Geo-archaeological Appraisal for

Hunters Yard
Horsefen Road, Ludham, Norfolk

on behalf of

Norfolk Heritage Fleet Trust

HER Event Number: ENF126444

June 2011

thelandscapepartnership
landscape architecture urban design environmental planning

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Hunter's Yard, Ludham

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1 Introduction

1.1 Site location and context

1.1.1 Hunters Yard is situated on Womack Water, in the Thurne valley in northern Broadland, at approximate grid reference TG 396 176 (Figure 01). The proposal site comprises an area of reedbed, an existing boat dyke and grassed pathways. A boatshed and workshop lies to the north. A public footpath runs immediately to the east of the existing boat dyke, along the flood wall which separates Womack Water from the adjacent grazing marsh.

1.1.2 Hunters Yard is owned and run by the Norfolk Heritage Fleet Trust, whose staff maintain the fleet of traditional wooden gaff sloops with self-tacking jibs and a fixed keel and offer sailing holidays and tuition.

1.2 Background to the project

1.2.1 The Norfolk Heritage Fleet Trust wish to create a second boat dyke and extend an existing mooring basin at Hunters Yard on Womack Water. A maximum of 20-24 berths would be provided, which would be rented out for use by privately owned craft.

1.2.2 The proposed mooring basin lies on the edge of an area of reedbed, immediately to the south of the Broads Authority's 'Ludham Fieldbase'. It is proposed to create further moorings in a small cut to the east of Womack Water, south of the existing Hunters Yard mooring facilities.

1.2.3 As part of the Broads Flood Alleviation Project (BFAP), Broadland Environmental Services (BESL) Ltd have commenced flood alleviation works to Compartment 06 Ludham & Potter Heigham Marshes, which extends along the bank of the River Bure between Womack Water and Candle Dyke, and it is proposed that spoil won from the creation of the new mooring basin within an area which is currently reedbed is used within the flood defence works and that reed turves cut from the footprint of the mooring basin are used to create a reedbed in a new soke dyke on the western boundary of Horse Fen (Ludham and Potter Heigham Marshes).

1.3 Site description

1.3.1 The proposed boat dyke lies within a small area of reedbed, a Biodiversity Action Plan Priority Habitat, immediately to the west of the existing Hunters Yard dyke. A second area of proposed moorings is a short distance to the southeast and is currently mown grass. The flood bank which protects the adjacent grazing marsh is to the east of both the existing and the proposed moorings and carries a public footpath which runs from Ludham towards Potter Heigham along the side of Womack Water and thence along the Thurne. The grazing marsh to the east forms part of Ludham-Potter Heigham SSSI, a site which is designated primarily for the floristic interest of its dyke system.

1.3.2 The Site is accessed from the A1062 Hoveton to Potter Heigham road via Horsefen Road. Car parking is to the north and west of the sailing base, and is shared with the Broads Authority fieldbase.

1.3.3 Land use in the surrounding area is predominately grazing marsh on the floodplain, with arable land on the upland to the north.

1.3.4 The proposed mooring dyke lies in an area with a high potential for important heritage assets to be present. A Bronze Age flint dagger has previously been found at the site itself in 1933, probably during the construction of the existing mooring dyke. Consequently there is a high potential that the significance of important heritage assets will be affected by the proposed development (in this case both archaeological and palaeoenvironmental remains). Norfolk County Council Historic Environment Service have requested that the results of an archaeological evaluation are submitted with the planning application so that an informed and reasonable planning decision can be taken when the results of the evaluation have been considered.

1.4 Objectives

1.4.1 Norfolk County Council Historic Environment Service (NHES) have determined that a hand auger survey is required to determine the presence/absence, stratigraphic sequence, date, extent, state of preservation and significance of any archaeological layers or subsoil archaeological features. Due to the nature of the investigation, it is expected that few artefacts will be recovered. This evaluation may indicate a need for a further phase of archaeological evaluation through trial trenching and/or an excavation or archaeological monitoring during the development if features of importance are found and these cannot be preserved *in situ*. It is anticipated that any requirement for further ground/intrusive investigation would be agreed between the various interested parties following completion of a report on the geo-archaeological survey and a supporting desk based assessment.

1.4.2 The objectives of this part of the geo-archaeological survey are therefore as follows:

- to identify, characterise, describe and approximately date the gross superficial stratigraphic sequences in the area proposed for excavation
- to identify any potential for presence of buried deposits or artefacts through identification and interpretation of particular types of deposits, including, but not restricted to, buried lenses of alluvial silt or mud, or fragments of wood
- to undertake initial interpretation of the findings
- to provide a detailed report of the survey findings and initial interpretation to Norfolk County Council Historic Environment Service sufficient to enable the HES to identify requirement for further site investigation

2 Survey methodology

2.1 Desktop study

2.1.1 A desk-based archaeological study (DBA) was undertaken in April and May 2011, and is the subject of a separate report. Some further desk study was carried out to provide context and certainty of interpretation for the geo-archaeological study, and a desk study to inform a Geodiversity Appraisal was undertaken in April 2011. The purpose was to identify published information on local geodiversity, and designations relevant to the development site and immediate environs. Faden's map of 1797 and the Broads Landscape Character Assessment report provided information about local landscape development. Further data was drawn from a recent report produced by the Norfolk Geodiversity Partnership[1], and from British Geological Survey map sheets 52N 00 East Anglia (Solid Geology and Quaternary) at 1:250,000 scale, and sheet 132 & 148 Mundesley and North Walsham (Solid and Drift) at 1:50,000.

2.2 Field survey methodology

2.2.1 Field survey was undertaken on 19th and 20th April 2011, before the main reedbed-nesting birds breeding season started, to minimise disturbance to nesting birds in the reedbed. Gross stratigraphy of the upper 2m of the substratum within the footprint of the boat dyke was determined along transects through the areas to be excavated using a hand auger (a 2.1m modified Hiller Borer with 32cm chamber and 9m extension capability).

2.2.2 One north-south aligned transect and four east-west transects were set out within the main reedbed area on the footprint of the proposed mooring dyke (see Figure 02). Auger survey points were spaced at 5m intervals along these transects.

2.2.3 The orginal survey design proposed recording one north-south and one east-west transect on the rond to the south of the existing mooring basin, to provide context, and to help identify the extent of any features encountered during the survey of the boat dyke, and any local variations. This proved to be impossible due to the presence of nesting birds within dense willow and bramble scrub in this area, but would, in any case be likely to reveal little of value given that this part of the rond has been used for many decades as a site for depositing material dredged from the channel. The dredged deposits have been shown in other parts of the site to have led to substantial modification of underlying deposits through compression, and, in some cases, the migration of heavier materials (stones etc) in dredgings down through the underlying peat, with the resultant loss of context.

2.2.4 Fieldwork was undertaken between 8 am and 5 pm to ensure that light levels were sufficient to distinguish visual field attributes of the ground surface and samples.

2.2.5 Core arisings were examined in the field and recorded in a log showing the sequence of geological materials from the surface (i.e. depth below '0'm). The depths of cores was typically taken to:

a) a standard depth of 200cm below ground surface; or

b) the top of the underlying Crag formation deposits where these occur at depths of less than 200cm below ground surface; and

c) deeper cores to 250 or 300cm were also recorded at selected locations in order to supply archaeological and geological context and to assist with the dating of sequences.

2.2.6 Extraction and assessment of the arisings from each core comprised:

- augering the core in c0.25 cm depth sections

[1] Holt-Wilson, TD. (2010) *Norfolk's Earth heritage – Valuing our Geodiversity*. Norfolk Geodiversity Partnership.

- distinguishing discrete sedimentary units within each core by means of macrofabric characters, colour and textural classification;
- identifying and recording unit boundaries within each core by recording a 'below ground level' (b.g.l.) measurement to the nearest centimetre;
- recording the depth of water within the core when first encountered (ie the watertable depth) to the nearest centimetre b.g.l.

2.2.7 Each core was assigned a unique identifier, made up of the transect identification code and the number of the core within the sequence along the transect.

2.2.8 Sample bags were taken to site for the purposes of storage of wood fragments or other materials out of context/sequence, for possible dating; no wood or anomalous materials which might have been considered unusual or out of context were, however, encountered.

2.2.9 4 person days were required for the completion of the fieldwork stage of this project (1 staff member, Dr Jo Parmenter and 1 experienced subconsultant, Rob Driscoll, over 2 days). A second staff member (Kate Scrivener) attended for part of 1 day at the beginning of the project. Coring was carried out using this 2-3 person team, ensuring Health and Safety compliance and effective and efficient survey and recording.

2.2.10 All field survey was carried out in full accordance with Gurney, D., 2003, '**Standards for Field Archaeology in the East of England',** as adopted by the Association of Local Government Archaeological Officers for the East of England Region and published as *East Anglian Archaeology Occasional Paper* 14. www.eaareports.org.uk

2.3 Determination of local geological context

2.3.1 Local geological context was determined by Dr Tim Holt-Wilson on 29th April 2011, following completion of the stratigraphy survey, by inspection of the freshly recut banks of the new soke dyke bordering Horse Fen, and is described in more detail in a separate report (Hunters Yard Geodiversity Appraisal).

2.4 Recording and Reporting

2.4.1 The HER Officer of the Historic Environment Service was contacted in advance of commencement of fieldwork, to obtain a HER number for the site. The HER event number for this study is ENF126444.

2.4.2 An OASIS online record http://ads.ahds.ac.uk/project/oasis/ was initiated immediately before fieldwork commenced, and the key fields completed on Details, Location and Creators forms.

2.4.3 Upon completion of the survey work, analysis and reporting, all parts of the OASIS online form were completed for submission to the Norfolk Historic Environment Record. The submission included an uploaded .pdf version of the completed report.

2.4.4 The coring results were recorded on a series of data sheets which included the unique identifier, coring data, vegetation type, location, GPS, present management (taken from phase 1/II vegetation survey), the depth of the core, water table height and presence of standing/surface water. This same information was entered into an Excel database and has been presented in Appendix 1 of this report in tabular form. Plans were then prepared to show illustrative transects; an extrapolation of the location of selected types of deposits in plan view, and in cross section along the transects, using a variety of symbols and colours to represent substrate type (i.e. peat, clay, sands/gravels). These illustrative cross sections are given in Figure 03.

2.5 Report circulation

2.5.1 Two hard copies and a PDF copy on CD of the Report were supplied to the Historic Environment Service for the attention of the Senior Historic Environment Officer within eight weeks of the

completion of the fieldwork. It is understood that this will become a public document after an appropriate period of time and will be deposited with the Norfolk Historic Environment Record.

2.5.2 A third copy of the report was sent directly to the Regional Advisor for Archaeological Science, English Heritage, Brooklands House, 24 Brooklands Avenue, Cambridge CB2 2BU.

2.6 Health and Safety compliance

2.6.1 In accordance with the Management of Health and Safety at Work Regulations 1992, an assessment of the risks to the health and safety of employees of The Landscape Partnership Ltd, whilst they are undertaking survey, and of others who may be affected by the work activities, was carried out and reviewed by a senior member of staff prior to commencement of fieldwork. The Landscape Partnership Safe System of Working on Site form will be completed by the senior staff member responsible for coordinating the fieldwork prior to visiting the site. A copy of the completed form is provided at Appendix 2. The form is supported by a series of 9 documents detailing specific hazards associated with working on particular sites or habitats, for example, working near water, and the strategies which should be followed to minimise risk.

2.6.2 The approach to risk assessment can be summarised as follows:

a) identify the hazard associated with the work place or work activity;

b) evaluate the risks arising from the hazard;

c) decide who might be harmed by the activity;

d) decide whether existing precautions are adequate, or whether more needs to be done (having regard to the likelihood of the hazard occurring and the seriousness of the risk);

e) record any significant findings; and

f) review the assessment from time to time, and on any occasions when new equipment or new working practices have been introduced.

2.6.3 Particular hazards at this site include working near water, with risks including drowning, hypothermia and Weils Disease; working on uneven terrain, and working in a reedbed environment, with the attendant risks of lacerations from leaves and broken stems, and risk of eye injury. Appropriate mechanisms were put in place to ensure that risks were minimised, for example the use of safety glasses and gloves at all times. Additional risks may come from core sampling, for example muscle strains and sprains. This latter risk was minimised by ensuring trained personnel only undertake the coring, and by the use of a lightweight auger (modified Hiller borer).

2.7 Limitations to survey

2.7.1 There were no limitations to survey, with the exception of the survey being limited to the main reedbed and not extended to the dredged spoil on the rond to the south of the proposed mooring basin extension.

3 Methodology for interpretation and dating

3.1 Field identification of substrate type

3.1.1 The peat recording made note of the following substrate types, and recorded the depths from surface at which they occurred, and the depth of the layer. Where possible, the type of peat (i.e. originating material) was identified (e.g. reed peat, sedge peat etc).

- Humified peat
- Primary peat (and type (eg reed/sedge), where identifiable)
- Secondary peat (and type (eg reed/sedge), where identifiable)
- Breydon Formation clay
- Silt/mud/alluvial deposits
- Crag
- Wood fragments
- Other types of non-peat deposit

3.1.2 The following terms are used to describe the general field characters of the materials likely to be encountered in this area:

Material	**Field characters**
Peat	Peat is defined by the British Geological Survey (BGS) as partially decomposed masses of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions. The general locations of peat bodies are mapped by BGS within the Broads river floodplains, and are typically degrading as a result of drainage, leading to a reduction in extent and changes in their character.
Silty clay	This material is typically grey, varying from light to dark according to the degree of oxidation and chemical composition. This fine, alluvial material is found either within or below peats in the Broads area or as a mantling layer.
Clay loam	Clay loam is found within the valley floors as a superficial material overlying clay alluvium or peat. It may be derived by the development of soils in floodplain clay alluvium following drainage and cultivation or more locally as hillwash or stream wash materials near valley floor margins.
Silty loam	Silty loam topsoils are often developed by marked and long-term drainage and cultivation of peat topsoils. As fen peats develop, they accumulate silts and fine sands blown onto them; the oxidation of peat topsoils by drainage tends to concentrate these deposits and the topsoil becomes increasingly composed of mineral rather than organic materials.
Sandy loam	This is a typical substrate on valley slopes, derived from sandy sediments that have accumulated finer particles, often by wind deposition. The material may also occur overlying peats near the valley margin, or form accumulations within the valley sediments following hillwash.
Silt	Silt sediments are water-borne mineral deposits that have typically accumulated in floodplain situations where water flow has slowed. They tends to be composed largely of similar-sized particles (fine, medium and coarse) and are commonly found at the base of floodplain peat bodies where previous excavation has taken place.
Sand	Like silts, sand layers are separated into fine, medium and coarse grades according to their typical grain size. Sands are similar to silts in their mode of deposition, but are found in deposition environments formerly characterised by higher water energy. In the survey areas, beds of sands are likely to be located beneath the peat bodies.

