of a collation of existing written, graphic, photographic and electronic information in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in a local, regional, national or international context as appropriate.

The purpose of desk-based assessment is

> To gain information about the known or potential archaeological resource within a given area or site (including its presence or absence, character and extent, date, integrity, state of preservation and relative quality of the potential archaeological resource) in order to make an assessment of its merit in context, leading to one or more of the following:
>
> - The formulation of a strategy to ensure the recording, preservation or management of the resource;
> - The formulation of a strategy for further investigation, whether or not intrusive, where the character and value of the resource is not sufficiently defined to permit a mitigation strategy or other response to be devised;
> - The formulation of a proposal for further archaeological investigation within a programme of research.

The submission of a desk-based assessment to accompany a planning application also conforms to the intent of paragraph 7 (under 'The role of public authorities and planners') of the *Code of good practice* established by the Cultural Heritage Committee of the Council of Europe (CHCE 2000), which states that 'before taking decisions affecting the archaeological heritage, planners should obtain adequate information and advice, applying non-destructive methods of investigation wherever possible'; and also with the intent of paragraph 1 (under 'The role of architects and developers') which states that 'the purpose [of assessment] will be not only to establish if it is necessary to dig but also to build a picture of [the site's] morphology and its potential.'

1.5 Methodology

The assessment has been carried out in accordance with guidance from various bodies including the Greater London Archaeology Advisory Service (GLAAS), the Institute of Field Archaeologists (IFA) and the Association of Local Government Archaeological Officers. In summary, the work has involved:

- Identifying the client's objectives;
- Identifying the sources available for consultation;
- Assembling, consulting and examining these sources; and
- Consulting specialists within MoLAS-PCA as appropriate

The degree to which archaeological deposits actually survive on the site will depend on previous land use, so an assessment is made of the destructive effect of the previous and present activity and/or buildings, from the study of available plan information, ground investigation reports, or similar.

In order that the appropriate response(s) can be identified, consideration is given to the need for further assessment and/or field evaluation work and/or recording to identify, locate and/or record surviving deposits and/or structures on the site or in its setting.

1.6 Sources consulted

In order to set the proposed site into its full archaeological and historical context, the present study focused on a 500m study area around the site, although occasional references are made to known sites and finds within the broader area, where relevant, as held by the primary repositories of archaeological information within Greater London. These comprise the Greater London Sites and Monuments Record (GLSMR) and the London Archaeological Archive and Resource Centre (LAARC). The SMR is managed by English Heritage and includes information from past investigations, local knowledge, find spots, and documentary and cartographic sources. LAARC includes a public archive of past investigations and is managed by the Museum of London.

The following additional sources were consulted for the present detailed desk-based assessment:

- MoLAS – Geographical Information System for Greater London, published local history and archaeological publications
- London Society Library – published sources on London's water supply
- Landmark Envirocheck - Ordnance Survey maps from the 1st edition (1869) to the present day
- British Geological Survey – solid and drift geology maps
- Greater London Industrial Archaeology Society (GLIAS) - GLIAS database version v.2.65
- London Borough of Waltham Forest - information on Listed Buildings (statutory and local listing), Conservation Areas and Archaeological Priority Area
- English Heritage – information on Scheduled Monuments
- Internet – web–published material

Fig 6 shows the location of known archaeological sites and finds within the 500m study area and the proposed development site respectively. These have been allocated a unique assessment reference number (Site A, B etc for past investigations and Sites 1, 2 etc for known sites, and finds recorded on the SMR and identified by the present assessment), which is listed in a gazetteer in section 4.3, and which is referred to in the report text.

1.7 Summary of the proposed development

The proposed development for the site at Marsh Lane incorporates the reprovision of 81 garden allotments (the Eastway Allotments in the London Borough of Newham), together with associated facilities and the necessary enabling works and subsequent

wider landscape and access improvements (LDA/LBWF/ML/APP/DOC/002-Planning Statement). See section 6 for details of the planning proposal.

2 Planning and legislative framework

2.1 National planning policy guidance

2.1.1 Archaeology

Planning Policy Guidance Note 16: Archaeology and Planning (PPG16) sets out the Secretary of State's policy on archaeological remains, and provides many recommendations subsequently integrated into local development plans. The key points in PPG16 can be summarised as follows:

> Archaeological remains should be seen as a finite and non-renewable resource, and in many cases highly fragile and vulnerable to damage and destruction. Appropriate management is therefore essential to ensure that they survive in good condition. In particular, care must be taken to ensure that archaeological remains are not needlessly or thoughtlessly destroyed. They can contain irreplaceable information about our past and the potential for an increase in future knowledge. They are part of our sense of national identity and are valuable both for their own sake and for their role in education, leisure and tourism.
>
> Where nationally important archaeological remains, whether scheduled or not, and their settings, are affected by a proposed development there should be a presumption in favour of their physical preservation.
>
> The key to informed and reasonable planning decisions is for consideration to be given early, before formal planning applications are made, to the question of whether archaeological remains are known to exist on a site where development is planned and the implications for the development proposal.
>
> When important remains are known to exist, or when archaeologists have good reason to believe that important remains exist, developers will be able to help by preparing sympathetic designs using, for example, foundations which avoid disturbing the remains altogether or minimise damage by raising ground levels under a proposed new structure, or by careful siting of landscaped or open areas.
>
> If physical preservation in situ is not feasible, an archaeological excavation for the purposes of 'preservation by record' may be an acceptable alternative. From an archaeological point of view, this should be regarded as a second-best option. Agreements should also provide for the subsequent publication of the results of any excavation programme.
>
> Decisions by planning authorities on whether to preserve archaeological remains in situ, in the face of proposed development, have to be taken on merit, taking account of development plan policies and all other material considerations – including the importance of the remains – and weighing these against the need for development.
>
> Planning authorities, when they propose to allow development which is damaging to archaeological remains, must ensure that the developer has satisfactorily provided for excavation and recording, either through voluntary agreement with the archaeologists or, in the absence of agreement, by imposing an appropriate condition on the planning permission.

The importance of heritage in consideration of development proposals is recognised at a European level. In 2000, the Cultural Heritage Committee of the Council of Europe adopted the Code of good practice on archaeological heritage in urban development policies (CC-PAT [99] 18 rev 3). The document states that 'a balance must be struck between the desire to conserve the past and the need to renew for the future'.

2.2 Regional guidance: The London Plan

The over–arching strategies and policies for the whole of the Greater London area are contained within the GLA's London Plan (Feb 2004) also include statements relating to archaeology:

> Policy 4B.14 Archaeology The Mayor, in partnership with English Heritage, the Museum of London and boroughs, will support the identification, protection, interpretation and presentation of London's archaeological resources. Boroughs in consultation with English Heritage and other relevant statutory organisations should include appropriate policies in their UDPs for protecting scheduled ancient monuments and archaeological assets within their area."

2.2.1 Archaeology and planning in Waltham Forest

The London Borough of Waltham Forest's revised *Second Deposit Unitary Development Plan* (UDP) was published in 2003, but is currently being reviewed. The policies set out in this document determine the position of archaeology as a material consideration in the planning process and incorporate recommendations from the Department of the Environment's *Planning Policy Guidance Note 16* (PPG 16). The most important of these are as follows:

> **BHE 16** The Council will seek to encourage the conservation, protection and enhancement of the archaeological heritage of the Borough.
>
> When any development involving a site of 0.4 of an acre or more is proposed within the Archaeological Priority Zones (as shown on the proposals map), or for any site identified by a recognised archaeological authority, the archaeological significance of the site will be considered. Where appropriate, the Council may require a preliminary archaeological site evaluation before development proposals are considered.
>
> The Council will seek to ensure that the most important archaeological remains and their settings are permanently preserved, if necessary for public access and display.
>
> Sites of archaeological significance or potential not requiring permanent preservation shall have provision made for an appropriate level of archaeological investigation and excavation to be undertaken by a recognised archaeological organisation before and during the process of development. Such provision shall also include the subsequent analysis, interpretation and in appropriate cases, presentation to the public of the archaeological results and finds.
>
> **Para 8.106** The Greater London Archaeological Advisory Service has defined a number of Archaeological Priority Zones (APZs) which have been identified as having particular archaeological interest. Some of the APZs are extensive and include the whole of the Lea Valley, the valleys of The Ching and The Fillebrook Rivers and areas around former Saxon and Mediaeval settlements such as Chingford, Walthamstow, Leyton, Highams Park and Leytonstone. There are also a number of less extensive APZs. For proposed developments involving a site of 0.4 acres or more within the APZs, the Council will liaise with the Greater London Archaeology Advisory Service in order to assess the archaeological significance of the site. Where appropriate, a preliminary archaeological site evaluation or desk-based assessment may be required by the Council before such proposals are considered.
>
> **Para 8.107** The Council considers that wherever possible, the most important archaeological remains and their setting should be permanently preserved. Developers can help to achieve this by, for example, preparing sympathetic designs and using foundations which avoid disturbing remains altogether. If the physical preservation of

> remains is not feasible, an archaeological excavation for the purposes of "preservation by record" may be an acceptable alternative.

The Council has designated a number of Archaeological Priority Zones in the borough. The present site lies within one of these Zones, APZ1: Lea Valley and its tributaries.

3 Geoarchaeological Deposit Model

3.1 Introduction

This section reports on the results of the MoLAS-PCA geoarchaeological monitoring of the boreholes and window samplers carried out at Marsh Lane, Leyton, between the 20th June and 5th July 2006. White Young Green Ltd undertook the work on behalf of the client, Capita Symonds Ltd.

The site was divided into two zones of investigation (see Fig 2). Zone 1 covered a small parcel of land on the western part of the site, with Zone 2 covering the remainder of the site towards the east and south. Zone 1 covered the area of a proposed reallocation of use, while Zone 2 involved a preliminary investigation of the ground with no proposed change to the parcel of land. For the purpose of this report both zones have been considered together as the results of Zone 2 aid understanding and inform the interpretation of the deposits within Zone 1.

The geoarchaeological terms used in this report are highlighted in bold and explained within the geoarchaeological glossary (see Section 7)

3.2 Geoarchaeological background and topography

The British Geological Survey (BGS) solid and drift geology map no. 257 shows that the Marsh Lane site falls within the eastern edge of the alluvial floodplain of the River Lea. The main course of the River Lea lies further to the west of the site, in the vicinity of the Hackney Marshes.

The site is bordered to the east by the Taplow terrace, a former riverbed of the Lea that was deposited during the Wolstonian **Glacial** between 128 to 280K BP. The Wolstonian Glacial is one of many cold climate episodes that occurred during the last 2 million years during the **Pleistocene** period.

Below the **alluvial** deposits and gravel terraces tertiary deposits of Woolwich and Reading beds occur which date to the Eocene epoch of 50 million years ago.

Although the site falls within the alluvial floodplain, previous mapping of the gravel surface, undertaken as part of the Lea Valley Mapping Project (Burton, *et al*, 2002), suggests that the floodplain contains more than one terrace. The Taplow terrace towards the east of the site exists at around 9 to 10m OD. Within the site boundary the gravels drop to *c* 5m OD, dipping down to around 3 to 4m OD within the present floodplain of the Lea further to the west.

This suggests that a low terrace exists along the eastern edge of the floodplain, representing a former alignment of the Lea, present before a downcutting event that occurred towards the end of the Devensian Glaciations; the last cold period before the **Holocene**.

The Dagenham Brook is aligned along the interface of the Taplow terrace and the alluvial floodplain, and flows along the east side of the site. Although this channel

may have originally been a natural water course, significant recutting and alterations appear to have occurred during the Post-Medieval period, resulting in the fairly straight channel apparent today.

The current surface of the site exists at around 6.5m OD. Towards the south-eastern part of the site an extensive dump of made ground exists which raises the ground level to *c* 9.5m OD. Further east, where the Taplow terrace rises up on the valley sides, the modern ground level exists at between 12 to 14m OD.

3.3 Methodology

3.3.1 Monitoring of window samplers and boreholes

Zone 1 contained 6 boreholes and 25 window samplers. Zone 2 contained 5 boreholes and 20 window samplers.

The boreholes were drilled with the use of a cable percussion rig. The window samples were taken with a terrier rig that extracted 1m length plastic cores of continuous undisturbed sediment. Only the boreholes and window samplers that extended below the base of the alluvium have been considered within this report. The distribution of borehole and window sampler data is illustrated in Fig 2.

The deposits retrieved through the boreholes and window samplers were examined and logged on site. These deposits were described using standard sedimentary criteria, as outlined in Jones et al (1999). This attempts to characterise the visible properties of each deposit, in particular relating to its colour, compaction, texture, structure, bedding, inclusions, clast-size and dip. The depths and nature of the interfaces were noted and a provisional on-site interpretation made.

Small sub-samples were taken from selected cores for future diatom and pollen analysis. Radiocarbon samples were also taken from Z1WS1 and ZSWS3 and submitted for dating (see section 3.4.2).

3.3.2 Deposit model construction

The borehole and window sample logs were entered into a digital (Rockworks 2006) database.

Each deposit component (gravel, sand silt etc) was given a colour and a pattern and, as a result, the two major variables of any deposit were stored in the Rockworks database and used to construct the deposit model.

Working cross-sections (transects: vertical slices through the sub-surface stratigraphy) were drawn through the boreholes and window samplers and correlations were made between key deposits. Interpretation of the data is based to a large extent on examining these transects. Individual lithostratigraphic units with related characteristics within a borehole were grouped together and then linked with similar deposits, which may be made up of a number of individual contexts (lithostratigraphic units) in adjacent boreholes. Linking deposits between boreholes produced a series of site-wide deposits (facies), which are representative of certain environments. Thus a sequence of environments both laterally and through time has been reconstructed for the site.

The transects drawn through the borehole profiles form a major means of illustrating the buried stratigraphy in this report and two transects were selected to illustrate the stratigraphic sequence and distribution of deposits across the site (see Fig 3, Fig 4). A key to the lithostratigraphy and its interpretation is provided with the illustrated transects.

Where possible, landscape features (such as palaeochannels, gravel high points) have been identified and the changing morphology, or influence on the pattern of deposit accumulation, inferred.

The surface of the Pleistocene gravels is an approximation of the topography of the site at the start of the Holocene (i.e.: in the early Mesolithic, about 10,000 years ago). This surface is likely to have influenced the changing environments of the site for much of the prehistoric and even historic period. It also acts as the bottom line for archaeological potential in this area.

3.4 Results

3.4.1 Window samples and boreholes

The lithostratigraphy recorded within each borehole and window sample was entered directly into the Rockworks database, forming a digital archive of the borehole and window sample logs. The borehole and window sample logs are not presented within this report.

