Lytham Quays, Liggard Brook, Lytham,

Lancashire

Archaeological Evaluation and Palaeoenvironmental Coring

Oxford Archaeology North

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Atkins Consultants Ltd

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SUMMARY

Following submission of a project design to meet a specification formulated by Atkins Consultants in liaison with Lancashire County Archaeology Service (LCAS), Oxford Archaeology North were commissioned to undertake a programme of archaeological work ahead of a proposed development on a *c*29 hectare site at the mouth of Liggard Brook, Lytham, Lancashire NGR SD 37910 22561. This program of work was to consist of an archaeological evaluation comprising the excavation of 23 trial trenches, coupled with a programme of palaeoenvironmental coring. Due to the current status of land ownership within the development area, it was proposed that a two-phased approach be undertaken. The first phase involved the excavation of 14 trenches (Trenches 8-14 and 17-22), and *c*75% of the required palaeoenvironmental coring (21 boreholes). Trenches 1-5, 15 and 16, and the outstanding coring requirements, will be undertaken during the second phase of fieldwork, once this land has been acquired.

The 14 evaluation trenches were positioned in such a manner as to investigate areas of known archaeological potential, particularly the graving dock and ship-building yard located to the north of the study area and identified from old maps. Trench 8 was placed staddling the flood defence associated with the former graving dock, and it is possible that truncated building debris dump ***51*** could relate to the demolition of this feature. Trenches 9-14 were placed within the suspected area of the former shipyard. Wall ***65*** within Trench 11 was on a very similar north-north-east/south-south-west alignment to that of a long building from the shipyard. Other features such as sunken barrel ***64*** (Trench 11), industrial floor surface ***76*** (Trench 14) may also relate to the shipyard, as might the layers of demolition debris ***69***, ***63*** (dated to 1887-1925 on the basis of finds), ***53*** (dated to the turn of the twentieth century), ***72*** and ***75*** in Trenches 9, 11, 12, 13 and 14 respectively.

Material in Trenches 17 and 20 was possibly indicative of attempts at land consolidation and reclamation, particularly as old maps show the areas investigated by these trenches to be either very close to the Ribble mudflats or within the marshy mouth of the Liggard Brook. Evidence for rubbish dumping was found in Trench 21, as was a possible path indicated on the 1895 map of the area. Many of the trenches encountered layers of naturally deposited sand and estuarine mud, several of which, such as the laminated layers in Trenches 21 (Contexts ***28***, ***30***, ***31***, ***34***, ***35*** and ***36***, for instance) and 22 (Contexts ***21-24***) may be indicative of periodic minor flooding.

Subsamples from three boreholes, L1, L9 and L13, forming a north-east/south-west-aligned transect across the site, were subjected to assessment of the analytical potential of preserved biological material. The basal deposits encountered within Borehole L1, at a depth of *c*4.5m, appeared to have developed within marine conditions. Subsamples taken at depths of between *c*3m and *c*5m suggested that the local area was well-vegetated by trees, shrubs, grasses and bracken, with some agricultural associates. Between *c*2m and *c*3m depth, there was evidence for increased wetness, with an increase in the proportion of heather pollen at the expense of agricultural indicators and trees. Above *c*2m depth, possibly representing the last 200 years, the proportion of agricultural indicators increased relative to trees. Deposits within Borehole L9 below *c*2.4m in depth had accumulated within brackish or marine conditions, above that, freshwater conditions. The subsamples indicated a progression from mixed deciduous woodland with limited pasture among the lower deposits, to an

increase in grass and pasture above *c*2.4m depth. Subsamples from the most northerly of the boreholes, L13, indicated that below *c*2m in depth, deposits had accumulated within a freshwater environment, most likely relating to the Liggard Brook, whereas above *c*2m there was a much greater marine influence, indicating either that sea levels had risen or, that the Liggard Brook had been a more significant water course in the past.

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The evaluation was undertaken by Paul Clark, Chris Naisbitt, Sarah Housley, Chris Ridings, Nicola Gaskell and Martin Sowerby. Chris Wild undertook the survey, whilst Denise Druce supervised the coring program. The report was written by Paul Clark and Denise Druce, with the drawings created by Emma Carter. Sylvia Peglar undertook the assessment of the pollen samples and contributed to the report accordingly. Ian Miller undertook the project management and Stephen Rowland edited the report, along with Alan Lupton.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 Prior to a proposed development on a *c*29 hectare site at the mouth of Liggard Brook, Lytham, Lancashire, NGR SD 37910 22561, the County Archaeologist at Lancashire County Council provided a verbal brief detailing the required archaeological works. In the first instance, an archaeological evaluation was required, comprising the excavation of 23 trial trenches, coupled with a programme of palaeoenvironmental coring. Due to the current status of land ownership within the development area, it was proposed that a two-phased approach be undertaken. The first phase involved the excavation of 14 trenches (Trenches 8-14 and 17-22), and *c*75% of the required palaeoenvironmental coring. Trenches 1-5, 15 and 16, and the outstanding coring requirements, will be undertaken during the second phase of fieldwork, once this land has been acquired.

1.1.2 This report details the results of the excavation of the evaluation trenches and the palaeoenvironmental coring, including a biological assessment.

1.2 SITE LOCATION, TOPOGRAPHY AND GEOLOGY

1.2.1 The site is located to the south-east of the main centre of Lytham, in an area bounded by Preston Road to the north-west, the government offices to the west and the estuary to the south-east (Fig 1).

1.2.2 The topography of the area is generally flat, with the present ground surface varying between roughly 5m and 9m OD. The original ground surface is, however, believed to have been obscured across much of the site by the deposition of material and landfill (Atkins n.d.).

1.2.3 The drift geology on the site is a combination of wind-blown sand and alluvial deposits, whilst the underlying solid geology comprises Triassic mudstone (Atkins n.d.).

1.3 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

1.3.1 ***Palaeolithic:*** the earliest evidence for human activity within the area is from Poulton-le-Fylde, approximately 10 km to the north of the site, with the 1970 discovery of an elk skeleton (*Alces alces*) containing barbed points, showing that this creature had been hunted by early man (Jacobi *et al* 1986). The elk is thought to have lived during the Windermere interstadial, between 12,400±300 BP (OxA-150), which was a period when the area was covered with lightly-wooded tundra (Middleton *et al* 1995, 87).

1.3.2 ***Mesolithic:*** The evidence for the Mesolithic in this area consists of a charcoal band at Starr Hills, dated to 8390±105 BP (Hv-4343) and interpreted as being anthropogenic in origin, along with five Late Mesolithic/Early Neolithic flint sites found as part of the North West Wetlands Survey (*ibid*). It is interesting to note that the evidence of the charcoal band suggests that 'much of the evidence for early Mesolithic activity will be buried under many metres of later marine silts and clays' (*ibid*).

1.3.3 ***Neolithic/Early Bronze Age:*** flint scatters continue to form the most numerous site type during the early Neolithic in Lancashire (Middleton 1996, 36), the most relevant Neolithic flint scatters in this instance having being published as part of the North West Wetlands Survey (Middleton *et al* 1995, 89-99). The mosses and coast appear to be the focus for settlement activity during the Late Neolithic/Early Bronze Age, and the closest known sites to the study area are located in Lytham Moss, *c*2 km to the north-west and in the dunes to the west (*ibid*). There are indications from pollen diagrams at Peel, to the north, that the occupation of the sites may have been associated with clearance of woodland and the cultivation of cereals (*ibid*).

1.3.4 ***Iron Age:*** no sites are recorded in the area between *c*1000 BC and the Romano-British period. It has been speculated that this period is marked by the expansion of raised mires to cover the area to the north-west of the study area, currently known as Lytham Moss, spreading to areas currently buried under modern sand dunes (*ibid*). This may account for the lack of Iron Age activity in the area, although it should be noted that very few Iron Age sites have been identified across the whole of Lancashire (Haselgrove 1996).

1.3.4 ***Romano-British:*** no sites of this period indicating local habitation are known in the area, although archaeological visibility of rural sites of this date is very poor within the region as a whole (Middleton *et al* 1995). A possible Roman road was described by Thornber (1837) running north-west from Kirkham (*c*15km to the north-east of Lytham) to the mouth of the river Wyre at Fleetwood, where he suggested the still undiscovered Roman town of *Portus Setantiorum* was sited. Alternatively, Whittaker (1773) suggests this town is located at Freckleton Naze on the River Ribble (*c*6km east of Lytham), while Shotter (1997, 114) suggests that it may be located near the southern end of Lake Windermere in Cumbria. During the North West Wetlands Survey (Middleton *et al* 1995), no trace of this road was located, although at the time of its original description in 1837, the agger was said to be being removed for road stone.

1.3.5 The Roman fort at Dowbridge, Kirkham, *c*8km to the north-east of Lytham, contains three phases of development (Howard-Davis and Buxton 2000). These comprise a series of three temporary camps with some permanent or semi-permanent structures in the late AD 70s or early 80s, followed by a small signal station/fortlet. The construction of a stone fort at the site in the second century AD, with outworks and a defensive annex, is thought to mark an increase in road and river commerce at Kirkham with other Roman sites in the Ribble Valley and with other seaports. It is likely that the fort would have been supplied via the Ribble, and a port in the Lytham area would potentially have been able to command riverine and coastal trade before sending goods inland by road.

1.3.6 ***Medieval:*** in 1086 the Domesday Survey assessed the township of Lytham (*Lidun*) at two plough-lands and was part of Earl Tostig's Amounderness Lordship, subsequently held by the crown in thegnage by the Lord of Woodplumpton (Farrer and Brownbill 1912, 214-215). Documentary evidence records that in 1190 the monastery at Durham gained Lytham at the bequest of the childless Richard Fitz Roger and duly established a cell or priory (*ibid*). It also indicates the presence of cultivated lands, pastures, mills and fisheries in the area, but also large areas of unreclaimed marsh land (Middleton *et al* 1995, 100).

1.3.7 ***Post-Medieval:*** this period, particularly the eighteenth and nineteenth centuries, witnessed extensive drainage of the mosses, although it is clear that some reclamation was already being undertaken in the seventeenth century. By the time Yate's map was surveyed in 1786, the southern section of Lytham Moss was no longer marked as a moss (Middleton *et al* 1995, 102-106). Flooding was a constant concern for the low-lying area, and by 1805, strong flood defences had been constructed as far as Warton, *c*5km eastwards along the Ribble estuary (Newsquest Media Group 2005). The Clifton family of Lytham Hall acquired land in the development area between 1812 and 1885, the parts of Lytham Moss not already included in their estate being purchased by 1822. They actively drained and enclosed areas, not so much to improve the value of the land as to acquire social prestige and political importance (*ibid*). Land reclamation (including part of the development area) within the estuary was achieved by planting lines of stakes perpendicularly from the bank into the river channel, so that vegetation might be trapped and silting encouraged (Atkins nd).

1.3.8 The sea remained Lytham's economic mainstay, with fishing and shipbuilding as the towns most important industries. The dockyard within the study area seems to have been built in 1841, but closed again in 1885 (Newsquest Media Group 2005). The dockyard was built at the northernmost extremity of Lytham pool, a large natural harbour which serves as the entrepôt for Preston (Ransom Burton 2004; Lytham St Anne's History 2005), while the graving dock was built on the south bank of the Liggard Brook which flows from the west into the pool. Within the study area, the graving dock, a specially gated dock from which the water could be pumped to allow ship hulls to be repaired, was a prominent feature on the 1847 first edition Ordnance Survey (OS) map, but is shown as disused on the 1893 first edition OS map. The graving dock may have fallen out of use due to the construction of a shipbuilding yard shown on the 1893 OS map on the south bank of the Liggard Brook, close to where it flows into the pool. Towards the end of the nineteenth century, tourism became increasingly important, with Lytham, St Anne's-on-Sea and Blackpool becoming known for their summer visitors, with promenades and piers, the company at the former town described as "[if] *less fashionable than at Blackpool it is generally more numerous and usually very respectable*" (Farrer and Brownbill 1912, 214-215).

2. METHODOLOGY

2.1 PROJECT DESIGN

2.1.1 A project design (*Appendix 1*) was submitted by OA North in response to a request from Atkins Consultants Ltd for an archaeological evaluation at Lytham Quays, Liggard Brook, Lytham, Lancashire. Following its acceptance OA North was commissioned to carry out the work. The project design was adhered to in full, and the work was consistent with the relevant standards and procedures of the Institute of Field Archaeologists, and generally accepted best practice.

2.2 EVALUATION TRENCHING

2.2.1 The 16 Phase 1 trenches were placed in the positions specified by Atkins Consultants Ltd, and were targeted to evaluate known archaeology and areas of significant archaeological potential.

2.2.2 Excavation of the uppermost levels of modern overburden/demolition material was undertaken by a machine fitted with a toothless ditching bucket to the top of the first significant archaeological level, or to a depth of 1.2m. The work was supervised by a suitably experienced archaeologist. Spoil from the excavation was stored adjacent to the trench, and was backfilled upon completion of the archaeological works.

2.2.3 Machine excavation was then used to define carefully the extent of any surviving foundations and other remains. Thereafter, structural remains were cleaned manually to define their extent, nature, form and, where possible, date. It should be noted that no archaeological deposits were entirely removed from the site. For excavation below a depth of 1.2m, as was the case for the sondages within Trenches 21-23, the trenches were widened sufficiently to allow the sides to be stepped in.

2.2.4 All information identified in the course of the site works was recorded stratigraphically, using a system adapted from that used by the English Heritage Centre for Archaeology Service. Results of the evaluation were recorded on *pro-forma* context sheets, and were accompanied by sufficient pictorial record (plans, sections and both black and white and colour photographs) to identify and illustrate individual features. Primary records were available for inspection at all times.

2.2.5 The precise location of the evaluation trenches, and the position of all archaeological structures encountered, were surveyed by EDM tacheometry using a total station linked to a pen computer data logger. This process generated scaled plans within AutoCAD 14, which have then been subject to manual survey enhancement. The drawings were generated at an accuracy appropriate for 1:20 scale, but can be output at any scale required. Sections were manually drafted as appropriate at a scale of 1:10. All information has been tied in to Ordnance Datum.

2.3 ENVIRONMENTAL CORING

2.3.1 In total, 21 boreholes were drilled in order to determine the nature of the underlying stratum at the development site. Eighteen of the cores were taken using a Competitor-type windowless sampling rig with which a depth of up to *c*5m was reached. Two cores were taken with a Cable Tool Boring rig, which is capable of penetrating deeper and harder deposits, with which up to 12.5m was reached. The latter was deployed specifically in the area of the landfill site south-east of the Government Offices in order to determine the nature of the deposits underlying the landfill. The drilling locations were chosen in order to provide an overview of the underlying geology, and in several cases were placed adjacent to the trenches in order to compare stratigraphy. Additionally, those deposits in the trenches with the potential for containing palaeoenvironmental indicators, such as plant macrofossils, were bulk sampled. Each drilling location was marked with a stake and surveyed in using standard survey equipment where Ordnance Survey grid references and height above sea level (Ordnance Datum (OD)) were obtained. The height of the development site proved to range from *c*9m OD on the area of the landfill, to 5-6m OD elsewhere.

2.3.2 The stratigraphy of each bore hole was provisionally noted in the field, and 1m long plastic cores were taken and capped so that an OA North environmental specialist could analyse each profile and carry out detailed sediment descriptions back at the laboratory. In order to augment the data from the current borehole survey, copies of borehole logs recorded from the area in the past by Strata Surveys have also been obtained. The location of each borehole taken, plus those utilised from previous investigations are shown in Figure 2.

2.3.3 The cores were cut open in the laboratory. The sediments were cleaned, photographed and the stratigraphy and lithology recorded by an OA North specialist. The lithology was recorded on *pro-forma* recording sheets and the data, together with the total station readings, was inputted into the specialist computer programme (ROCKWORKS). The data was correlated and several stratigraphic profiles of the site were produced. This model illustrates the possible sediment formation of the site.