3.1.3 An assessment of peat types and condition was a key aspect of the survey. In the field, colour and consistency are critical field characters. Freshly formed fen peat is made up of barely altered plant fragments in a usually light-coloured and clear liquid. The plants may be fen mosses or higher plants, including trees. In the complete absence of oxygen, peats may remain in this condition for thousands of years. More usually, however, slow chemical changes gradually break down the fresh fen peat. Plants fragments progressively disappear and the

residues become increasingly paste-like in texture. Breakdown products stain the liquid darker and the plant fragments and liquid progressively combine until the peat has a uniform colour and paste-like consistency.

3.1.4 In natural fen situations, the height above Ordnance Datum of the peat surface will be in direct relation to the seasonal height of the groundwater table. In theory, a balance is achieved between the addition of dead plant remains and their rate of decomposition and/or preservation as peat. Unless raised bog development is initiated using rainwater, rather than groundwater to preserve plant remains, the upper surface of the peat will consist of freshly added plant litter overlying fibric and hemic peat layers. The following terms are used to describe peat types:

Material	**Field characters**
Fibric peat	This type of peat is typically composed of visible fragments of fen mosses, plants and pieces of wood suspended in a straw-coloured liquid. Encountered in the Broads in the base of turbaries. Its presence indicates part of the peat body that has remained virtually anaerobic since its formation.
Hemic peat	This type of peat has been partially decomposed so that much of the softer plant remains are no longer more than „fossil" traces left in a watery mid-brown paste that also suspends fragments of wood and other harder plant remains. In this survey, hemic peat was initially recognised by its colour. Secondary forms of recognition are by squeezing a sample (confirming a watery paste) and by locating plant fragments.
Woody inclusions	In many cases, the hemic peat is largely derived from the remains of fen woodlands. Where wood fragments occurred within hemic peat in a core, this will be recorded.
Liquid peat	Liquid hemic peat indicates the build-up of groundwater within the peat body.
Humified (Earthy) peat	Found above the hemic peat, and usually forming the ground surface of the peat body, earthy 'humified' peat is the very dark brown to black-coloured form of peat exposed to the atmosphere. Called "humified" peat to signify the ripening, or maturing, of the peat near the ground surface, the material is dust-like when dry. As the dust cannot return to the gel-like consistency when wet, it typically ponds rainwater after a shower. Moisture held in the peat topsoils therefore becomes increasingly different from the groundwater. In fen peats, this is reflected in the vegetation that develops.
Silty loam	The topsoils of several types of drained peats in the Broads can be defined as silty loams. Here, oxidation and dispersal of the organic matter has increased the proportion of silt and fine sand particles either entrained during peat formation or subsequently blown in from surrounding mineral soils. The development of this kind of peat topsoil may be hastened by cultivation, as this increases the loss of organic matter by oxidation, or simply be a feature of the original peat-forming environment.
Gritty peat	This distinctive material is associated with fluctuating watertable levels in drained peatlands. It is caused by the effects of the periodic wetting and drying on the chemistry of that part of the peat body defined by the high and low watertable levels. Typically, gritty peat marks the boundary between earthy and hemic peat layers in susceptible types of peat. The material indeed has a granular texture, and is dark grey to black in colour, depending on the chemistry of the type of peat in which it forms, and the intensity and duration of the process. Once formed, a layer of gritty peat will remain even if changes in watertable level means that it is no longer subject to wetting and drying.
Sapric peat	Sapric is a generic term to describe well-decomposed peats where fibrous plant remains are no longer evident.
Sapric elements	Within hemic peat bodies, pockets of sapric peat can often be found.

3.2 Assessment of peat condition

3.2.1 Peat is an accumulation of partially decayed vegetation, and as such plays an important role in sequestrating carbon. Work is being carried out in the Broads area to evaluate the significance

of the area's role in carbon capture. Here the total CO_2 stored in peaty material in deep and shallow peaty soils has been estimated to be over 25 million tonnes[2].

3.2.2 A subjective assessment of the condition of the peat body was also made, using the indicative criteria given below. This assessment relies on features of the subsurface and surface peats, as well as the location of groundwater within the peat body; it is based solely on observed features and is not intended to be definitive.

Condition	**Indicative criteria**
Pristine	Well-preserved subsurface peats Active peat formation Watertable fluctuating around surface
Excellent	Well-preserved subsurface peats Hemic peat topsoil; sometimes thin earthy peat topsoil Favourable watertable depth
Good	Subsurface peats intact, largely in good condition Thin earthy peat topsoil Mainly favourable watertable depth
Fair	Subsurface peats intact, with no significant detractors Rather degraded topsoil, with potential rewetting problems Largely unfavourable watertable depth
Poor	Subsurface peats absent or, if intact, with significant detractors Degraded topsoil with no potential for re-wetting Unfavourable watertable depth

3.3 Preparation of illustrative cross sections

3.3.1 The depths of the different deposits encountered were plotted onto a chart, with all depths initially plotted as below '0' – ie below ground level. The illustrative cross section for each core sample was then individually adjusted to take into account approximate spot-height estimates made during the field survey, and the results of a separate topographic survey. Following this adjustment, within each transect, '0' is the ground level of the lowest lying sample; all other cross sections are illustrated as relative to '0' within that transect.

3.4 Dating

3.4.1 The dating of the peat and clay deposits encountered during the survey was undertaken in accordance with a chronology of relative sea level change in Broadland, and sea flooding, developed for the Broadland Fen Resource Survey[3] from a variety of published and unpublished sources. The chronology is reproduced overleaf.

[2] University of East Anglia (UEA) 2010 *Carbon Audit and Reduction Plan for the Broads.* UEA Report for the Broads Authority.

[3] Parmenter, J 2000 *The development of the wetland vegetation of the Broadland region: A study of the sociohistorical factors which have influenced and modified the development of fen vegetation in Broadland.* Unpublished doctoral thesis (UEA).

Chronology of relative sea level changes in Broadland and sea flooding

Approximate date	Relative sea level	Deposit	Notes	Period
6900BC-c5400BC		Lower Peat	Freshwater swamp phase, during which the Lower Peat was deposited.	Mesolithic
c5500BC	-7.0m O.D.		Start of the Flandrian marine transgression, which deposited the Lower Clay.	Mesolithic
c5500BC-c2500BC		Lower Clay	Flandrian marine transgression.	Mesolithic-Neolithic
c2500BC	-1.0m O.D.		^{14}C date of top of Lower Clay and end of the transgression, possibly because of shingle spit formation across the mouth of the estuary.	Neolithic
c2500BC-c1500BC		Middle Peat	Formation of Middle Peat (reed peat followed by brushwood peat).	Neolithic
c1500BC			Partial disintegration of shingle spit, allowing increased tidal penetration.	Bronze Age
c250BC-c400AD	0-+1.5m O.D.		Romano-British marine transgression.	Iron Age-Roman
c10AD		Upper Clay	Probable date for total disintegration of spit (^{14}Cdate of base of Upper Clay).	Iron Age-Roman
c375AD	+1.75m O.D.	Upper Clay	Maximum inland extent of Romano-British marine transgression.	Late Roman
c375AD-450AD			Formation of shingle spit across mouth of estuary and end of marine transgression.	Late Roman-Early Saxon
c500AD		Upper Peat	Exclusion of estuarine water from all parts of Broadland excepting the immediate area of Breydon Water.	Early Saxon
500-700AD		Upper Peat	Post-Roman land emergence. Commencement of deposition of Upper Peat.	Early Saxon
c700AD		Upper Peat	Maximum land emergence.	Middle Saxon
post 700AD		Upper Peat	Commencement of a gradual submergence.	Middle Saxon
c900AD		Upper Peat	Start of large-scale peat digging in Broadland (exploitation of Middle Peat).	Late Saxon
900-1350AD	+0.8-+1.5m O.D.	Upper Peat	Excavation of the present day 'broads' and growth of Great Yarmouth on the coastal spit.	Late Saxon-Early Medieval
post 1100AD		Upper Peat	Marine transgression.	Early Medieval
1250AD		Upper Peat	Major tidal surge and breaching of Happisburgh-Winterton dunes.	Medieval

Approximate date	Relative sea level	Deposit	Notes	Period
1287AD	+2.0-+2.5m O.D.	Upper Peat	The great flood (3024ha inundated).	Medieval
post 1300AD		Upper Peat	Increased flooding and decline of the peat extraction industry.	Medieval
1347AD		Upper Peat	Yare/Bure outfall channel blocked by the continued growth of the sand spit.	Medieval
c1350AD		Upper Peat	Approximate date of abandonment of deeper peat workings.	Medieval
1608AD-1609AD		Upper Peat	Major flooding in Bure, Thurne and Yare valleys.	Post-Medieval
1665AD		Upper Peat	Major tidal surge and breaching of Horsey-Waxham dunes.	Post-Medieval
1700AD -1900AD		Upper Peat	Period of maximum activity in shallow peat excavations.	Early Modern
1791AD		Upper Peat	Major tidal surge and breaching of Horsey-Waxham dunes.	Early Modern
1897AD		Upper Peat	Major tidal surge and breaching of Horsey-Waxham dunes, with serious flooding.	Modern
1912AD		Upper Peat	Severe flooding, particularly of Upper Thurne basin.	Modern
1938AD		Upper Peat	Flooding in Bure and Thurne valleys.	Modern
1953AD	+3.3m O.D.	Upper Peat	Major flooding throughout much of Broadland.	Modern

4 Results and interpretation

4.1 Results of desktop study: Geological and geomorphological context

4.1.1 The desktop study was used to identify key deposits present within the local area. Some of these deposits were encountered during the survey; others will have had an influence upon the development of the peat resource at this site.

Solid geology

4.1.2 The bedrock geology of the site is mapped as the Crag Group of Pliocene-Pleistocene age, comprising a range of sands, gravels, clays and silts of marine origin. The Royal Society Borehole at Ludham proved 52m of Crag overlying Eocene London Clay[4]. Located at 100m from the site, BGS Borehole TG31NE35 proved over 7m of Crag Sands at a depth of over 5m[5]. The Crag acts as a significant local aquifer. Crag outcrops at the foot of higher ground along the side valleys, providing baseflow to land springs that discharge into the river and its tributaries.

Superficial geology

4.1.3 The superficial geology of the site is mapped by the BGS as Holocene peat and alluvial deposits of the Breydon Formation[6]. The alluvial deposits are mostly of marine origin and are relatively impermeable. In this part of the Broads, the peat deposits of predominantly freshwater origin tend to be present towards the marsh edges, feathering out against higher ground, and the estuarine clay deposits occur towards the river channel, although there are complex local variations in the thickness of these deposits.

4.1.4 Successive Holocene sea level changes have led to the formation of an interdigitating sequence of marine clays and freshwater peats in this part of the Broadland, comprising Lower Peat, Lower Clay, Middle Peat, Upper Clay and Upper Peat[7,8]. The Middle Peat and Upper Clay have been identified adjacent to the site by Field Survey. These sediments contain significant palaeo-environmental (macro- and micro-fossil) archives. The most recent of these deposits, the Upper Peat beds, are forming locally at the present day in the Womack Water embayment. As the relative water levels in the river valleys began to rise in the Middle Saxon period, the rate of peat accrual kept pace to produce the Upper Peat deposits, upon which most of the Broadland fens and reedbeds are founded. See results of Geological Context Survey (section 3.3 below).

4.1.5 Solifluction deposits mapped as head of periglacial origin outcrop in the upper reaches of the Womack Water embayment. Close to the site, BGS Borehole TG31NE35 proved 0.7 m of grey-brown silty sands with some subangular flint gravel below 4.3 m, classed as Alluvial Sands. A mixture of solifluction and alluvial superficial deposits (diamicton) is likely to underlie the Holocene valley fill of the embayment. Its boundary with the underlying Crag may be difficult to determine due to cryoturbation and fluvial reworking.

Geomorphology

4.1.6 The site is located at the mouth of the valley of the Womack Water, a minor right-bank tributary of the River Thurne. The Womack Water occupies a drainage basin formed in an embayment 1 km long, including an area of flooded Mediaeval peat diggings which had become a broad by the 18th century[9]. A Drainage Commission was set up at Ludham in 1801 as an consequence of the Enclosure Awards[10], and the watercourse has been embanked since at least

[4] Arthurton et al, 1994 *Geology of the country around Great Yarmouth.* (British Geological Survey)
[5] Information based upon records provided by the British Geological Survey - Borehole TG31NE35 Horsefen Road Ludham 1.
[6] *England and Wales Sheet 132 and 148 – Mundesley and North Walsham.* (British Geological Survey, 1999)
[7] Arthurton et al, ibid
[8] Parmenter, J. 2000: *The development of the wetland vegetation of the Broadland region: A study of the sociohistorical factors which have influenced and modified the development of fen vegetation in Broadland.* Unpublished doctoral thesis (University of East Anglia)
[9] The Broads Authority 2006: *Local Character Area 31 Thurne & Bure Valley - Martham Ferry to Oby* (Broads Landscape Character Assessment)
[10] George, M. 1992: *The Land-use, Ecology and Conservation of Broadland* (Packard, Chichester); p241

the 1840s[11]. Immediately downstream of the site, the Womack Water is confined to its channel by artificial banks / levées, and hence is excluded from an active geomorphological relationship with the wider Thurne floodplain (geomorphologically more correctly termed a drained estuarine plain).