3.4.2 Radiocarbon dating

The table below presents the radiocarbon results for the two sampled boreholes.

Sample	Beta Sample No.	Material	13C/12C ratio	Conventional Radiocarbon Age	Calibrated Age BC, 2 sigma calibration	Calibrated Age BP, 2 sigma calibration
Z1WS1-3.20	Beta-220030	Plant material	-28.1	4390+/-40 BP	3100 to 2900 Cal BC	5050 to 4860 Cal BP
Z2WS3-3.50	Beta-220031	Plant material	-26.5	4060+/-60 BP	2870 to 2800 Cal BC	4820 to 4750 Cal BP

Table 1: Radiocarbon results

3.5 Discussion of site stratigraphy

The deposits of archaeological or palaeoenvironmental interest are discussed in this section in stratigraphic order, from the oldest to the most recent.

The stratigraphic sequence is illustrated in the cross-sections drawn across the site (see Fig 3, and Fig 4)

3.5.1 Facies 1: Pleistocene Gravels and fine grained deposits

The basal deposits recorded within the boreholes and window samplers consisted of a light orangey/yellowy brown medium sandy gravel with angular, sub-angular and sub-rounded gravel clasts. Across the site the level of the gravels remained at a fairly constant level: between 3.5 to 4m OD.

Above the gravels were light greyish brown/ yellowy sandy clays. The sandy clays generally formed a fining up sequence from the coarse sandy gravels to coarse to fine sandy clays. The sandy clays varied in thickness from 0.15 to 0.4m in thickness and occurred at *c* 4 to 4.5m OD.

The coarse gravels and overlying sandy clays are all likely to be Pleistocene in date; deposited in a cold climate braided river environment. The overlying finer sandy clays represent a reduction in the fluvial energy of this river with the formation of sand bars within an active channel or alluvial fans adjacent to a channel.

The BGS mapping of the area positions the site within the present alluvial floodplain of the River Lea. Therefore the gravels encountered within this area should all date to the **Late Glacial** early Holocene interface, when the Lea cut down to its present floodplain position around 15 to 10,000 years ago. However, past mapping of the gravel surface (Burton, et al, 2002) has suggested that a low terrace exists along the eastern edge of the floodplain.

This low terrace is likely to be analogous with the **Kempton Park** gravels which BGS mapping positions further to the south near the Leas confluence with the Thames. The Kempton Park gravels are thought to date to around 30 000 to 140 000 BP and were deposited during the Devensian Glaciation.

3.5.2 Facies 2: Holocene Channel deposits

Towards the northern edge of the site (within Z2WS1 to 5, and Z1WS1) a sequence of gravel and overlying finer minerogenic deposits occurred, which displayed noticeably different characteristics than the Pleistocene gravel and fine grained material observed elsewhere on the site. These deposits suggest that a later channel cuts down through the older Pleistocene gravels.

Within Z1WS1 a mid orangey brown sandy gravel occurred at *c* 3.2m OD. Although similar in characteristics to the Pleistocene gravels, this unit contained a lens of organic fibrous material at *c* 3.1m OD. The organic material appeared to form a distinct lens within the gravels rather than forming as a result of root action travelling down through the profile from a soil horizon above. The presence of organic material within the gravels would suggest that the unit was reworked by fluvial action during the Holocene period, when vegetation, leading to the formation of organic deposits, began to colonise the landscape towards the end of the last glaciation.

The lower part of the gravels is likely to be Pleistocene in origin, but it is difficult to discern the Pleistocene from the Holocene gravels. A radiocarbon date was obtained from the organic lenses in the upper part of the gravel unit (Beta-220030). This produced a calibrated date of 3100 to 2900 BC. This indicates that the channel was active prior to the Neolithic period. The C13 to C12 ratio of –28.1 of the sampled plant material suggests the plants were terrestrial rather than aquatic. Therefore the organic lens appears to represent the formation of a vegetated gravel bar following a

period of channel migration that left the gravel deposits exposed and relatively dry on the edge of an active channel.

Within Z1WS1 a sand deposit 0.10m thick, occurring at c. 3.3m OD, overlay the gravel unit. Above this sand unit another sandy gravel unit occurred measuring 0.10m thick at 3.4m OD. This gravel unit also contained fine brown organic flecks. These deposits represent a probable reactivation of the channel on this part of the site with another period of gravel accumulation forming a point or channel bar.

Possible reworked Pleistocene gravels also occurred within Z2WS5. The unit occurred at 3.7m OD and consisted of a calcareous rich light orangey brown sandy gravel with occasional mollusc shell fragments. The presence of the mollusc shell and organic material again suggests that these gravels are Holocene rather than Pleistocene in date.

Within Z2WS1 sandy gravels were overlain by a silty fine gravel, which occurred at 3.1m OD and measured 0.10m in thickness. This was overlain by calcareous rich fine gravel, which measured 0.10m in thickness and occurred at 3.2m OD. The calcareous material is like to derive from redeposited tufa eroded from earlier boreal (*c* 7000 BP) deposits further upstream.

Elsewhere on the northern part of the site, where the window samples did not reach the surface of the coarser gravels, finer minerogenic deposits consisting of sands and clayey sands also suggest the presence of a later Holocene channel. Within Z2WS3 a mid yellowy brown coarse sand occurred at 2.7m OD. A mid grey clayey sand that contained frequent small plant remains overlay this. The clayey sand may have been deposited during a more tranquil flowing episode, which resulted in the formation of sand rather than gravel bars. A radiocarbon date was obtained from the plant remains, and produced a calibrated date of 2870 to 2800 BC (Beta-220031). The C13 to C12 ratio of –26.5 suggests these plant remains were terrestrial rather than aquatic in nature. As with the coarser gravel deposits it would appear vegetated surfaces formed over these sand bars once channel migration or abandonment had occurred.

Within Z2WS2 a mid greenish grey fine sandy clay was overlain by a dark grey woody clayey peat, which measured *c* 0.10m in thickness and occurred at 2.57m OD. This peaty material, which was only observed within this one window sample, may have formed within an abandoned part of the channel that created a vegetated waterlogged hollow, leading to the formation of this thin organic unit.

The window samples on this part of the site clearly show that the coarse grained sands and clays and gravels occur at a lower depth than on other parts of the site. In general the gravels occur at around 4m OD over the vast majority of the site. Within this channel area they occur at around 3m OD or lower. These deposits also differ from the Pleistocene deposits by the presence of organic lenses, mollusc fragments and calcareous rich layers. The deposits within these window samplers are unlikely to all be contemporary, but represent the formation of sand bars, in-channel deposits, peaty abandoned hollows, and the vegetated gravel bars of a migrating stream channel.

The radiocarbon dates obtained from the gravels and sands are nearly contemporary, differing by only a few hundred years. The sampled material from both deposits suggests the plants were terrestrial and had colonised exposed gravel and sand bars. The rapid change from coarser to finer sediments within the stream channel suggests that the channel flow rate was rapidly reduced within a relatively short space of time.

This may have been due to a high sediment input in the channel, which blocked the flow leading to rapid accumulation of the sands and silts. It is probable that by the Bronze Age the channel had ceased to exist.

3.5.3 Facies 3: Alluvial Clays

Above the Pleistocene gravels and sands, clays and silty clays were recorded within the interventions across the majority of the site. Although slight differences in the colour and nature of these sediments was apparent, the sediments formed two main units. A lower mid orangey brown/ light greenish grey mottled clay with frequent iron-staining and root channels, and a upper mid bluish grey clay with moderate manganese staining. The interface between these two units was often gradual and diffuse.

The lower clay occurred at between 4 to 4.5m OD and varied between 0.2 to 0.5m in thickness. This lower unit is likely to be derived from a combination of overbank flooding and windblown material, and may be Pleistocene in origin where it occurs above the Pleistocene gravels. Similar material is found to occur lower down the Lea Valley where the Kempton Park terrace is overlain by a brickearth deposit known as the Enfield silts. The Enfield silts are dated to around 17,000 BP and are generally characterised by fine grained minerogenic material deposited through alluvial fans and windblown processes in a cold climate periglacial environment.

It is possible that the fine grained material overlying the gravels at Marsh Lane is of a similar date and origin, although the upper part of this lower oxidised clay may be an alluvial deposit of Holocene origin. The oxidised, root disturbed nature of the unit suggests that the deposit formed a dry terrestrial soil during the Holocene period suitable for human occupation. A similar sequence to this was recently identified within the Warton Road area (Halsey, *2006*) where a gravel deposit was also overlain by a heavily oxidised and root disturbed fine grained deposit. Features dating to the Bronze Age period were found to cut through this horizon.

This oxidised clay unit also occurs above the deposits characterising the later Holocene channel (facies 2), although they tend to have a slightly more mottled greenish appearance. The clays which occur on this part of the site are not contemporary with the clays which occur over the older Pleistocene gravels, and are likely to have been deposited by gentle overbank flooding during the Holocene period, when the channel represented by the underlying deposits had become abandoned or migrated away from the vicinity of the site.

However, across the whole of the site the lower clays are all likely to have formed dry terrestrial soil horizons during the latter part of the Holocene, with post-depositional processes of oxidation and root disturbance homogenising the appearance and characteristics of the earlier and later clays into one apparent unit. A projected line for the top of the buried dry soil horizon is illustrated in Fig 3 and Fig 4. This essentially marks the limit between the lower oxidised clays, and the upper grey clays.

In contrast to the lower clays, the upper unit displayed a more gleyed waterlogged appearance, with the presence of the manganese staining suggesting fluctuating periods of ground waterlogging. This upper clay occurs over large areas of the Lea Valley, and is often interpreted as a gentle overbank flood deposit with accretional soils forming within the unit. This type of accumulation is indicative of hay or grass

meadows, which remain dry during the summer months becoming inundated by overbank flooding during the wetter winter months. Unlike the lower part of the clay unit, the upper clays are likely to be contemporary across the site. The top part of this unit has been truncated by modern ground disturbance and so the level at which they occur varies between 5.5 and 4.5m OD. They vary in thickness between 0.9 and 0.2m.

3.5.4 Facies 4: Modern made ground.

Across the site the alluvial clays (facies 3) were sealed by deposits of made ground. The made ground occurred at around 6.5 to 7m OD and measured up to 3m in thickness. The made ground consisted of silty clays, redeposited alluvium, and industrial debris and brick rubble. The top 0.1 to 0.2m comprised a topsoil horizon composed of a dark greyish brown humic silty clay.

Within Zone 2 towards the south-eastern part of the site, extensive dumping has occurred. On this part of the site the made ground measures up to 5m in thickness, raising the ground level to *c* 9m OD. This made ground predominately comprises industrial waste, consisting of clinker and coal, with some brick and concrete debris.

The made ground deposits are likely to be derived from the dumping of modern demolition and industrial debris associated with nearby industrial activity.

3.6 Past landscape characteristics of the site

In order to discuss the landscape evolution and archaeological potential, the site has been divided into areas (zones) where similar sequences of deposits exist and thus are likely to have a comparable potential for archaeological and archaeo-environmental remains.

The characteristics and distribution of these landscape zones (LZs), illustrated in Fig 5 are summarised below.

3.6.1 Landscape Zone 1

LZ 1 covers the northern periphery (across Zone 1 and 2) of the site and represents deposits associated with a possible Holocene channel. The basal deposits within this zone consist of coarse gravels that contain lenses of sand, calcareous material, and organic fragments.

The gravels (facies 2) occur at *c* 3.5m OD (within Z1WS1 and Z2WS1), although where the window samples did not reach the top of the gravels (between Z1WS1 and Z2WS1) the channel may be considerably deeper with the gravels existing below 2.5m OD. The lower part of the gravels may be Pleistocene in date, but the presence of the organic lens dated to *c* 2800 BC within the upper part, demonstrates that deposition did occur during the Holocene period, with the gravel surface forming a vegetated horizon by the Neolithic period.

Above the gravels, fine grained deposits, consisting of sands and sandy clays with flecks of organics and mollusc shell occur (upper part of facies 2). These deposits are likely to have accumulated as point or channel bars, or as a horizontal sequence of dips (pools) and highs (riffles) within the streambed.

Within the pools where the water is deeper and the flow velocity lower, finer clayey sediments would have settled out from suspension, while over the higher parts, where the flow velocity is higher, finer clay and silt sediments would have been removed exposing the underlying coarser gravels. However, a radiocarbon date of *c* 2900 BP from these finer sands, corresponds closely with the date obtained with the gravels. This suggests that the fluvial regime may have been reduced fairly rapidly, probably as a result of high sediment input into the channel.

Such rapid accumulation of sediment may have choked the streambed leading to sudden abandonment, and it is probable that the channel ceased to exist by the Bronze Age period.

A thin lens of woody peat occurred within Z2WS2. This deposit probably accumulated within a vegetated waterlogged hollow, formed by a cut-off pool within the riverbed following channel migration. It is possible that deeper pockets of peaty material exist elsewhere within this zone.

In general these in-channel sediments occur at between 3.5 and 3m OD, and could extend to below 2.5m OD where the channel is at its deepest. The distribution of these deposits suggest that a tributary channel flows into the Lea Valley on a roughly east to west orientation. It is possible that this channel may be a former early Holocene course of the Dagenham Brook.

Such deposits, although predominantly minerogenic, may preserve palaeoenvironmental evidence in the form of diatoms and mollusc fragments, which can be utilised to answer questions on river hydrology and formation processes. Where organic sediments survive in the abandoned cut-off hollows of the streambed, pollen may be preserved which can be utilised to reconstruct the landscape and vegetational conditions prevalent in the local area during the Prehistoric period.

Following channel migration vegetated soil horizons would have began to develop across higher points within the streambed created by point and channel bars. Lower lying areas would have existed as pools of standing water or waterlogged vegetated hollows. The high points within this zone would have been attractive locations for Mesolithic hunter gatherer's to access the adjacent stream channels for raw materials to produce flint tools, and to procure wild fowl and fish for subsistence. Former gravel and sand bars and riffles within streambeds have shown evidence of such hunter gatherer activity in the Colne Valley (Halsey, 2005, Lewis 1991, 1992). This activity is identified by the presence of *in situ* scatters of flint tools and butchered animal bone.

Sedimentation would have continued across this part of the site from the influx of overbank flooding from adjacent stream channels. This is represented by the lower alluvial clays (facies 3), which overlie the in-channel sediments.

The clays in this area tend to be mottled greenish grey/mid orangey brown with evidence of rooting. Although these clays would initial have created waterlogged gleyed soil horizons, continued sedimentation would have raised the ground level leading to the formation of drier soil horizons. During this time the area would developed into a grass meadow environment. These lower alluvial clays exist at around 4 to 3.5m OD.