2.4 LABORATORY ASSESSMENT OF ENVIRONMENTAL REMAINS

2.4.1 Sediments from three cores, L1, L9 and L13, which formed a rough south-west/north-east transect across the site (Fig 3), were assessed for environmental remains. From these cores, samples of known volume were prepared for pollen analysis using a standard chemical procedure (method B of Berglund & Ralska–Jasiewiczowa 1986). The samples were then stained with safranin, dehydrated in tertiary butyl alcohol, and the residues mounted in 2000 cS silicone oil. Eight of the samples from borehole L1 (taken at 1.75m, 1.82m, 2.44m, 2.98m, 3.47m, 3.61m, 4.07m, and 4.21m depth) had already been prepared using the method above but substituting a physical method (differential flotation in zinc bromide) for the chemical procedure with HF, to remove silicates. Tablets containing *Lycopodium* spores were added at the beginning of the preparation so that pollen concentrations could be calculated (Stockmarr 1971).

2.4.2 The sievings from the 16 preparations made were examined at a magnification of x25 for any identifiable plant and/or animal remains, sand, macro charcoal particles, etc. These can give invaluable evidence for the local occurrence of plants and/or animals, local fires, marine incursions, etc. Slides were examined at a magnification of x400 (x1000 for critical examination) by equally-spaced traverses across a slide to reduce the possible effects of differential dispersal on the slide (Brooks & Thomas 1967).

2.4.3 The aim was to obtain a pollen count of at least 100 grains. This was achieved in all but two of the samples (L1 2.44m and 2.98m), which were rather sparse, possibly due to over-dilution with silicone oil. Pollen identification was made using the keys of Moore *et al* (1991), Faegri & Iversen (1989), and a small modern pollen reference collection. As appropriate for assessment purposes, time was not spent on identifying pollen grains to the lowest possible taxonomic level unless immediately obvious. Indeterminable grains were also recorded as an indication of the state of the pollen preservation. Plant nomenclature follows Clapham *et al* (1987).

2.5 ARCHIVE

2.5.1 The results of the fieldwork will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines (*The Management of Archaeological Projects, 2nd edition, 1991*) and the *Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. The deposition of a properly ordered and indexed project archive in an appropriate repository is considered an essential and integral element of all archaeological projects by the IFA in that organisation's code of conduct.

2.5.2 The archive for the archaeological work undertaken at the site will be deposited with the Museum of Lancashire, Preston, the nearest museum which meets Museums' and Galleries' Commission criteria for the long term storage of archaeological material (MGC 1992). This archive can be provided in the English Heritage Centre for Archaeology format, both as a printed document and on computer disks as ASCii files (as appropriate). The archive will be deposited with the nominated museum within six months of the completion of the fieldwork. Except for items subject to the Treasure Act, all artefacts found during the course of the project will be donated to the receiving museum.

2.5.3 A synthesis (in the form of the index to the archive and a copy of the publication report) will be deposited with the Lancashire Sites and Monuments Record. A copy of the index to the archive will also be available for deposition in the National Archaeological Record in London.

3. RESULTS

3.1 INTRODUCTION

3.1.1 The following section provides summary results obtained from the evaluation trenches excavated thus far: Trenches 8-14 and 17-23, as well as that of the boreholes. It is envisaged that Trenches 1-5, 15 and 16 will be excavated as a second phase of the evaluation programme; Trenches 6 and 7 have been omitted from the scheme of works as they would affect existing flood defences. Individual context descriptions are provided in *Appendix 2,* and finds are catalogued in *Appendix 3*.

3.1.2 ***Trench Locations:*** Trenches 8-14 were located at the northern end of the site in the area of the industrial estate, between Dock Road and the Liggard Brook with Trench 8, close to the Graving Dock Bridge, the most westerly, and Trenches 9 and 14, opposite the southern terminus of the access road, the most easterly (Fig 2). Trench 17 was located towards the centre of the site, *c*100m west of the bank of the Ribble, while Trench 18 was positioned at the south-west end of the site, close to the bakery. Trenches 19 and 21-23 occupied the centre of the site, south of Dock Road and east of South Street, while Trench 20 was placed north of Liggard Brook, straddling the route of the access road.

3.2 TRENCH 8

3.2.1 Trench 8 (Plate 1) was located to the north of Dock Road, at its western end and was designed to identify any remains relating to the graving dock, identified in the desk-based assessment. The trench was intended to be 30m long, but due to on-site constraints, this was reduced to 13m.

3.2.2 The earliest deposit revealed, ***48***, comprised a pinkish-red sandy-clay, which appeared to represent redeposited natural, although it is possible that it may represent *in-situ* natural geology. At the north-western end of the trench, this layer exceeded the1.2m depth of the trench and was immediately beneath the topsoil, but sloped sharply downwards to the south-east. Layer ***48*** was directly beneath a layer of building rubble, ***49***, with a maximum thickness of 0.23m which, in turn, was sealed by a 0.4m thick layer, ***50***, of mid-yellow sand. This lay underneath a layer of black sandy-silt, ***51***, containing about 10-15% brick rubble, with many of the bricks still cemented together.

3.2.3 Layer ***51*** was sealed by the topsoil, ***47***, which comprised a mid-brown silty-sand to a maximum depth of 0.1m. No upstanding remains of the graving dock were observed within this trench, although it is possible that the large numbers of bricks found within layer ***51***, represent its demolished remains.

3.3 TRENCH 9

3.3.1 Trench 9 was located at the eastern end of Dock Road, to the north of Trenches 13 and 14, although circumstances on site meant that the trench was moved slightly to the south of its proposed position. The trench was placed across the position of an enclosure shown on the Ordnance Survey 6”: 1 mile map, published in 1847; it measured 25m by 1.8m, and was excavated to a maximum depth of 1.2m.

3.3.2 The earliest layer encountered (at a depth of 1.2m below the ground surface), ***71***, comprised greyish-brown clay containing modern rubble. This was sealed by layer ***70***, a 0.65m thick deposit of relatively clean yellow sand containing occasional pieces of metal debris. This layer was in turn overlain by a 0.4m thick deposit of dark grey silt, ***69***, containing a high proportion of modern rubble. This was directly overlain by the topsoil, ***68***, which comprised grey silts to a depth of 0.15m. No trace of the enclosure shown on historic mapping was identified, with the trench revealing evidence of fairly modern disturbance to a depth of greater than 1.2m.

3.4 TRENCH 10

3.4.1 Trench 10 was aligned north/south and located to the north of Dock Road and formed an 'L'-shaped trench with Trench 11. The trench measured 30m by 1.8m, and was excavated to a maximum depth of 1.2m. The trench was located across the west end of the former ship building yard, and partly encompassed the footprint of a building, as shown on the 1893 Ordnance Survey map.

3.4.2 The earliest layer exposed within this trench, at a depth of 0.63m below the ground surface, was ***61***, which comprised a fine grey clay containing occasional thin bands of organic material. This layer appears to represent a natural deposit. A 3.5m long pebble bank, ***62***, was observed approximately 6m from the northern end of the trench, probably also representing a natural deposit. These layers were sealed by a 0.29m thick layer of redeposited natural, ***60***, which in turn was overlain by a 0.14m thick levelling deposit, ***59***.

3.4.3 The uppermost level was formed by a concrete slab, ***58***, up to 0.2 m thick. No remains relating to the dock buildings were observed, although it is possible that the modern buildings in the area could have truncated the remains of the older buildings.

3.5 TRENCH 11

3.5.1 This trench, aligned east/west, was located to the north of Dock Road and adjoined the northern end of Trench 10 perpendicularly. The trench was positioned to evaluate the sub-surface survival of shipyard buildings identified in the desk-based assessment. The trench measured 20m by 1.8m, and was excavated to a maximum depth of 1.2m.

3.5.2 The earliest layer revealed in this trench was a mixed grey and yellow sandy-clay, ***66***, which had a depth of greater than 0.44m and had been cut by two features, a wall, ***65***, (Plate 2) and a probable barrel, ***64***.

3.5.3 Wall ***65*** was aligned broadly north-north-east/south-south-west and was 0.47m wide (two brick-widths). Probable barrel ***64*** was 0.65m in diameter, and had been sunk vertically into layer ***66***. The individual planks from which it was constructed were 0.12m wide. These features were sealed by a 0.76m thick layer of overburden, ***63***, containing a high proportion of rubble, concrete and make-up for a thin concrete slab. At the eastern end of the trench, a layer of relatively clean brown silty-clay, ***67***, was exposed, which is probably the same as layer ***57*** in Trench 12. It is possible that the wall exposed in this trench represents the remains of the dock buildings identified in the desk-based assessment and on the 1893 OS map, as they share the same alignment. The sunken barrel may also relate to these structures.

3.6 TRENCH 12

3.6.1 Trench 12, aligned broadly east/west, was located to the north of Dock Road, and to the south-east of Trenches 10 and 11. The trench was placed over the site of a 'travelling crane', shown on the OS first edition map of 1893 (Fig 3). The trench measured 30m by 1.8m, and was excavated to a maximum depth of 1.2m.

3.6.2 The earliest layer encountered within this trench, at a depth of 0.55m, comprised a pale yellowish-grey sandy-clay, ***54***, at the eastern end of the trench. This layer had been truncated by a large feature that was backfilled with a black sandy-silt deposit, ***53***, containing numerous fragments of glass and pottery vessels.

3.6.3 Layer ***54*** was also cut *c*8m from the western end of Trench 12 by the foundation trench for a wall, ***55***, which was 0.42m wide and aligned north/south. To the north, the continuation of this wall survives as the partially demolished remains of a standing building. A further 8m to the west of Wall ***55***, another wall, ***56***, was observed, running parallel to Wall ***55*** and forming the other side of the still standing structure to the north. These walls were both abutted by a layer of clean light grey sandy-clay, ***57***, which had a maximum depth of 0.66m and had presumably been placed between the walls to act as a levelling deposit for the floor surface.

3.6.4 Layer ***57*** was sealed by the latest deposit encountered, which comprised a 0.15m thick concrete slab, ***52***. The only structural remains revealed within this trench related to a still-standing structure, and not to the travelling crane, although it is possible that the remains of the crane remain deeper than the 1.2m this trench was excavated to.

3.7 TRENCH 13

3.7.1 Trench 13, aligned north/south, was located to the north of Dock Road and to the south of Trench 9, forming an 'L'-shaped trench with Trench 14. The trench measured 20m by 1.8m, and was excavated to a depth of 1.2m. The trench was located across the footprint of the main buildings of the ship building yard, shown on the 1893 Ordnance Survey map for the area.

3.7.2 The earliest layer encountered within this trench, at a depth of 0.53m, was the natural geology, ***73***, comprising a pale greyish-yellow clayey-sand. At the southern end of the trench, this layer incorporated a small patch of water-worn pebbles, ***74***, seemingly derived from natural processes of deposition. The natural subsoil was sealed by a layer of black gravelly silts, ***72***, 0.67m thick and containing modern brick and concrete rubble inclusions. No remains of the ship building yard were identified within this trench.

3.8 TRENCH 14

3.8.1 This east/west-aligned trench was located to the north of Dock Road, to the south of Trench 9 and adjoined the northern end of Trench 13, forming an 'L'-shape. The trench was located to investigate the remains of the ship building yard identified in the area and straddled the footprint of one of the central buildings. The trench, excavated to a maximum depth of 1.2m, was originally intended to be 30m in length, although constraints meant that only a 20m by 1.8m trench could be excavated.

3.8.2 The earliest layer identified within this trench, at a depth of 1m, comprised a clean mid-greyish brown clay, ***82***, which appeared to represent a natural deposit. This layer had been cut by a square-cut wooden post, ***77***, measuring 0.25m by 0.25m, with the post surviving to a depth of 1.7 m. This was sealed by a thin (0.01m) band, ***81***, of either sandstone or crushed brick, which was sealed by a 0.25m thick layer of dark grey clay, ***80***.

3.8.3 Layer ***80*** was sealed by a 0.2m thick layer of light yellow silty-sand, ***79***, which was in turn overlain directly by a 0.15m thick layer of mixed brick rubble, fine gravel and sharp sand, ***78***, which appeared to represent the make-up layer for the floor surface, ***76***, immediately above it. This surface (Plate 3) was dark bluish-grey in colour and was constructed of concrete. There were patches of reddening on the floor, presumably evidence of burning taking place, and a number of small circular metal objects were found within the floor. A single wooden beam, 2.5m long, was observed on the floor, on the northern side of the trench. It seems likely that this floor could represent the remains of structures associated with the ship building yard. The floor was sealed by a 0.4m thick layer of modern rubble, gravels and sands, ***75***.

3.9 TRENCH 17

3.9.1 Aligned east/west, this trench was located in the south-eastern corner of the site, measured 30m by 1.7m, and was excavated to a maximum depth of 1.2 m. The trench was located to evaluate the survival of three sea walls identified in the desk-based assessment.

3.9.2 The earliest deposit, ***5***, encountered within this trench at a depth of *c*0.2m, comprised grey silty-sand containing a high proportion of concrete, bricks and domestic refuse. The deposits at the western end of the trench appeared to pre-date those at the eastern end, suggesting different phases of dumping, but the degree of disturbance made this difficult to prove. This layer was sealed by a layer of clean light yellow sand, ***6***, which was itself overlain by the topsoil, ***4***. No significant archaeological remains were revealed within this trench, and no physical evidence for the sub-surface survival of the former sea walls was identified.

3.10 TRENCH 18

3.10.1 Trench 18, aligned north-west/south-east, was located on the site of the former bakery; it measured 20m by 1.8m, and was excavated to a maximum depth of 1.2m. This trench was located over the site of a structure of uncertain function identified in the desk-based assessment.

3.10.2 The earliest layer revealed within this trench, ***3***, consisted of a natural pebble bank at a depth of 0.65m and at least 0.55 m thick. The bank was overlain by the light yellow sandy subsoil, ***2***, which had a maximum thickness of 0.39m. This layer was directly overlain by the topsoil, ***1***, which comprised mid-brown sandy-silt to a maximum depth of 0.26m. No archaeology was observed within this trench, and the stratigraphy corresponded closely with that observed in Core L2, taken nearby (*Sections 3.16 and 3.17*).

3.11 TRENCH 19

3.11.1 Aligned north-west/south-east, this trench was located immediately to the south of Dock Road and to the south-west of the shipbuilding yard, straddling the site of a north-east/south-west aligned footpath marked on the 1893 map. The trench aimed to investigate former land surfaces in the area. The trench measured 20m by 1.8m, and was excavated to a maximum depth of 1.2m.

3.11.2 The earliest layers revealed (***41-46***) were layers of yellow sand interleaved with thin bands of bluish-grey clay. All of these layers represented natural deposits. These deposits had been cut by a number of services, and were sealed by the topsoil, ***40***, which comprised mid-brown sand. No archaeological remains were observed within this trench.

3.12 TRENCH 20

3.12.1 Trench 20 was located on the northern side of the Liggard Brook, straddling the route of the proposed site access road and was positioned to investigate any possible former land surfaces surviving in the area. The trench, aligned east/west, measured 30m by 1.7m, and was excavated to a maximum depth of 1.2m.

3.12.2 The earliest layer uncovered, ***86***, comprised black sandy-clay containing a high proportion of rubble including bricks with frogs and concrete. This layer was sealed by an extremely compact layer of red clay, which had a maximum thickness of more then 0.67m, and was overlain by a 0.3m thick layer of light yellowish-grey sandy-clay, ***82***, containing modern rubble fragments. This was sealed by the topsoil, ***83***, which comprised brownish-grey sandy-silt. No obvious remains of former land surfaces were observed within this trench.

3.13 TRENCH 21

3.13.1 This trench was located to the south of Dock Road and to the south-west of the site of the former shipbuilding yard and straddling the north-east/south-west aligned footpath marked on the 1883 map. The trench itself was aligned east/west and was positioned to investigate any possible former land surfaces surviving in the area. The trench measured 30m by 1.7m, and was excavated to a maximum depth of 1.69m in a sondage at the eastern end of the trench; although the main part of the trench was only excavated to a depth of 1.2m.

3.13.2 This trench revealed evidence of the build-up of a number of layers of natural sands and clays, ***28-31*** and ***34-39***, similar to the stratigraphic pattern revealed in Core L10 (*Sections 3.16 and 3.17*). These had been truncated by a substantial north/south aligned cut filled with modern refuse, ***32***, which was sealed by the topsoil ***33***.