4.1.7 The site includes an area of fen within the embanked area of the Womack Water channel, bounded by slight levées formed of dredged spoil and made ground. As the first edition Ordnance Survey map makes clear, it can be seen to be a local remnant of a formerly more extensive area of fenland now largely occupied by carr woodland and made ground with buildings within the Womack Water embayment. Before drainage, it is likely to have been continuous with fenland on the adjacent Horse Fen; ground wastage on Horse Fen has since altered relative ground levels, and water levels there are now at least 1.0 m lower. The area of fen acts as a temporary flood water storage area within the catchment, and hence is a very localised floodplain[12]. It is an example of an actively developing landform: the substrates are continuing to develop in response to silt deposited from the river system and to rainwater and possibly groundwater flows, and through the natural accumulation of vegetation and consequent peat formation.

4.1.8 The basin of the Womack Water is a former estuarine embayment, part of the 'Great Estuary' of Broadland in Roman and Saxon times, and hence the site may be considered to be part of an area of relict coastline or palaeo-coastline[13].

Soils

4.1.9 The site is located at the interface between two naturally functioning and structured soil types. The soils of the Womack Water embayment includes peat soils mapped as the Hanworth Association, deep coarse loamy and peaty soils with high groundwater overlying glacio-fluvial or terrace deposits. The alluvial soils of the Thurne valley and Horse Fen are mapped as the Newchurch 2 Association, stoneless, clayey marine alluvium.

4.1.10 There are significant areas of made ground on site along the grassed pathways and beside the buildings and mooring basin. This anthropogenic material is not classified as geodiversity, but its management has implications for managing geodiversity assets.

4.2 Results of Geological Context Survey

Results of survey

4.2.1 Evidence of the local geological context on the landward margin of the Thurne floodplain was obtained by inspecting the recently recut banks of the soke dyke at the western extremity of Horse Fen, parallel to the embankment on the eastern side of Hunters Yard. The following units were identified from the exposure, 145 m long and 0.7 m in height above standing water level on 29th April 2011.

Unit	Lithology	Details and Interpretation
4	Topsoil	
3	Silty, almost stoneless clay; humified upper layer	Marine alluvium underlying the drained estuarine plain of the Thurne valley. ⇨ The 'Upper Clay'.
2	Humified peat, with silty basal layer	Unit 2 feathers out to landward at approx 80 m from dyke end. ⇨ The 'Middle Peat', with lower transitional layer.
1	Diamictic, poorly-sorted gravelly sand, silt and clay; rounded and sub-angular flint and erratic clasts	Gently undulating upper boundary dipping southwards and disappearing beneath Unit 2 at approx 65 m from dyke end. ⇨ Superficial deposits of periglacial origin.

[11] See Tithe Map for Ludham on Norfolk County Council eMap Explorer *http://www.historic-maps.norfolk.gov.uk/*
[12] George, op cit, p.238
[13] George, op cit, p.16

Palaeo-environmental interpretation

4.2.2 Unit 1 is a gently dipping sheet of diamicton which underlies the landward margin of the Thurne valley here. It is poorly-sorted and is interpreted as a mixture of reworked fluvial deposits, Norwich Crag, glacial deposits of the Happisburgh Formation, coverloam and colluvium. It was deposited over 5,000 years ago, as it clearly antedates the deposition of Unit 2, and is likely to be a late Devensian solifluction deposit.

4.2.3 Unit 1 is unconformably overlain by the valley peats of Unit 2, the 'Middle Peat', which was deposited under freshwater conditions between c.4500 and 2250 years ago[14]; it feathers out on the underlying gravelly substrate of Unit 1 beyond the present landward margin of the present floodplain. The increasing silt content at the bottom of Unit 2 marks the transition from terrestrial to freshwater conditions. Although not determined in this exposure, a relict soil (palaeosol) may be present on the upper surface of Unit 1 where it is overlain by the peat, indicating the development of a former land surface.

4.2.4 A sheet of marine alluvium (Unit 3) attributed to the 'Upper Clay' later covered both deposits; this was formed by a marine transgression which reached its maximum extension into the Thurne valley c.1600 years ago[15]. The present drained estuarine plain (floodplain) of the Thurne valley is developed on these sediments. It is unclear to how deeply the upper surfaces of Units 1 and 2 were eroded by the transgression, however Unit 3 rests unconformably on Unit 1 to landward, and also possibly on Unit 2. The eroded surface of Unit 1 may have been exploited agriculturally before the transgression.

4.2.5 The topsoil (Unit 4) is composed of humified, weathered residues of wasted peat and alluvium on the surface of Horse fen. The local absence of a unit of 'Upper Peat' which may be found elsewhere in Broadland is attributed to the effects of drainage in recent centuries.

4.3 Condition of peat resource

4.3.1 The general condition of the peat resource over much of the survey area is 'Excellent' to 'Pristine', reflecting the consistently high water table. Some samples close to the reedbed surface contained small amounts of humified soils, however the presence of humified peat was an exception rather than the norm. The areas where dredgings have been deposited have a much lower water table, and the surface deposits have become oxidised and have mixed to produce soils. The virgin peat sealed beneath these dredged deposits is, however in 'Pristine' condition.

4.4 Stratigraphy survey

4.4.1 The results of the stratigraphy survey and the dating of the deposits encountered is set out in full in Appendix 1. Illustrative cross sections are given in Figure 03. Gross stratigraphy of the upper 2m of the site's substratum was determined along transects through the areas to be excavated using a modified Hiller borer. The results of the Field Survey reveal a sequence of Holocene deposits within the site area (see Figure 03).

4.4.2 The summary stratigraphy is as follows.

Unit	Lithology	Interpretation
5	Soil comprised of humified peat and sandy loam with occasional stones over diamictic peat, sand and clay with reed fragments.	Topsoil and made ground including dredged material
4	Light and reddish-brown fibric and hemic reed peat, containing reed rhizomes	Upper Peat
3	Grey / yellow-grey clay; organic content and reed rhizomes	Upper Clay

[14] George, op cit: p19.
[15] George, ibid.

	increasing upwards; firmer towards base; some thin peat horizons present.	
2	Red-brown hemic and sapric brushwood and reed peats, with wood and reed inclusions. Silt and fine stones variably present at base.	Middle Peat, possibly grading into Lower Peat
1	Diamictic grey clay or sand, with varying proportions of gravel, sand, silt and clay; occasional organic remains, above Crag	Local basement of soliflucted and/or colluvial and/or alluvial material

Crag

4.4.3 The illustrative cross sections show an undulating Crag deposit at the base of many of the cores. The Crag occurs typically between 120cm below ground surface and in excess of 350cm below ground surface, and generally slopes downwards from north to south on Transect A, and from east to west on Transects B, C and D, as might be anticipated in a valley-side location. The deepest crag deposits were therefore encountered in the south and west of the site, and in many of the cores in this part of the site (Transect E and the southern part of Transect A), the Crag was not encountered, as it lay much deeper than the 2m standard core depth. In several locations, for example A2 and A3, the upper surface of the Crag appears significantly lower than the surrounds, suggesting that the surface of the Crag may be dissected by a series of channels and runnels, possibly eroded by run-off water from the adjacent upland.

Solifluction deposits and palaeosol (Unit 1)

4.4.4 Periglacial solifluction deposits, or diamicton, (consisting of Crag, glacial deposits of the Happisburgh Formation, coverloam, and colluvium) were encountered just above the Crag in a large number of the cores. For the purpose of recording illustrative cross sections these solifluction deposits have also been described as 'Crag'. Likewise, a palaeosol was encountered just above the Crag in a number of the cores along Transect D and in Core A10; the palaeosol occurred chiefly in the south of the site, and presumably developed on the lower slopes of the former land surface, prior to the sea level rise that brought about the formation of the overlying brushwood peat. It is not known whether this palaeosol extended further south along the line of Transect A, nor along Transect E as the 2m bores carried out did not reach the much deeper Crag.

Middle Peat (Unit 2)

4.4.5 Deposits of Middle Peat were encountered below the Upper Clay (see below) in the vast majority of the cores. Most of these were typically woody ' brushwood' peat, which dates from the latter part of the Neolithic; some reed peat, presumed to date from the earlier part of the Neolithic was also encountered beneath the brushwood peat, for example in the bottom 50cm of Core A12. Because the Flandrian marine transgression which marked the latter part of the Mesolithic did not leave deposits in this part of the Broads, it is not possible to ascertain the dates or origins of the deeper peats which were encountered during the survey; some of the deposits identified in Appendix 1 as Middle Peat may in fact be Lower Peat; however given that the relative sea level at the start of the Flandrian marine transgression is thought to be in the region of 7m below O.D., it would be expected that significant Lower Peat deposits, if present, would occur at depths in excess of 7m below the present ground surface; spot heights recorded across the reedbed varied between 0.85m above O.D. and 0.12m above O.D. The maximum core depth recorded during the survey was 330m below ground level, and thus all recorded deposits are therefore assumed to date from the Neolithic. There was no indication of medieval turbary (peat extraction) in any of the samples, as evidenced by the intact layer of Upper Clay above the Middle Peat. There is likewise no evidence to suggest the presence of any artificial dykes or cuts into these deposits, which might now be overgrown, however the upper surface of the Middle Peat does undulate markedly in some locations; for example between A7 and A11, from B3 to B5, and at D3, where it is absent altogether, and these undulations may suggest the existence of former channels, possibly carrying run-off water from the adjacent upland.

Upper Clay (Unit 3)

4.4.6 Upper Clay deposits dating from the Iron Age through to the late Roman period were encountered in all but 2 of the cores (C1 and C2, which may correspond to former 'higher ground'), at depths varying between 50cm below the ground surface to in excess of 200cm below ground surface where the latter had been artificially raised by dredgings. The overall width of this layer also varied greatly, which the thickest band of clay encountered being in excess of 100cm deep. The nature of the clay varied considerably, with samples in the north and west of the survey area typically revealing organic clay, full of reed rhizomes and root matter, indicative of deposition in shallow, brackish water, whilst pure blue-grey clay, deposited under estuarine conditions was typically found at the base of the deeper clay deposits in the south and west of the site, close to the Womack Water Channel. Very wet, sloppy Upper Clay deposits were noted above the more consolidated blue clay in the vicinity of the channel (for example along Transect E). There is no evidence to suggest the presence of any artificial dykes or cuts into these deposits, which might now be overgrown.

Upper Peat (Unit 4)

4.4.7 Upper Peat deposits were found in all sample locations, and are assumed to have been deposited from the late Roman period (when the shingle spit started to form across the mouth of the estuary) onwards. There was no evidence of turbary (medieval or later peat extraction) in any of the samples. The nature of the Upper Peat varied through the site and particularly with depth, with the more recent deposits being firmer, hemic (partly decomposed) peat, in places bordering on sapric peat, which has few identifiable plant fragments present, and the older deposits closer to the Upper Clay becoming wetter, sloppier and more fibric in character. This suggests better preservation in the lower layers of the Upper Peat, but where very wet, sloppy fibric peat deposits were encountered in the south of the site (Cores A12-A15, and Transect E, could also suggest that at least some of the fibric peat may have formed as reed hover above the former Womack Water channel, which is assumed to have been historically wider than at present. This theory may be supported by the existence of very wet, sloppy Upper Clay deposits in the vicinity of the present channel (for example Transect E). In most locations, the Upper Peat is the uppermost deposits present, although oxidation to humified peat has occurred in a couple of locations where the ground surface is above the water table, and along the eastern and southern edge of the reedbed the Upper Peat has been capped with dredgings (see below).

4.4.8 In the northern part of the reedbed there is some surface evidence of a narrow foot drain (some 50-75cm in width), cut into the Upper Peat, which has since infilled. The footdrain runs approximately east-west. The dimensions and location suggest that this is a relatively recent feature; many managed reedbeds contain footdrains to assist water movement on and off site and prevent stagnation which might impede reed growth.

Recent deposits (Unit 5)

4.4.9 The stratigraphy survey confirmed the existence of dredged material around the entire eastern and southern periphery of the reedbed. The dredged material is thought to have originated both from dredging the main channel, and also minor dredging works to the boat dyke. It is also possible that material dug from the existing boat dyke when it was created was also used to build up the land along the eastern margin of the reed bed. These dredged deposits are variable in their make up, containing mixtures of peat, silt and clay, and sand and gravel from the underlying Crag, and have, at least in their upper layers, which are well above the water table, developed into a loamy soil. The deepest of the dredged deposits, at A15, close to the main channel, are in excess of 100cm from the surface of the ground, and have locally raised the ground surface by up to 60cm. The presence of a thick, dense layer of dredged material has noticeably compressed the underlying strata, so that, at, for example, E1, E2 and A15, the overlying dredgings can be seen to have compressed the Upper Peat and Upper Clay deposits, while at D2 the dredged material has pushed the Upper Peat down into the underlying clay.

5 Consideration of archaeological potential

5.1 Archaeological potential

5.1.1 The proposed mooring dyke lies in an area with a high potential for important heritage assets to be present. A Bronze Age flint dagger has previously been found at the site itself in 1933, probably during the construction of the existing mooring dyke, and has given rise to a suggestion that there may be more material of archaeological importance on the site which is as yet undiscovered.

5.1.2 The excavation of the new boat dyke will involve the removal of material from the reedbed to a depth of up to 1.75m below present ground level. Because the footprint contains some raised ground along the west side of the current boat dyke, and adjacent to the Womack water Channel, the actual excavation depths in these latter locations could be up to 2.25m. The materials removed will therefore comprise sediments dating from the Neolithic to Modern (between c2500BC and present day), and including Bronze Age deposits.