The upper part of the alluvial clays predominately consist of gleyed alluvial clays, which suggest the area was becoming progressively wetter with a rising water table

and a more permanently waterlogged sub-surface horizon. However, a grassy meadow would still have been prevalent at this time, susceptible to pools of standing water developing on the surface during the wetter winter months. The upper clays occur at *c* 4.5m OD and measure up to 1m in thickness.

The sequence is buried by up to 2m of made ground (facies 4) consisting of brick rubble, redeposited alluvial clays and industrial waste. The ground surface exists at around 6.5m OD. The presence of the redeposited alluvial clay suggests that some truncation of the natural sequence has occurred.

3.6.2 Landscape Zone 2

LZ 2 covers the central and southern parts of the site.

This zone is characterised by the Pleistocene gravels, probably forming part of the Kempton Park gravel terrace, overlain by fine-grained Pleistocene deposits. This higher terrace along the edge of the valley formed a dry soil horizon over which alluvial clays accumulated during the later part of the Holocene.

The Pleistocene gravels (facies 1) are generally fairly level across the site occurring at *c* 4m OD. The gravels are overlain in parts by fine sandy clays, which display a fining up sequence from the underlying coarser gravels. The sandy clays are all likely to be Pleistocene in date and represent a gradual reduction in the fluvial regime, which deposited the coarser gravels. The sandy clays grade into alluvial clays deposited through gentle overbank flooding (facies 3).

The lower part of the alluvial clays, and the Pleistocene sandy clays all displayed an oxidised iron stained appearance with evidence of rooting. This suggests that a dry soil horizon had formed within these lower deposits. The upper part of the alluvial clays displayed a greyer more gleyed appearance suggesting that the ground conditions were becoming increasingly waterlogged. The top of the dry soil horizon varies across the site but generally occurs at around 4.5m OD.

A similar sequence to this has been identified at Warton Road (Halsey, *2006*), where Bronze Age features were found to cut through the lower fine grained oxidised deposits, sealed by greyer alluvial clays.

The deposits within LZ2, which represent the same environments, therefore have the potential to contain archaeological features of a prehistoric date.

The top of the alluvial clay sequence varies across the site depending on the level of modern truncation, but can generally be expected to occur between 4.5 to 5m OD. The alluvial clays are overlain by made ground (facies 4) consisting of brick and concrete rubble, redeposited alluvium and industrial debris. The made ground measures up to 3m thick in places, with the modern ground surface occurring at *c* 7m OD. Where the embankment exists in the south-eastern part of the site the made ground is considerably thicker measuring up to 5m in thickness and occurring at *c* 9m OD.

3.7 Potential

The geoarchaeological potential of the site is discussed in section 5.3.2

3.8 Recommendations

The geoarchaeological recommendations are presented in section 6.

4 Background: archaeological and historical

4.1 Past archaeological investigations

Although there have not been extensive archaeological excavations nearby, the site was subject to a geoarchaeological watching brief, reported on in detail as part of this assessment (see section 3.4). This provides useful information about the nature and depth of archaeological deposits likely to be found on the site.

4.2 Archaeological and historical summary

4.2.1 Prehistoric (450,000BC - AD43)

In addition to the conclusions drawn from geoarchaeological assessment a number of isolated finds of prehistoric date have been recorded in the vicinity of the site, giving further indications of the nature of prehistoric expectation of the site.

4.2.1.1 Palaeolithic– Neolithic

The majority of these finds are antiquarian observations and therefore their spatial locations are not always securely located.

Palaeolithic finds from the vicinity of the site include the 19th century discovery of 17 polished 'Celts' (axes) from Temple Mills vicinity, provisionally located *c* 120m south of the site (Site 1) and an acheullian handaxe from the base of Lea Valley gravels within a quarry pit, *c* 200 m to the south-east (Site 2) in 1924. The find was reported at 16 feet below contemporary ground level (*c* 4.8m).

Such Lower Palaeolithic finds (handaxes) are unlikely to be *in situ,* as the floodplain of the Lea was not itself carved out until the Upper Palaeolithic period, towards the end of the Devensian cold stage. They are most likely to have been eroded from their original places of discard, which may have been up the valley side, and transported onto the floodplain by meltwater streams towards the end of the last cold stage.

A Neolithic stone axe (purchased by the Passmore Edwards Museum) was found during gravel extraction in 1932 at the site of French's pit *c* 1km to the south-east, at modern day Ruckholt Road (Site 3).

Importantly for the archaeological potential of the site, a large concentration of *in situ* prehistoric evidence was found 650m to the south of the site at Site 4, where the Inner London Archaeological Unit (ILAU) recorded quantities of polished hand axes, flint arrowheads, flakes and knives. Site 4 lies on the east bank of the Lea River, close to an island of higher ground in the middle of the floodplain. This find suggests potential for similar such survival at the site.

4.2.1.2 Bronze Age–Iron Age

During the Bronze Age (1,800–600 BC) and Iron Age (600 BC–AD43) the Lea Valley was clearly well populated.

The Upper Lea Valley has evidence for Bronze Age / Iron Age settlement in the form of crannogs; dwellings set on piles driven into marginal and wetlands. Although no such finds are as yet known from the vicinity of the site, the possibility of similar structures having been present cannot be discounted, as the preliminary reconstruction of the past environment of the vicinity discussed in section (the geoarchaeological report) suggests it would have been conducive to such settlement during the Bronze and Iron Ages.

Several excavations in the area, to the east of the site on the dry land beyond the edge of the Lea Valley, have revealed features and finds of prehistoric date. A ring–ditch, circular alignments of postholes and various fence alignments, of late Bronze Age date were found at Site C (LE–OC93), approximately 300m to the east. Further north, at Site B (LE–OC95), a series of post-holes and pits was recorded, one of which produced sherds of Late Bronze Age plain ware; at Site A (OVC01), several small pits and postholes cut into the natural gravel may represent an extension of this Bronze Age activity. At Site E (Leyton Orient Football Ground), two residual worked flints of probable Bronze Age date, one a crude flake and the other a side scraper were the only evidence for Bronze Age activity in the general area of the site. To the south of the site, within the floodplain, a spear head with a circular socket of Iron Age date was found on the northern side of the River Lea, in the Hackney Marsh, (Site 4) but is not well located.

These finds indicate a pattern of prehistoric settlement in the dry land gravel terrace no further than 300m east of the site. Similar occupation may have extended onto the drier, more accessible, parts of Lea floodplain.

In particular, the mosaic of dry hummocks, boggy hollows and streams that may have existed on the site are likely to have sustained a diverse range of wildlife and resources suitable for exploitation.

4.2.2 Roman period (AD43-410)

The Lea is likely to have been an important route in the Roman period. It may have been used to supply the London area both with agricultural produce and, in the late period, with pottery from Much Hadham, via the River Stort.

A number of Roman roads have been conjectured to cross the River Lea at various places along its course, based on likely topographical conditions, later Medieval or post medieval crossing places and antiquarian observations.

One such crossing has been placed in the vicinity of the Lea Bridge Road, *c* 1km to the north-west of the site. In 1722 Daniel Defoe reported a stone causeway during unspecified works, which continued from Temple Mills to Ruckholts (site 5), near what is now Temple Mills Marshalling Yards, though the feature is undated and not securely located.

A further road *c* 1km to the south along the route of Quarter Mile Lane (not illustrated) is described on the SMR as being part of the extension of a minor road that may have existed along the line of Ridley Road and Homerton High Street, extending

to a postulated crossing point at Temple Mills. The evidence for this road in Homerton has previously been examined and it has been concluded that it is unlikely to have existed (Tyler 1998, 157). Further evidence of Roman crossings of the Lea have been reported to the west of the site adjacent to a former narrow meander of the river, where a ford was located at a distance of *c* 300m (site 6) and another fragment of road (site 7), *c* 250m distant.

More reliable evidence suggesting a local crossing point comes from the area to the north-east of the site, where a pattern of Roman occupation has been identified from recent excavations in the Church Road/Grange Park area of Leyton. A concentration of Roman activity along a north-east to south-west alignment has been suggested as representing activity along a road – perhaps a minor road or the southern continuation of the Dunmow to London Road (Moore and Sabel 2006). This alignment is also reflected in the axis of field patterns recorded at sites such as Livingstone College Towers, Leyton (site code LE-LC94, not illustrated) approximately 2km to the north-east of the site. The roadside activity is likely to have been in the form of farmsteads, field systems or small-scale ribbon settlement. A feature interpreted as part of the road itself has recently been recorded at the Beaumont Road Estate site in Leyton (site code BEU04, not illustrated) approximately 1.2km to the east of the site. Here, a metalled surface approximately 6m wide, with a north-south ditch on each side was recorded, although there was no evidence for contemporary roadside activity. Further evidence in support of the axis can be seen in the distribution of finds within Leyton: a flagon was found in Ive Farm close, adjacent to Church Road, *c* 340m east of the site (site 8); a ditch was recorded on the east side of Church Road to the rear properties 57–59, *c* 400m east of the site (site 9) and a 1st century coin and cremation were discovered in St Mary's churchyard (site 10).

Significantly, if projected south-west, the zone of occupation associated with the road may cover the south side of the site. The potential for such activity would be largely influenced by how wet or dry the area was during the Roman period.

4.2.3 Saxon (AD410–1000)

The place name Leyton derives from the Anglo Saxon for 'settlement on the Ley' (Lea), centred around St Mary's church, *c* 600m to the east (site 11). Similarly, west of the Lea River, Hackney in Anglo Saxon alludes to the well-watered meadows by the River Lea marshes.

Despite this etymology, little physical evidence has been found to substantiate the documentary evidence for settlement in the immediate vicinity of the site. Evidence of settlement appears to concentrate further south at Old Ford, in an area previously established as a Roman crossing of the Lea, and at Stratford where fragments of Saxon pottery were recovered during excavations at the former market depot and a timber revetment was recorded at Gibbins Yard.

The old Lea, flowing south through Stratford, branched into several channels, collectively called the Stratford Back Rivers. Although the pattern of channel has been associated with King Alfred, who in AD895 apparently obstructed the river to strand the Danish fleet, the evidence is inconclusive. The pattern does however seem to go back to at least the 11th century.

The River Lea was navigable during the Saxon period and a possible Saxon Boat, measuring *c* 20 feet in length, was found at the Lea Bridge filtering beds in 1830 (site 12). A second boat, dated by tree-ring analysis to AD950–1000, was found in 1987 at Springfield Park on the west bank of the Lea, approximately 2.5km to the north-west of the site. This was found some 6m below modern ground level.

4.2.4 Medieval period (AD1000–1500)

The development site lies within the ancient parish of Low Leyton, probably within the Manor of Leyton as described in the Domesday survey of 1086. The Domesday Book records the manor being in possession of Robert, son of Corbutio, and the manor probably remained in the Cobutio family until 1200. The survey records that the Manor was predominately agricultural. Seven and a half plough-teams cultivated the arable lands; there was woodland for 490 swine and 149 acres of meadow. A rouncey, 15 swine, and 60 sheep completed the stock (VCH 1973,197).

The area of the site on alluvial flood plain, divided from the gravel terrace by Dagenham Brook along its east side, was probably open marsh throughout the medieval period.

The marshland was held in common for pasturage and production of hay. Strips of common marsh (lammas land) and their associated grazing rights were retained until the late 19th century.

About AD1200 Richard Corbutio leased the Manor of Leyton, with Leyton church, to Stratford Abbey. The abbey held the manor until the mid-16th century Dissolution under Henry VIII. The church of St Mary the Virgin in known to have existed on its present site by 1182 (Weinreb and Hibbert 19930, 765).

The medieval manor house of Leyton (site 13), later Leyton Grange, *c* 500m east of the site, near present day St Mary's church, that existed in 1470 had reportedly disappeared by 1640, replaced by a newer grange building.

Approximately 1km to the south-east of the site was the moated site of Ruckholt Manor (not illustrated), which documentary evidence suggests was in existence by 1066. It was forfeited to the crown in 1345, after which it was variously inherited and sold. A later manor house was built on the same site in 1592. Nearer to the site, a medieval cultivation soil was recorded in Church Road (site 9) to the east.

The medieval activity both to the south and the east of the site, suggests that some form of as-yet undefined local cultural impact may have taken place on the site.

4.2.5 Post-medieval period (AD1500 – present)

The agricultural character of the site and its vicinity continued well into the post-medieval period.

The estimated population remained low, barely changing from the 11th-century Domesday figure of 43 persons to 49 in the mid-16th century. By 1778 the number had changed to *c* 300 (Guildhall MS. 9558, f. 218., fr VCH 1973), with the settlement growing around the Leyton High Road, Church Road and what was later to become the Lea Bridge Road.

By the late 17th century the area around Leyton had become a fashionable 'retiring place from London' for bankers and wealthy merchants. The 16th and 17th centuries saw the arrival of occasional illustrious personages such as the grandson of Thomas Moore and Nathaniel Tench, one of the first governors of the Bank of England (Weinreb and Hibbert, 468). Early maps depicting Leyton show grand houses and mansions with extensive estates. One of the mansions still exists close to the site today: Etloe House, originally built *c* 1760 occupies the south side of Marsh Lane at the junction with Church Road, *c* 300m to the east.

Rocque's map of 1746 (see Fig 7) shows the site occupying low marshy land (Leyton Marsh) immediately west of the watercourse latterly known as Dagenham Brook, and east of the Lea meanders. A precursor to Marsh Lane is evident as a footpath to the north of the site.

From Rocque's map and later surveys Dagenham Brook appears to be a relatively straight man-made channel, flowing south from John Phillipps' estate. Later surveys extend the brook's course northward to Low Hall Farm and beyond, to the vicinity of Higham Hill. The brook acted as a boundary separating the marsh from Leyton proper, presumably along the edge of the Taplow Gravel terrace.

Chapman and Andre's map of 1777 (Fig 8) shows little change to the site, although Etloe Place has been constructed fronting onto Church Lane. Marsh Lane does not appear, however.

Milnes's land use survey of 1800 (Fig 9) clearly depicts the site in common marsh land, south of the Marsh Lane footpath, with the southern part of the site overlying a field (drainage) ditch. The 1805 OS surveyors drawing shows a similar layout (Fig 10).

Stanford's map of 1862 (Fig 11) shows the first major change to the landscape of the site with the construction of the Eastern Counties Railway (Cambridge Line), on an embankment over the marshes, west of the site. Marsh Lane is formally represented, projecting west from Church Lane to the Lea. Dagenham Brook (unnamed) has a noticeable drainage ditch (or channel) to the south, enclosing the site within a plot of marsh land.