3.14 TRENCH 22

3.14.1 Trench 22, aligned roughly east/west, was located to the south of Dock Road and to the south of Trench 21. The trench was placed across the boundary of what appeared on the 1893 OS map, to be a funnel-shaped enclosure, and aimed to investigate any possible former land surfaces surviving in the area. The trench initially measured 30m by 1.7m, and was excavated to a depth of 1.2m. A further sondage was excavated at the eastern end of the trench, close to the position of the proposed boundary feature, which required the excavation of a wider area, to a total depth of 1.92m from the modern ground surface.

3.14.2 This trench again revealed numerous thin layers of sands and clays, ***18-25***, all of natural origin. This sequence of layers had been cut by two features of modern origin. The first of these, ***26***, was 10m wide, was located at the western end of the trench, and comprised modern building rubble and post-medieval pottery within a matrix of black sand, whilst the other, ***27***, was located further east, measured 3m in width and comprised modern building debris within a matrix of redeposited natural material. The alignment and positioning of deposit ***27*** was similar to the expected position of the boundary of the feature observed on the 1893 OS map.

3.14.3 Both features were sealed by the topsoil, ***17***, which had a maximum depth of 0.22m. No significant archaeological features were encountered, although the stratigraphy revealed was matched by the evidence recovered from the palaeoenvironmental cores (*Sections 3.16 and 3.17*).

3.15 TRENCH 23

3.15.1 Trench 23 was located to the south of Dock Road and to the south of Trench 22, transecting the boundary of the possible enclosure observed on the 1893 OS map and aimed to investigate any possible former land surfaces surviving in the area. The trench initially measured 30m by 1.7m, and was excavated to a depth of 1.2m. A sondage (Plate 4) was excavated at the western end of the trench, which required the excavation of a wider area, to a total depth of 2.40m from the modern ground surface.

3.15.2 The lowest deposits exposed remained rather indistinct as the sondage rapidly collapsed due to the ingress of water. However, the lowest layers observed were naturally deposited bands of sand and clay, ***8-10*** and ***13-16***, which had been truncated by two relatively recent dumps of modern building material, ***11*** and ***12***. The former was 1.2m wide and was located approximately 13m from the western end of the trench, whilst the latter was greater than 17m wide and accounted for the eastern end of the trench. No significant archaeological features were encountered, although Cut ***12*** is again on a similar alignment and in the right location as the boundary of the feature on the 1893 OS map.

3.16 THE PALAEOENVIRONMENTAL SURVEY

3.16.1 Preliminary observations show that the study area is situated on a former beach. Deep deposits of sand and pebbly sand have developed over the whole of the site, which, in places, is intercalated with deposits of peat and organic clay, with a depth from surface range of *c*3m to *c*15m. These organic deposits range from being 0.10m to 2.0m thick and are typical of the coastal sequence in the area, where peats and organic clays are found to be intercalated with estuarine clays and silts and/or blown sand, the whole deposited during the Flandrian period. The deposits overlie a highly undulating mudstone or till surface (Tooley 1978), which in the study area has been proved to depths of between *c*13m and 25m.

3.16.2 The shallower cores (L1-L18), taken with the Competitor-type windowless sampling rig, to a depth of up to 5 metres show that the much of the uppermost deposits are quite variable. In general, there appears to be an area of relatively shallow sand deposit overlying a deposit of sand and gravel at a depth of *c* 2m and this appears to be concentrated in the southern part of the study area, running parallel with the modern coastline (proved in cores L2, L5, L7, L8, L16 and L18) (Fig2). These deposits are likely to represent a former beach, and, in fact, correspond well with the edge of the coastline shown on the first edition map (Fig3). Four cores were taken in the area of the landfill (L3, L6, L17, and LD 2) and only one of these (LD2) penetrated the deposits below the landfill material. Both LD2 and LD1, taken just north of the landfill, prove that the deposits of sand and gravel in this area reach depths of up to 11.50m.

3.16.3 North of the beach deposits the stratigraphy is much more complex and both the cores taken during this phase of work, and those taken prior to this phase, show a complex sequence of sands, sand and gravel and clays. In some cases, in L1, L9, and L13 for example, the clay deposits are highly organic. Organic clay and/or peat deposits were also present in many of the Strata Surveys cores situated in the same area. Palaeoenvironmental investigations should provide information on the depositional nature of these complex deposits.

3.16.4 Due to the limited number of deeper cores and due to the complex nature of the deposits, the creation of a terrain model of the stratigraphy proved difficult. However, a series of two-dimensional figures were produced using ROCKWORKS in order to illustrate the nature of selected cores in relation to each other. This was concentrated in the area of complex stratigraphy to the north of the beach deposits and utilised the Strata Surveys borehole records that had accompanying ground heights above OD (annotated as BH1-BH5 on Figs2 and 3).

3.16.5 Figure 5 shows a section running north-west to south-east and exemplifies the complex stratigraphy present in the central area of the study area. The two southernmost cores are much shallower and coincide with the ridge of sand and gravel evident in this southern area, which probably represents the former coastline. Although L10 and L9 appear relatively shallow compared to the other cores, both contain a complex sequence of sand and clay. The deeper cores serve to illustrate that this sequence continues to a depth of *c*20m in places. Figure 6 shows a section running south-west to north-east and, again, shows the relatively complex stratigraphy present in the central part of the study area.

3.17 RESULTS OF THE PALAEOBIOLOGICAL ASSESSMENT

3.17.1 The results of the assessment of samples from cores L1, L9 and L13 are presented in *Appendix 4* as percentages of the total pollen sum: SumP (trees + shrubs + herbs + ferns). Aquatics, *Sphagnum*, indeterminable grains, Dinoflagellate cysts (Hystrichospheres), and Pre-Quaternary spores, are presented as percentages of the pollen sum + the group sum (eg. Aquatic taxa as percentages of SumP + sum Aquatics). Some finds from the pollen preparation sievings are also given. Throughout, samples are referred to by the depth at which they were taken.

3.17.2 Pollen was quite well-preserved in all the samples. Indeterminate pollen values were higher in L1 samples than in L9 and L13 but still quite low, averaging 8.2%. All slides contained many micro-charcoal particles which were not quantified.

3.17.3 ***Borehole L1:*** the ten samples from L1 appear to split into three groups: the basal six samples taken at 3.47m, 3.61m, 4.07m, 4.21m, 4.39m and 4.88m; samples 2.44m and 2.98m; and the two top samples, 1.75m and 1.82m.

3.17.4 *Samples between 3.47m-4.88m:* the pollen assemblages are dominated by tree and shrub pollen (>50% SumP) but also with an average of 30% herb pollen. The main tree and shrub taxa are alder (*Alnus*), the importance of which within these basal samples increases up the core, hazel (*Corylus*), oak (*Quercus*) and birch *(Betula*). The main herb component is grasses (Gramineae), but ferns, particularly bracken (*Pteridium*), are also well-represented. Cereal-type pollen is also present, but it is also possible that these grains may be from certain wild grasses which grow near the coast. Many other herb taxa are also present, including taxa associated with agriculture, such as *Plantago lanceolata*, *Rumex acetosa*-type, *Aster*-type, Compositae (Liguliflorae) and *Artemisia*, but these also occur in natural situations. Dinoflagellate cysts (Hystrichospheres), indicative of marine conditions were also found in the basal sample. Pre-Quaternary spores were found in four of these samples, particularly in 4.88m and 3.47m, and probably derived from reworked glacial till.

3.17.5 Pollen washing sievings were only available from the two basal samples, but these contained Foraminifera, which grow in brackish/marine water, and macro-charcoal particles, a better indicator of local fires or burning than micro-charcoal particles. A fern sporangium was also found in 4.39m, and *Sphagnum* leaves in 4.88m.

3.17.6 *Samples 2.98m and 2.44m:* these samples contain less tree and shrub pollen, particularly alder and hazel, and increased values of ferns and dwarf shrubs, such as heather (*Calluna*). Pre-Quaternary spore values are very high, reflecting reworked sediment and, it may be that the high fern values include reworked fern spores, which are very resistant to corrosion, although indeterminate pollen and spore values are low. The low concentrations of pollen and spores in these samples also suggest the inclusion of much reworked till. Willow pollen is also higher than in the basal samples.

3.17.7 *Samples 1.75m and 1.82m*: the pollen assemblages from the two uppermost samples are very different from those below. Pollen concentrations are very high, and tree and shrub, dwarf shrub, and fern values are much lower with total herb values concomitantly much higher. Grasses are dominant, but with high cereal-type values, and also high values for taxa associated with agriculture, both arable and pastoral, including *Plantago lanceolata*, *Aster*-type, Compositae (Liguliflorae), and *Ranunculus acris*-type. Pre-Quaternary spores are absent from the assemblages.

3.17.8 ***Borehole L9:*** five samples, taken at 2.34m, 2.38m, 2.55m, 3.35, and 3.57m were processed from Borehole L9, and all are rather different in character. Samples 2.55m, 3.35m and 3.57m are dominated by tree and shrub pollen (>41%), but also with high values for herbs and ferns. Values for oak and birch pollen are higher in the basal two samples and then drop, whilst hazel values are highest in the basal three samples and then fall before sample 2.38m. The reverse is true in the case of grass pollen, with lower values in the basal three samples and very high counts in 2.38m, which remain constant in the topmost sample (2.34m). No cereal-type grains were encountered, but taxa indicative of agriculture, particularly pasture, are common and particularly high in 2.38m.

3.17.9 Pollen washing sievings contained Foraminifera in all samples except the topmost, and Dinoflagellate cysts were found in three of the samples including the topmost. This suggests that the sediments were all laid down in brackish and/or marine water. However, the topmost sample sieving also contained one Plumatella statoblast and three chironomids, which would suggest some freshwater input. The occurrence of pre-Quaternary spores in all the samples suggest that a lot of older material was reworked into the sediments.

3.17.10 ***Borehole L13:*** nine samples, taken at 0.59m, 0.66m, 0.75m, 1.26m, 1.84m, 2.46m, 2.80m, 4.11m and 4.68m were processed. All the samples are similar, with more or less equal values of total tree and shrub, and total herb values, as in Borehole L9. Again, these samples are suggestive of extant mixed deciduous woodland but with some clearance for agriculture. Cultural indicator taxa are common, and the samples probably represent a similar age range to those of Borehole L9. Cereal-type pollen grains were identified but these could be of coastal wild species of grass.

3.18 FINDS

3.18.1 In total, 98 artefacts were recovered from the site, most of which were fragments of pottery; the remainder comprised ceramic building material and glass. All of the finds were retrieved from modern deposits (dumped refuse layer ***5*** (Trench 17), mid-brownish sand layer ***11*** (Trench 23), modern disturbance layer ***26***, redeposited natural layer ***27*** (both in Trench 22), sandy-silt layer ***51*** (in Trench 8), Rubble layer ***53*** (Trench 12), overburden ***63***(in Trench 11)), and a single complete sample brick was retrieved from wall ***65***. The type of finds found is summarised in Table 1, below.

	Modern deposits (*5, 11, 26, 27, 51, 53, 63*)	**Wall (*65*)**	***Total***
Ceramic building material	2	1	*3*
Glass	23	0	*23*
Pottery	72	0	*72*
Total	*97*	*1*	***98***

Table 1: Summary of artefacts by material and context

3.18.2 All artefacts are likely to date to between the mid-nineteenth and the early twentieth century, with the marked bottles and jars providing the most reliable dating evidence. Details of the bottles and jars, and also of the other pottery, are set out below, followed by a brief record of the bricks.

3.18.3 ***Bottles and jars:*** of the 98 artefacts recovered, 53 were glass or pottery bottles and jars. A number of the containers were marked with company names, some of which related to the contents of the bottles and jars, while others related to the manufacture of the vessels themselves. Table 4 lists examples of different types of bottles with text relating to their contents. They included several types of drinks: beer, ginger beer, and water. There were, in addition, a number of medicine and poison bottles. The companies represented were all based in Lancashire, with the drinks companies being located in Poulton-le-Fylde, Blackpool, and Preston, all of which lie within approximately 16km of Lytham, and the chemists being based within Lytham itself.

Bottle type	**Example**	**Context**
Beer	Queen’s Brewery, C & S Ltd, Poulton-le-Fylde	***63***
Cough medicine	Crozier’s Cough Linctus	***53***
Ginger beer	E. L & V. Newsome, East St Bonny St, Blackpool	***53***
Ginger beer?	J. & H. Billington, Blackpool	***53***
Ginger beer	J. Singleton, Blackpool	***53***
Medicine	R. Crozier, Dispensing Chemist, Lytham	***53***
Medicine	Tomlinson, Chemist, Lytham	***53***
Poison	Poison, 4oz	***5***
Poison	2oz	***53***
Water	J. Seed & Sons, Trade Mark, Preston	***53***
Water	Seed’s Waters, Trade Mark, J & W Seed, Registered, Preston	***53***

Table 2: Examples of different types of bottles

3.18.4 Three small round-sectioned colourless bottles from rubble layer ***53*** appear to be medicine bottles, possibly of the single dose variety popular at the start of the nineteenth century (Jackson 1999, 15). Another medicine bottle was graduated and had the name of the chemist (R. Crozier, Dispensing Chemist, Lytham) moulded in the glass. This is an example of a multi-dose bottle, the graduations on the side of the bottle allowing the doses to be measured. During the Victorian period there was a rapid growth in the use of multi-dose bottles for medicines and, by the 1860s these accounted for much of the output of dispensed medicines (*ibid*).

3.18.5 Two poison bottles were identified. One of these was cobalt blue and contained two fluid ounces, was hexagonal in shape, and had three fluted sides. Its colour and hexagonal shape both marked it out as a poison bottle, and the fluting on the sides was designed to make it easy to identify in a dimly lit room. This type of poison bottle was common during the late nineteenth century (Fletcher 1975, 85). The second bottle contained four fluid ounces, and could easily be distinguished from more harmless substances by its unusual shape – it sat at angle on its side, giving it a similar appearance to a miniature urine bottle. In addition, it had the word 'POISON' embossed on its side.

3.18.6 Six mineral water bottles, all by Seeds, were recovered, of which two were Codd bottles. In 1871 Hiram Codd patented a bottle with a spherical, marble-like glass stopper, an annular groove in the neck to hold a washer, and a recess in the neck to hold the glass marble while the contents of the bottle were being poured (Fletcher 1975, 29). This type of bottle became known as the Codd bottle, and was popular until around 1920 (Fletcher 1972, 48).

3.18.7 It is possible to identify the contents of other vessels based on their shapes. Blacking bottles (Blakeman 2002, 8), cream pots (*op cit*, 14), jam or marmalade jars, paste pots (*op cit*, 42), and cleaning or other fluid bottles (*op cit*, 16) were all identified.

3.18.8 Examination of the manufacturers of the vessels reveals that in all cases the vessels were made further away than their contents were. All the glass bottles for which a place name was available were made in Northern England – in St Helens, which is now in Merseyside, and in Dewsbury, now in West Yorkshire. In addition, Y G Co has tentatively been identified as York Glass Co, based in York. Stoneware and earthenware vessels were made still further away – in Tamworth, Newcastle, Glasgow, and Bristol. Manufacturer's marks on bottles and jars are shown in Table 3, below.

3.18.9 ***Tableware and bedroomware:*** a single press-moulded drinking glass was recovered from dumped refuse layer ***5***, but the majority of the tableware was pottery, both earthenware and porcelain. Bedroomware vessels, such as chamber pots, ewers, and basins, were recovered in small numbers, and larger quantities of tableware was present. This included dinnerware, represented by ashets, dinner plates, jugs, tureens, and vegetable dishes, and breakfast or teaware, represented by bowls, saucers, cups, tea pot stands, tea or coffee pots, and side plates. Decoration was mainly transfer-printed and/or enamel-painted, with sponge-printed designs relatively uncommon. The transfer-printed patterns included Asiatic Pheasants, a dinnerware pattern, and Brosely, a breakfastware pattern. The style of decoration on the tableware and bedroomware indicated a mid-nineteenth to early twentieth century date.