5.1.3 As noted above, there is no evidence for any artificial cuts except for a narrow footdrain, assumed to have been dug to assist water movement across the reedbed, and likely to be less than 200 years old. The reedbed appears to have remained very wet throughout its history, as evidenced by the excellent peat preservation, and much of the site is likely to have supported reedbed or reedswamp for most of the post Roman period, and is thus unlikely to yield any artefacts. The brushwood peat (Middle Peat) deposits were notable for their uniformity, and there is no suggestion of there having been any land cover other than carr woodland, and before that in the early part of the Neolithic, reedswamp, although the upper surface of the Middle Peat does undulate markedly in some locations; for example between A7 and A11, from B3 to B5, and at D3, where it is absent altogether, and these undulations may suggest the existence of former channels, possibly carrying run-off water from the adjacent upland.

5.1.4 In the area closest to the Womack Water channel, as described above, the stratigraphic evidence suggests that the Roman and post-Roman period channel was formerly wider than at present, extending under the reedbed to the approximate position of A12. The former channel has since been infilled by wet, loose fibric peat in a silty matrix. Because this presumed channel would have been likely to have been navigable during the Roman and post Roman period, there may be some potential for archaeological finds from these periods in the south of the site, although the likelihood is no greater than anywhere else on the Broads river network. It is not unlikely that a river channel would have existed during the Neolithic and Bronze Age in a broadly similar location to that postulated for the Roman and post Roman periods. There is nothing in the stratigraphic sequence in the south of the site to suggest the existence of such a channel, although this cannot be determined with certainty from shallow cores.

5.2 Palaeological resource

Assessment of value of resource

5.2.1 Uncut peat, i.e. peat deposits which have not previously been excavated for fuel, is a finite resource within the Broads, with the area of the present day fens having been excavated for fuel estimated as being around 60-70%. The Broadland peat grazing marsh, which occupies perhaps a fifth to a quarter of the 13500ha area of Broadland grazing marsh has generally not been cut. The extent and distribution of the clay in Broadland is imperfectly known[16] and hence the extent of intact interdigitating peat and clay sequences is also unknown, however is likely to be between 50 and 75% of the total remaining uncut peat resource, i.e. around 4000-6000ha. Intact interdigitating marine and terrestrial sequences have been highlighted as one of the

[16] Parmenter, J 2000 *The development of the wetland vegetation of the Broadland region: A study of the sociohistorical factors which have influenced and modified the development of fen vegetation in Broadland*. Unpublished doctoral thesis (UEA).

geoconservation priority features for Norfolk[17]. The peat component of the deposits is also of importance for its carbon storage function.

5.2.2 The intact Broadland peat resource as a whole is considered to be of value at both the county (local) and national scale.

5.2.3 Damage to palaeo-environmental archives in peat and alluvium through drainage and excavation has been identified as one of the principal threats to geodiversity in Norfolk[18]. Non-recording or sampling of temporary exposures, including road cuttings, quarry sections, and, by inference, excavations within floodplain peat is also a key issue.

Impact of proposals upon palaeological resource

5.2.4 The footprint of the proposed development occupies approximately 0.1ha, and will result in the removal of approximately 1,000 cubic metres of uncut peat (the remainder of the excavation will remove clay and Crag). This represents the loss of a carbon storage resource, and also the loss of intact interdigitating marine and terrestrial sequences (some 0.001% of the overall uncut peat resource in the Broads, and between 0.001 and 0.0025% of the uncut intercalated deposits).

5.2.5 The proposals result in the removal of a relatively small quantity of a finite resource. This is a permanent change that will affect a natural geomorphological system, albeit on a very localised scale, and is a permanent change to the natural earth heritage resource at the local level. In summary, the impact is considered to be Significant and Adverse, however the magnitude of impact is minor, given the very small area of land which will be affected.

[17] Tim Holt-Wilson 2010 *Norfolk's earth heritage – Valuing our Geodiversity*. Norfolk Geodiversity Partnership
[18] Tim Holt-Wilson 2010 *Norfolk's earth heritage – Valuing our Geodiversity*. Norfolk Geodiversity Partnership

6 Recommendations

6.1.1 Trial trenching is thought to be unlikely to be possible or effective given the very wet, loose nature of much of the Upper Peat and Upper Clay, and it is considered that, should NHES require further ground investigation to be undertaken, that this is carried out by watching brief during excavation of the new boat dyke. Recommendations on the level of any archaeological work required will be made by NHES.

6.1.2 The following mitigation will be adopted for loss of the palaeological and geo-archaeological record:

- The interdigitating sequences of peat and clay in the area to be excavated have been fully recorded through peat stratigraphy survey. The survey records have been reproduced in this report.
- The Norfolk Geological Society will be invited to visit the site during excavation and make records of the exposed peat faces
- The excavated material will be maintained wet through being utilised in dyke restoration on the adjacent SSSI. The new reedbed which is created on the SSSI will continue to form new peat deposits and hence store atmospheric carbon.

Appendices

Appendix 1

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
A1		0-76	Hemic brown peat		UPPER PEAT	POST ROMAN
		76-82	Fibric brown peat, paler than previous and very wet		UPPER PEAT	POST ROMAN
		82-121	Silty grey estuarine clay with reedy inclusions; including narrow bands of reed peat	Deposited in brackish conditions	UPPER CLAY	ROMAN
		121-139	Very wet fibric peat in silty matrix		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		139-165	Silty clay		CRAG	
		182-200	Firm, gritty clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39572					
Northing	17655					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
A2		0-41	Brown hemic peat; soft and loose. Contains rhizome mat.		UPPER PEAT	POST ROMAN
		41-78	Loose wet fibric reed peat		UPPER CLAY	ROMAN-POST ROMAN
		78-90	Organic grey clay with reed peat inclusions	Possibly developed under brackish conditions	UPPER CLAY	IRON AGE-ROMAN
		90-133	Organic silty clay		UPPER CLAY	IRON AGE-ROMAN
		133-150	Narrow band of reddish fibric peat.			IRON AGE-ROMAN
		150-176	Silty fibric peat		MIDDLE PEAT	BRONZE AGE-IRON AGE

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		176-180	Gritty grey clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39574					
Northing	39579					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
A3		0-49	Red-brown, fudgy hemic peat, becoming very wet with depth.		UPPER PEAT	POST ROMAN
		49-72	Loose wet fibric reed peat		MIDDLE PEAT	BRONZE AGE
		72-121	Silty organic clay with reed inclusions; becoming firmer with depth	Possibly developed under brackish conditions	UPPER CLAY	POST ROMAN
		121-152	Solid sapric red peat.		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		152-182	Reddish fibrous peat with numerous reed fragments		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		182-190	Sandy clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39579					
Northing	17646					
WATER TABLE:	10					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
A4		0-32	Brown hemic reed peat containing numerous rootlets/reed rhizome mat; becoming paler with depth		UPPER PEAT	POST ROMAN
		30-64	Very wet fibric reed peat		UPPER PEAT	POST ROMAN
		64-91	Light brown organic clay with high peat content; numerous reed fragments and reed peat inclusions	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		91-117	Silty organic clay with reed fragments		MIDDLE PEAT	NEOLITHIC
		117-145	Slightly silty, wet brown hemic peat with reed fragments		MIDDLE PEAT	NEOLITHIC
		145-151	Gritty grey clay with small sub angular flints		CRAG	
		151-162	Sandy clay, becoming firmer and more gritty with depth		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39578					
Northing	17642					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
A5		0-31	Soft pale brown hemic reed peat; becoming firmer with depth		UPPER PEAT	POST ROMAN
		31-76	Very wet reddish fibric reed peat		UPPER PEAT	POST ROMAN
		76-80	Brown, silty peaty clay containing reed rhizomes	Possibly developed under brackish conditions	UPPER CLAY	ROMAN

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		80-115	As above, with increasing clay content with depth		UPPER CLAY	ROMAN
		115-148	Gritty coarse grey clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39579					
Northing	17639					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	just off edge of dredged spoil					
A6		0-20	Mixture of humified peat, sand and silt	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		20-57	Hemic reed peat; quite firm. Large flint fragment found at c55cm	Flint assumed to have moved down from dredged deposits above.	UPPER PEAT	POST ROMAN
		57-91	Very wet reddish fibric reed peat, with rhizomes throughout		UPPER PEAT	POST ROMAN
		91-132	Soft wet grey clay containing reed rhizomes	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		132-135	Gritty, firm clay with fragments of gravel		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39582					
Northing	17629					
WATER TABLE:	30					
VEGETATION:	pond sedge					
MANAGEMENT:	none					

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
NOTES:	surface 15cm above A5					
A7		0-65	Moist hemic reed peat containing rhizomes and root matter		UPPER PEAT	POST ROMAN
		65-113	Buttery grey organic clay containing numerous reed rhizomes and root fragments	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		113-131	Wet loose peat containing reed rhizomes		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		131-152	Gritty grey clay; loose and wet. Contains small sub angular stone fragments		CRAG	
		152-160	Grey sand and gravel		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39582					
Northing	17624					
WATER TABLE:	10					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	surface 20cm below A6					
A8		0-28	Humified crumbly dark peat containing root matter	Possibly partially derived from dredged material. Has formed soil in presence of oxygen		MODERN
		28-45	Moist red brown fibric reed peat containing rhizomes and root matter		UPPER PEAT	POST ROMAN
		45-81	Wet sloppy fibric reed peat		UPPER PEAT	POST ROMAN

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		55-136	Silty wet organic clay containing numerous reed rhizomes and root fragments	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		136-152	Solid hemic red brown peat with wood inclusions		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		152-180	Gritty grey clay containing large amounts of sand and gravel.		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39583					
Northing	17617					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	c10cm above A7					
A9		0-15	Hemic, slightly decomposed brown peat	Beginning to form soil in presence of oxygen		MODERN
		15-47	Wet hemic reed peat containing numerous rhizomes and root matter		UPPER PEAT	POST ROMAN
		47-75	Wet fibric reed peat in silty matrix. Narrow band of wet reddish peat at c70cm		UPPER PEAT	POST ROMAN
		75-90	Silty wet organic clay containing numerous reed rhizomes and root fragments.	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		90-119	As above, but with clay becoming firmer and less organic with depth	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		119-130	Pure grey clay		UPPER CLAY	IRON AGE-ROMAN

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		130-159	Buttery grey clay with organic inclusions, including fragments of reed rhizome	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		159-170	Solid hemic brushwood peat with wood inclusions		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		170-175	Grey sand containing sub angular gravel fragments and some clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39584					
Northing	17613					
WATER TABLE:	10					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	c10cm below A8					
A10		0-19	Hemic, grey brown peat with reed rootlets		UPPER PEAT	POST ROMAN
		19-50	Wet hemic brown peat containing numerous rhizomes		UPPER PEAT	POST ROMAN
		50-72	Wet fibric reed peat in silty matrix. Narrow band of wet reddish peat at c70cm		UPPER PEAT	POST ROMAN
		72-85	Silty wet organic clay containing numerous reed rhizomes and root fragments, becoming wetter and sloppier with depth.	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		85-106	As above, but with clay becoming less organic with depth	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		106-144	Firm grey clay containing reed rhizomes		UPPER CLAY	IRON AGE-ROMAN

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		144-160	Solid red brown hemic brushwood peat with large wood inclusions. Containing very small stone fragments in lower third		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		160-195	Dark earthy peat soil containing small wood and stone fragments		PALAEOSOL	PRE NEOLITHIC??
		195-200	Grey sand containing sub angular gravel fragments		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39589					
Northing	17605					
WATER TABLE:	15					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
A11		0-51	Homogeneous hemic peat with reed rhizomes, becoming moister and redder in colour with depth		UPPER PEAT	POST ROMAN
		51-72	Wet grey yellow fibric peat in a silty matrix, containing numerous reed rootlet fragments	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		72-131	Silty, buttery grey clay containing numerous reed rhizomes and root fragments	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		131-155	Band of hemic red brown peat mixed with clay. Some wood fragments	Possibly developed under brackish conditions	UPPER PEAT/CLAY	ROMAN

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		155-200	Solid red brown hemic brushwood peat with large wood inclusions. Containing very small stone fragments towards bottom of sample		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39587					
Northing	17603					
WATER TABLE:	10					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
A12		0-15	Humified dark brown peat	Beginning to form soil in presence of oxygen		MODERN
		15-49	Firm, buttery hemic peat		UPPER PEAT	POST ROMAN
		49-64	Loose wet fibric peat containing numerous rhizomes and reed root fragments	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		64-103	Very wet, liquid fibric peat with traces of silt and clay towards the base of the sample	Possibly developed in former channel	UPPER PEAT/CLAY	ROMAN-POST ROMAN
		103-111	Firm red hemic peat with reed rhizomes		UPPER PEAT	ROMAN
		111-138	Sloppy wet organic clay with reed rootlets	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		138-152	Solid red brown hemic brushwood peat with wood inclusions.		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		152-200	Wet hemic reed peat		MIDDLE PEAT	NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
Easting	39587					
Northing	17603					
WATER TABLE:	15					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	on shallow dredgings					
	c10cm above previous					
A13		0-28	Homogeneous hemic peat containing numerous reed rootlets		UPPER PEAT	POST ROMAN
		28-111	Loose unconsolidated fibric reed peat; very wet and sloppy	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		111-119	Loose wet fibric peat in a silty matrix	Possibly developed under brackish conditions	UPPER PEAT/CLAY	POST ROMAN
		119-169	Organic silty grey clay contain fragments of reed	Possibly developed under brackish conditions	UPPER PEAT/CLAY	ROMAN
		169-181	Blue-grey clay with occasional fragments of reed rhizome		UPPER CLAY	ROMAN
		181-200	Pure blue grey clay		UPPER CLAY	ROMAN
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39586					
Northing	17600					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
	c10cm below previous					

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
A14		0-27	Homogeneous hemic peat containing numerous reed rootlets and rhizomes		UPPER PEAT	POST ROMAN
		27-106	Loose unconsolidated fibric reed peat in silty matrix; very wet and sloppy; becomes slightly denser with depth	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		106-141	Buttery blue grey clay containing reed rhizomes and some organic matter	Possibly developed under brackish conditions	UPPER CLAY	ROMAN
		141-200	Red brown, hemic brushwood peat with occasional reed and wood inclusions		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39582					
Northing	17591					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
A15		0-47	Humified peat-based soil containing clay and sedge peat inclusions and root matter	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		47-111	Hard blue clay with organic inclusions	Derived from dredged material.		MODERN
		111-122	Homogeneous, firm hemic reed peat	Compressed by overlying deposits	UPPER PEAT	POST ROMAN
		122-141	Firm yellow-grey fibric reed peat in silty matrix	Possibly developed in former channel. Compressed by overlying deposits.	UPPER PEAT	POST ROMAN