The 1868 1st edition OS map (Fig 12) shows the extent of the site in greater detail, subdivided by several tree-lined drainage channels, bounded to the west and south by the railway. The 1896 OS map (Fig 13) shows little change within the site, although the railway to the south has expanded to accommodate the Temple Mills sidings and depot track. The route of the Marsh Lane footpath has evened out, losing the earlier kink, seen in the previous map. The 1913 OS map (Fig 14) shows further expansion of the Great Eastern Railway Wagon Works sidings, claiming much of the former Leyton Marsh. Two buildings have been constructed fronting onto Marsh Lane, outside the north edge of the site. The southern part of the site is occupied by allotments.

Little change occurs within the site during the 20th century. An area of raised made ground appears within the centre and south of the site *c* 1950 and remains today as the raised playing fields.

4.3 Archaeological gazetteer

4.3.1 Introduction

The list below represents a gazetteer of known sites and finds within the 500m study area around the site. For clarity, post-medieval features noted on the SMR which do not lie within the immediate vicinity of the site and which do not extend to within the site have not been included in the gazetteer or features mapping.

4.3.2 Previous archaeological investigations in the study area

4.3.2.1 ***Site A:*** *Oliver Close Estate, Oliver Road, Leyton, E10*

537680 186580, PCA OVC01

During evaluation work in 2001, several small pits and postholes were recorded in the natural gravel, probably representing an extension of the Bronze Age activity recorded in earlier excavations (LA 8, supp. 2 (1997), 60 (LE–OC95)) to the south of the site. A sherd of possible Roman pottery was retrieved from the top of one of them. These features were overlaid by a plough soil through which several 19th –20th–century features were cut: pits, postholes and modern services trenches. A contemporary layer of garden soil overlay the plough soil.

4.3.2.2 ***Site B:*** *Oliver Close, Oliver Road, Leyton, E10*

NGR 537430 186730, NMS LE–OC95

An evaluation was carried out in 1995. Phase II revealed post–holes and pits, one of which produced sherds of Late Bronze Age plain ware (settlement of this period was found nearby in 1993). Above these deposits was a 19th–century plough soil beneath 20th–century dumps of concrete.

4.3.2.3 ***Site C:*** *Oliver Close Estate, Oliver Close, Leyton E10*

NGR 53768 18654, NMS LE–OC93

Work took place in two areas, one on the east gravel terrace of the River Lea, the other to the west in the flood plain. Beneath 1.2m of plough soil and post–war dumping on the gravel terrace lay a prehistoric horizon. At least nine structures were uncovered, including a ring–ditch, circular alignments of postholes and various fencing alignments. Finds consisted of basic settlement debris, plain pottery, small quantities of worked flint, and much burnt flint. The settlement provisionally dates to the later Bronze Age. Two trenches were excavated through the alluvial deposits below the gravel terrace; one down to a dept of over 3m to obtain an environmental column sample; the other found stratified Roman finds overlying prehistoric pits.

4.3.2.4 ***Site D:*** *11–21 Wilmot Road, Leyton, E10*

NGR 537820 186800, MoLAS WMT98

During evaluation work, a number of 19th– and 20th–century features cutting the natural gravel were revealed but generally the gravels were truncated and overlaid by modern overburden.

*4.3.2.5 **Site E:** Leyton Orient Football Ground, Brisbane Road, Leyton, E10*

NGR 537856 186463, MoLAS LYO04

An evaluation was carried out in 2004. Natural gravel and brickearth was defined on site at a level of between 9.84m OD (N) – 6.79m OD (S). Across the northern half of the site no archaeological deposits or cut features earlier than isolated late 19th– early 20th century pits survived due to terracing. A greater depth of similarly dated deposits at the south end of the site in trenches 1 and 2 sealed a post–medieval plough soil horizon, which sealed an east–west drainage or boundary ditch of possible 17th century date. Similar post–medieval ditches found during the construction of the south stand in 1996 were interpreted as features associated with field systems belonging to the Ruckholt estate. Two residual worked flints of probable Bronze Age date, one a crude flake and the other a side scraper found in trenches 1 and 5 are the only evidence for Bronze Age activity in the general area of the site.

*4.3.2.6 **Site F:** Temple Mills Marshalling Yards, Leyton, E10*

NGR 538300 186040, NMS LE–MY93

An auger survey revealed that extensive gravel extraction in the 19th century had removed almost all archaeological evidence, except for the base of a well or cess pit, which yielded several sherds of Colchester coarse ware dating to AD 1150–1250.

*4.3.2.7 **Site G:** 24-34 Oliver Road, Leyton, E10*

NGR 537580 186700, ECCFAU OLV03

Above the natural gravel were three features: a gully and two pits which, although undated, appear to be considerably earlier than other features on the site. The gully was aligned perpendicular to Oliver Road, suggesting that it may have been associated with the pre-suburban development field system. These features were sealed by ploughsoil, through which several Victorian or later pits were cut.

*4.3.2.8 **Site H:** Leyton Orient Football Ground, South Stand, Buckingham Road, Leyton, E10*

NGR 537880 186400 NMS LE-LO96

The evaluation revealed deposits dating to the post-medieval period. A horn-core lined drain, dating to the 18th century, and a possible field boundary were recorded, both of which appear to be associated with field systems belonging to the Ruckholt Estate. Post-holes were also found, one of which contained fragments of daub. They pre-date the horn-core drain.

4.3.2.9 Site I: Temple Mills Depot, Orient Way, Lea Bridge, E5 to Stratford Station, Leyton Road, E15

NGR 537500 186250 WA TPD04

Holocene alluvial sediments were recorded and, in the centre of the investigated area, a palaeochannel represented by a general thickening of channel deposits following the topography of the gravel surface. To the south-east a second channel was identified from its alluvial deposits.

4.3.3 Known sites and finds recorded by the GLSMR and identified by the present study

Site ref.	GLSMR Ref.	Period	Description	Easting	Northing
1	061750	Prehistoric	Unspecified works at Temple Mills in the 19th century revealed 17 polished 'Celts'	537000	186540
2	061614	Prehistoric	Gravel extraction from Mssrs Singles pit (north of Temple Mills Lane) c 1924 revealed a late chellean hand axe 2 16 feet (4.88m) down at the base of Low Level Lea Valley Gravel2. Donated to the Passmore Edwards Museum in 1924 by Mr Best (acc. No PEM 15357)	537500	186500
3	061487	Prehistoric	Presumed gravel extraction works at French's Pit in 1932, revealed a Neolithic stone axe. Axe was purchased from Mr Glover by Passmore Edwards Museum, acc no PEM 16370	537800	186100
4	080064 080087 080065	Prehistoric Palaeolithic Iron Age	Excavations by ILAU recovered large quantities of polished handaxes flint arrowheads, flakes and knives Various animal remains have been recovered from Lea Valley deposits, including: Brown Bear, Grizzly Bear, Hippo, Elephant, Lion, Wolf, Stag, Fox, Boar, Beaver, Elk, bison, Mammoth and woolly rhino Spear head with circular socket	537000	186000
5	060734	Roman?	Unspecified works in the 18th century, reported on by Daniel Defoe in 1722, revealed "the remains of a great stone causeway, …which continued over by the present site of Temple Mills to Ruckholts"	53735	18630
6	080112	Roman	Ford across the River Lea	536600	186600
7	060834	Roman	Fragment of road	536640	186600
8	061582	Roman	Flagon	53750	18680
9	060715 060725	Roman Medieval	Ditch system Cultivation soil	537580	186830
10	061116 060747	Roman	Coin Cremation	537690 537690	186870 186880
11	061198	Saxon	Settlement-Leyton	537680	186850
12	080122 080133	Saxon	Boat Water channel	535900	186500
13	060685	Medieval	Manor House, site of 15th century Leyton Grange		
14	060688	Medieval	Ruckholt Moated Manor House.		
15	060734	Med–Post Medieval	Causeway	537350	186300

Table 2: Known sites, built heritage features and finds recorded by the SMR and identified in the present study

5 Archaeological potential

5.1 Factors determining archaeological survival

5.1.1 Natural geology

The geoarchaeological deposit model has demonstrated that the majority of the site lies within an area characterised by a Pleistocene terrace over which dry terrestrial soils have developed (defined by LZ1).

The site probably remained as dry land into the Historic period, after which time alluvial clays started to accumulate across the site, with the area developing into a grass or hay meadow. The site would have been suitable for human occupation from the beginning of the Holocene period onwards, and therefore archaeological features can be expected to survive beneath the upper alluvial clay.

These dry terrestrial soils are unlikely to preserve palaeoenvironmental evidence. However, the area identified as a Holocene channel (LZ2) may preserve organic deposits, and calcareous deposits with good mollusc preservation, which can be utilised to reconstruct the past environment.

5.1.2 Truncation

Where truncation goes into the Pleistocene gravels it is likely to have removed entirely any archaeological remains. Where truncation is only of the upper Holocene alluvium, deposits with Prehistoric potential may survive. The geoarchaeological deposits model has demonstrated that very little, if any truncation has occurred across the site.

Some of the window samples did contain evidence of redeposited alluvial material, but this material may have come from elsewhere beyond the site boundary. All the window samplers displayed undisturbed natural sequences, perhaps with only the Post-medieval topsoil horizon being lost to truncation. Whether this was deliberately stripped or simply masked by the dumping of the made ground is uncertain.

5.1.3 Ground raising

Across the majority of the site ground raising has occurred which has raised the ground level by up to 3m to around 7m OD. Towards the south-eastern part of the site an embankment exists which has raised the ground level to around 9m OD.

5.2 Depth of archaeological deposit

Archaeological survival is likely to vary across the site depending on its landscape position in the past as well as levels of truncation and disturbance.

Information is available from the geotechnical borehole data used for the geoarchaeological deposit modelling that provides information (either direct or implied) about the likely depth of archaeological deposit across the site.

This information includes:

- Typical thicknesses of made ground (may contain historic and/or industrial archaeology, especially in its lower part);
- The level of the pre-modern ground surface (deposits recorded as, or appearing to be, alluvium above this level are likely to be redeposited);
- The thickness of alluvium, which may contain archaeology of Mesolithic to medieval date;
- The level of the buried Early Holocene topography (the bottom line for deposits of the Mesolithic period onwards);
- The thickness of Pleistocene deposits (which may contain Upper Palaeolithic archaeology and environmental evidence);
- The level of the bedrock surface (the bottom line for deposits of archaeological interest).

The level and/or thickness of each of the variables listed above is outlined in the table below.

Deposit	**Depth**
Modern ground level	c 7 to 9m OD
Thickness of made ground	3-5m
Pre-modern ground surface (top of alluvium)	c 4.5 to 5.5m OD
Thickness of (in situ) alluvium	c. 1m
Buried (Early Holocene) topography (base of alluvium)	4.0 to 4.5m OD
Thickness of Pleistocene deposits	Unknown
Bedrock surface	Unknown

Table 3: Depth of archaeological deposits

5.3 Archaeological potential

5.3.1 Introduction

The nature of possible archaeological survival in the area of the proposed development is summarised here, taking into account the levels of natural geology (see section 3) the level and nature of later disturbance and truncation (see section 5.1) and the nature of archaeological deposits and features known from adjacent sites (see section 4).

5.3.2 Geoarchaeological assessment of potential

The geoarchaeological potential of the site is discussed with reference to the Landscape Zones (LZ's) identified within the geoarchaeological deposit model.

5.3.2.1 Landscape Zone 1

LZ 1, which characterises the Holocene channel on the northern edge of the site, has a moderate to high potential to contain environmental evidence in the form of pollen, diatoms and molluscs which can be utilised to answer questions on the past landscape conditions and fluvial regimes which existed in this part of the Lea Valley from the early Holocene onwards. Tributary channels of the Thames have demonstrated in the past the potential to contain long palaeoenvironmental sequences which can inform on the changing environmental conditions prevalent at the time of the Late Glacial/Early Holocene interface (Chambers, *et al*, 1996, Halsey, 2005). Such a sequence may exist within this zone

The gravel and sand bars and riffles, which were identified within this channel, also have the potential to contain evidence of *in situ* Mesolithic activity in the form of flint and bone scatters. Former channel bars and gravel high points adjacent to active channels are often favoured locations for Mesolithic activity, and such activity in similar locations has been identified within the Upper Lea Valley and the Colne Valley (Halsey, 2005, Lewis, 1991, 1992, Warren *et al*, 1934). Although the radiocarbon dates suggested such areas that became exposed and dry by the Neolithic period, similar locations of an earlier Mesolithic date may occur within this zone.

LZ 1, at the northern periphery (across Zone 1 and 2) of the site represents deposits associated with a possible Holocene channel, and has surface levels of up to *c* 4.5m OD, with a archaeological horizon of up to 1m in thickness

5.3.2.2 Landscape Zone 2

LZ 2, which formed a dry terrestrial over the Kempton Park gravels, has the potential to contain archaeologically features of a prehistoric date onwards. These may exist as cut features such as pits and ditches. The location of the site on higher drier ground adjacent to the River Lea, would have made this area particularly attractive for occupation due to the ease of access to water and other wetland resources.

The dry minerogenic nature of the deposits within this zone suggests the preservation of environmental evidence in the form of pollen or plant macro material is likely to the poor, and therefore these deposits can be considered to have low potential for landscape reconstruction. However, the presence of pollen within the drier soil horizons cannot be ruled out altogether. Pollen analysis carried at Warton road (Halsey, 2005) on a similar sequence has provided evidence of agricultural activity and the local environment, although the root disturbed nature of the profile means the interpretation of the sequence should be treated with caution.

LZ 2, the dry soil horizon varies across the site but generally occurs at around 4.5m OD, with a base level (LZ 2 overlies Pleistocene gravels) of *c* 4m OD..

5.3.3 Prehistoric period

The site, within the Landscape Zones described above, has a moderate potential to contain archaeological remains dated to the prehistoric period. The radiocarbon dates of *c* 2900 BP and *c* 2800 BC for LZ 1 demonstrate that archaeological survival is possible.

This possibility is underlined by the results of excavations carried out in the vicinity, notably at Oliver's Close to the south (sites A–C) where extensive remains, dating to the Bronze Age period, included ring ditches and settlement activity, along the dry land of the western edge of the Taplow Gravel Terrace overlooking the Lea floodplain.

Isolated finds of Palaeolithic date have also been retrieved from the gravels underlying the Lea Valley Alluvium.

5.3.4 Roman period

The site has an uncertain but possibly low to moderate potential to contain archaeological remains dated to the Roman period.