Manufacturer's mark	**Vessel on which mark appears**	**Context**
Adamson & Co, Makers, Dewsbury	E. L & V. Newsome, East St Bonny St, Blackpool, glass bottle	***53***
George Skey, Wilnecote, Tamworth	stoneware bottle	***53***
Grosvenor, Glasgow	stoneware storage jar	***53***
Maling, F, Newcastle	earthenware jam jar	***53***
N & Co	Queen's Brewery, C & S Ltd, Poulton-le-Fylde, glass bottle	***63***
Nuttall, Makers, St Helens	J. Singleton, Blackpool, glass bottle, four Seeds water bottles	***53***
Port-Dundas Pottery Coy, Glasgow	stoneware cream pot	***5***
Price, H, Bristol	stoneware bottle	***53***
T Turner & Co, Makers, Dewsbury	Seed's Codd water bottle	***53***
Y G Co	Tomlinson, Chemist, Lytham, glass bottle, and cobalt blue possible poison bottle	***53***

Table 3: Manufacturer's marks on bottles and jars

3.18.10 ***Kitchenware:*** a small number of kitchenware vessels were present. These were predominantly pancheons, in both brown-glazed red earthenware and stoneware, and they also included small bowls, pie dishes, storage jars, and crocks. Due to their utilitarian nature, the style of these vessels changes little over time, and they are of little use in dating given the more precise dates available from the manufacturers named on the bottles and jars.

3.18.11 ***Toys and ornaments:*** the remaining three items of pottery were identified as a doll's porcelain plate, a bisque figurine of a young boy, and a small bottle, probably for perfume.

3.18.12 ***Ceramic building material:*** the three bricks recovered during the course of the evaluation (overburden ***63*** and wall ***65***) were all of an extruded, wire-cut variety, popularly used as engineering bricks. These may be dated broadly to the late nineteenth to mid-twentieth century.

3.18.13 ***Dating:*** the dates of operation of the manufacturing companies named on the bottles and jars are shown in Table 4, below. Those within Lancashire were researched using trade directories (Kelly 1855, 1879, 1885, 1886, 1898, 1899, 1901, 1905, 1913, 1929, and 1932). Since the run of directories available was incomplete, dates for which the company was *not* listed have been added in square brackets. The dates indicate possible deposition periods of 1828-1930 for dumped refuse layer ***5***, 1887-1901 for rubble layer ***53***, and 1887-1925 for overburden ***63***. Indeed, rubble layer ***53*** may be very closely dated to the turn of the twentieth century on the basis of the J&H Billington mineral water/ginger beer bottle, a company that appears to have operated only between 1898 and 1899. The very closely dated medicine bottle from Joseph C

Tomlinson, the local chemist, provides a similar date for the same context, as this business only operated between 1898 and 1901. However, it is probable that much of this domestic refuse was redeposited, possibly becoming mixed-up with the rubble at a later date rather than being originally discarded within this material.

Date of operation	***Reference***	***Context***
[1855] 1879-1913 [1929]	Robert Crozier, Chemist, Clyton Square, Lytham	***53***
1855 or earlier – 1913 [1929]	John Singleton, Ginger beer and aerated water manufacturer, 3 South Edward Street, Blackpool	***53***
1855 or earlier – 1929 [1932]	John Seed, Mineral water manufacturer, Kirkham Street, Preston	***53*** and ***63***
[1886] 1898-1901 [1905]	Joseph C. Tomlinson, Chemist, Warton Street, Lytham	***53***
[1886] 1898-1899 [1901]	J & H Billington, Mineral water and ginger beer manufacturers, Hornby Road, Blackpool	***53***
[1879] 1885-1905 [1913]	EL & V Newsome, Mineral water and ginger beer manufacturers, East St Bonny Street, Blackpool	***53***
[1886] 1898-1932 or later	Queen's Brewery, Catterall & Swarbrick Ltd, Poulton-le-Fylde	***63***
1828-1930	Port-Dundas Pottery Company, Glasgow (Kelly 1999, 165-6)	***5***
1868-1923	Grosvenor, Glasgow (Kelly 1999, 89)	***53***
1872-1925	Codd bottles	***53*** and ***63***
1855 or earlier – 1932 or later	Nuttall & Co, Glass bottle makers, Ravenhead, St Helens	***53***
1844 or earlier - *c*1930	Y G Co, probably York Glass Co (Cavendish Auctions 2002; Petrides and Petrides 1999-2004)	***53***
1862-1899	George Skey, Wilnecote, Tamworth (Hampshire Museums 2004)	***53***

Table 4: Manufacturers named on bottles and jars, with dates of operation (square brackets indicate the company was not listed for that year)

4. DISCUSSION

4.1 EVALUATION TRENCHES

4.1.1 The evidence from this phase of evaluation trenching has revealed a degree of relatively recent disturbance in all of the trenches investigated. In some of the trenches, such as 10, 11, 13, 14, 18, 19, and 21-23, this has not entirely removed the earlier stratigraphy, whilst in the other trenches lying in areas of documented potential, *ie* 9, 12, 17 and 20, truncation was so severe that the only evidence recovered from these trenches pertained to the modern period.

4.1.2 The 14 evaluation trenches were positioned in such a manner as to investigate areas of known archaeological potential, particularly the graving dock and ship-building yard located to the north of the study area and identified from the old maps. Trench 8 was placed straddling the flood defence associated with the former graving dock, and it is possible that truncated building debris dump ***51*** could relate to the demolition of this feature. Trenches 9-14 were placed within the suspected area of the former shipyard. Wall ***65*** within Trench 11 was on a very similar north-north-east/south-south-west alignment to that of a long building from the shipyard. Other features such as sunken barrel ***64*** (Trench 11) and industrial floor surface ***76*** (Trench 14) may also relate to the shipyard. The argument for the latter is particularly convincing as the numerous circular objects interpreted as punched-out rivet wasters could well have been used for ship-building. The fire-reddened area to the west of Trench 14 may also be indicative of some industrial activity. Post ***77***, driven into natural clay ***82*** and sealed by a series of possibly natural flood deposits and by the preparation layers for floor ***76***, is likely to pre-date the construction of the ship-building yard, but by how long, is not apparent. The squared nature of post ***77*** might suggest that it is part of larger structure (rather than an individual mooring post for instance), but the limited evidence is insufficient to be certain.

4.1.3 Within many of the trenches there were distinct layers of demolition debris, some of which seem likely to have been used to level or consolidate ground for later development, but demolition layers ***69***, ***63*** (dated to 1887-1925 on the basis of finds), ***53*** (dated to the turn of the twentieth century), ***72*** and ***75*** from Trenches 9, 11, 12, 13 and 14 respectively may pertain to the demolition of the shipyard itself. If such layers do relate to the demolition of the ship building yard, then it is highly likely that the same is true of the rubbish contained within such deposits. The dating of this rubbish would indicate that the ship building yard was operating between the second half of the nineteenth century and the early twentieth century, which is consistent with the cartographic evidence.

4.1.4 Material in Trenches 17 and 20 was possibly indicative of attempts at land consolidation and reclamation, particularly as old maps show the areas investigated by these trenches to be either very close to the Ribble mudflats or within the marshy mouth of the Liggard Brook. Evidence for rubbish dumping was found in Trench 21, as was a possible path, indicated on the 1895 map of the area. Many of the trenches encountered layers of naturally deposited sand

and estuarine mud, several of which, such as the laminated layers in Trenches 21 and 22 may be indicative of periods of minor flooding. The fact that the low-lying land was subject to periodic flooding, meant that the stratigraphy was not always easy to interpret, as anthropogenic deposits could be sealed as well as underlain by those of natural origin. The limited archaeological evidence may reflect the depth to which the trenches were excavated, and a small possibility remains that structures survive at a greater depth than has been evaluated. It is perhaps more likely however, that until the area was fully consolidated and adequately protected by flood defences, that it was fairly unattractive to development.

4.2 THE PALAEOENVIRONMENTAL SURVEY

4.2.1 The sand/clay/peat sequences observed as a result of the deeper coring reflect movements in relative sea level and should provide detailed information regarding changes in sea level as reflected by palaeoenvironmental indicators such as pollen and foraminifera. For example, a layer of basal peat at *c*10m depth, situated on the till surface at Lytham St Annes has been dated to 8575 ± 105 BP (Hv 4346) (Tooley 1978), and is likely to have developed when the area was first flooded by rising sea-levels following the end of the last glacial period *c*10,000 years ago. Additionally, the survival of peat under sand dunes is well documented at Lytham St. Annes and Lytham Moss, further inland, where the drifting of sand onto agricultural land and buildings has been dated to the mid- to late medieval period (Middleton *et al* 1995; Tooley 1978). This may indicate a period of reduced relative sea level and/or a period of much drier conditions.

4.2.2 The shallower deposits in the study area are variable and appear to be made up of beach sand and gravel in the southern part, which correlates with the position of the coastline shown on the 1847 first edition OS map, and a more complex sequence in the northern area. Interleaved layers of sandy and silty sediments within the northern area are similar to those observed during the evaluation trenching and are likely to relate to periodic episodes of aeolian deposition and alluviation from the Liggard Brook. The influence of the latter could have resulted in the formation of peat and organic clay deposits observed within many of the northern cores, but it is also possible that more widespread brackish, lagoon-like conditions previously existed, and may be hinted at by the results of the palaeobiological assessment. The preliminary palaeoenvironmental investigations suggest that the environment of deposition of the sequence varied from marine, to brackish, through to freshwater. However, it is unclear at this stage how this sequence varies spatially and through time.

4.3 PALAEOBIOLOGICAL ASSESSMENT

4.3.1 All the samples submitted contained quite well-preserved pollen at reasonable concentrations, with low amounts of indeterminable pollen and spores. It is difficult to ascertain the nature of the local vegetation using such small pollen counts. Local vegetation was probably sparse and scattered in the inter-tidal and peri-marine zones represented here, and its pollen swamped by the regional pollen component.

4.3.2 The results from the basal deposits (between 4.88m and 3.47m depth) of Borehole L1 suggest that there was still a lot of deciduous woodland growing in the region at the time of deposition, but also that there was significant agricultural activity in the area, both arable and pastoral. Comparison with pollen analyses from Fenton cottage, Over Wyre (Wells *et al* 1997) suggest that these samples are probably post-Roman in age.

4.3.3 The decrease in alder and the concomitant increase in willow and bog moss seen in samples between 2.98m and 2.44m depth within Borehole L1 suggest that there may have been increased wetness at the time of deposition. Small decreases in many herb values, including Gramineae and some indicators of arable farming, the absence of cereal-type grains, together with increased values of heather, could also suggest increasing wetness with a spread of heather moorland and bog as marginal areas of arable activity were abandoned.

4.3.4 The preponderance of herb pollen and the great drop in tree and shrub pollen values seen in samples taken at 1.75m and 1.82m within Borehole L1 show that the amount of woodland within the area had significantly declined by the time these sediments were laid down, probably during the past 200 years, a similar situation to that observed at Fenton cottage (*ibid*). The domination of grasses and agricultural indicator types suggest widespread arable and pastoral farming.

4.3.5 The sediments in Borehole L1 are probably from sand dunes, dune slacks, and inter-tidal situations. The two basal samples, at least, were probably laid down in brackish and/or marine water, but there are few indications of whether other samples were laid down under fresh or marine conditions. Interestingly, the three groups of samples from Borehole L1 are separated by distinct layers of sand. Tooley (1978) has defined the marine transgression sequences in this part of Lancashire on the basis of several sites just to the north-east of Lytham Quays, in Nancy's Bay, further up the Lytham-Skippool Valley, and to the west, in Lytham Hall Park. He recognised ten marine transgressions, with which he correlated sand dune stability. His transgressions Lytham IX and Lytham X are dated to 1795-1370 yrs B.P. and 817 yrs B.P. (approximately 150 – 580 A.D. and 1130 A.D.) and were found in Lytham Hall Park and Lytham Common at a similar latitude to Lytham Quays. These transgressions could therefore be represented in the basal samples from Borehole L1.

4.3.6 The three basal samples and the topmost sample in Borehole L9 are similar to the eight basal samples from Borehole L1, and are probably post-Roman in date. They indicate quite a lot of mixed deciduous woodland in the region, but with some clearance and agriculture, particularly grazing. Sample 2.38m may represent a phase of further clearance, and the topmost sample may be indicative of some woodland regeneration.

4.3.7 Of particular interest regarding the series of samples from Borehole L13 is that the sievings from the basal two samples (4.11m and 4.68m) contain wood fragments and Sphagnum leaves, and no Foraminifera or Dinoflagellate cysts, whereas the three samples above them contain foraminifera and dinoflagellate cysts, but no Sphagnum leaves or wood. This would suggest that the basal two samples were laid down in fresh water whereas the three samples above were laid down in brackish/marine water. However, the sieving from sample 2.46m also contained 69 mites, insect parts, and three chironomids, indicative of freshwater conditions. Macro-charcoal particles were also found in samples 4.11m, 2.80m and 2.46m, indicative of local burning or fires.

5. IMPACT AND RECOMMENDATIONS

5.1 EVALUATION TRENCHING

5.1.1 In broad terms, it would seem likely that any redevelopment of the area would have a low negative impact on the sub-surface archaeological resource. Only two of the trenches excavated showed the remains of upstanding structures; both of these will be impacted upon by the proposed reduction of ground level across the site to 4m OD (Trench 11 is at c5.46m OD, Trench 14 at c5.74m OD). Trench 12, excavated at a similar height to Trench 11, contained a floor layer probably relating to the former ship-building yard, which is likely to be threatened by any further development. It is, therefore, recommended that a watching brief be maintained during any ground-penetrating earth-moving works within these areas, defining as they do, the surviving parts of the ship-building yard. It is recommended that any such groundworks be undertaken in a controlled manner within those areas identified as containing archaeological features. For example, where deeper excavations are carried out across wide areas, it would be preferable for material to be removed stratigraphically, in spits, rather than immediately dug to final depth. This would mean that any archaeological features would, firstly, be more readily identified and placed within a wider context and, secondly be more easily investigated. During this phase of the evaluation, it was not possible to excavate all of the trial trenches due to various constraining factors. If these constraints have since been removed, it is recommended that the remaining trial trenches, Trenches 1-5 and Trenches 15 and 16 be evaluated as, particularly in the cases of Trenches 1-5, these lie to the north of the Liggard Brook, an otherwise uninvestigated area.

5.2 THE PALAEOENVIRONMENTAL SURVEY

5.2.1 The development of the site is likely to have a negative impact upon sequences that should provide detailed information regarding changes in sea level, the nature of local landuse and also of climate change. At least two locations that appear to have the potential for containing the most complete sequence of intercalated peats and silts, i.e. in the central area of the site, should be cored with a rig capable of penetrating relatively hard and deep deposits (as at present only the top 5 metres has been cored). Cores taken in this manner should be examined to produce measured sediment descriptions and subjected to full assessment. Plus, if possible, a number of radiocarbon dates should be taken to provide a chronology for the sequence.

5.2.2 It is also recommended that once further palaeoenvironmental work has been carried out on the deposits, a detailed report of their sedimentation history, through both space and time, is produced. This may also be compared to stratigraphic work that has been carried out nearby and further inland. No further work is recommended on the areas revealing natural sands and gravels, as in the southern part of the study area.

5.3 POLLEN ASSESSMENT

5.3.1 It is recommended that all samples from this phase of investigation should be fully analysed in order to elucidate the findings, and clarify the local environment. The cereal-type grains encountered could possibly be determined to a lower taxonomic level, using the criteria of Anderson (1979), to determine whether they are from wild coastal grass species or cultivated cereals. A single sample from L13 was not prepared due to time and financial constraints and it would be useful to prepare and count this sample as it is from just above the black clay with 'organic' inclusions from which sample 2.46m, with a high pollen concentration, many foraminifera, mites, chironomids etc, was taken. It would also be very useful to have the diatoms in the samples assessed by an expert in order to determine whether the sediments were laid down in fresh or marine water.

5.3.2 It is also recommended that should any suitable, deeper, deposits be encountered in any further investigations, these should be assessed for their palaeoenvironmental potential, including, where appropriate, pollen, plant macrofossils, insects, chironomids, diatoms, ostrocods, foraminifera, and fungal spores preferably within a framework of absolute dating by radiocarbon assay.