Appendix 1
Results of stratigraphy survey

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
		141-165	Firm brown fibric reed peat, becoming denser in texture, and darker in colour, with depth	Possibly developed in former channel. Compressed by overlying deposits.	UPPER PEAT	POST ROMAN
		165-200	Blue grey clay containing occasional reed rhizomes	Possibly developed under brackish conditions	UPPER CLAY	IRON AGE-ROMAN
			END OF LOG			
RECORDER(S)	RJD, JMP, KS					
GRID REF	TG					
Easting	39580					
Northing	17589					
WATER TABLE:	70					
VEGETATION:	pond sedge					
MANAGEMENT:	none					
NOTES:	c40cm above A14					
	On dredged material					

CORE		DEPTH (cm)	FIELD OBSERVATIONS	INTERPRETATION	DEPOSIT	APPROX DATE
B1		0-29	Homogeneous soil comprised of humified peat and dredged clay. Some root fibres.	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		29-73	Homogeneous red brown peat. Layer of sand at 35cm and a layer of estuarine clay at 45cm	Dredged material.		MODERN
		73-103	Homogenous hemic red brown reed peat. Numerous reed fragments.		UPPER PEAT	POST ROMAN
		103-132	Smooth grey estuarine clay with numerous reed fragments; becoming more organic with depth.		UPPER CLAY	ROMAN
		132-150	Mid-brown, sapric brushwood peat with small wood fragments		MIDDLE PEAT	NEOLITHIC
		150-161	Hemic reed peat - some silt content		MIDDLE	NEOLITHIC

					PEAT	
		161-180	Coarse, sandy/gritty clay containing rhizome fragments	Derived from crag?	CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39581					
Northing	17652					
WATER TABLE:	60					
VEGETATION:	amenity grass					
MANAGEMENT:	mown					
NOTES:	On dredgings					
B2		0-47	Humified dark brown peat admixed with clay. Some sandy content. Becomes more consolidated with depth.	Derived from dredged material. Peat deposit out of context		MODERN
		47-59	Red brown hemic peat. Well consolidated. Numerous reed fragments.		UPPER PEAT	POST ROMAN
		59-95	Mid brown hemic peat, with numerous reed rhizomes and fragments. Fairly uniform, although becomes denser and more sapric with depth.		UPPER PEAT	POST ROMAN
		95-127	Smooth organic estuarine clay with numerous reed rhizomes.	Deposited in brackish reedswamp?	UPPER CLAY	ROMAN
		127-150	Fudgy red brown sapric brushwood peat. Small wood inclusions.		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		150-167	Fudgy red brown sapric peat. No wood inclusions.		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		167-180	Coarse sandy clay, with few gravel inclusions.		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					

GRID REF	TG					
Easting	39583					
Northing	17646					
WATER TABLE:	60					
VEGETATION:	Pond sedge					
MANAGEMENT:	none					
NOTES:	On dredgings					
	20cm lower than B1					
B3		0-15	Humified moist dark brown peat		UPPER PEAT	POST ROMAN
		15-55	Consolidated red brown hemic peat with numerous reed rhizomes.		UPPER PEAT	POST ROMAN
		55-60	As above, but with traces of clay		UPPER PEAT	POST ROMAN
		60-81	Organic estuarine clay with numerous rhizome fragments		UPPER CLAY	ROMAN
		81-90	Red brown sapric peat. Well consolidated with fudgy texture. Occasional reed inclusions.		MIDDLE PEAT	NEOLITHIC
		90-132	Loose red brown hemic peat with numerous reedy inclusions.		MIDDLE PEAT	NEOLITHIC
		132-151	Sapric brushwood peat with inclusions of both reed and wood		MIDDLE PEAT	NEOLITHIC
		151-168	Sapric peat, becoming wetter with depth. Fewer wood inclusions.		MIDDLE PEAT	NEOLITHIC
		168-190	Gritty pale grey sandy clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39581					
Northing	17644					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						

	On TRANSECT A					
B4						
		0-14	Consolidated dark brown humified peat		UPPER PEAT	POST ROMAN
		14-50	red brown hemic reed peat containing reed rhizome mat.		UPPER PEAT	POST ROMAN
		50-72	Pale brown hemic peat, becoming more buttery and cohesive with depth. Numerous rhizomes and reed rootlets		UPPER PEAT	POST ROMAN
		72-157	Grey estuarine clay, with numerous reed inclusions - high organic content. Becomes more consolidated with depth		UPPER CLAY	ROMAN
		157-200	Red brown sapric brushwood peat - fudgy texture with wood inclusions		MIDDLE PEAT	BRONZE AGE-NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39579					
Northing	17644					
WATER TABLE:	30					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
B5						
		0-15	Slightly humified hemic dark brown reed peat		UPPER PEAT	POST ROMAN
		15-40	red brown hemic reed peat - well consolidated		UPPER PEAT	POST ROMAN
		40-55	Pale reddish-brown, very wet fibric peat. Numerous reed rhizomes and roots		UPPER PEAT	POST ROMAN

		55-111	Organic grey estuarine clay, with numerous reed rhizomes	Upper estuarine deposits	UPPER CLAY	ROMAN
		111-115	buttery peat inclusion			
		115-122	Organic grey estuarine clay, with numerous reed rhizomes	Upper estuarine deposits	UPPER CLAY	ROMAN
		122-140	Clay-peat matrix with numerous reedy inclusions	Upper estuarine deposits	UPPER CLAY	ROMAN
		140-153	Soft loose red brown hemic peat. No wood fragments	Formed in reedbed	MIDDLE PEAT	BRONZE AGE - NEOLITHIC
		153-200	Fudgy red brown sapric peat with reed inclusions.	Formed in reedbed	MIDDLE PEAT	NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39569					
Northing	17641					
WATER TABLE:	20					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						

CORE		**DEPTH (cm)**	**FIELD OBSERVATIONS**	**INTERPRETATION**	**DEPOSIT**	**APPROX DATE**
C1		0-77	Coarse, gritty dark brown, loam soil. Occasional peat inclusions (from dredged material)	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		77-89	Humified loamy, firm peat. Some reed fragments and rhizomes.		UPPER PEAT	POST ROMAN
		89-121	Dark-brown, firm sapric peat with 'fudgy' texture; partially humified. Contains occasional reedy inclusions.		UPPER PEAT	POST ROMAN
		121-135	Coarse, grey sand with gravel inclusions	Possibly stained by humus	CRAG	

			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39595					
Northing	17624					
WATER TABLE:	90					
VEGETATION:	amenity grass					
MANAGEMENT:	mown					
NOTES:	On dredgings					
C2		0-63	Light brown sandy loam soil containing reed fragments, occasional peaty inclusions and large stones	Derived from dredged material. Peat deposit out of context		MODERN
		63-81	Dark grey, firm estuarine clay with reed fragments. Peaty inclusions.	Derived from dredged material. Peat deposit out of context		MODERN
		81-90	Humified brown peat with fragments of reed rhizome		UPPER PEAT	POST ROMAN
		90-105	As above, but with large flint fragments - these are assumed to have 'sunk' into deposit from dredged material above		UPPER PEAT	POST ROMAN
		105-119	Wet hemic peat with numerous reed fragments		UPPER PEAT	POST ROMAN
		119-135	Wet sapric peat - fudgy, with few plant remains		UPPER PEAT	POST ROMAN
		135-150	Very dark grey sand, admixed with clay. Numerous large gravel fragments and high organic content.		CRAG	
		150-166	As above, becoming paler with depth		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					

Easting	39592					
Northing	17627					
WATER TABLE:	80					
VEGETATION:	Tall Herb fen					
MANAGEMENT:	none					
NOTES:	On dredgings					
	10cm higher than C1					
C3		0-28	Gritty, coarse brown-grey loamy soil	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		28-50	Very dark brown, gritty humified peat with roots and plant fragments.	Probable dredged material		MODERN
		51-52	Band of light grey sand	Dredged material - out of context		MODERN
		52-71	Hemic red brown peat with numerous reed rootlets		UPPER PEAT	POST ROMAN
		71-86	Sapric fudgy red brown peat with occasional reed rhizome fragments		UPPER PEAT	POST ROMAN
		86-135	Red brown fibric peat		UPPER PEAT	POST ROMAN
		135-160	Grey estuarine clay with v high organic content. Numerous reed fragments and root matter.	Possibly developed in former channel, under brackish conditions	UPPER CLAY	POST ROMAN
		160-185	Gritty grey clay with high organic content	Estuarine clay possibly deposited over eroded crag surface	UPPER CLAY	ROMAN
		185-190	Coarse, grey sand with some clay content		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39586					
Northing	17626					

WATER TABLE:	55					
VEGETATION:	Tall Herb fen					
MANAGEMENT:	none					
NOTES:	On dredgings					
	c10cm lower than C2					
C4		0-16	Dark brown hemic peat with reed rootlets		UPPER PEAT	POST ROMAN
		16-30	Wet, light red-brown hemic reed peat containing reed rhizome mat.		UPPER PEAT	POST ROMAN
		30-55	Red-brown, very wet fibric peat. Wet and sloppy.		UPPER PEAT	POST ROMAN
		55-60	Grey estuarine clay, with numerous reed inclusions - high organic content		UPPER CLAY	ROMAN
		60-117	Very loose wet yellow-grey estuarine clay with high fibric peat content.	Upper estuarine deposits	UPPER CLAY	ROMAN
		117-120	Red brown, sapric, brushwood peat. Occasional wood inclusions.		MIDDLE PEAT	NEOLITHIC
		120-138	Very wet sapric peat with large number of reed inclusions.	Formed in reedbed	MIDDLE PEAT	NEOLITHIC
		138-151	Grey, sandy crag clay		CRAG	
		151-155	Grey sand		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39581					
Northing	17625					
WATER TABLE:	5					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	Just off edge of dredgings					

	c40cm lower than C3					
C5		0-22	Wet, light brown hemic reed peat containing reed rhizome mat.		UPPER PEAT	POST ROMAN
		22-56	Red-brown fibric peat. Wet and sloppy.		UPPER PEAT	POST ROMAN
		56-103	Grey estuarine clay, with reed inclusions		UPPER CLAY	ROMAN
		103-114	Very wet yellow-grey estuarine clay with some fibric peat content.	Upper estuarine deposits	UPPER CLAY	ROMAN
		114-133	Red brown, sapric brushwood peat. Occasional wood inclusions.		MIDDLE PEAT	NEOLITHIC
		133-140	Grey, sandy crag clay		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39576					
Northing	17625					
WATER TABLE:	5					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:	Just off edge of dredgings					
	on line of TRANSECT A					
CORE		**DEPTH (cm)**	**FIELD OBSERVATIONS**	**INTERPRETATION**	**DEPOSIT**	**APPROX DATE**
D1		0-29	Gritty dark brown, clay-loam soil. V uniform and well-consolidated. Occasional flint inclusions (from dredged material)	Derived from dredged material. Has formed soil in presence of oxygen		MODERN

		29-75	Dark brown, uniform clay-loam soil. Well consolidated, and becoming wetter and darker in colour with depth. Large flint fragments present.	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		75-79	Narrow inclusion of grey sand.	Derived from dredged material. Crag deposit out of context.		MODERN
		79-101	Dark-brown, consolidated sapric peat with 'fudgy' texture; partially humified. Contains occasional wood inclusions.		UPPER PEAT	POST ROMAN
		101-117	Fibric red-brown peat, containing numerous reed rhizomes, root fibres etc		UPPER PEAT	POST ROMAN
		117-138	Organic grey estuarine clay; very sloppy, and containing abundant reed fragments and occasional inclusions of fibric reed peat.	Deposited in brackish conditions	UPPER CLAY	ROMAN
		138-150	Gritty, very dark, humified peat admixed with sand. Contains wood fragments and large gravel fragments.	May derive from a thin layer of middle peat which has been compressed into/mixed with the underlying sand deposits, or from woodland growing on the palaeosol.	MIDDLE PEAT/PALAEOSOL	???
		150-182	Very dark, gritty, loamy soil. Some clay content.	May derive from a thin layer of middle peat which has been compressed into/mixed with the underlying sand deposits, or from woodland growing on the palaeosol.	PALAEOSOL	PRE NEOLITHIC??
		182-200	Coarse, light grey sand with flint fragments	Coloured by humus layer	CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39597					
Northing	17605					

WATER TABLE:	90					
VEGETATION:	amenity grass					
MANAGEMENT:	mown					
NOTES:	On dredgings					
D2		0-15	Light brown sandy soil containing numerous small flints	Derived from dredged material.		MODERN
		15-20	Very dark, almost black humified peat	Derived from dredged material.		MODERN
		20-28	Dark red-brown humified peat with root fragments.	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		28-35	Grey-brown organic clay.	Derived from dredged material.		MODERN
		35-70	Dark grey, consolidated estuarine clay with high organic content and occasional small flint inclusions. Peaty inclusion at 55-57cm	Derived from dredged material. Peat deposit out of context		MODERN
		70-76	Grey brown sapric peat - contains some clay	Possibly derived from dredged material.		MODERN
		76-102	Red brown, consolidated sapric peat with few visible plant remains. Becoming wetter with depth.		UPPER PEAT	POST ROMAN
		102-135	Fibric reed peat becoming admixed with estuarine clay with depth		UPPER CLAY	ROMAN-POST ROMAN
		135-145	Organic, smooth grey clay with reed inclusions		UPPER CLAY	IRON AGE-ROMAN
		145-151	Red-brown sapric peat with numerous large wood inclusions		MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		151-203	As above, becoming more consolidated, and darker in colour with depth		MIDDLE PEAT	NEOLITHIC