Few Roman remains have been found in the immediate vicinity of the site. The site does however lie near a suspected settlement to the north-east at Leyton aligned along a possible north–east/south–west axis from Grange Park Road to Hackney Marsh and there is evidence (although presently unsatisfactory) of a possible crossing of the Lea River nearby. The extent of activity is likely to depend on how wet or dry the environment was during the Roman period.

5.3.5 Early medieval period

The site has an uncertain, but possibly low, potential to contain archaeological remains dated to the early Medieval (Saxon) period. According to place name evidence (farm or settlement on the Lee '*Ley Tun'*) the village of Leyton has its origins in this period. There is no evidence for Saxon activity either on or in the vicinity of, the site.

5.3.6 Later Medieval period

The site has an uncertain, but possibly low, potential to contain archaeological remains dated to the Medieval period.

Until the late post-medieval period, most of the site would have been low lying meadow and marshland, prone to flooding, and was probably used for rough pasture and/or hay cultivation and harvesting.

5.3.7 Post-medieval–modern

The site has a moderate potential to contain archaeological remains dated to the post-medieval period as the site lay in open fields up to the present day.

There is no indication from cartographic evidence of any buildings existing on within the development site prior to the 20th century.

The pattern of land use within the site remained unchanged from the Medieval period until the 19th century. The majority of the site remained as open land until construction of the Great Eastern Railway in the mid-1800s. Drainage ditches are known to have been present within the land from cartographic sources. Evidence for the nature and/or date of past land management and exploitation may survive in buried, backfilled drainage ditches and former stream channels, whose potential survival marks the main focus of any post-medieval remains on the site. There is

again limited potential for isolated structures of post-medieval date relating to stream channels such as the Dagenham Brook.

5.3.8 Research objectives

Although any excavation research objectives for sites are normally listed in more detail in Project designs compiled at a later stage – often after archaeological field evaluation has taken place – some outline suggestions can usefully be made during the initial Impact assessment. In the case of this site, the most significant themes can be outlined as follows:

- What is the thickness of modern overburden and depth of truncation? Where do deposits of archaeological interest survive on the site and what is their thickness?
- Do Late Glacial deposits exist within the gravels on the site? What is the potential for past environment reconstruction and/or Late Upper Palaeolithic activity in these deposits?
- What is the extent of the river terrace / valley side and tributary valley / low-lying area on the site and to what extent can information from the site contribute to a better understanding of the buried topography and past landscape in this part of the Lea Valley?
- Is their prehistoric (Bronze Age) cultural activity associated with the dated material recovered during the geoarchaeological watching brief?
- Does the post-medieval / pre-modern land surface survive on the site and what were its characteristics? Can it be related to the evidence of historic maps?

6 Impact of proposals

6.1 Proposals

No detailed architectural or engineering plans have been produced at this stage and the proposals are based on drawing LDA/LBWF/ML/APP/002 (October 2006) supplied by EDAW/AECOM (see Fig 15). Based on these drawings and information provided in the Explanatory Statement supporting the Marsh Lane Planning application (LDA/LBWF/ML/APP/DOC/002, 1st November 2006), the proposed works within Delivery Zone1 comprise:

- Ground preparation including ground remediation to a 500m depth from existing, and replacement with imported topsoil to a depth of 600mm, and formation of ground contours to finished levels.
- The provision of 81 individual plots, measuring approximately 13.75m in length and 9m in width. Each plot will contain an individual shed. A communal plot is proposed at the Marsh Lane entrance to the site, which will comprise a storage area, composting area and a larger shed (approximately 3m by 5m and 2.5m in height).
- New services providing water supply to the 81 allotment plots
- Provision of new access routes to the allotment site and an access road 3m wide within the site.
- Construction of temporary site wide perimeter fencing to a height of *c* 2m. Temporary works access (8 weeks duration) will also be provided to the site from Orient way, utilising an existing pedestrian access point.
- Planting new hedgerows along the northern and western boundaries of the site, outside the perimeter fencing to enhance the allotment perimeter and local landscape

This section provides a general indication of the likely archaeological implications arising from the development proposals. This takes into account past impacts and the likely depth of natural deposits and made ground. The impact assessment is likely to require revision once detailed engineering information is available.

6.2 Archaeological implications

6.2.1 Ground preparation, remediation and ground raising and landscaping

Initial site ground preparation includes removal of the present topsoil to a depth of 500mm. The soil is to be replaced with a 600mm thickness (cap) of imported topsoil that will be subsequently landscaped to allow demarcation of the allotment plots and access road. Impacts to this depth would not be sufficiently deep to affect the deeply buried (earlier) remains.

New hedgerow planting along the northern and western boundary of the site, outside the perimeter fencing, will allow for additional screening of the allotments and

enhancement of the local ecology and natural habitat. Hedgerow planting is not estimated to be of sufficient depth to cause any archaeological impact, given the thickness of modern made ground beneath the site.

6.2.2 Provision of access roads, cycleways and footpaths

The allotments will be serviced using a 3m wide, gravel access road running from the proposed entrance on Marsh Lane. The nature of the proposed groundworks for the proposed access road are not currently known, however it is assumed that the creation of such a feature would not have an impact on archaeological remains within the site.

The proposals involve the resurfacing of the existing Marsh Lane to create a dedicated cycle path and to improve the existing road surface. It is proposed that the cycle route along Orient Way will be linked to Marsh Lane through the opening up of entrances into Marsh Lane for pedestrians and cycles. Provision of new access ways are unlikely to

6.2.3 Services, drainage and fencing

New water supply runs and fencing are to be constructed as part of the development proposals. Although no detailed construction designs are currently available, it is anticipated that these constructions would entail ground disturbance up to *c* 0.5–1m below ground level. Ground disturbance to these depths would have no impact upon remains at the top of the alluvial sequence, and only minimal disturbance of the made ground deposits. Landscaping would not be sufficiently deep to affect the more deeply buried (earlier) remains.

7 Conclusions and recommendations

7.1 Archaeology

There are no nationally or locally designated (protected) features within the site, such as scheduled monuments, listed buildings or conservation areas. The site does however fall within the Archaeological Priority Area APZ1: The Lea Valley and tributaries, of the London Borough of Waltham Forest.

The archaeological potential within this zone is considered by the local authority to be sufficiently high (due to the site's location on the alluvial floodplain of a major watercourse, and the potential for well preserved archaeological and palaeoenvironmental remains) to warrant investigation prior to any development.

However, any interventions or developments, which encroach *below the level* of the upper alluvial clays within LZ 1 and 2, should seek to ascertain the existence of possible palaeoenvironmental and archaeological evidence. In areas where good palaeoenvironmental sequences are identified these should be adequately sampled for pollen, diatom or mollusc analysis. Such evidence would provide a valuable resource for reconstructing the evolution of the river system in this part of the Lea Valley. This is of particular relevance within LZ 1 where the channel deposits identified have the potential to contain evidence of environmental change from the early part of the Holocene period onwards

The presence of archaeological remains, both within LZ 1 and 2, would prove highly significant as little is known about the human exploitation of this area of the Lea Valley. The presence of *in situ* Mesolithic remains would be of particular importance, as little evidence exists in the greater London area for archaeology of this date.

Superficial surface ground disturbance, including site preparation, services and drainage, and ground raising, is unlikely to penetrate the 20th century made ground on the site and is consequently unlikely to have an archaeological impact, as these works are unlikely to be sufficiently deep to penetrate modern overburden (made ground), which is 3-5m thick.

The impacts arising from the proposed reprovisioning of allotments with attendant water supply, individual shed footings, access routes and landscaping, are unlikely to present any damage to underlying archaeological deposits. Therefore, it is not recommended that (further) archaeological fieldwork be undertaken.

8 Geoarchaeological glossary

Alluvium. Sediment laid down by a river, and usually well-sorted. Can range from sands and gravels deposited by fast flowing water and clays that settle out of suspension during overbank flooding. Other deposits found on a valley floor are usually included in the term alluvium. Peat develops when there is little mineral sediment deposition and impeded drainage, which limits biological decay; and tufa accumulates when springs rich in calcium carbonate discharge in damp well-vegetated situations.

Arctic Beds. Cold climate deposits, pre-dating the Last Glacial Maximum and sometimes found within the gravels of the Lower Lea. They may survive within parts of the floodplain not reworked by the river during the Late Glacial.

Colluvium. Sediment eroded from upslope and transported (by water, gravity etc) down a valley side. Often accumulates at break of slopes on the valley side or at the junction of valley side and valley floor and can interleave with alluvium deposited by a river on the floodplain. Generally poorly sorted.

Holocene. The most recent epoch (part) of the Quaternary, covering the past 10,000 years during which time a warm interglacial climate has existed. Also referred to as the 'Postglacial' and (in Britain) as the 'Flandrian'.

Kempton Park Gravels these gravels belong to a younger river terrace than the Taplow Gravels mapped on the valley side in this area by the BGS.

Late Glacial. The period following the Last Glacial Maximum and lasting until the climatic warming at the start of the Holocene. In Britain this period is subdivided into a warm 'interstadial' episode the **Windermere Interstadial**, followed by a renewed cold ('stadial') episode, in which local ice advances occurred (the **Loch Lomond Stadial**).

Last Glacial Maximum. The height of the glaciations that took place at the end of the last cold stage, around 18,000 years ago.

Loch Lomond Stadial. See **Late Glacial**.

Pleistocene. Used in this report to refer to the earliest part of the Quaternary, the period of time until the start of the Holocene, about 10,000 years ago. However, since the present Holocene epoch is almost certainly only a warm interglacial episode within the oscillating climate of the Quaternary, it is often seen as being part of the Pleistocene epoch, in which case the terms Pleistocene and Quaternary are interchangeable. As it is necessary, in this report, to differentiate between the events that took place at various times during the last cold stage and earlier in the Quaternary and those that took place during the Holocene, the Pleistocene is used to refer to the parts of the Quaternary pre-dating the climatic amelioration that took place at the start of the Holocene.

Quaternary. The most recent major sub-division (period) of the geological record, extending from around 2 million years ago to the present day and characterised by climatic oscillations from full glacial to warm episodes, when the temperate was as warm as if not warmer than today. To a large extent human evolution has taken place within the Quaternary period.

Soliflucted sediment. In periglacial environments, surface thawing results in a saturated surface layer overlying a still-frozen substrate. Where this occurs on valley sides it can result in the surface layers sludging down-slope over the frozen subsoil.

Windermere Interstadial. See Late Glacial.

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9.2 Cartographic sources

LMA= London Metropolitan Archives

Rocque's *Exact Survey of the City of London Westminster and Southwark and the Country 10 Miles Round* (1746)

Chapman and André's map of Essex 1777

Milne's map of London (1800)

Early OS survey drawing of west Essex, *c* 1805

Ordnance Survey 1st edition 6" (1:10560) map (1868).

Ordnance Survey 2nd edition 6" (1:10560) map (1896)

Ordnance Survey 3rd edition 25" (1:2500) map (1913)

10 Appendix: Oasis Data Collection Form: England

OASIS ID: molas1-23708

Project details

Project name	Marsh Lane Playing Fields, Leyton
Short description of the project	Geoarchaelogical borehole and window sample pit survey across the site. The basal deposits recorded consisted of sandy gravel. Across the site the level of the gravels remained at a fairly constant level: between 3.5 to 4m OD. Above the gravels were sandy clays. The site probably remained as dry land into the historic period, after which time alluvial clays started to accumulate across the site, with the area developing into a grass or hay meadow. Towards the northern edge of the site deposits suggest that a later channel cuts down through the older Pleistocene gravels. The survey suggested that archaeological features could be expected to survive beneath the upper alluvial clay.
Project dates	Start: 20-06-2006 End: 05-07-2006
Previous/future work	Not known / Not known
Any associated project reference codes	OL-01006 - Sitecode
Type of project	Desk based assessment
Site status	Area of Archaeological Importance (AAI)
Current Land use	Other 14 - Recreational usage
Monument type	CHANNEL Late Mesolithic
Monument type	MADE GROUND/INDUSTRIAL Post Medieval
Project location	

Country	England
Site location	GREATER LONDON WALTHAM FOREST WALTHAM FOREST Marsh Lane Playing Fields
Postcode	E10
Study area	75000.00 Square metres
Site coordinates	TQ 36975 86750 51.5624771551 -0.02367627546020 51 33 44 N 000 01 25 W Point
Height OD	Min: 3.50m Max: 4.00m
Project creators	
Name of Organisation	MoLAS/PCA
Project brief originator	Capita Symonds Ltd
Project design originator	MoLAS/PCA
Project director/manager	Nick Bateman
Project supervisor	Jane Corcoran
Type of sponsor/funding body	Capita Symonds Ltd
Project archives	
Physical Archive recipient	LAARC
Digital Archive recipient	LAARC
Paper Archive recipient	LAARC

Paper Media available	'Unpublished Text'
Entered by	Pat Miller (patm@molas.org.uk)
Entered on	13 February 2007