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7. ILLUSTRATIONS

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APPENDIX 1: PROJECT DESIGN

Oxford Archaeology North

September 2004

LYTHAM QUAYS,

LIGGARD BROOK,

LYTHAM,

LANCASHIRE

ARCHAEOLOGICAL EVALUATION PROJECT DESIGN

(2nd Revision)

Proposals

The following project design is offered in response to a request from Mr Dan Bashford, Heritage Consultant acting on behalf of Atkins Consultants Ltd, for an archaeological investigation in advance of the proposed development of land at the mouth of the Liggard Brook, Lytham, Lancashire.

1 BACKGROUND

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 A proposal for a mixed use development was recently formulated for a *c*29 hectare site at the mouth of Liggard Brook, Lytham, Lancashire. The site currently consists of rough pasture, light industry and a former boatyard. However, the site is considered to have a high potential to contain prehistoric deposits, based upon known finds within the wider region. There is a low potential for remains of Roman and medieval date, but there are several known sites of post-medieval date that will be effected by the proposed development. These include a sequence of sea walls, a graving dock, a trackway and a sub-square enclosure.

1.1.2 In order to secure archaeological interests, the Senior Archaeologist at Lancashire County Council has in the context of any future development provided a verbal brief detailing the required archaeological works. In the first instance, an archaeological evaluation is required, which will be aimed at establishing the extent of survival of sub-surface archaeological remains.

1.1.3 This project design is to be read in conjunction with a specification (20/08/04) issued by Atkins Consultants Ltd (the client) in consultation with the Senior Archaeologist at Lancashire County Council. The archaeological works will comprise the excavation of 23 trial trenches, coupled with a programme of palaeoenvironmental coring. Due to the current status of land ownership within the development area, it is proposed that a two-phased approach is undertaken. The first phase will involve the excavation of 16 trenches, and *c*75% of the required palaeoenvironmental coring. Trenches 1 -5, 15 and 16, and the outstanding coring requirements, will be undertaken during the second phase of fieldwork, once this land has been acquired.

1.2 PREVIOUS WORK

1.2.1 The proposed development area has been subjected to a desk-based assessment (Atkins Consultants Ltd 2004). This provided an overview of the archaeological background of the study area, and provided an assessment of the likely impacts on the archaeological resource by the proposed development. It also determined the nature and scale of evaluation to be carried out in order to inform a full mitigation strategy for the development.

1.3 OXFORD ARCHAEOLOGY

1.3.1 Oxford Archaeology has over 30 years of experience in professional archaeology, and can provide a professional and cost effective service. We are the largest employer of archaeologists in the country (we currently have more than 200 members of staff) and can thus deploy considerable resources with extensive experience to deal with any archaeological obligations you or your clients may have. We have offices in Lancaster and Oxford, trading as Oxford Archaeology North (OA North), and Oxford Archaeology (OA) respectively, enabling us to provide a truly nationwide service. Watching briefs, evaluations and excavations have taken place within the planning process, to fulfil the requirements of clients and planning authorities, to very rigorous timetables. OA is an Institute of Field Archaeologists Registered Organisation (No 17), and is thus bound by the IFA's Code of Conduct and required to apply the IFA's quality standards.

1.3.2 Given the geographical location of Lytham, it is intended to co-ordinate the project from our northern office in Lancaster, though the project team will use the most appropriate resources from both offices. Between our two offices our company has unrivalled experience of working on post-medieval sites, and is recognised as one of the leading archaeological units in the country with regard to dealing with industrial archaeological projects. OA North has considerable experience of the assessment, evaluation and excavation of sites of all periods, and has particular experience of industrial archaeology in the North West, as well as the assessment of the potential for palaeoenvironmental deposits, eg North West Wetlands Survey.

2 AIMS AND OBJECTIVES

2.1 ACADEMIC AIMS

2.1.1 The main research aim of the investigation, will be to characterise the level of preservation and significance of any sub-surface archaeological remains, and to provide a good understanding of their potential. This will be achived via a two-stage process:

- *Stage 1:* evaluation trenching
- *Stage 2:* core sampling

2.2 OBJECTIVES

2.2.1 The objectives of the project may be summarised as follows:

- to expose and determine the presence, character, and level of survival of historic sea defences;
- to expose and determine the presence, character, and level of survival of dockyard structures;
- to expose and determine the presence, character, and level of survival of general deposits;
- to determine the nature of archaeological mitigation required in advance of the proposed development.

3 METHOD STATEMENT

3.1 The following work programme is submitted in line with the aims and objectives summarised above, and in accordance with the project brief supplied by Atkins Consultants Ltd (the client), which was devised in consultation with the Senior Archaeologist at Lancashire County Council.

3.2 FIELDWORK

3.2.1 ***Evaluation Trenching***: it is proposed that the site be investigated initially via 23 trenches, which will be excavated to the top of significant archaeological deposits, or to a depth of 1.2m. The trenches will be placed in the positions specified by Atkins Consultants Ltd, and have been targeted to evaluate known archaeology and areas of significant archaeological potential. In the first instance, 16 trenches will be excavated, and the remaining seven trenches will be excavated as a second phase of fieldwork.

3.2.2 Excavation of the uppermost levels of modern overburden/demolition material will be undertaken by a machine fitted with a toothless ditching bucket to the top of the first significant archaeological level. The work will be supervised by a suitably experienced archaeologist. Spoil from the excavation will stored adjacent to the trench, and will be backfilled upon completion of the archaeological works.

3.2.3 Machine excavation will then be used to define carefully the extent of any surviving foundations and other remains. Thereafter, structural remains will be cleaned manually to define their extent, nature, form and, where possible, date. It should be noted that no archaeological deposits will be entirely removed from the site. If the excavation is to proceed below a depth of 1.2m, as is envisaged with respect to sondages within Trenches 21-23, then the trenches will be widened sufficiently to allow the sides to be stepped in.

3.2.4 All information identified in the course of the site works will be recorded stratigraphically, using a system adapted from that used by the Centre for Archaeology Service of English Heritage. Results of the evaluation will be recorded on *pro forma* context sheets, and will be accompanied with sufficient pictorial record (plans, sections and both black and white and colour photographs) to identify and illustrate individual features. Primary records will be available for inspection at all times.

3.2.5 A full and detailed photographic record of individual contexts will be maintained and similarly general views from standard view points of the overall site at all stages of the evaluation will be generated. Photography will be undertaken using 35mm cameras on archivable black and white print film as well as colour transparency, and all frames will include a visible, graduated metric scale. Extensive use of digital photography will also be undertaken throughout the course of the fieldwork for presentation purposes. Photographs records will be maintained on special photographic *pro-forma* sheets.

3.2.6 The precise location of the evaluation trenches, and the position of all archaeological structures encountered, will be surveyed by EDM tacheometry using a total station linked to a pen computer data logger. This process will generate scaled plans within AutoCAD 14, which will then be subject to manual survey enhancement. The drawings will be generated at an accuracy appropriate for 1:20 scale, but can be output at any scale required. Sections will be manually drafted as appropriate at a scale of 1:10. All information will be tied in to Ordnance Datum.

3.2.7 Human remains are not expected to be present, but if they are found they will, if possible, be left *in situ* covered and protected. If removal is necessary, then the relevant Home Office permission will be sought, and the removal of such remains will be carried out with due care and sensitivity as required by the *Burials Act 1857*.

3.2.8 Any gold and silver artefacts recovered during the course of the excavation will be removed to a safe place and reported to the local Coroner according to the procedures relating to the Treasure Act, 1996.

3.2.9 ***Finds policy:*** finds recovery and sampling programmes will be in accordance with best practice (following current Institute of Field Archaeologists guidelines) and subject to expert advice in order to minimise deterioration. OA has close contact with Ancient Monuments Laboratory staff at the University of Durham and, in addition, employs in-house artefact and palaeoecology specialists, with considerable expertise in the investigation, excavation, and finds management of sites of all periods and types, who are readily available for consultation. Finds storage during fieldwork and any site archive preparation will follow professional guidelines (UKIC). Emergency access to conservation facilities is maintained by OA North with the Department of Archaeology, the University of Durham. Samples will also be collected for technological, pedological and chronological analysis as appropriate. OA North employs palaeoecology and soil micromorphology specialists with considerable expertise in the investigation, excavation and analysis of sites of all periods and types, who are readily available for consultation.

3.3 ENVIRONMENTAL CORING

3.3.1 ***Fieldwork:*** areas in which the made ground is too deep for deposits to be evaluated by trenching, it is proposed that the production of a deposit model, through the drilling of cores, will be undertaken. The borehole transects, with the cores at 100 metres intervals, will be drilled using a terrier rig to retrieve windowless samples in 1 metre lengths. An OA North specialist will advise the contractor on the positioning of the boreholes. These will be taken to a depth of 10 metres, unless the underlying solid geology is reached before this depth. The cores will be capped and taken to the laboratory for recording. The position of each borehole will be logged in three dimensions using either a GPS system or a total station. If the made ground is impenetrable by a Terrier rig, it may be necessary to use a percussion rig to obtain continuous sampling; this will require a reduction in the number of samples that could be taken within the time constraints of the project.

3.3.2 Approximately 75% of the palaeoenvironmental coring requirement will be undertaken intially, with the remainder of the requirement to be completed as a second phase of fieldwork.

3.3.3 ***Assessment:*** the cores will be cut open in the laboratory. The sediments will cleaned, photographed and the stratigraphy and lithology recorded by an OA North technician and specialist. The lithology will be recorded on *pro forma* and the data together with the GPS readings will be inputted into the specialist computer programme (ROCKWORKS). The data will be correlated and a terrain model of the site will be produced. This model will illustrate the possible sediment formation of the site. This is likely to be complex because the site is in an area of Lancashire known to have been greatly influenced by changing sea-level in the Holocene after the retreat of the ice from the last ice age (Tooley 1978).

3.3.4 If the borehole data record changes in sedimentation 25% of the cores will be assessed rapidly for biological indicators. These indicators may include pollen, diatoms, water-logged plant remains and foraminfera depending on the type of deposits recorded. The state of preservation of these indicators, and their possible ecological significance relating to changing sea-level, will be recorded.

3.4 HEALTH AND SAFETY

3.4.1 OA North provides a Health and Safety Statement for all projects and maintains a Safety Policy (see *Appendix 1*). All site procedures are in accordance with the guidance set out in the Health and Safety Manual compiled by the Standing Conference of Archaeological Unit Managers (3rd Edition, 1997). OA North will liase with the client/main contractor to ensure all current and relevant health and safety regulations are met.

3.4.2 A risk assessment will be completed in advance of any on-site works. OA North staff will be equipped with the appropriate PPE, including disposable overalls and gloves, and welfare facilities including a washing facility will also be provided.

3.4.3 OA North has professional indemnity to a value of £2,000,000, employer's liability cover to a value of £10,000,000 and public liability to a value of £15,000,000. Written details of insurance cover have been forwarded.

3.4.4 Normal OA North working hours are between 9.00 am and 5.00 pm, Monday to Friday, though adjustments to hours may be made to maximise daylight working time in winter and to meet travel requirements. It is not normal practice for OA North staff to be asked to work weekends or bank holidays and should the client require such time to be worked during the course of a project a contract variation to cover additional costs will be necessary.

3.5 OTHER MATTERS

3.5.1 Access to the site will be arranged via the Client/main contractor.

3.5.2 The Client/main contractor is asked to provide OA North with information relating to the position of live services on the site. OA North will use a cable detecting tool in advance of any machine excavation.

3.5.3 OA North has made provision for the installation of secure fencing (Herras) to protect the trenches during the course of the fieldwork.

3.6 POST-EXCAVATION AND REPORT PRODUCTION

3.6.1 ***Archive:*** the results of the fieldwork will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines (*The Management of Archaeological Projects, 2nd edition, 1991*) and the *Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. The deposition of a properly ordered and indexed project archive in an appropriate repository is considered an essential and integral element of all archaeological projects by the IFA in that organisation's code of conduct.

3.6.2 The archive for the archaeological work undertaken at the site will be deposited with the nearest museum which meets Museums' and Galleries' Commission criteria for the long term storage of archaeological material (MGC 1992). This archive can be provided in the English Heritage Centre for Archaeology format, both as a printed document and on computer disks as ASCii files (as appropriate). The archive will be deposited with the nominated museum within six months of the completion of the fieldwork.

3.6.3 Except for items subject to the Treasure Act, all artefacts found during the course of the project will be donated to the receiving museum.

3.6.4 A synthesis (in the form of the index to the archive and a copy of the publication report) will be deposited with the Lancashire Sites and Monuments Record. A copy of the index to the archive will also be available for deposition in the National Archaeological Record in London.

3.6.5 ***Report:*** an interim report will be produced during the course of the fieldwork, which will summarise the results obtained to date. This report will be resticted to a summary of the results obtained from the Phase 1 evaluation trenching, as it will not be possible to produce the results of the palaeoenvironmental coring within this timescale. Similarly, full recommendations for any mitigation work required cannot be formulated until the entire site has been evaluated.

3.6.6 Upon completion of the Phase 2 works (which are excluded from the costings presented below), a final report will be compiled. Four copies of this bound and collated final report will be submitted to the Client within six weeks of the completion of the fieldwork. Further copies will be sent to the Senior Archaeologist at Lancashire County Council, and the Lancashire Sites and Monuments Record, following discussions with the Client. The final report will include a copy of this project design, and indications of any agreed departure from that design. It will include an historical and archaeological background to the study area, an outline methodology of the investigation, and present, summarise, assess, and interpret the results of the programme of archaeological works detailed above. It will also include an assessment of the finds, which will be accompanied by relevant proposals for detailed finds analysis and conservation with costs. In addition, recommendations for any further mitigation works and details of the final deposition of the project archive will also be made.

3.6.7 A summary of the results produced from the archaeological investigation will be published in the CBA North West magazine, although a more detailed article will be provided should the results be of sufficient merit.

3.6.8 ***Confidentiality:*** the final report is designed as a document for the specific use of the client, and should be treated as such; it is not suitable for publication as an academic report, or otherwise, without amendment or revision. Any requirement to revise or reorder the material for submission or presentation to third parties beyond the project brief and project design, or for any other explicit purpose, can be fulfilled, but will require separate discussion and funding.

4 WORK TIMETABLE

4.1 A 12-day period is required to excavate, record and backfill the evaluation trenches.

4.2 An interim statement can be submitted by 01/10/04, if the fieldwork commences on 13/09/04. The final, detailed report will be submitted within six weeks of the completion of the second phase of fieldwork.

4.3 OA North can execute projects at very short notice once an agreement has been signed with the client.

5 STAFFING PROPOSALS

5.1 The project will be under the overall charge of **Ian Miller BA** (OA North Project Manager) to whom all correspondence should be addressed. Ian has considerable experience and particular research interests in Industrial Archaeology and, amongst numerous other projects, was involved in the excavation recording, analysis and publication of the Netherhall blast furnace site in Maryport, Cumbria, the excavation, recording and publication of work at Carlton Bank alum works in North Yorkshire, and the evaluation and excavation of the Jersey Street Glass Works in Manchester.

5.2 The evaluation will be undertaken by **Paul Clarke BA** (OA North Project Supervisor). Paul will be assisted by at least two technicians.

5.3 The environmental coring will proceed under the direction of **Elizabeth Huckerby BA MSc** (OA North Environmental Archaeologist) and **Dr Denise Druce** (OA North Environmental Archaeology Specialist). Elizabeth has extensive experience of the palaeoecology of the North West, having been one of the principal palaeoenvironmentalists in the English Heritage-funded North West Wetlands Survey. Denise has carried out fieldwork and laboratory work on a number of developer-funded projects, and is currently one of a team of environmental specialists working on the English Heritage-funded Upland Peat Project. In addition, specialist advice will be sought from **Prof Michael Tooley**, a leading researcher in sea-level change, with a particular knowledge of the coats of North West England.

5.4 Assessment of any finds from the excavation will be undertaken by OA North's in-house finds specialist **Christine Howard-Davis BA** (OA North Finds Manager). Christine has extensive knowledge of all finds of all periods from archaeological sites in northern England.