		203-210	Very dark brown (almost black), humified peaty loam. Some sand content.		PALAEOSOL	???
		210-239	As above, becoming darker and with a higher sand content with depth. Gravel and flint fragments occur in the bottom 5cm.		PALAEOSOL	???
		239-245	Coarse, dark grey sand	Coloured by humus layer	CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39594					
Northing	17605					
WATER TABLE:	80					
VEGETATION:	Tall Herb fen					
MANAGEMENT:	none					
NOTES:	On dredgings					
	10cm lower than D1					
D3		0-29	Sandy brown-grey loamy soil with high clay content.	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		29-78	Red-brown, fudgy hemic peat, with increasing preserved plant content with depth. Iris seed noted at c35cm, containing numerous reed and sedge rootlets		UPPER PEAT	POST ROMAN
		78-151	Wet, sloppy yellow-grey clay with high organic content. Numerous reed fragments and root matter.	Possibly developed in former channel, under brackish conditions	UPPER CLAY	POST ROMAN
		151-165	Pure estuarine clay	Possibly developed in former channel	UPPER CLAY	IRON AGE-ROMAN

		165-185	Black humified peaty loam, becoming gritty with depth.	May derive from a thin layer of middle peat which has been compressed into/mixed with the underlying sand deposits, or from woodland growing on the palaeosol.	PALAEOSOL	???
		185-200	Brownish-grey sand. Black humic stain at interface between soil and sand. Numerous flint and gravel inclusions		CRAG	
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39591					
Northing	17608					
WATER TABLE:	30					
VEGETATION:	Tall Herb fen					
MANAGEMENT:	none					
NOTES:	On dredgings					
	c20cm lower than D2					
D4		0-17	Dark, slightly humified hemic peat with reed rootlets		UPPER PEAT	POST ROMAN
		17-30	Red-brown hemic reed peat containing numerous rootlets/reed rhizome mat.		UPPER PEAT	POST ROMAN
		30-68	Red-brown, very wet fibric peat with numerous reed fragments. Wet and sloppy.		UPPER PEAT	POST ROMAN
		68-90	Very wet, sloppy grey estuarine clay, with numerous reed inclusions - bordering on fibric peat inclusions	Possibly developed in former channel	UPPER CLAY	ROMAN

		90-119	As above, becoming firmerwith depth.	Possibly developed in former channel	UPPER CLAY	IRON AGE-ROMAN
		119-152	Firm grey estuarine clay with frequent reed rhizome and reed fibre inclusions	Possibly developed in former channel	UPPER CLAY	IRON AGE-ROMAN
		155-178	Red brown, sapric peat with large number of reed inclusions. Very occasional wood inclusions	Formed in reedbed/open carr woodland	MIDDLE PEAT	NEOLITHIC
		178-200	Very dark brown (almost black), gritty humified peaty loam.	May derive from a thin layer of middle peat which has been compressed into/mixed with the underlying sand deposits, or from woodland growing on the palaeosol.	PALAEOSOL	???
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39588					
Northing	17607					
WATER TABLE:	0					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
	c30cm lower than D3					
D5		0-34	Red-brown hemic reed peat containing reed rhizomes		UPPER PEAT	POST ROMAN
		34-72	Red-brown, wet, sloppy fibric peat with numerous reed fragments.		UPPER PEAT	POST ROMAN
		72-123	Very wet, sloppy grey estuarine clay, with numerous reed inclusions	Possibly developed in former channel	UPPER CLAY	ROMAN

		123-155	Firm grey estuarine clay with frequent reed rhizome and reed fibre inclusions	Possibly developed in former channel	UPPER CLAY	IRON AGE-ROMAN
		155-200	Red brown, sapric peat with large number of wood inclusions	Formed in carr woodland	MIDDLE PEAT	NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39584					
Northing	17605					
WATER TABLE:	5					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						

CORE		**DEPTH (cm)**	**FIELD OBSERVATIONS**	**INTERPRETATION**	**DEPOSIT**	**APPROX PERIOD**
E1		0-25	Reddish brown, clay-loam soil. V uniform and well-consolidated	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		25-28	V dark, uniform clay-loam soil. Well consolidated	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		28-61	V dark, uniform clay-loam soil. Well consolidated. Occasional narrow inclusions of grey sand	Derived from dredged material. Has formed soil in presence of oxygen. Crag deposit out of context.		MODERN
		61-84	As above - becoming more crumbly with depth	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		84-85	Narrow inclusion of grey sand	Possibly developed in former channel		MODERN
		85-87	Dark red-brown compressed woody peat layer	Derived from dredged material. Peat deposit out of context		MODERN

		87-100	Dark brown, consolidated sapric peat; partially humified	Possibly derived from dredged material.		MODERN
		100-136	Consolidated red-brown hemic peat, containing numerous reed rhizomes		UPPER PEAT	POST ROMAN
		136-146	Yellowish-grey fibric reed peat, becoming slightly silty with depth		UPPER PEAT	POST-ROMAN
		146-157	Firm grey estuarine clay with numerous reed rhizome inclusions.	Deposited in brackish conditions	UPPER CLAY	ROMAN
		157-200	Grey, uniform, estuarine clay with occasional reed inclusions. Very occasional wood inclusions	Deposited in deeper water	UPPER CLAY	IRON AGE-ROMAN
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39593					
Northing	17591					
WATER TABLE:	70					
VEGETATION:	amenity grass					
MANAGEMENT:	mown					
NOTES:	On dredgings					
E2		0-14	Uniform red-brown peaty soil - high organic content	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		14-30	Consolidated grey clay soil with occasional peaty inclusions	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		30-57	As above - becoming more consolidated with depth	Derived from dredged material. Has formed soil in presence of oxygen		MODERN

		57-75	Pure, uniform dark grey clay. Occasional peaty inclusions towards bottom of sample	Derived from dredged material. Peat deposit out of context		MODERN
		75-80	Dark brown humified peaty layer	Derived from dredged material. Peat deposit out of context		MODERN
		80-99	Pure, consolidated, uniform dark grey clay.	Derived from dredged material.		MODERN
		99-110	Dark brown humified peat			??
		110-121	Dark red, consolidated hemic reed peat with occasional woody inclusions		UPPER PEAT	POST ROMAN
		121-136	Sloppy, fibric reed peat in silty matrix	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		136-150	More consolidated fibric reed peat. Traces of clay.	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		150-168	Very wet and sloppy: Yellow-grey fibric peat in clay matrix	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		168-180	Wet estuarine clay with numerous reed inclusions		UPPER CLAY	ROMAN
		180-200	Consolidated blue-grey clay	Deposited in deeper water	UPPER CLAY	IRON AGE-ROMAN
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39589					
Northing	17592					
WATER TABLE:	90					
VEGETATION:	bramble and nettle					
MANAGEMENT:	none					
NOTES:	On dredgings					
	20cm higher than E1					

E3		0-28	Uniform humified peat soil, becoming more consolidated with depth.	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		28-60	Wetter peaty soil, containing numerous reed and sedge rootlets	Derived from dredged material. Has formed soil in presence of oxygen		MODERN
		60-91	Very wet, sloppy, fibric reed peat.	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		91-127	Very wet, sloppy, fibric reed peat in silty matrix. Becomes slightly more consolidated with depth.	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		127-152	Very wet, sloppy, fibric reed peat in silty-clay matrix. Becomes slightly more consolidated with depth.	Possibly developed in former channel	UPPER CLAY	POST ROMAN
		152-165	Red brown, wet, but consolidated brushwood peat	Formed in carr woodland	MIDDLE PEAT	NEOLITHIC-BRONZE AGE
		165-211	Wet, hemic red-brown brushwood peat with large wood inclusions	Formed in carr woodland	MIDDLE PEAT	NEOLITHIC
		211-330	Very wet red-brown sapric peat with large wood inclusions	Formed in carr woodland	MIDDLE PEAT	NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39586					
Northing	17593					
WATER TABLE:	20					
VEGETATION:	pond sedge					
MANAGEMENT:	none					
NOTES:	On dredgings					
	c40cm lower than E2					

E4		0-20	Wet, sloppy, hemic reed peat	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		20-108	Very wet fibric reed peat in silty matrix	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		108-135	Very wet, grey estuarine clay, with numerous reed inclusions	Possibly developed in former channel	UPPER CLAY	IRON AGE-ROMAN
		135-200	Red brown, wet, brushwood peat; numerous wood inclusions	Formed in carr woodland	MIDDLE PEAT	NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39581					
Northing	17595					
WATER TABLE:	0					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						
	c20cm lower than E3					
E5		0-10	Muddy water within rootmat			MODERN
		10-30	Very wet, hemic brown peat with abundant reed fragments		UPPER PEAT	POST ROMAN
		30-91	Very wet, fibric reed peat	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		91-110	As above, becoming more silty with depth	Possibly developed in former channel	UPPER PEAT	POST ROMAN
		110-142	Very wet, grey estuarine clay with numerous reed inclusions; becomes more consolidated with depth	Possibly developed in former channel	UPPER CLAY	IRON AGE-ROMAN

		142-200	Dark red-brown sapric brushwood peat with very occasional wood inclusions		MIDDLE PEAT	NEOLITHIC
			END OF LOG			
RECORDER(S)	RJD, JMP					
GRID REF	TG					
Easting	39577					
Northing	17598					
WATER TABLE:	0					
VEGETATION:	reed					
MANAGEMENT:	none					
NOTES:						

Appendix 2

The Landscape Partnership. Safe System of Working on site.

Valid from: 4th February 2011
Valid to: 30th June 2011 and reviewed at that date.

1 Introduction

This Safe System of Working (SSW) on site is provided to give The Landscape Partnership and its staff the confidence to know that the Health and Safety of staff, sub-consultants and accompanying people working on site has been fully considered and that no unacceptable risks are taken. The SSW is intended to be applicable to site visits (i.e. outdoor workplaces and / or surveying visits) rather than, for example, meetings within other organisations' offices.

2 Operation of the Safe System of Working on site

Before attending site, you and your project manager are required to consider which potentially dangerous situations might be present on the site, and therefore which risk assessments you need to read. You must record the harm reduction measures appropriate to your visit. It is not always possible to predict the conditions to be found at some sites and a range of scenarios may be considered.

Complete the checklist below before visiting the site. You may complete it by hand or electronically; if you complete it electronically you may use the appropriate tick box instead of a signature. Use continuation sheets if necessary.

3 Checklist

3.1 Details of site visit

Name of site visit / project / location:

Hunters Yard Ludham

Date(s) and times of visit:

19/04/11 - 20/04/11 0830-1830

Names of TLP Staff, sub-consultants and / or other people involved:

Jo Parmenter	Rob Driscoll
Kate Scrivener	

Description of site and work involved

Reedbed/tall herb fen

Peat stratigraphy survey along transects

3.2 Travelling to site

Have you recently read the 'travelling to site' risk assessment? Yes ☒ No ☐

Will you travel by car / train / walk / bus / other* (describe your journey)

Car via Acle to Ludham and then along Horsefen Road

Are there any potential hazards e.g unsafe car parking areas, risk of assault whilst walking to site from the station or bus stop, travel requirement whilst tired etc? Describe any potential hazards and your risk reduction mechanisms or write 'no specific hazards'

N/A

3.3 Lone working

Have you recently read the 'lone working' risk assessment? Yes ☒ No ☐

Will you work on site alone? Yes ☐ No ☒

If lone working, who is your buddy who will know where you are, when you will be back, and who shall we contact if you don't report finishing on site?

Buddy:

Return time:

Contact on site:

3.4 Time of day for working

Have you recently read the 'on-site safety' risk assessment Yes ☒ No ☐

Will you work during the day? Yes ☒ No ☐

Will you work during the evening or night? Yes ☐ No ☒

Have you recently read the 'night-time working' risk assessment Yes ☐ No ☐ n/a☒

List any specific measures required to reduce risk for this site in relation to the time of day for working

N/A

3.5 Working in or near water

Are you working in water or close to water? Yes ☒ No ☐

Have you recently read the 'working in or near water' risk assessment?
Yes ☒ No ☐ n/a☐

Describe the water body characteristics (if known) e.g shallow pond, shallow stream, deep pit, fast-flowing river. Has it got steep banks or deep mud which would make it hard to escape from the water. If you are not familiar with the water body then you must assume that there is a potential risk from one or more of the above risk factors.

Shallow boat dyke (to 1m deep), edged with boardwalk appox 10cm above water surface, with access ramp.

May be shallow (to 5cm deep) water in base of reedbed.

Describe your work in relation to water e.g sampling aquatic fauna or flora, bankside surveys, no need to approach water's edge

Sampling in reedbed - no requirement to approach within 1m of waters edge

Water in reebed too shallow to pose hazard

Describe any specific measures required to reduce the risk for this site

Appropriate footwear Use of disinfectant handwash before eating/touching face Use of protective waterproof gloves

3.6 Working in or near buildings

Are you working in or near buildings, or parts of buildings not normally occupied by people e.g bat surveys in barns, disused factories, roof spaces? Yes ☐ No ☒

Have you recently read the 'working in or near buildings' risk assessment?
Yes ☐ No ☐ n/a☒

Have you asked the client for a copy of any asbestos survey Yes ☐ No ☐ n/a☒

Have you asked the client if the building is safe to enter / if there are any hazards present?
Yes ☐ No ☐

Describe any known hazards and measures required to reduce risk

3.7 Working in high risk sites

Are you working on a construction site, mine or quarry, motorway or trunk road, railway, confined space, industrial area or other difficult site? Yes ☐ No ☒

Have you recently read the 'working in difficult sites' risk assessment?Yes ☐ No ☐ n/a☒

Have you discussed the requirements for your working on these sites with the client or site manager in advance of your visit? Yes ☐ No ☐

Are you aware of the specific training you need to enter the site e.g. induction from site manager, certification requirements for motorway, railway, confined space, mines etc

Yes ☐ No ☐

Describe the required procedures you are required to implement for your work

4 Personal Protective Equipment

Indicate which PPE and other equipment you require as a result of the risk assessments

- ☒ Mobile phone, fully charged
- ☐ Site plan including escape routes
- ☐ Building plan including mark-up of asbestos or other hazardous areas
- ☐ Map of journey to site including parking arrangements
- ☒ Boots for rough or wet terrain
- ☐ Safety helmet
- ☐ Safety goggles
- ☐ Safety boots
- ☐ High-visibility waistcoat / jacket
- ☒ Sun cream / sunhat
- ☒ Warm / waterproof clothes
- ☒ Gloves
- ☐ Torch with good batteries and a spare torch
- ☐ Dust mask
- ☐ Overalls
- ☐ Buoyancy aid or lifejacket
- ☐ Rope

Other (list)disinfectant hand wash

5 Approvals

I / we confirm that the information in this Safe System of Working on Site is correct to the best of our knowledge.