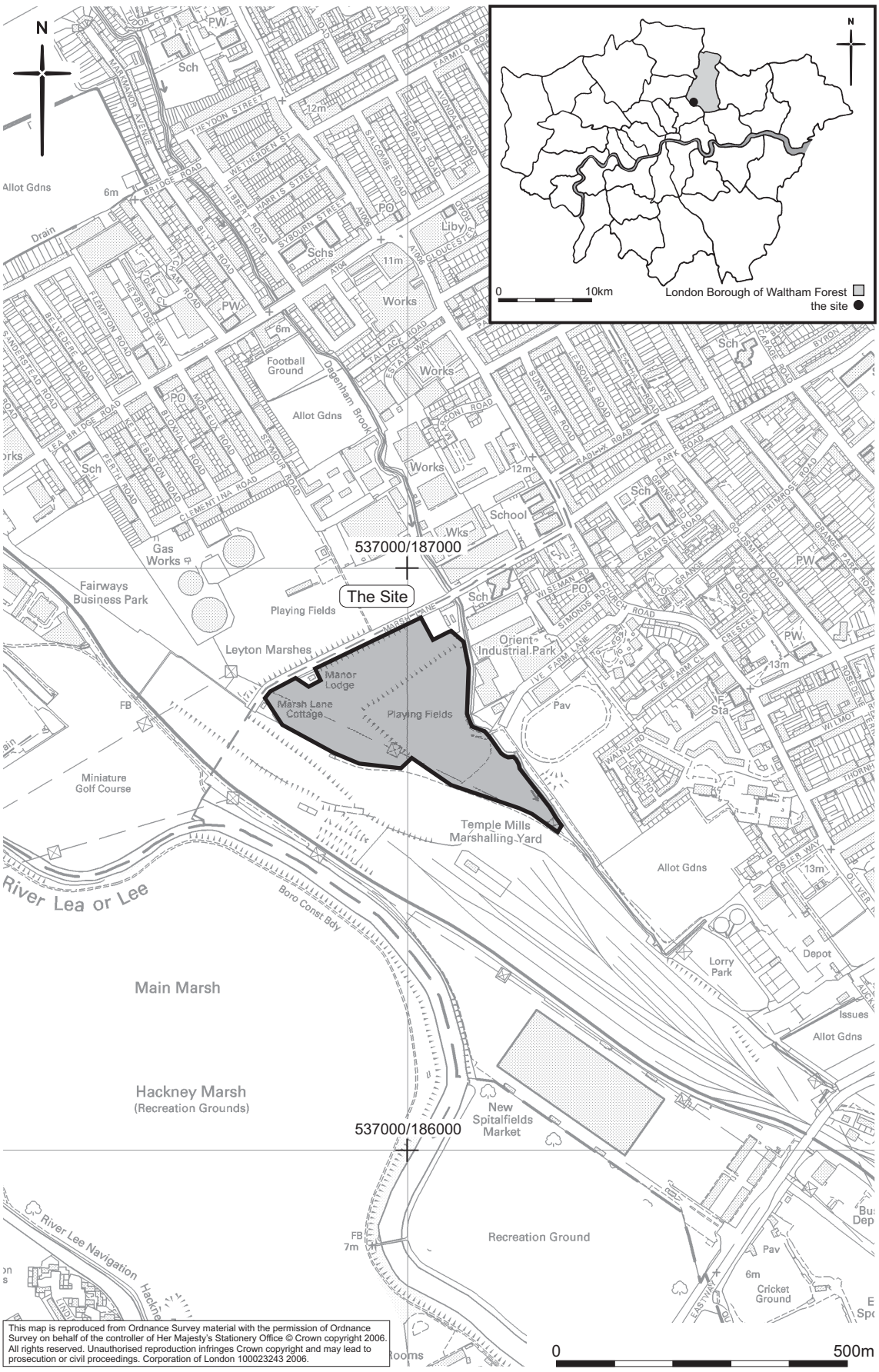

Fig 1 Site location

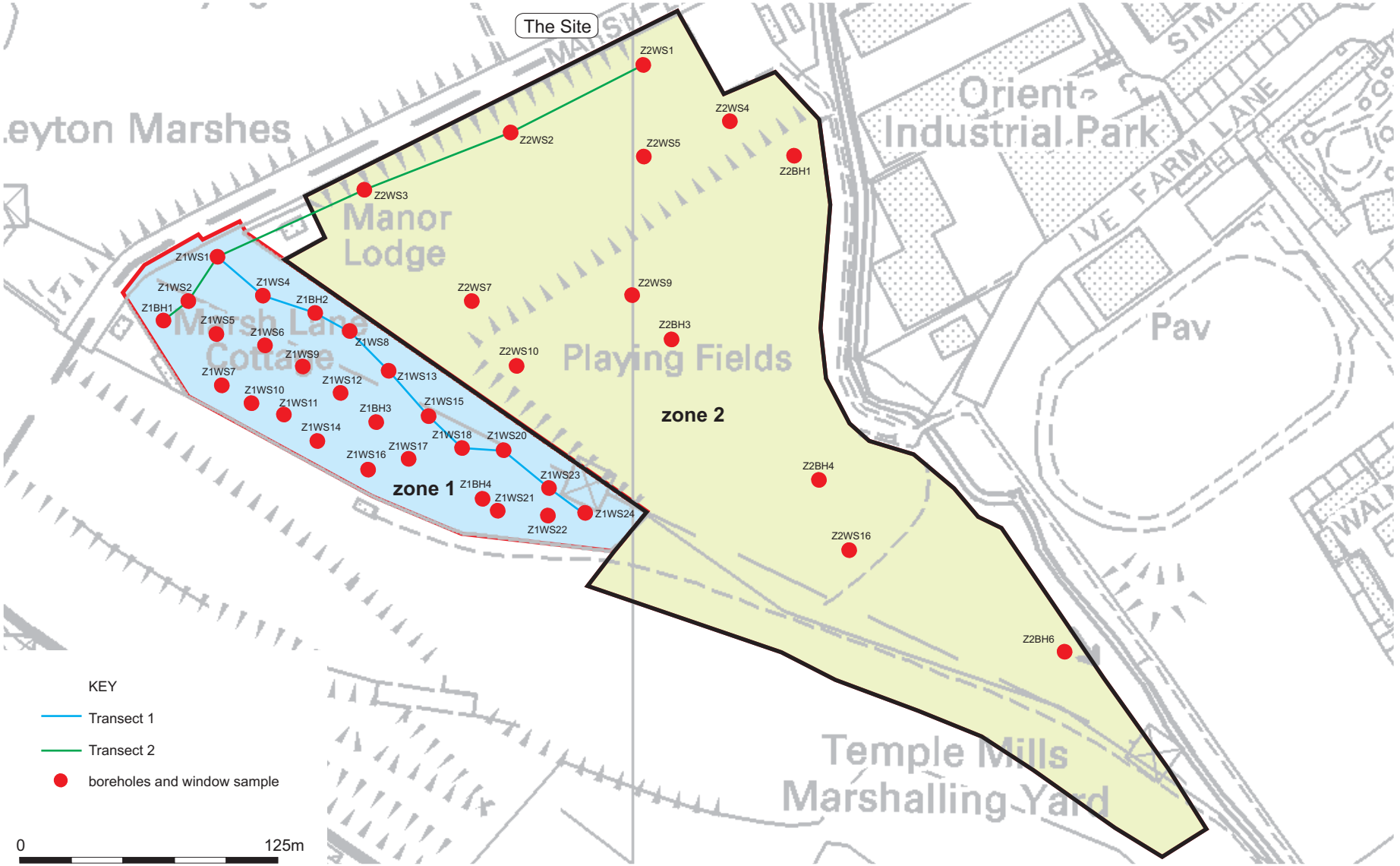

Fig 2 Distribution of borehole/window sample data and location of transects

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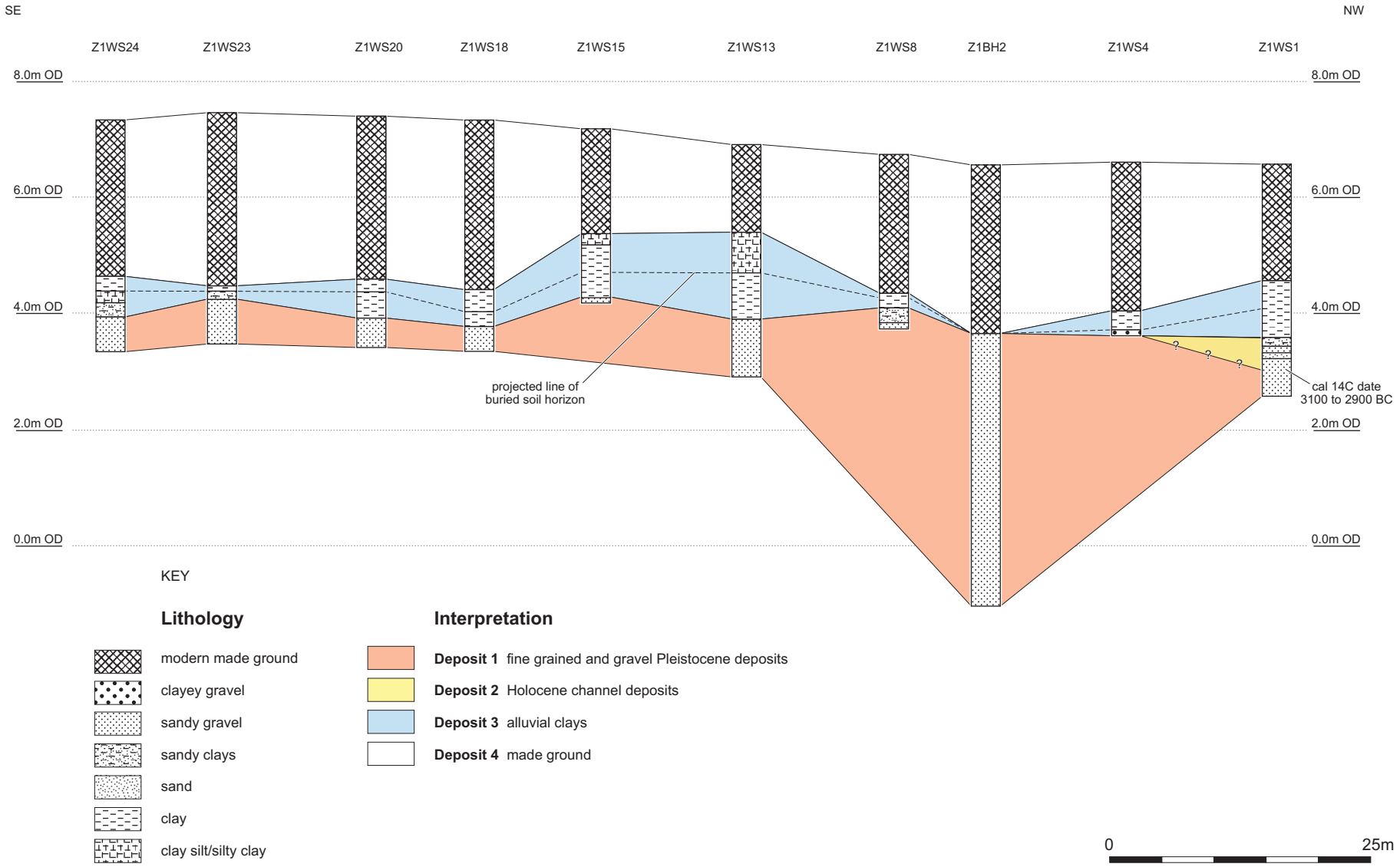

Fig 3 Transect 1

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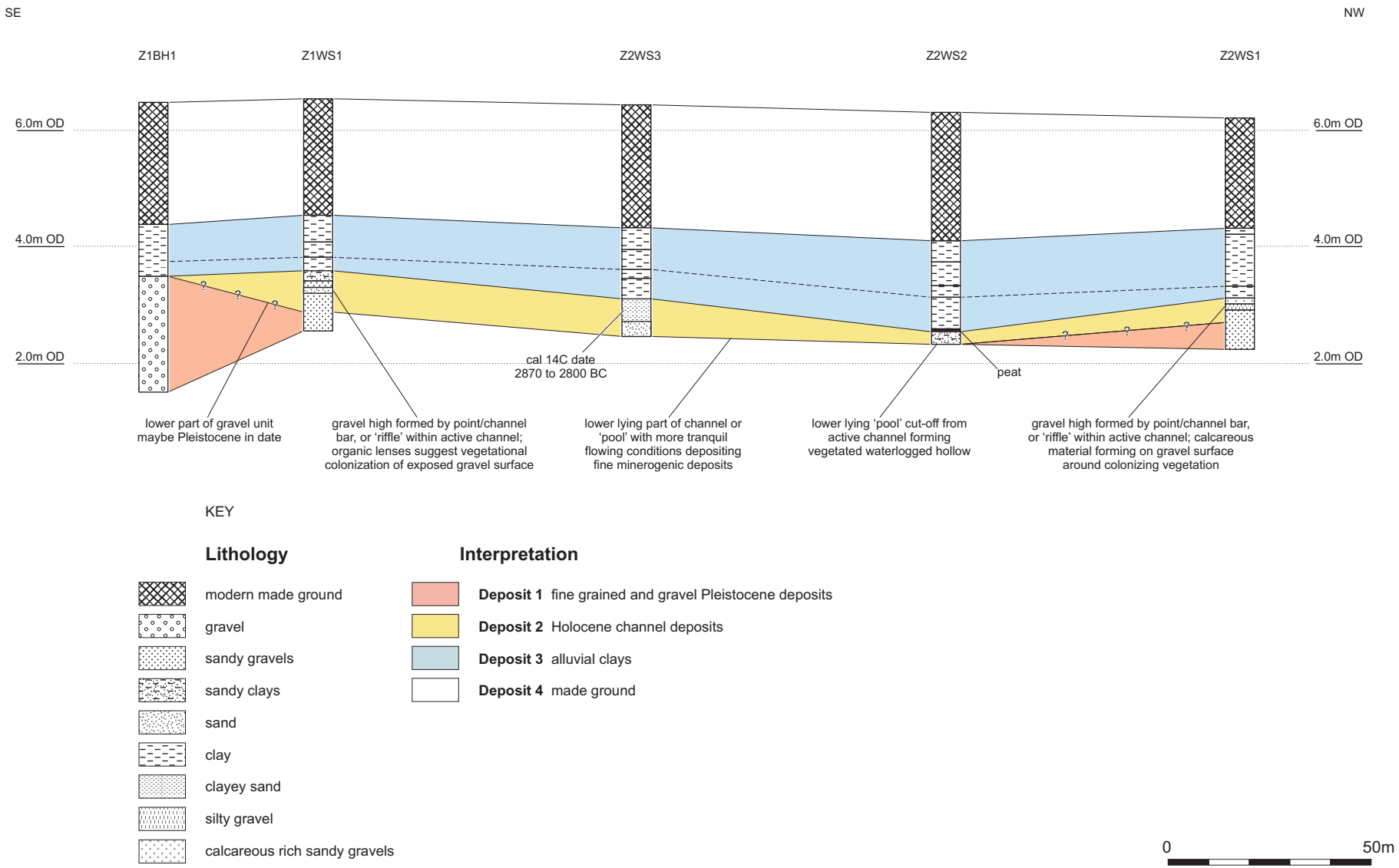