5.5 Any requirement for conservation work will be undertaken by **Jennifer Jones**, the AML contract conservator based at the University of Durham. Jennifer is a nationally-recognised specialist in conservation, and is readily available to provide advice on the treatment of any delicate finds recovered from the evaluation.

6 MONITORING

6.1 A programme of monitoring meetings will be established at the outset of the project. Meetings will be arranged through Atkins Heritage (the client).

BIBLIOGRAPHY

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Standing Conference of Archaeological Unit Managers (SCAUM), 1997 *Health and Safety for Field Archaeologists Manual*, 3rd Edition, Southampton

Tooley, MJ, 1978 *Sea Level Changes*, Oxford

United Kingdom Institute for Conservation (UKIC), 1990 *Guidelines for the preparation of archives for long-term storage*, London

SAFETY ORGANISATION OF OXFORD ARCHAEOLOGY

Company Safety Management Structure

The **Director and Chief Executive** of Oxford Archaeology (OA) is ultimately responsible under the terms of the Health and Safety Act (1974) for ensuring the safety of OA employees. The director must: know the broad requirements of relevant legislation; attend meetings of their respective Health and Safety Committees; ensure that responsibility for health and safety is properly assigned and accepted at all levels. The Director and Chief Executive of the OA is David Jennings.

The OA **Health and Safety Co-ordinators** advise the director on matters of health and safety; keeps abreast of relevant legislation and approved practice, and disseminates this information to OA staff; advise staff as required on matters of health and safety; maintains the OA health and safety records; call and chair meetings of the OA Health and Safety Committee; request and receive consultation with/from staff Health and Safety Representatives. The Health and Safety Co-ordinators of the OA are David Wilkinson (Oxford) and Ian Miller (Lancaster). The post of Health and Safety Co-ordinator fulfils the requirement for a health and safety co-ordinator under the Management of Health and Safety at Work Regulations (1999).

The **Project Manager** is the person delegated to take overall charge of a particular project. She/he is responsible for health and safety matters on the projects which they manage, reporting to the Health and Safety Co-ordinator in the first instance, and ultimately to the Director and Chief Executive. She/he must ensure that adequate safety arrangements, including an appropriate level of risk assessment, have been drawn up for the project, or for each phase of a project, and that these arrangements are implemented and maintained.

The **Site Director** is the person delegated to take charge of a particular phase of a project. She/he will be involved in drawing up the health and safety arrangements, and is responsible for implementing and maintaining the arrangements at project level. She/he is immediately responsible for the Health and Safety of employees under her/his supervision. She/he reports directly to the Project Manager.

The **OA Health and Safety Committee** consists of the Director, Health and Safety Co-ordinators, Director Operations, Head of Fieldwork, the Site Staff Representative and two Health and Safety staff representatives. Meetings of the Committee are normally called by the Safety Co-ordinators when there is business for discussion, but may be called by other members of the committee. Project Directors or Project Managers may also be asked to attend, or may request to attend.

The **OA Health and Safety** advisors provide professional advice on health and safety matters. They may advise the Health and Safety Co-ordinators, or directly advise a Project Director or Manager. They will audit OA arrangements, including Health and Safety Plans. OA Health and Safety Advisors are Safety Services (UK) Ltd, Lakeside Industrial Estate, Stanton Harcourt, Oxford, OX8 1SL - 01865 883288.

Individual responsibility

Each person working at an OA site or premises is responsible for ensuring that their place of work is safe for themselves, their fellow workers and the public at large.

OA SAFETY MANUAL

OA has adopted the manual *Health and Safety in Field Archaeology* published by SCAUM (3rd Edition, 1997), and copies are available for consultation at the Unit's permanent offices.

For further information on safe practices there are sets of copies of H&SE guidance notes which have been selected by our safety consultants as being of relevance to our work. These and other relevant information are held by the Health and Safety Co-ordinator.

This information will be expanded from time to time by internal guidance memos on the safe use of equipment which is exclusive to OA.

Relevant legislation

OA will comply with all current and relevant Health and Safety legislation, including, but not limited to:

The Health and Safety at Work etc. Act 1974

Factories Act 1961

Offices Shops and Railway Premises Act 1962

Fire Precautions Act 1971

Construction (Design and Management) Regulations 1994

Construction (Health, Safety and Welfare) Regulations 1996

Health and Safety (Consultation with Employees) Regulations 1996

Management of Health and Safety at Work Regulations 1999

Manual Handling Operations Regulations 1992

Health and Safety (Display Screen Equipment) Regulations 1992

Personal Protective Equipment at Work Regulations 1992

Provision and Use of Work Equipment Regulations 1998

Workplace (Health, Safety and Welfare) Regulations 1992

Control of Substances Hazardous to Health Regulations 1999

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995

1.2 *On-site safety organisation*

The **Project Manager** will be responsible for ensuring that the site remains safe throughout the project's duration by noting the contents of the Risk Assessment, and following the Project Safety Plan and Project Method Statement; she/he will note any changes of circumstances which may affect health, and amend the Project Safety Plan if necessary. The Project Manager will inform the following people if a Project Safety Plan requires changing:

- Project Director
- URL Directors representative

The **Project Manager** will ensure that the following information is displayed in the site office: copy of the HSE poster `Health and Safety Law - What You should Know', copy of the Project Safety Plan, copy of the Project Method Statement, Emergency Information Sheet giving details of nearest hospital etc.

All **OA employees** under the supervision of the Project Manager must take reasonable care for their own Health and Safety and for others who may be affected by their acts or omissions.

An **Accident Book** will be kept on site. The Project Manager will fill this book in when an accident or dangerous incident takes place. This information must be copied to the relevant Safety Co-ordinator and to the Project Director, who will arrange for it to be copied to the URL Directors representative.

1.3 *Safety training*

The **Project Manager** must instruct OA staff under her/his supervision in all matters relating to health and safety on the project. This must include drawing their attention to the contents of the Project Safety Plan, and in particular to any precautions against particular hazards which are set out in the plan.

Instruction may be required in: working with the mechanical excavator, use and disposal of PPE, working beside roads and the safe use of shoring.

2 PLANT AND EQUIPMENT

2.1 *Mechanical excavators (including excavators fitted with breakers)*

Members of the project team present on site while a mechanical excavator is working must keep well clear of the excavator, and must not work within the swinging radius of the bucket arm. They must wear hard hats and high-visibility vests at all times. Members of the project team who need to approach the area where the mechanical excavator is working will approach from the front (meaning the excavating side of the machine) so as to be visible to the driver. They should make their presence known to the **Machine Supervisor** and should <u>not</u> signal to the machine operator.

The machine excavator will not work so close to the edge as to endanger the stability of the excavation sides.

The **Project Manager** or the person she/he delegates to supervise the machine excavator (the **Machine Supervisor**) will satisfy her/himself that the operator possesses an adequate level of skill. If the operator cannot control the machine in a reasonably smooth and careful manner, a replacement operator should be requested.

When the mechanical excavator is working, members of the project team may only enter into, and work in, the part of the trench behind the machine supervisor, i.e. the machine supervisor must be between themselves and the machine.

2.2 *Petrol and diesel*

The operator of the mechanical excavator will be responsible for the safe use and storage of any reserves of petrol or diesel brought onto the site.

3 HAND TOOLS

3.1 *General*

All hand tools must be kept in good condition and checked regularly. Damaged tools should be mended or replaced. When not in use they should be stored under cover so as to prevent deterioration and so as not to cause a tripping hazard by leaving them around the site.

3.2 *Buckets*

These can fail at the handle attachment point and should be checked regularly. They should be filled to take account of the abilities of the user, and the distance/gradient to be travelled.

3.3 *Shovels and spades*

These should be used from a firm, stable standing position which uses the legs rather than the back to lift the weight. The surrounding area is to be free of obstructions and other personnel.

3.4 *Picks and mattocks*

When using a pick or mattock, the users legs must be placed apart to obtain a firm footing, and the pick wielded so that the point of contact is within easy reach, but not too close to the feet. The surrounding area, including overhead, is to be free of obstructions and other personnel.

3.5 *Trowels*

Care is required when carrying trowels, which should never be placed in pockets or other parts of clothing.

3.6 *Grid pegs*

Metal grid pegs should be fitted with rubber `mushrooms' to protect against contact injuries.

3.7 *Wheelbarrows*

These should be loaded only to the lifting and pushing capabilities of the pusher, taking account of the weight and bulk of the material, and of the route to be travelled.

3.8 *Surveyors staff and tripods*

The surveyors staff and tripods will not be carried in the extended position. This applies particularly when working in the vicinity of roads and power lines.

4 TEMPORARY SITE ACCOMMODATION

4.1 *Site office*

This will provide adequate space for the site staff to sit comfortably at a table, and to store their outdoor clothing, and should also be suitable for desk-based work which cannot be carried out outdoors. The accommodation will also contain: a gas ring; water, soap, washing-up bowl, washing-up liquid; drinking water and cups; first-aid kit; fire extinguisher.

4.2 *Telephone*

A portable telephone will be provided.

4.3 *Lavatories*

A serviced portable lavatory will be installed on the site.

4.3 *Tool store*

A secure tool and equipment store will be installed on the site. This may be a separate compartment within the site office.

5 LIQUIFIED PETROLEUM GAS

The LPG cylinder will be positioned outside the site office when connected to the gas ring. The hose and clips will be regularly checked.

Adequate ventilation will be allowed in the site office to provide a supply of air for combustion, and to facilitate the escape of water vapour and carbon monoxide.

Flameproof material will be used to protect the surface and wall(s) where the gas ring is positioned.

Overnight storage (for a single gas cylinder only) will be in the secure equipment store/site office. The door of the equipment store/site office will have a fixed exterior sign stating `Danger - LPG Stored Inside'.

6 SAFETY OF THE WORKING AREA

6.1 *Site security*

Access to the evaluation area will be for authorised personnel only; there will be no public access.

6.2 *Fencing*

Trenches deeper than 1.2 m will be fenced off.

6.3 *Tidiness*

The working area of the site must be kept tidy at all times. Tools and other equipment should not be left lying around so as to cause a hazard.

6.4 *Waste disposal*

All site waste will be bagged and taken off site for disposal.

6.5 *Operations near adjacent roads*

Care will be taken when machinery, vehicles and personnel are moving to and from the public highway. Specific hazards are identified in individual Risk Assessments.

7 SERVICES

7.1 *Services research*

OA will identify the presence of services by directly contacting all relevant Statutory or other Service Authorities. This information and the necessary action required, will be provided as part of the site-specific Risk Assessments. In addition to this, each evaluation trench position will be scanned using a C-Scope U-Scan and Scansmitter. This will be carried out by staff who have been trained in the use of this equipment. Should the presence of services be detected where none were thought to exist, a check will be made with the Statutory Authorities.

8 COSHH STATEMENT AND CONTAMINATION RISKS

8.1 *Substances to be taken onto site*

8.1.1 Liquified Petroleum Gas - see 5.

8.1.2 Exhaust gases

The risk - DERV fumes given off by a machine excavator or other plant are toxic if inhaled, containing partly-burnt hydrocarbons, oxides of nitrogen, carbon monoxide and other chemicals. The risk is greater if the engine is badly adjusted. Carbon Monoxide is particularly dangerous, as it is colourless, odourless and de-oxygenates the blood when inhaled.

Measures to be taken - the machine supervisor will take account of the positioning of the exhaust on the mechanical excavator, and of the wind direction, and position her/himself so as to minimise the risk of inhaling exhaust fumes. The machine supervisor will also watch for signs that the engine is badly adjusted, such as blue or black colouring in the exhaust fumes. If this is the case, she/he should inform the operator that arrangements must be made for the engine to be adjusted.

9 OTHER PARTICULAR HAZARDS

9.1 *Leptospirosis*

All persons working on the site will carry a card informing them of the risks of leptospirosis and the precautions to be taken.

An `Emergency Contamination Procedure' will be adopted if any landfill is encountered during the excavation of a trench, or in the event of substances which appear to constitute a risk are encountered, PPE (which will be available on site, see below, 10.7) will be adopted and the trench then abandoned and backfilled.

10 PERSONAL PROTECTIVE EQUIPMENT

As there was no mention made of contaminated gound in neither the project brief nor the Engineering Appraisal Report (Buro Happold 2003), it is assumed that there is no requirement for anything other than the standard PPE, as listed below:

10.1 *Helmets*

Helmets provided by OA staff will be worn at the following times: whenever a mechanical excavator is present on the site (all members of the evaluation team); by any person working with their head below ground level. A supply of spare helmets will be kept on site for the use of visitors.

10.2 *High-visibility vests*

High-visibility vest will be provided by OA for staff to wear while machinery is working on site.

10.3 *Hearing protection*

Ear defenders will be provided for the use of staff working in the vicinity of operating plant. The defenders will be of a type which can be worn with helmets.

10.4 *Footwear*

All persons working on site will wear robust shoes or boots fitted with a steel toecap and mid-sole protection.

10.5 *Foul weather clothing*

Waterproof jackets and overtrousers will be provided by OA for persons required to work outside in foul weather.

10.6 *Eye/Breathing protection*

Eye goggles and dust masks will be provided by OA in case of dust or particle hazards.

10.7 *PPE against contamination*

A minimum of 6 sets of the following will be available on site at all times: protective overalls (Tyvek Pro-tech, or overalls to same or higher specification), protective gloves, rubber boots, dust masks.

11 EXCAVATIONS

11.1 *Geology and soil conditions*

Geotechnical data will be used to assess any particular hazards arising from the geology and soils.

11.2 *Excavation to depths of less than 1.2 m*

For the majority of trenches excavation will stop at the surface of the geology or at archaeological deposits, at depths of 0.3 to 0.6 m (see above and Project Method Statement) and no requirement for stepping or shoring is therefore anticipated.

Under normal circumstances the spoil heaps around the edge of the trench will act as a visible and physical reminder of the presence of a trench edge. Where the spoil heap does not perform this function, a line of easily visible bunting (normally strung on iron road pins) should be erected at a height of 1 m, and 1 m back from the trench edge.

Spoil heaps around the trench will be a minimum of 1.5 m from the edge of the trench, and the area between spoil heap and trench is to be kept as clean as is reasonable practicable.

11.3 *Excavation to depths greater than 1.2 m*

In trenches where there is a greater depth of overlying material (see above), or additional depth is required, excavation may proceed to a maximum depth of 2.4 m on the site, using the stepped technique as defined in the detailed method statement. If this technique is applied careful observance on site will be required to ascertain whether the material is sufficiently stable for the stepped trench technique. The opinion of a qualified engineer will be obtained if necessary.

It is impossible in advance to predict which if any trenches will require deepening. It is unlikely that entire trenches would be deepened in this manner, and the technique will only be applied in discrete locations within trenches

For definition of trench edges, see 11.2.

Spoil heaps around the trench will be a minimum of 1.5 m from the edge of the trench, and the area between spoil heap and trench is to be kept as clean as is reasonable practicable.

11.4 *Access and egress to excavations*

Access and egress to and from deep excavations will be by means of ramps at one or both ends of the trench, or by fixed ladder.

12 MANUAL HANDLING

A considerable amount of manual handling will be involved in the archaeological excavation work. This will include loading and unloading equipment, lifting wheelbarrows and buckets, shovelling, lifting soil samples.

Consideration must always be given to whether the load in question can be lifted by other means, e.g. the mechanical excavator can be used for large quantities of spoil unless archaeological circumstances dictate otherwise.

Members of the excavation team should not be asked to lift loads beyond their capabilities.

Manual lifting will be carried out carefully, and in a manner calculated not to cause injury to the lifter. In general, for the type of loads predicted, this means a lift carried out with the load close to the body. The back of the lifter should be kept upright so that the legs rather than the back provide the lifting force.

13 ENVIRONMENT

13.1 *Weather*

For foul weather clothing see 10.5. Outdoor work will not continue under weather conditions which constitute a risk to health and, e.g. very wet weather or extreme cold or heat. Work should not continue if wet weather, snow or frost make the site dangerous (e.g. slippery surfaces or poor visibility).

13.2 *Light*

Work will only take place during daylight hours.

13.3 *Noise*

For hearing protection see 10.3.