Name of TLP staff / sub-contractor	**date**	**Signature (sign or insert X if completing electronically)**
Jo Parmenter	18/04/11	☒
Kate Scrivener	18/04/11	☒
Rob Driscoll	18/04/11	☒
		☐
		☐
		☐
		☐

I have reviewed this information and consider that risks have been reasonably considered and the residual risk is acceptable.

Name of TLP Director / Associate Director / Associate / Project Manager	**date**	**Signature (sign or insert X if completing electronically)**
Jo PArmenter	18/04/11	☒

Appendix 3
OASIS form

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: thelands2-99331

Project details

Project name	Hunters Yard
Short description of the project	The objectives of this project are as follows: - to identify, characterise, describe and approximately date the gross superficial stratigraphic sequences in the area proposed for excavation - to identify any potential for presence of buried deposits or artefacts through identification and interpretation of particular types of deposits, including, but not restricted to, buried lenses of alluvial silt or mud, or fragments of wood - to undertake initial interpretation of the findings - to provide a detailed report of the survey findings and initial interpretation to Norfolk County Council Historic Environment Service sufficient to enable the HES to identify requirement for further site investigation
Project dates	Start: 19-04-2011 End: 01-06-2011
Previous/future work	No / Not known
Any associated project reference codes	ENF126444 - HER event no.
Type of project	Field evaluation
Site status	Area of High Ecological Value
Current Land use	Wetlands
Monument type	NONE None
Monument type	NONE None
Significant Finds	FLINT DAGGER Bronze Age
Methods & techniques	'Augering'
Development type	Boat Dyke excavation
Development type	Not recorded
Prompt	Direction from Local Planning Authority - PPS
Position in the planning process	Pre-application

Project location

Country	England
Site location	NORFOLK NORTH NORFOLK LUDHAM Hunters Yard
Postcode	NR29 5RA
Study area	1000.00 Square metres
Site coordinates	TG 39 17 52.6972930352 1.537567713750 52 41 50 N 001 32 15 E Point
Height OD / Depth	Min: 0m Max: 1.00m

Project creators

Name of Organisation	Norrfolk Museum and Archeology Service
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	The Landscape Partnership
Project director/manager	Jo Parmenter
Project supervisor	Jo Parmenter
Type of sponsor/funding body	Other Charitable Trust
Name of sponsor/funding body	Norfolk Heritage Fleet Trust

Project archives

Physical Archive Exists?	No
Digital Archive recipient	HES
Digital Contents	'Survey'
Digital Media available	'Text'
Paper Archive recipient	Brooklands House
Paper Contents	'Survey'
Paper Media available	'Report'

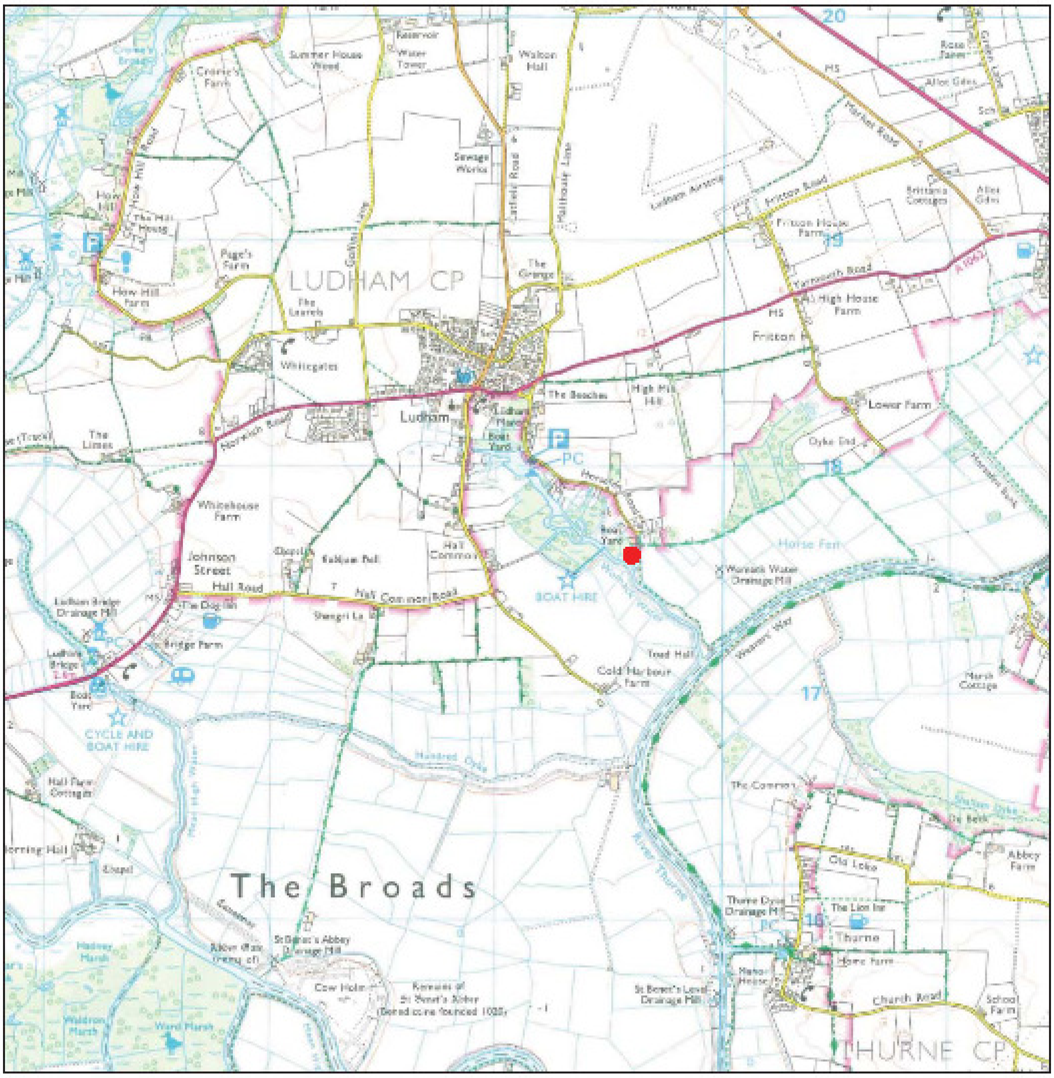
Project bibliography 1

Publication type	A forthcoming report
Title	Geo-archaeological Appraisal for Hunters Yard, Horsefen Road, Ludham, Norfolk
Author(s)/Editor(s)	The Landscape Partnership
Other bibliographic details	N11630
Date	2011
Issuer or publisher	The Landscape Partnership
Place of issue or publication	Norwich
Description	Geo-archaeological appraisal report
Entered by	Jo Parmenter (jo.parmenter@tlp.uk.com)
Entered on	20 June 2011

OASIS:

Figures

T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Fig 01 Location plan.indd



KEY:

● Site location

N10 630 Hunter's Yard

Location Plan

Figure 01

Scale 1: 25,000 @A4

October 2010

thelandscapepartnership

T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Site plan and location of transects.indd

Key

Transect

Position of core along transect

0m 5m 10m 25m

N10 630 Hunter's Yard, Ludham

Site plan and location of transects

Figure 02

Scale 1:500 at A4

May 2011

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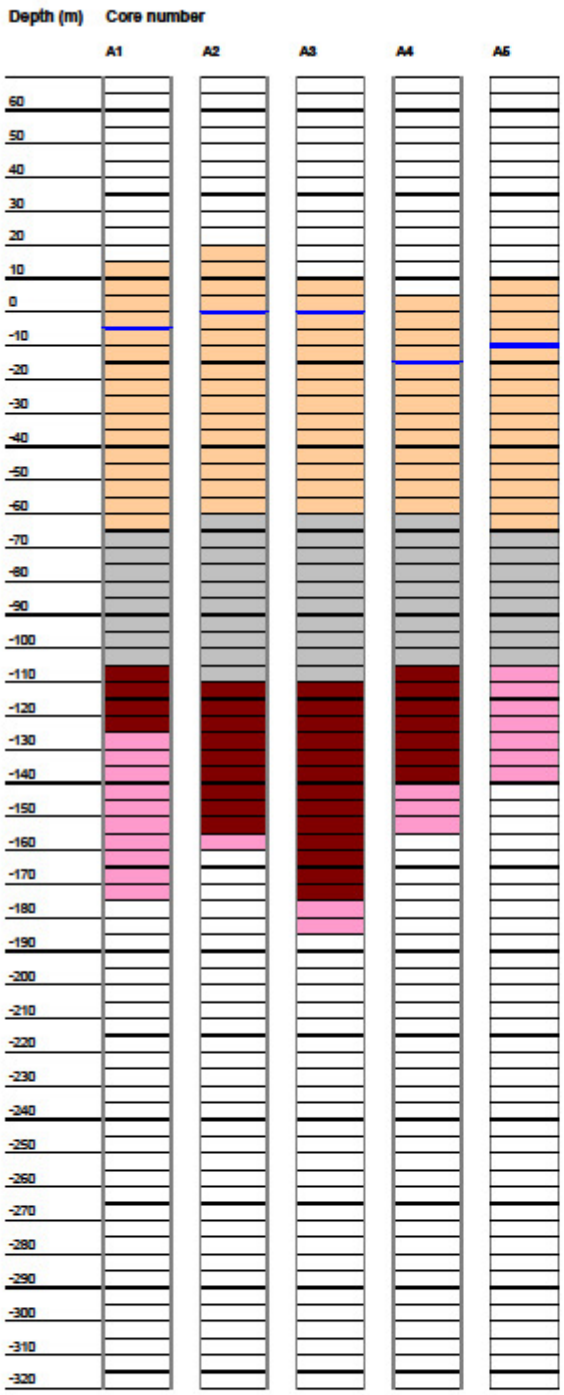
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3A-1\Components



Legend

- Dredgings
- Humified peat
- Upper peat
- Upper clay
- Middle peat
- Crag
- Palaeosol
- Water table (approx depth encountered)

N10 630 Hunter's Yard, Ludham

Borehole Log

Transect A - sheet 1 of 3

Figure 03A-1

Scale: not applicable

May 2011

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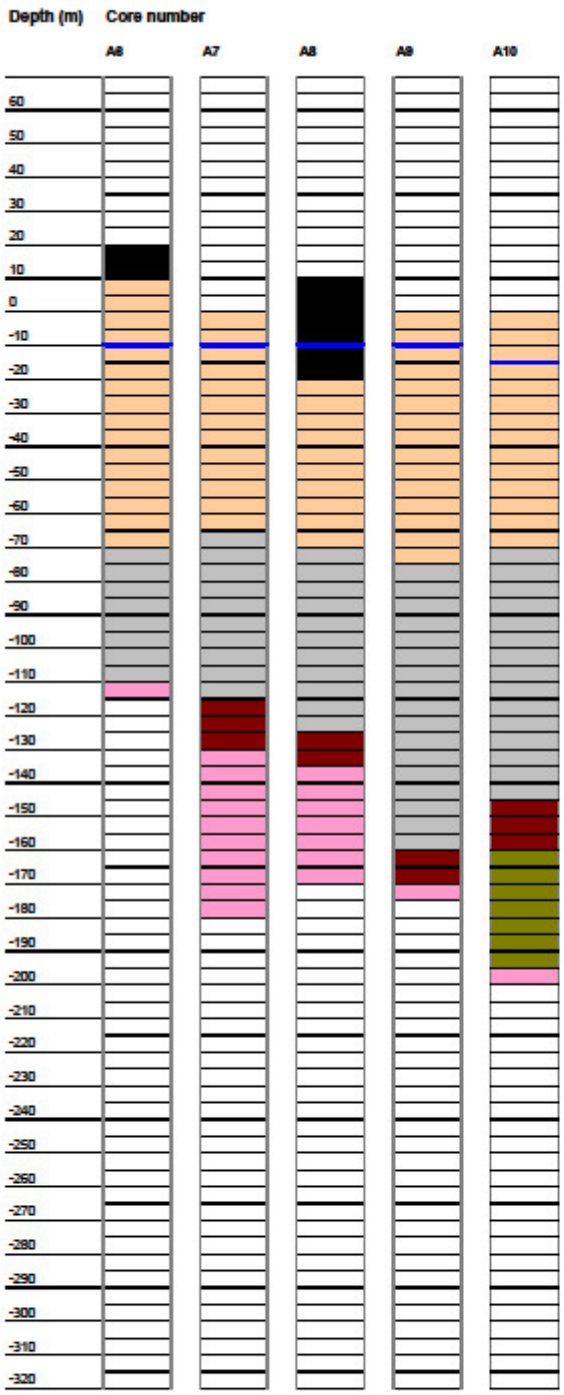
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3A-2\Components



Legend

- Dredgings
- Humified peat
- Upper peat
- Upper clay
- Middle peat
- Crag
- Palaeosol
- Water table (approx depth encountered)