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Fig 4 Transect 2

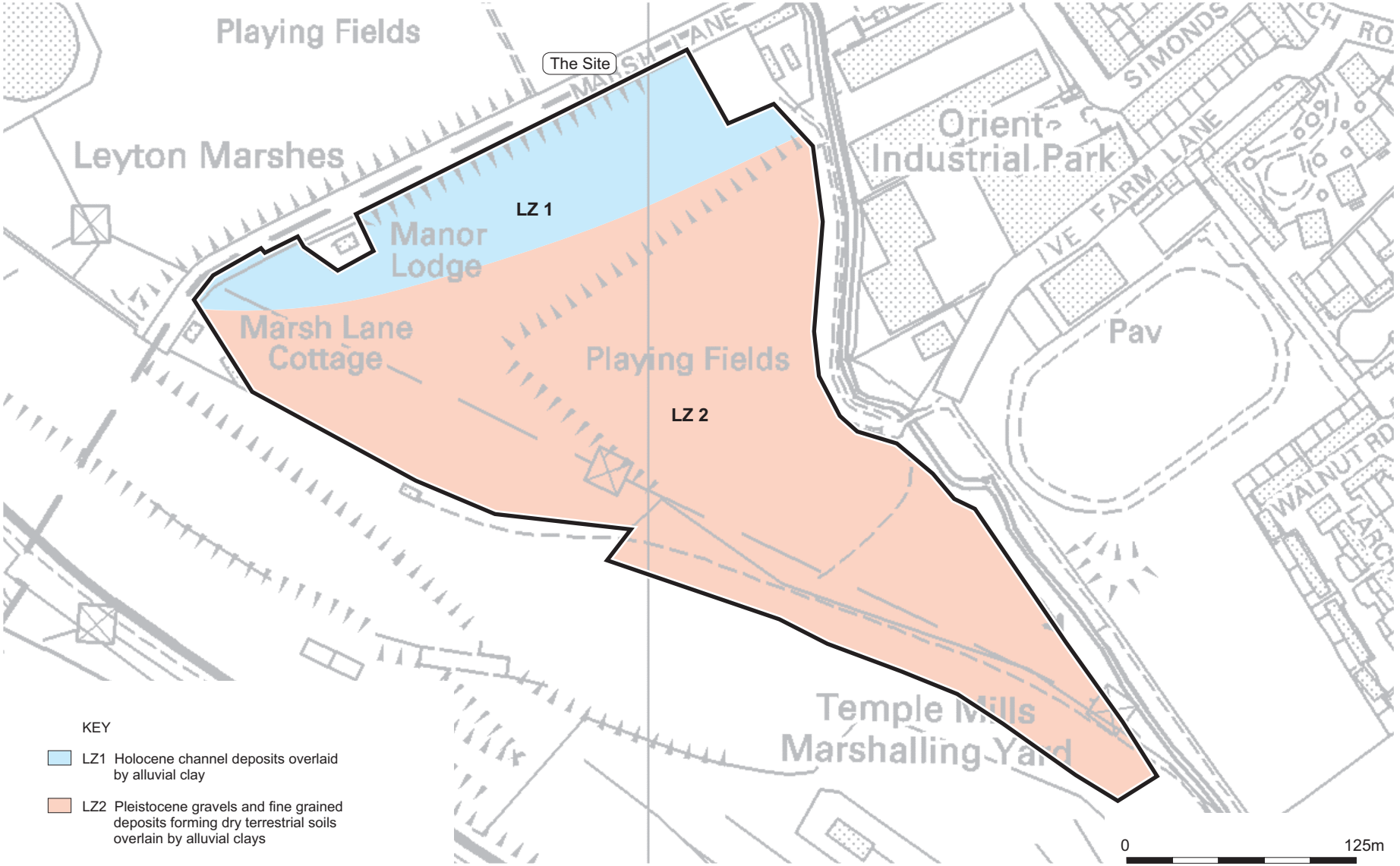

Fig 5 Landscape zones

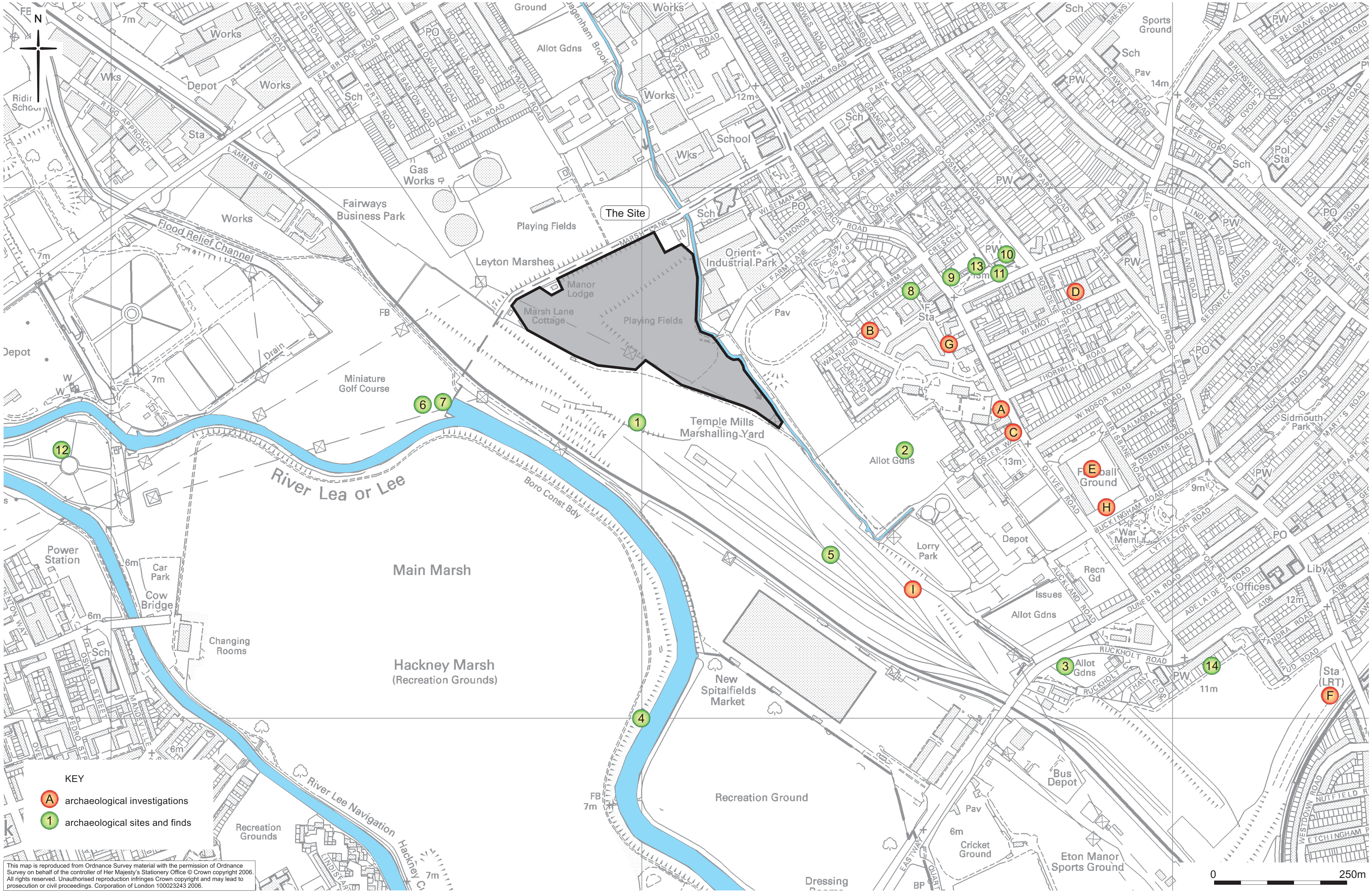

Fig 6 Known archaeological sites and finds within the study area

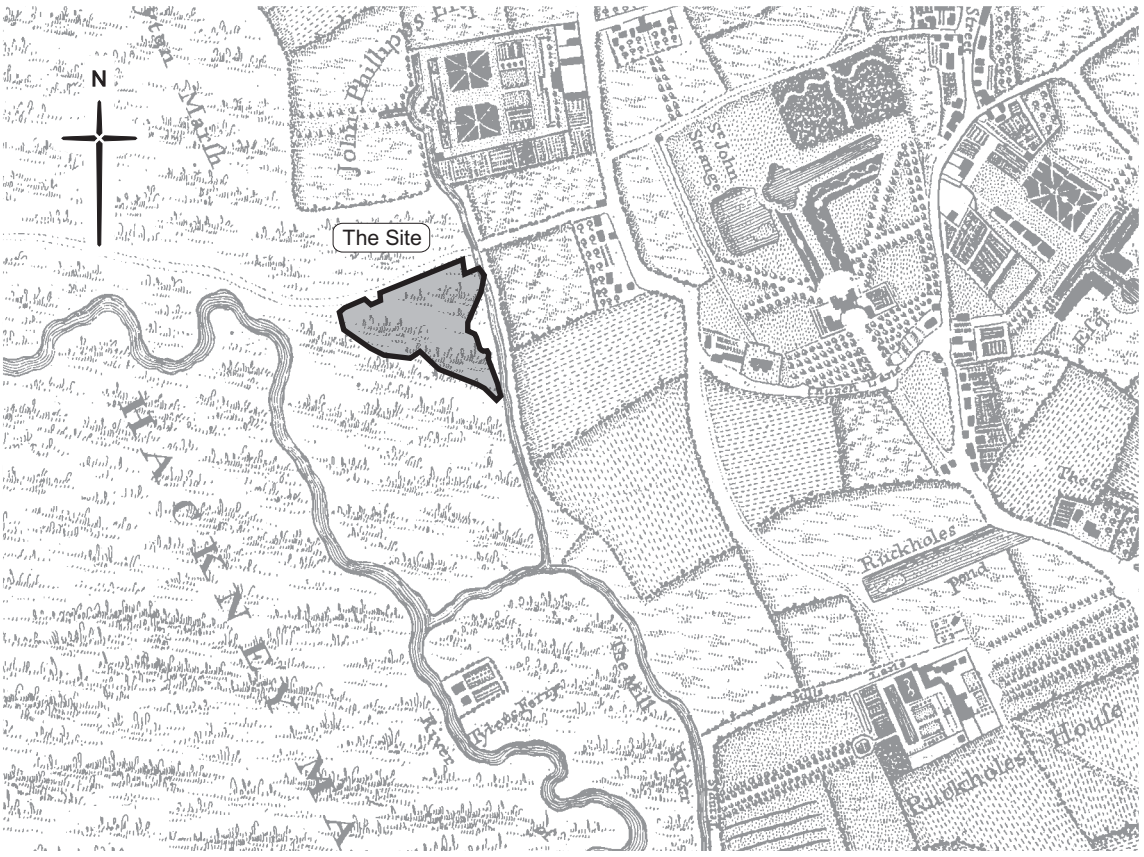

Fig 7 Roque's Map of 1746

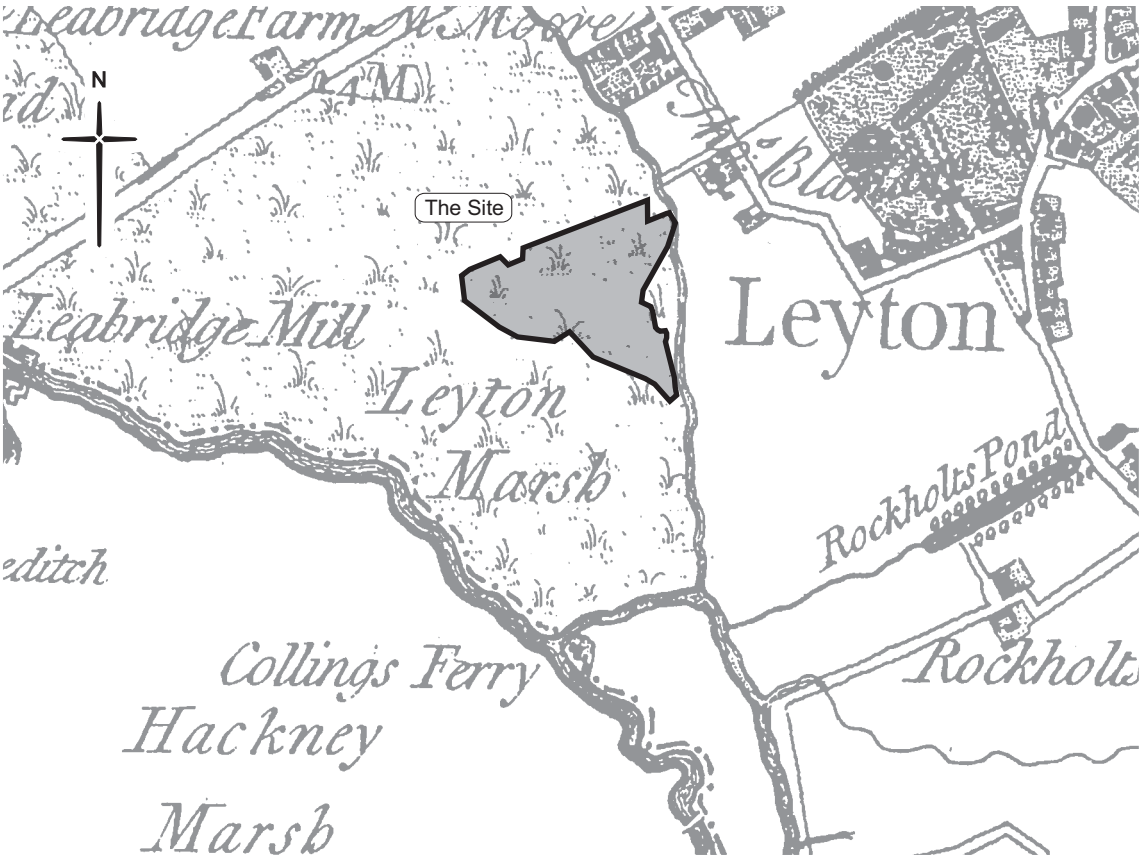

Fig 8 Chapman and Andre's map of 1777

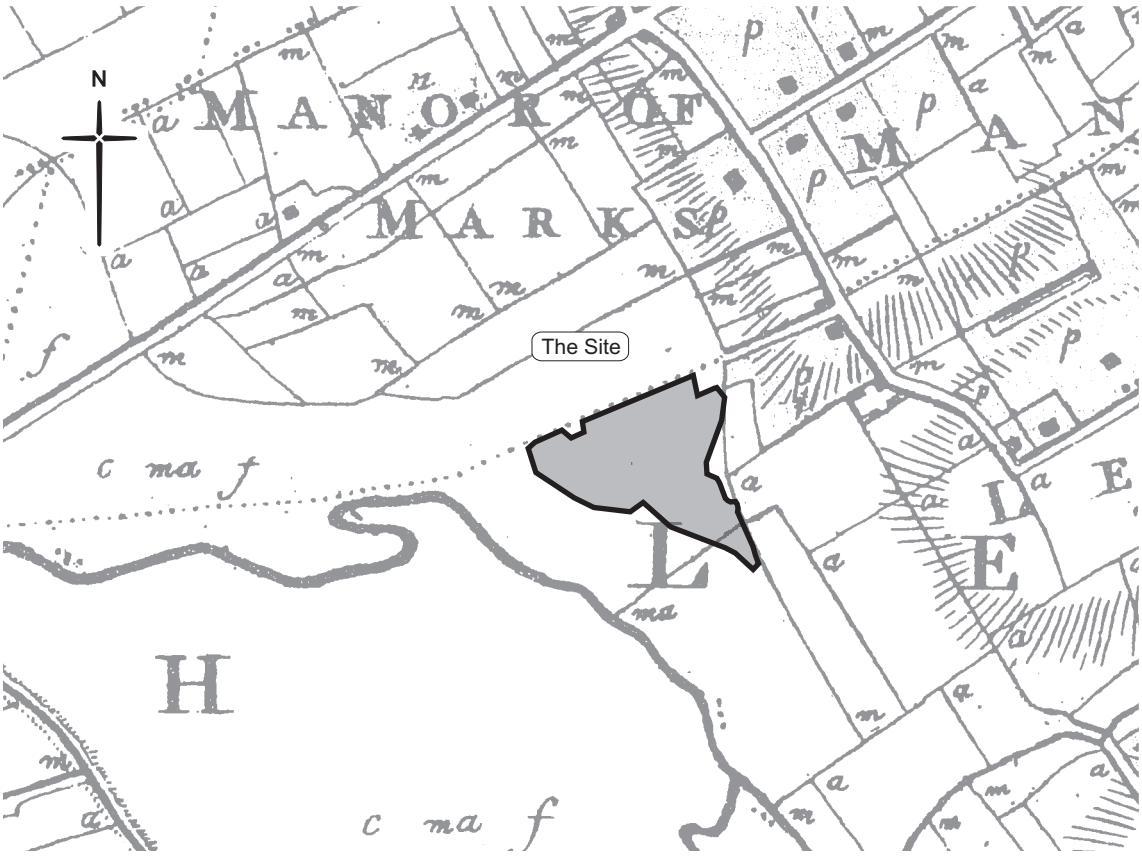

Fig 9 Milne's land use map of 1800

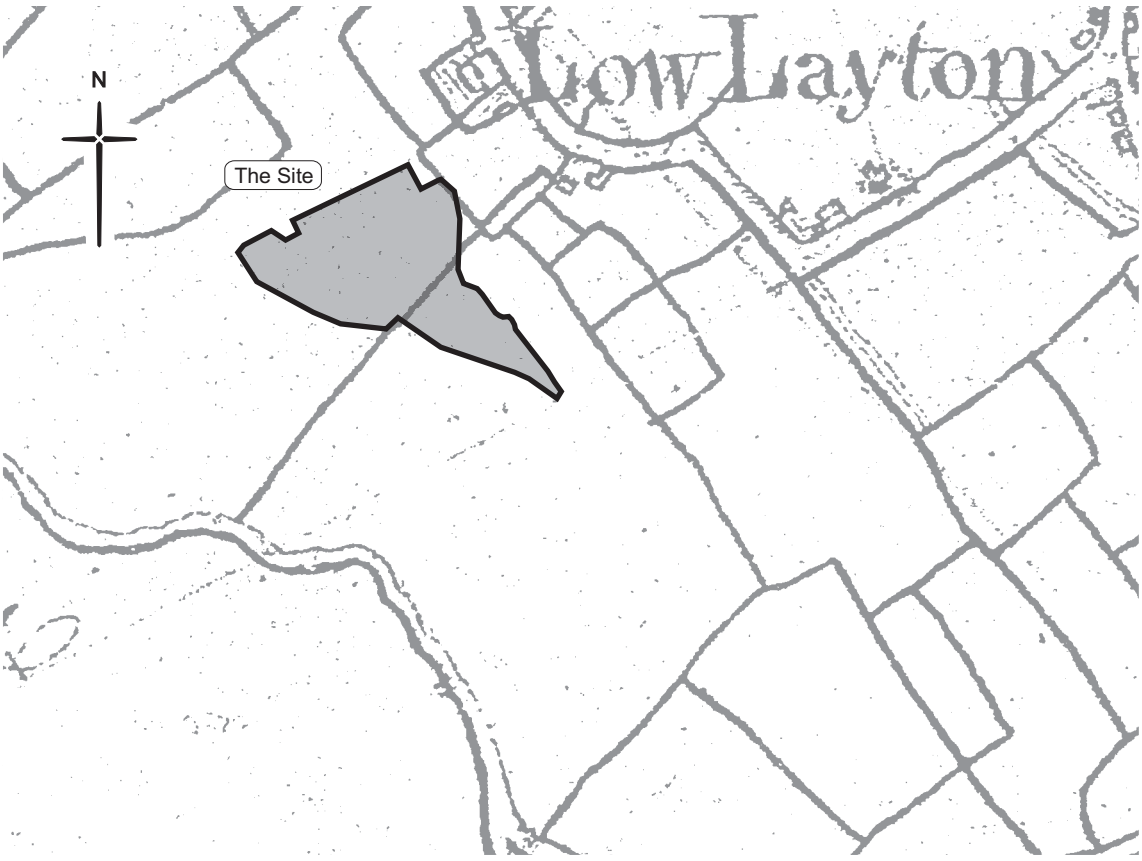