14 FIRST AID

14.1 *Trained first-aid personnel*

The excavation team will, whenever practicable, include a trained first-aider.

14.2 *First-aid equipment*

A clearly-marked First Aid kit will be kept in the Site Office. All members of the excavation team will be made aware of where it is kept. The first aid kit will contain:

1 guidance card; 20 (minimum) individually-wrapped plasters; 2 sterile eye pads; 6 triangular bandages; 6 safety pins; 11 sterile, unmedicated wound dressings (6 medium, 2 large, 3 extra large); 3 containers of saline or sterile water (300 ml minimum); 2 pairs disposable plastic gloves; 1 packet wet wipes.

15 SUBCONTRACTORS

Any sub-contractors present on site will be provided with a copy of the Risk Assessment, Project Safety Plan and Project Method Statement, and will be briefed on their safety responsibilities in relation to the site.

16 CONTROL OF VISITORS

Visitors to each site will be by appointment only, subject to the approval of the client. A record of all visits will be made recording the name(s) of the visitor(s), their company and their purpose for visiting the site.

APPENDIX 2: CONTEXT LIST

Context No.	**Trench**	**Description**
1	18	Brown silty-sand topsoil
2	18	Yellow sandy subsoil
3	18	Pebble Bank
4	17	Brown sand topsoil
5	17	Layer of dumped refuse
6	17	Yellow sand layer
7	23	Mid-brown sand
8	23	Mid-yellow sand
9	23	Brown sandy-clay
10	23	Light yellow sand
11	23	Mid-brown sand
12	23	Modern dump deposit
13	23	Dark orange sand
14	23	Light blue clayey-sand
15	23	Dark blue organic band
16	23	Light blue clayey-sand
17	22	Topsoil
18	22	Mid-yellow sand
19	22	Brown sandy-clay
20	22	Light yellow natural sand
21	22	Bluish-grey sandy-clay
22	22	Mid-yellowish-orange sand
23	22	Light blue sandy-clay
24	22	Blackis- blue sand
25	22	Brown sand
26	22	Modern disturbance
27	22	Redeposited natural
28	21	Bluish-black organic layer

Context No.	**Trench**	**Description**
29	21	Dark brown sandy-silt
30	21	Brown sandy-clay
31	21	Light yellow natural sand
32	21	Modern debris
33	21	Topsoil
34	21	Brown clay
35	21	Mid-yellow sand
36	21	Greyish- brown clay
37	21	Light bluish-grey silty-sand
38	21	Mid-yellow sand
39	21	Light brown silty-sand
40	19	Mid-brown sand
41	19	Dark brownish-black sand
42	19	Mid-yellow sand
43	19	Band of brown clay and sand
44	19	Light yellow sand
45	19	Greyish-brown layer
46	19	Light yellow natural sand
47	8	Mid-brown sandy-silt topsoil
48	8	Mid-red sandy-clay
49	8	Building rubble
50	8	Mid-yellow sand
51	8	Black sandy-silt
52	12	Concrete slab
53	12	Rubble layer
54	12	Light grey sandy-clay
55	12	Wall
56	12	Wall
57	12	Light grey sandy-clay

Context No.	**Trench**	**Description**
58	10	Concrete slab
59	10	Black rubble-rich layer, make-up for ***58***
60	10	Redeposited natural
61	10	Grey natural clay
62	10	Pebble layer
63	11	Overburden layer
64	11	Wooden barrel
65	11	Wall
66	11	Mixed grey and yellow sandy-clay
67	11	Light grey sandy-clay
68	9	Topsoil
69	9	Dark grey silt containing a high proportion of rubble
70	9	Pale yellow sand
71	9	Brown clay
72	13	Modern rubble layer
73	13	Light yellow natural sand
74	13	Water-worn pebbles
75	14	Modern rubble
76	14	Floor surface
77	14	Wooden post
78	14	Make-up layer for ***76***
79	14	Light yellow silty-sand
80	14	Dark grey clay
81	14	Band of sandstone/crushed brick
82	14	Mid-brown clay
83	20	Topsoil
84	20	Light grey sandy-clay
85	20	Red sandy clay
86	20	Black sandy clay

APPENDIX 3: SUMMARY FINDS CATALOGUE

Trench	**Context**	**Quantity**	**Material**	**Description**	**Date range**
8	***51***	2	Ceramic building material	Brick	Post-medieval
11	***63***	2	Glass	Green and very light turquoise	Nineteenth - early twentieth century
11	***65***	1	Ceramic building material	Brick	Post-medieval
12	***53***	10	Pottery	White-glazed white earthenware	Nineteenth - twentieth century
12	***53***	2	Pottery	Porcelain	Late nineteenth - twentieth century
12	***53***	17	Pottery	Stoneware	Nineteenth - early twentieth century
12	***53***	19	Glass	Colourless, very light turquoise, and cobalt blue	Nineteenth - early twentieth century
12	***53***	3	Pottery	Brown-glazed red earthenware (coarseware)	Late seventeenth - early twentieth century
17	***5***	6	Pottery	White-glazed white earthenware	Mid nineteenth - early twentieth century
17	***5***	7	Pottery	Stoneware	Nineteenth - early twentieth century
17	***5***	1	Pottery	Brown-glazed red earthenware (coarseware)	Late seventeenth - early twentieth century
17	***5***	2	Pottery	Porcelain	Late nineteenth - early twentieth century
17	***5***	1	Glass	Very light turquoise (bottle)	Nineteenth - early twentieth century
17	***5***	1	Glass	Colourless (drinking vessel)	Nineteenth - early twentieth century
22	***26***	3	Pottery	White-glazed white earthenware	Mid nineteenth - early twentieth century
22	***26***	1	Pottery	Porcelain	Nineteenth - early twentieth century
22	***26***	1	Pottery	Beige-glazed beige earthenware	Late eighteenth - twentieth century
22	***26***	1	Pottery	Brown-glazed red earthenware (coarseware)	Late seventeenth - early twentieth century
22	***26***	1	Pottery	Beige-glazed stoneware	Late nineteenth - early twentieth century
22	***27***	1	Pottery	Porcelain	Late nineteenth - early twentieth century
22	***27***	6	Pottery	White-glazed white earthenware	Mid nineteenth - early twentieth century
23	***11***	1	Pottery	Beige-glazed stoneware	Nineteenth - early twentieth century
23	***11***	1	Pottery	Brown-glazed red earthenware (coarseware)	Late seventeenth - early twentieth century

Trench	Context	Quantity	Material	Description	Date range
23	***11***	5	Pottery	White-glazed white earthenware	Late nineteenth - early twentieth century
23	***11***	2	Pottery	Porcelain	Mid nineteenth - early twentieth century
23	***11***	1	Pottery	Turquoise-glazed stoneware	Mid nineteenth - early twentieth century

APPENDIX 4: SUMMARY TABLES OF THE RESULTS OF THE PALAEOBIOLOGICAL ASSESSMENT

		Core L1										**L9**					**L13**								
Taxon	**Sample depth (cm)**	**175**	**182**	**244**	**298**	**347**	**361**	**407**	**421**	**439**	**488**	**234**	**238**	**255**	**335**	**357**	**59**	**66**	**75**	**126**	**184**	**246**	**280**	**411**	**468**
Trees & Shrubs																									
Betula	Birch		0.8	8.3	6.4	7.2	6.7	15	14	12	9.2	4.6	1.4	5	9	6.7	7.3	9	10.6	5.3	10.3	5.4	9	10.4	9.8
Pinus sylvestris	Pine			1.7	1.3	0.7				0.8	0.8	0.7		1.4	1.2			0.5	0.9		0.9	2.4	1.1	1.6	
Quercus	Oak	1.5		5	3.8	9.4	3.8	11	5	9.1	6.7	3.3	4.2	1.4	10.8	5.7	6.8	6.5	7.9	10.6	7.5	3.2	6.2	6.4	9.8
Ulmus	Elm	2.2						1		0.8			0.5	0.7		1									
Tilia cordata	Lime											0.7								0.9					0.8
Alnus glutinosa	Alder	3	1.6	18.3	22.9	30.2	31.7	21	25	24.3	18.5	15.8	4.2	16.6	16.8	15.4	16.1	22	13.2	12.3	14.1	9.5	13.4	13.6	16.4
Acer	Maple/Sycamore		0.8				1																0.6		
Carpinus betulus	Hornbeam																							0.8	
Fraxinus excelsior	Ash	0.7						1			0.8					1	0.7	0.5	0.9	1.8		0.8			
Cornus sanguinea	Dogwood										0.8											0.8			
Corylus avellana	Hazel	2.2	0.8	5	5.1	7.2	12.7	12	16	6.8	20.2	9.2	1.9	19.4	12	11.4	16.8	9	8.8	4.4	9.4	12.7	14	11.2	11.9
Salix	Willow		0.8	1.7	3.8	0.7					0.8		0.5					1	0.9		0.9	0.8	1.1		2.5
Hedera helix	Ivy											0.7													
Dwarf Shrubs																									
Calluna vulgaris	Heather	0.7		5	5.1	2.2	1	7	3	1.5	4.2	4.9	1.4	4.3	8.4	4.8	9.5	3	3.5	2.6	3.8	8.7	5	6.4	5.7
Ericaceae-type	Heather/Crowberry families		0.8						1									0.5	0.9			0.8	0.6		0.8
Herbs																									
Gramineae	Grass family	67	50.2	6.6	21.6	22.3	20.2	15	13	18.2	12.6	40	61.8	20.1	10.8	19	14.6	20	21.2	10.6	11.3	30	19	14.4	18.9
Cerealia-type	Cereals	1.5	4.9				3.8	1	3	2.3	0.8						2.9	0.5					1.1	0.8	1.6
Cannabaceae	Cannabis / Hops															1									0.8
Cyperaceae	Sedge family	1.5	1.6	3.3	5.1	6.5	1	6	6	4.7	4.2	2		5	6.6	4.8	5.1	3.5	6.2	14.1	11.3	3.2	9	9.6	6.6

		Core L1										**L9**					**L13**								
Taxon	**Sample depth (cm)**	**175**	**182**	**244**	**298**	**347**	**361**	**407**	**421**	**439**	**488**	**234**	**238**	**255**	**335**	**357**	**59**	**66**	**75**	**126**	**184**	**246**	**280**	**411**	**468**
Armeria maritima / Limonium	Thrift / Sea Lavender																0.5				1.6	0.6			
Aster-type	Daisy-type	2.2	4.9		1.3	0.7			2	0.8		1.3	3.3	1.4	0.6	1	0.7		0.9			0.8		0.8	0.8
Achillea-type	Yarrow-type						1																		
Artemisia	Mugwort	0.7					1			1									0.9	0.9			0.6		
Centaurea nigra-type	Knapweed-type																		0.9						
Compositae (Liguliflorae)	Dandelion-type	2.2	6.5				1	1	1			0.7	8.4	5	0.6	3.9	3.7	1	1.8	3.5	5.6	4	1.7	1.6	
Cirsium-type	Thistle-type		0.8										0.5	0.7											
Campanula-type	Campanula																							0.8	
Stellaria holostea	Stitchwort					0.7																	0.6		
Chenopodiaceae	Goosefoot family			3.3		0.7	1.9			0.8	0.8		0.9	0.7	3			0.5			0.9	1.6	0.6		
Cruciferae	Cabbage family										0.8				1.2			0.5		0.9	0.9	1.6	0.6		
Epilobium	Willowherb									0.8															
Filipendula	Meadowsweet		0.8	3.3	2.5										0.6	1			1.8	0.9					
Leguminosae und.	Pea family	0.7																0.5		0.9					
Vicia-type	Pea/Bean			3.3																					
Melampyrum	Cow-wheat																	0.5							0.8
Narthecium ossifragum	Bog Asphodel															1									
Plantago lanceolata	Ribwort plantain	7.4	16.2	1.3	2.2		1	1	1.5	1.7		2	5.6	2.1		1		1	3.5	1.8		1.6	1.7	3.2	3.3
Plantago coronopus	Buck's-horn plantain																	1							
Plantago maritima	Sea plantain											0.7	0.9	0.7				0.5				3.2			
Plantago major /P. media	Greater / hoary plantain		0.8	1.7					1																
Polygonum aviculare-type	Knotgrass-type			1.7							0.8														
Potentilla-type	Tormentil-type																0.7	1							

		Core L1										**L9**					**L13**								
Taxon	**Sample depth (cm)**	**175**	**182**	**244**	**298**	**347**	**361**	**407**	**421**	**439**	**488**	**234**	**238**	**255**	**335**	**357**	**59**	**66**	**75**	**126**	**184**	**246**	**280**	**411**	**468**
Ranunculus acris-type	Meadow buttercup-type	2.2	3.2				1					0.7	0.5												0.8
Rosaceae und.	Rose family	1.5	0.8	5				1			0.8		0.5						1.8						2.5
Rubiaceae	Bedstraw family	0.7																	0.9						
Rumex acetosa-type	Sorrel-type		1.6				1.9	1	1	1.5		0.7				1	0.7	1	2.6		0.9	1.6	0.6		
Dipsacaceae	Scabious family														0.6										0.8
Umbelliferae	Carrot family			3.3		0.7	1		2		0.8							0.5							
Urtica	Nettle		0.8		1.3											1.9									
Valeriana	Valerian																				0.9				
																								0.8	
Ferns & fern allies																								1.6	
Osmunda regalis	Royal fern															1								6.4	3.3
Polypodium vulgare agg.	Polypody fern			1.7	2.5	0.7	1.9			1.5	1.7	0.7		2.1	1.8	1	2.2	1		1	2.8	1.6	1.7	7.2	3.3
Pteridium aquilinum	Bracken		0.8		1.3	2.9	1.9	1	2	9.1	5	2.6	2.8	6.5	3.6	3.9	5.8	4	7.1	14.1	11.3	2.4	7.8		
Dryopteris-type	Und. Ferns		0.8	21.6	15.2	5	5.8	4	4	5.3	7.6	6.6	0.9	7.9	12	13.3	5.8	7.5	2.6	12.3	5.6	2.4	5		
Aquatics																								2.5	
Potamogeton/Triglochin	Pondweed/																								
Arrowgrass																				0.9	2.3				
Typha angustifolia-type	Bulrush/Bur-reed									0.8						1								2.4	1.6
Sphagnum	Bog moss	0.7		11.8	2.5	2.1	1.9	5.7	3	0.8	1.6	2		3.5	6.7	5.4	5.5	3.9	3.4	4.2	5.3	3.8	1.1	0.8	4
Indeterminable		5.8	9.2	7.5	10	9.1	7.3	10	12	7.1	4.1	4.5	4.8	4.2	4.1	7.1	2.1	2.2	3.5	2.6	4.5	6.1	3.3		
Dinoflagellate cyst											1.6	1.3		0.7		4.5	1.4	1	2.6	4.2	3.6	1.6	0.6	5.3	6.7

		Core L1										**L9**					**L13**								
Taxon	**Sample depth (cm)**	**175**	**182**	**244**	**298**	**347**	**361**	**407**	**421**	**439**	**488**	**234**	**238**	**255**	**335**	**357**	**59**	**66**	**75**	**126**	**184**	**246**	**280**	**411**	**468**
Pre-Quaternary spores				25	10.1	6			2	3	7.7	5	0.5	13.8	8.3	22.2	14.4	7.5	13	16.9	13.8	4	2.7	44	51.2
																								6.4	5.7
Sum Trees & Shrubs		9.6	4.9	39.8	43.2	55.4	55.7	61	60	50.9	57.8	35	12.7	44.5	49.8	41.2	46.8	48.9	43.2	35.3	43.1	35.6	45	32.8	36.9
Sum Dwarf Shrubs		0.7	0.8	5	5.1	2.2	1	7	4	1.5	4.2	9.9	1.4	4.3	8.4	4.8	9.5	3	4.4	2.6	3.8	9.5	5.6	16	6.6
Sum Herbs		89.6	93.2	31.5	33	33.8	33.6	26	30	31.4	23.5	48.8	82.3	36.4	24	35.3	29.9	34.6	43.4	33.6	32.7	49.2	36.1		
Sum Ferns			1.6	23.2	19	8.6	9.6	5	6	15.9	14.3	9.9	3.7	16.5	17.4	19.2	13.8	12.5	9.7	28.2	19.7	6.4	14.4	124	122
No. of grains in pollen sum		135	124	60	79	139	104	99	99	131	119	151	215	138	166	105	137	196	113	113	106	126	180		
																								-	-
From pollen washings:																								rare	-
No. of Foraminifera		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	1	-	1	3	4	1	-	-	-	-	1	13	2	3	4
Macro charcoal particles		-	-	-	-	-	-	-	-	rare	+	+	-	-	-	-	-	+	-	-	-	rare	occ.	2	-
No. of Sphagnum leaves		-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-		
No. of Juncus seeds											1	-	-	-	-	-	1	-	-	1	2	-	-		

based upon the Ordnance Survey 1:25000
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0 2500 5000
metres