N10 630 Hunter's Yard, Ludham

Borehole Log

Transect A - sheet 2 of 3

Figure 03A-2

Scale: not applicable

May 2011

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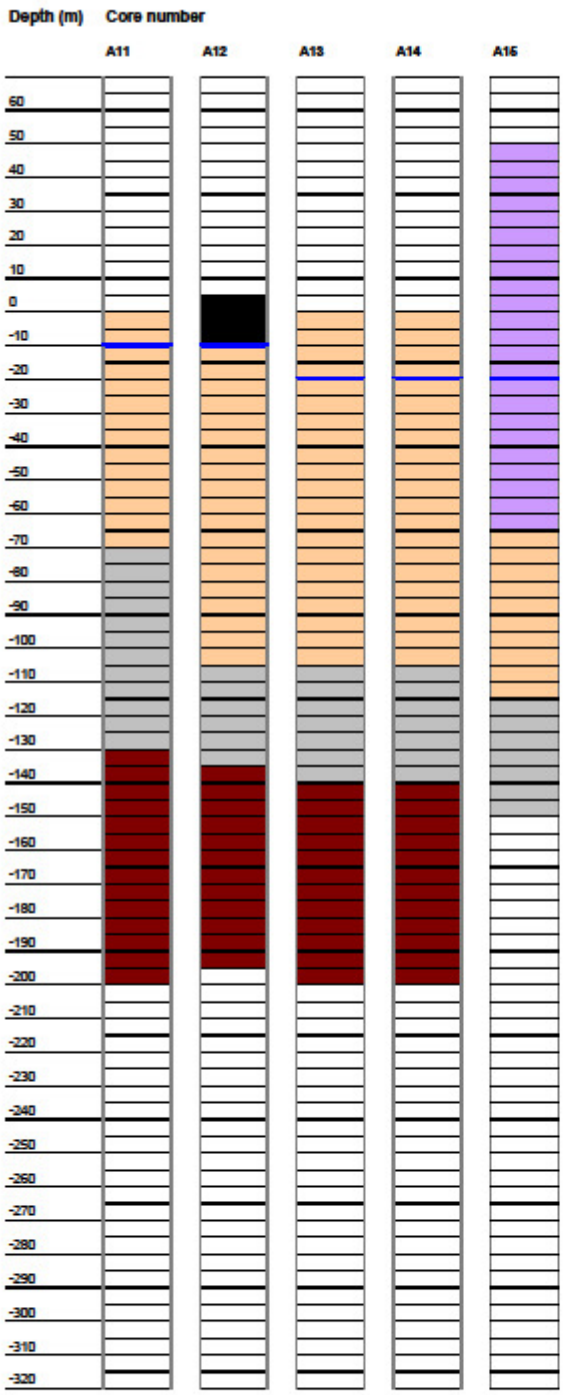
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3A-3\Components



Legend

- Dredgings
- Humified peat
- Upper peat
- Upper clay
- Middle peat
- Crag
- Palaeosol
- Water table (approx depth encountered)

N10 630 Hunter's Yard, Ludham

Borehole Log

Transect A - sheet 3 of 3

Figure 03A-3

Scale: not applicable

May 2011

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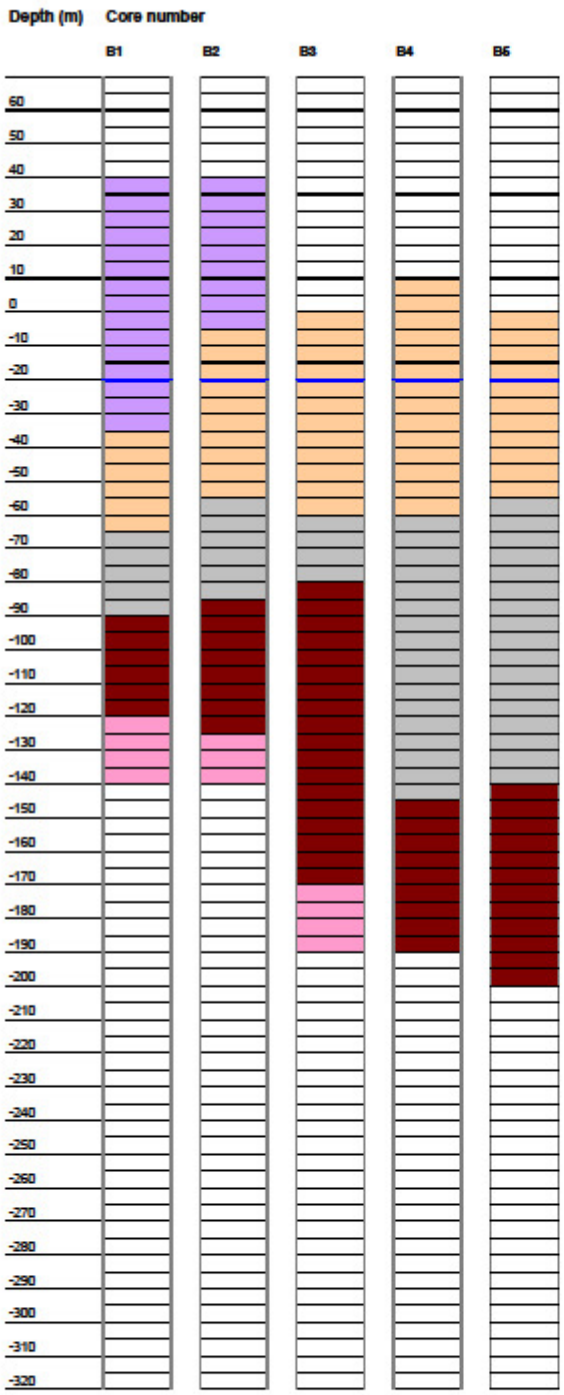
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3B\Components



Legend

- Dredgings
- Humified peat
- Upper peat
- Upper clay
- Middle peat
- Crag
- Palaeosol
- Water table (approx depth encountered)

N10 630 Hunter's Yard, Ludham

Borehole Log

Transect B

Figure 03B

Scale: not applicable

May 2011

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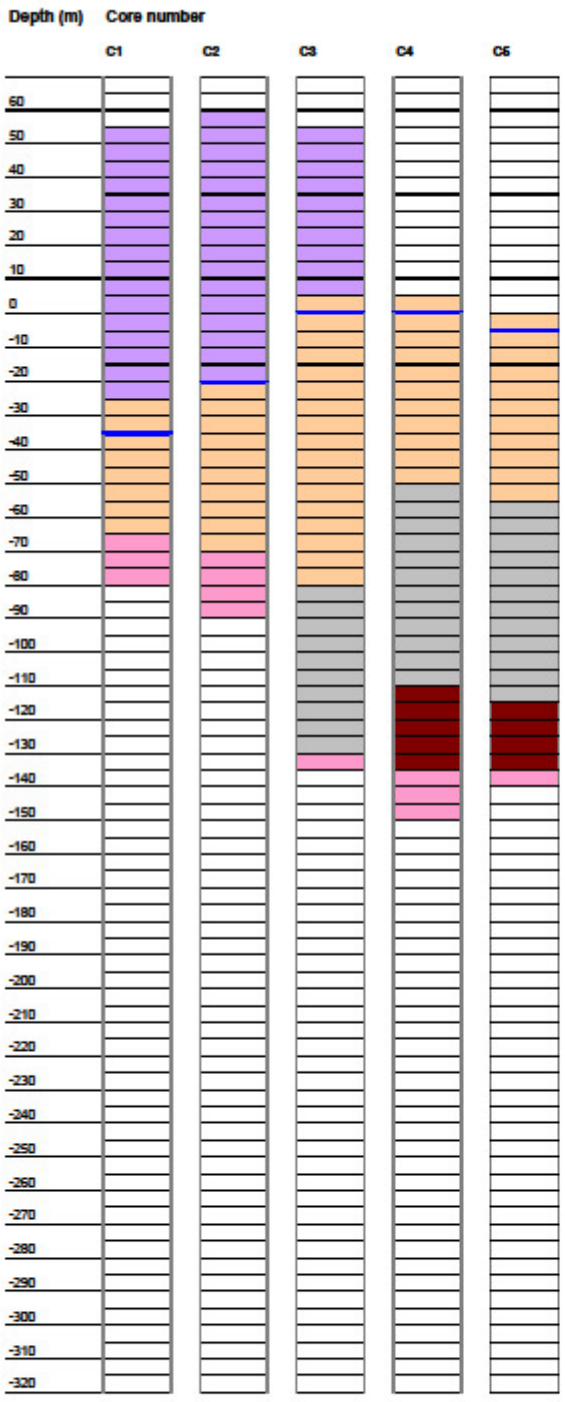
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3C\Components



N10 630 Hunter's Yard, Ludham

Borehole Log

Transect C

Figure 03C

Scale: not applicable

May 2011

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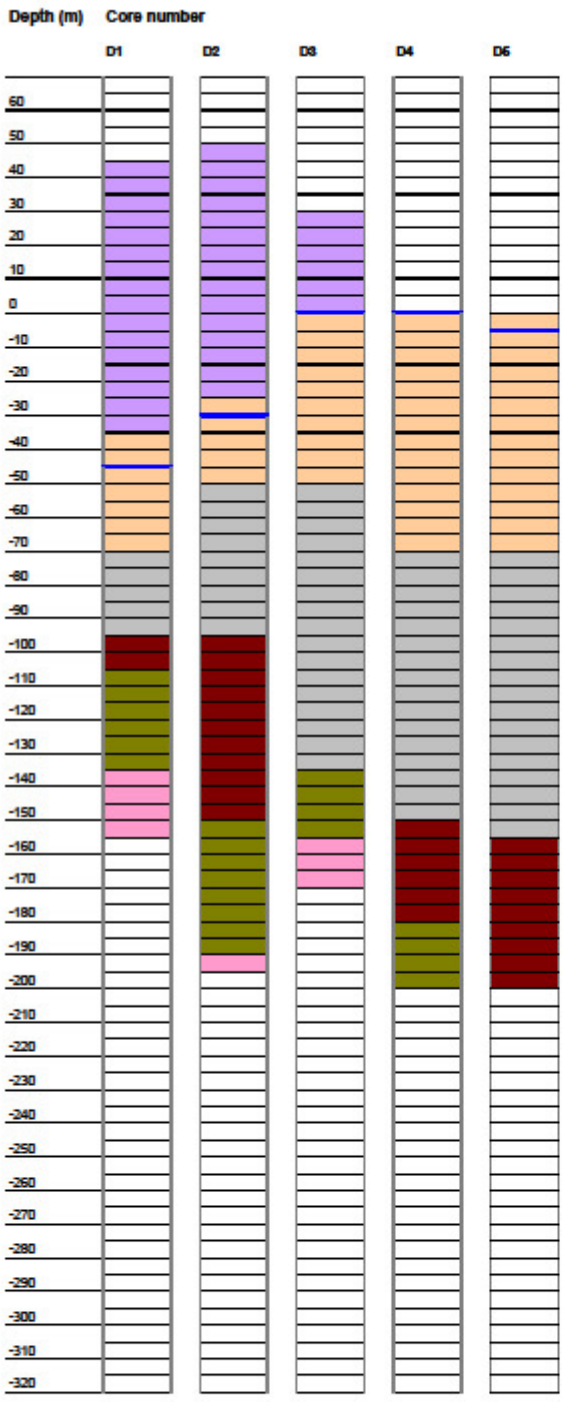
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3D Components



Legend

- Dredgings
- Humified peat
- Upper peat
- Upper clay
- Middle peat
- Crag
- Palaeosol
- Water table (approx depth encountered)

N10 630 Hunter's Yard, Ludham

Borehole Log

Transect D

Figure 03D

Scale: not applicable

May 2011

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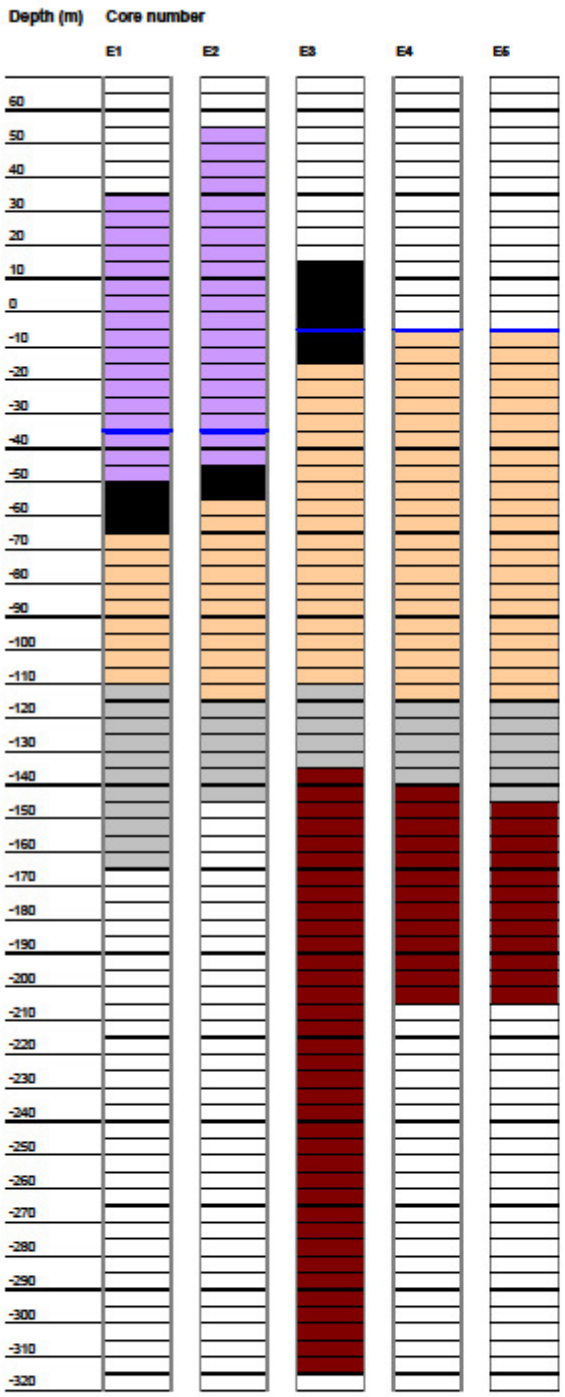
T:\2010 Projects\N10630 Hunters Yard Ludham\Drawings\Working Drawings\Figure 3E\Components



N10 630 Hunter's Yard, Ludham

Borehole Log

Transect E

Figure 03E

Scale: not applicable

May 2011

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