Fig 10 OS surveyors drawing of west Essex, *c* 1805

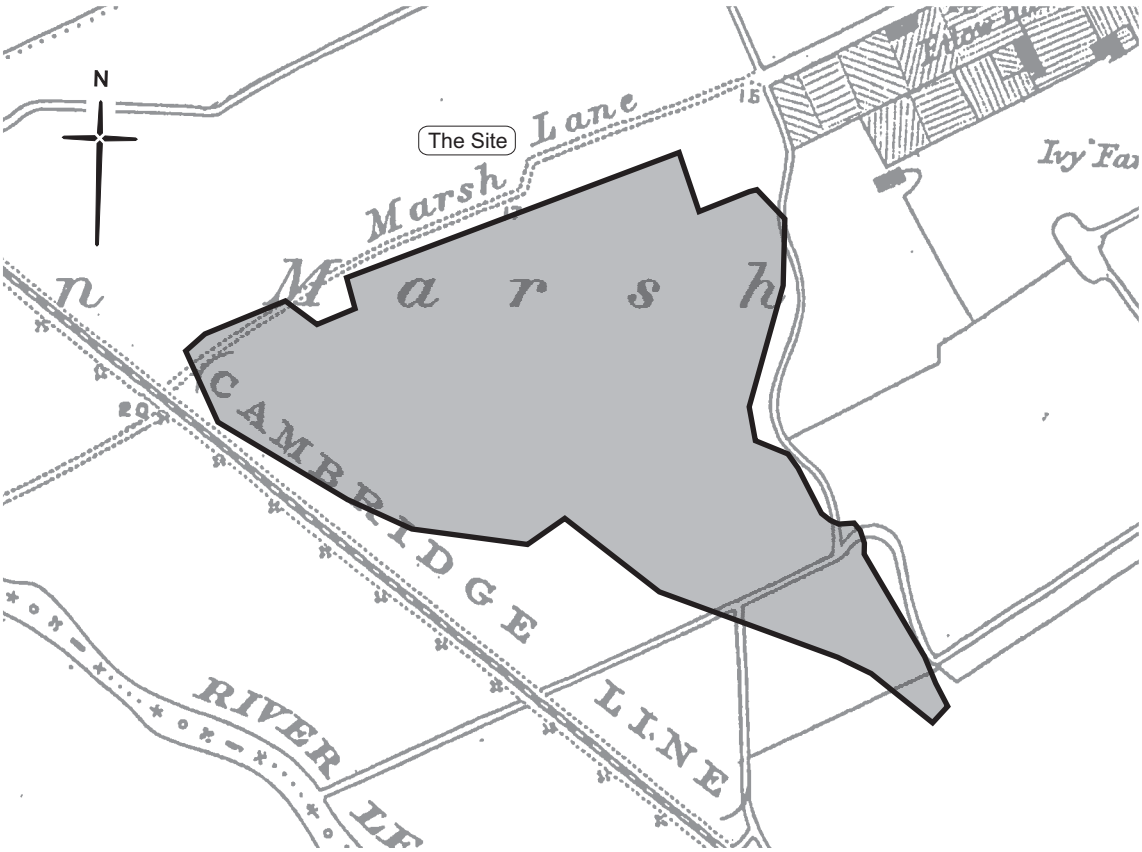

Fig 11 Stanford's map of London (published 1862)

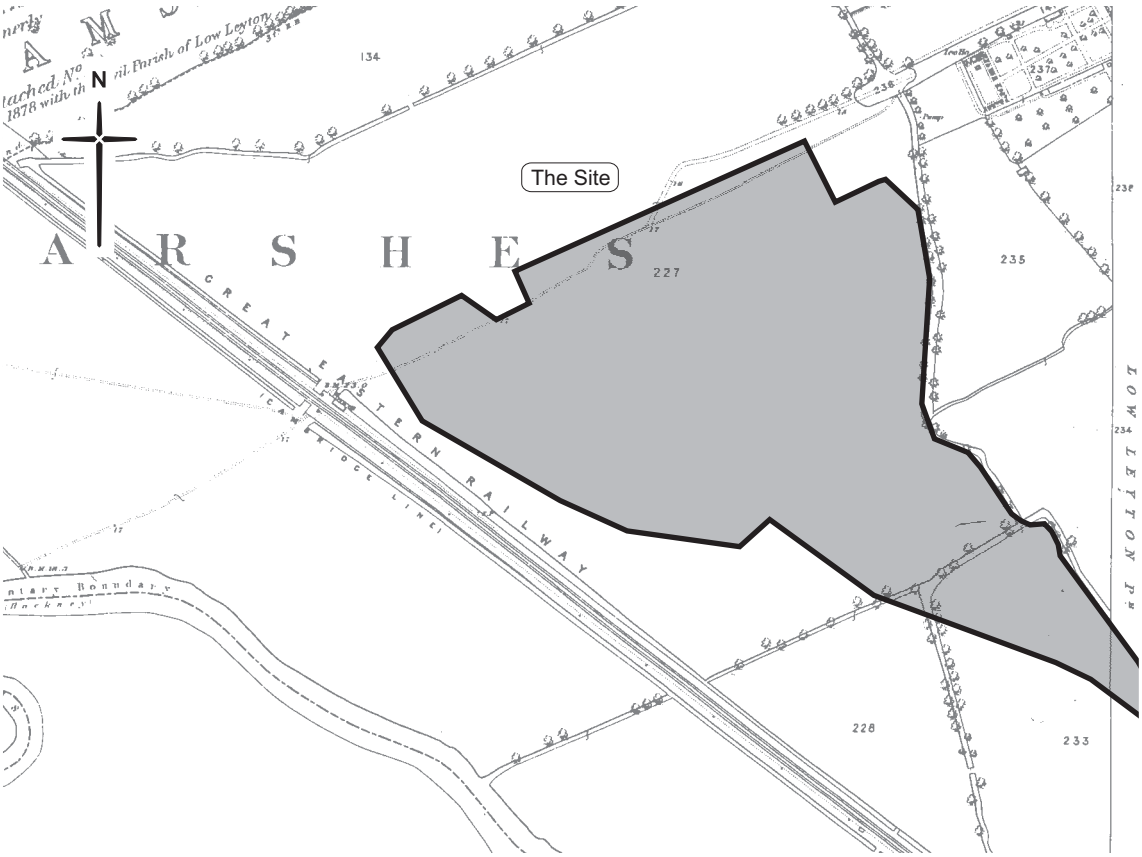

Fig 12 Ordnance Survey map 1st edition map 1:2500 scale (1868)

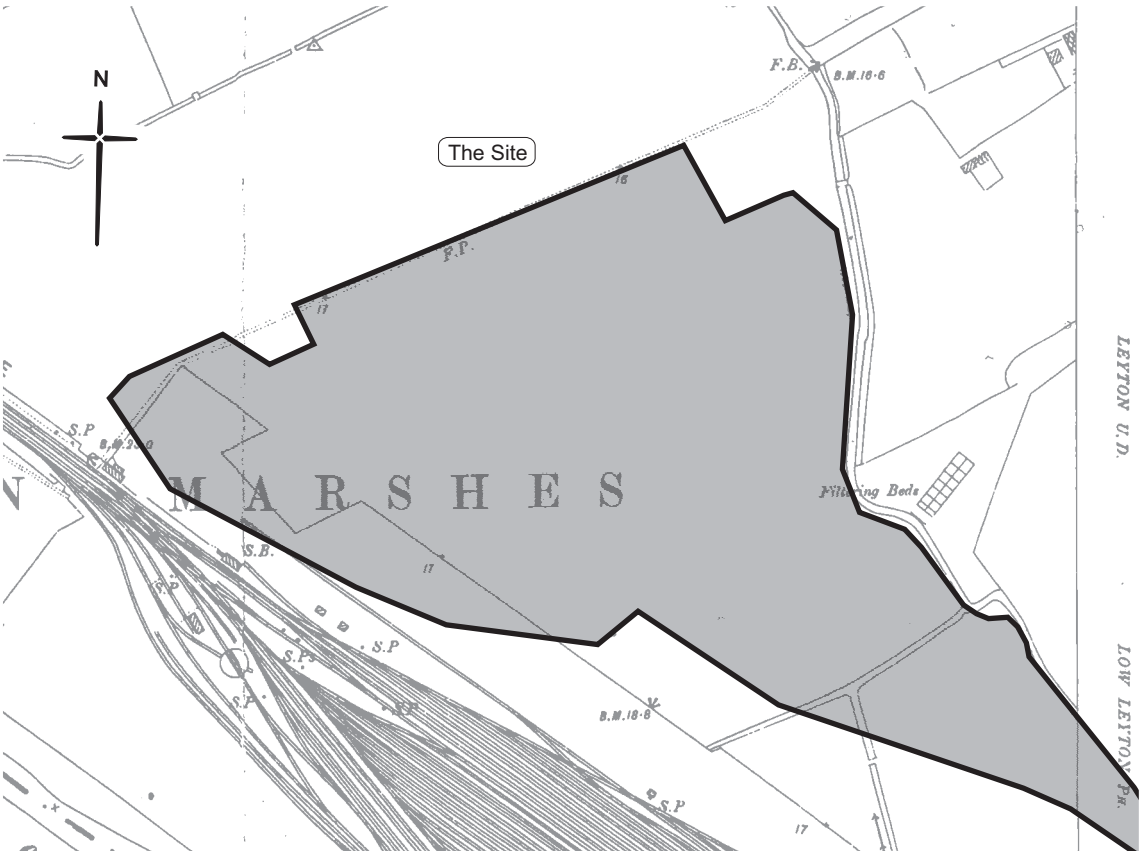

Fig 13 Ordnance Survey map 2nd edition map 1:2500 scale (1896)

Fig 14 Ordnance Survey map 3rd edition map 1:2500 scale (1913)

Fig 15 The proposed development (EDAW dwg no. LDA/LBWF/ML/APP/02. 23.11.2006)