Figure 1: Location Map

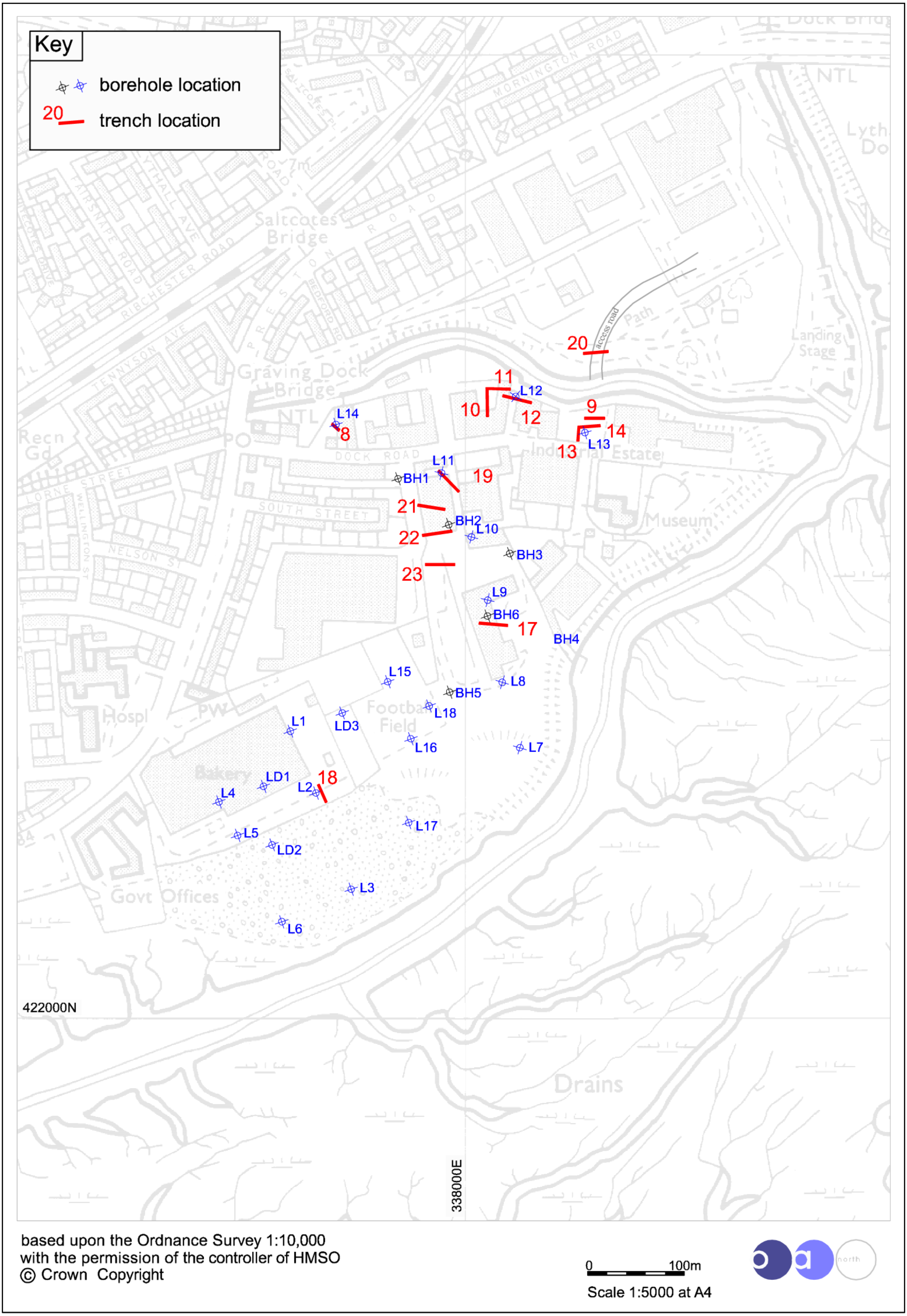

Figure 2: Trench and borehole location plan

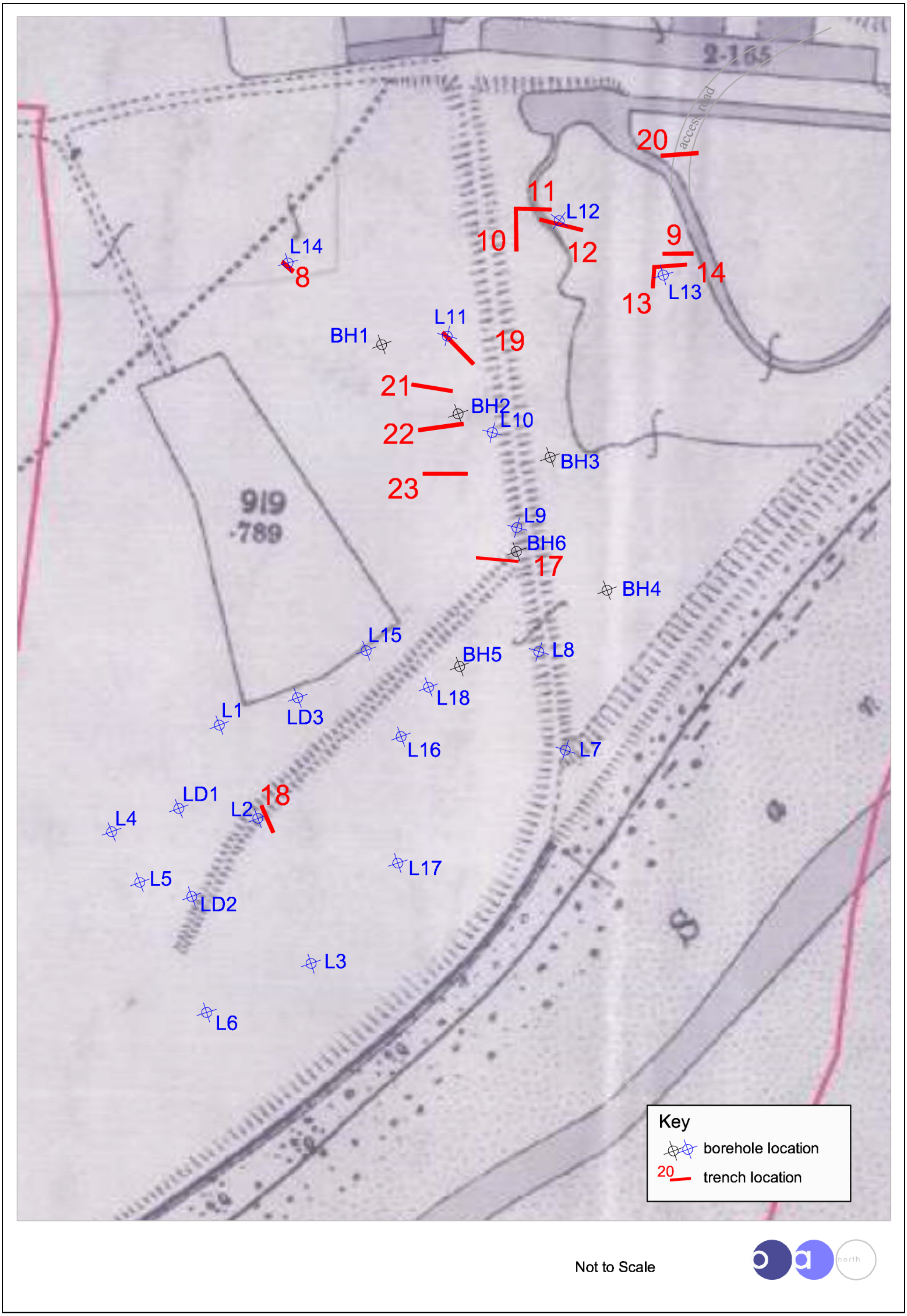

Figure 3: First edition Ordnance Survey 25": 1 mile, showing trench and borehole locations

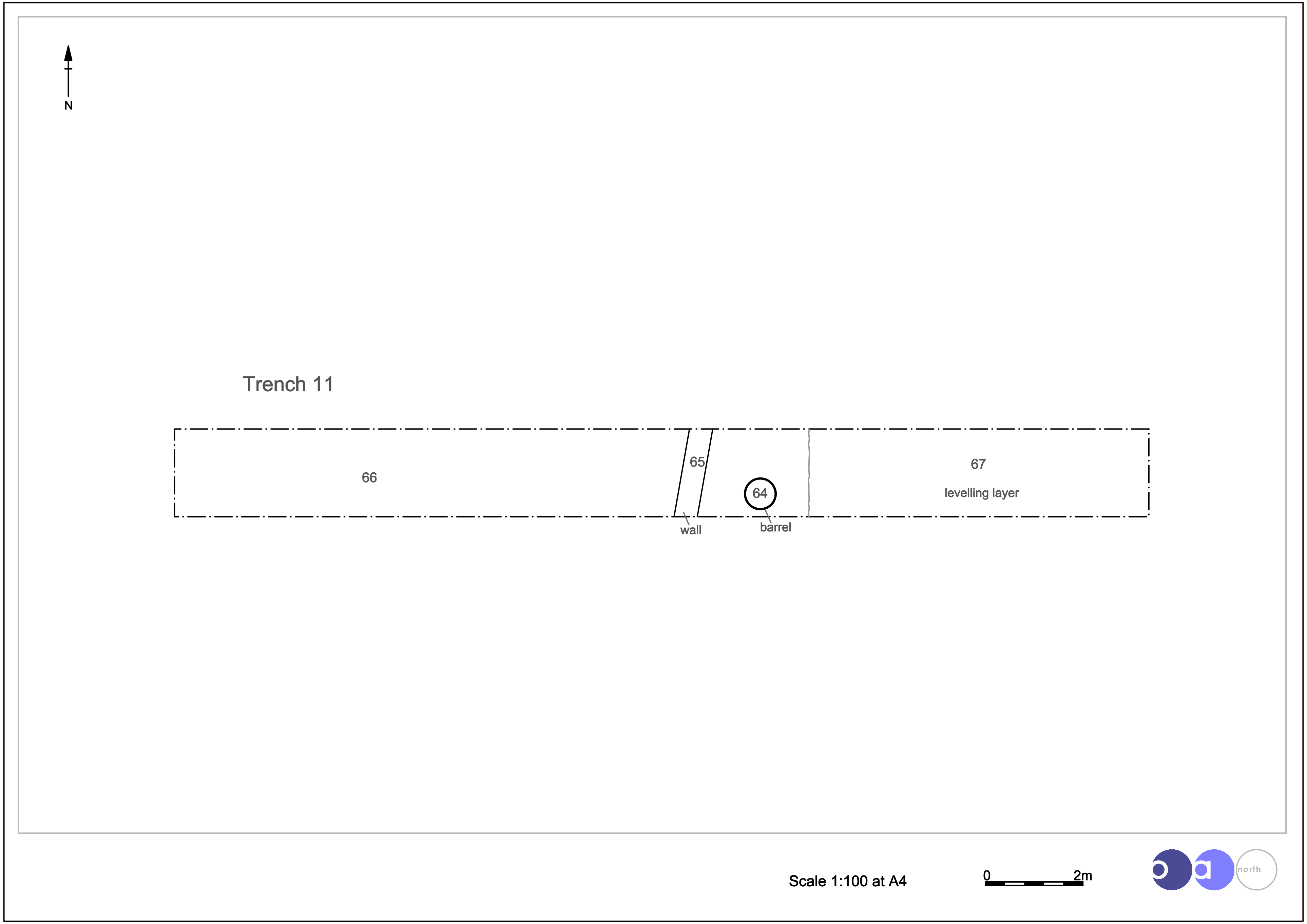

Figure 4: Plan of Trench 11

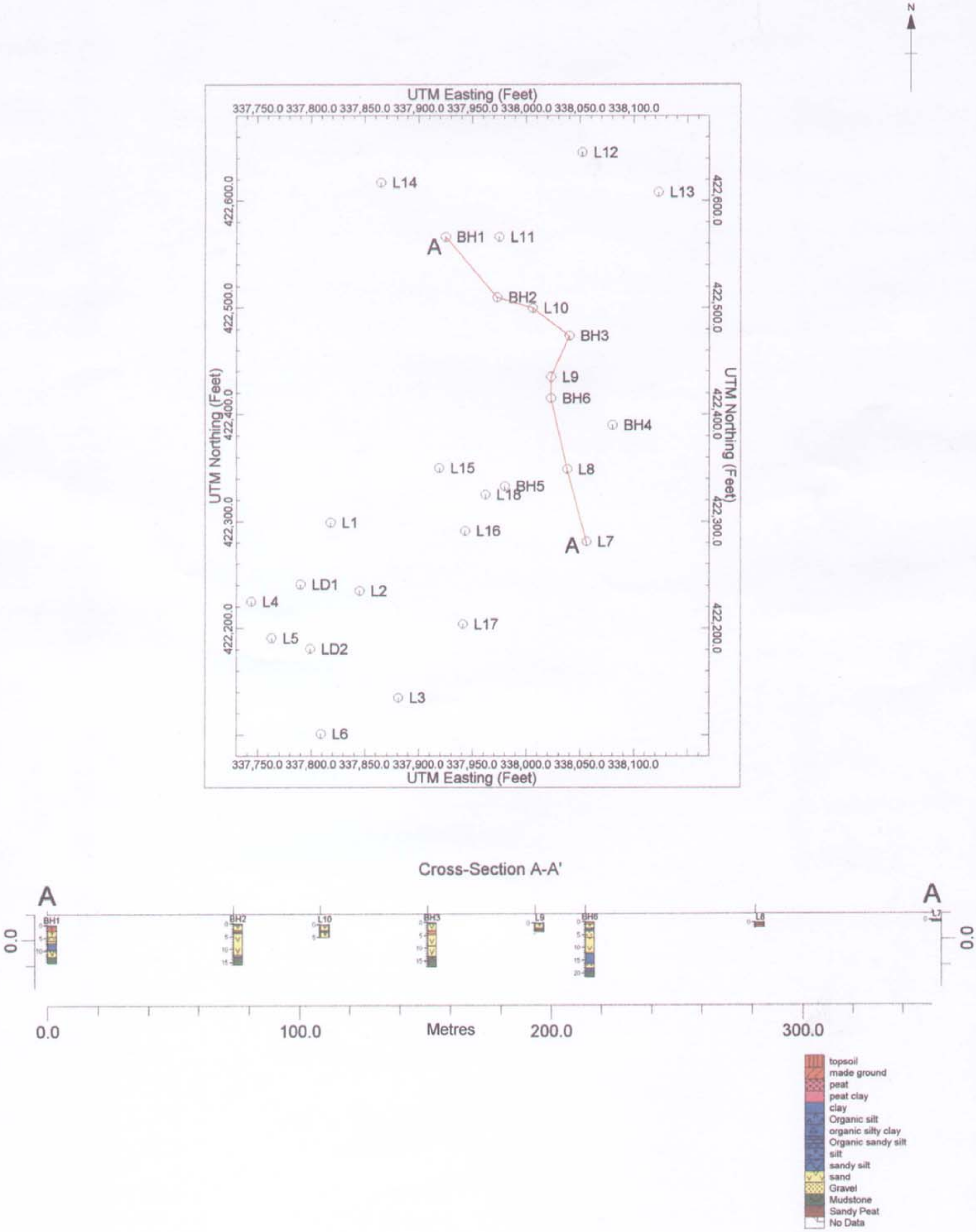

Figure 5: Section showing deposits from the north-west to south-east

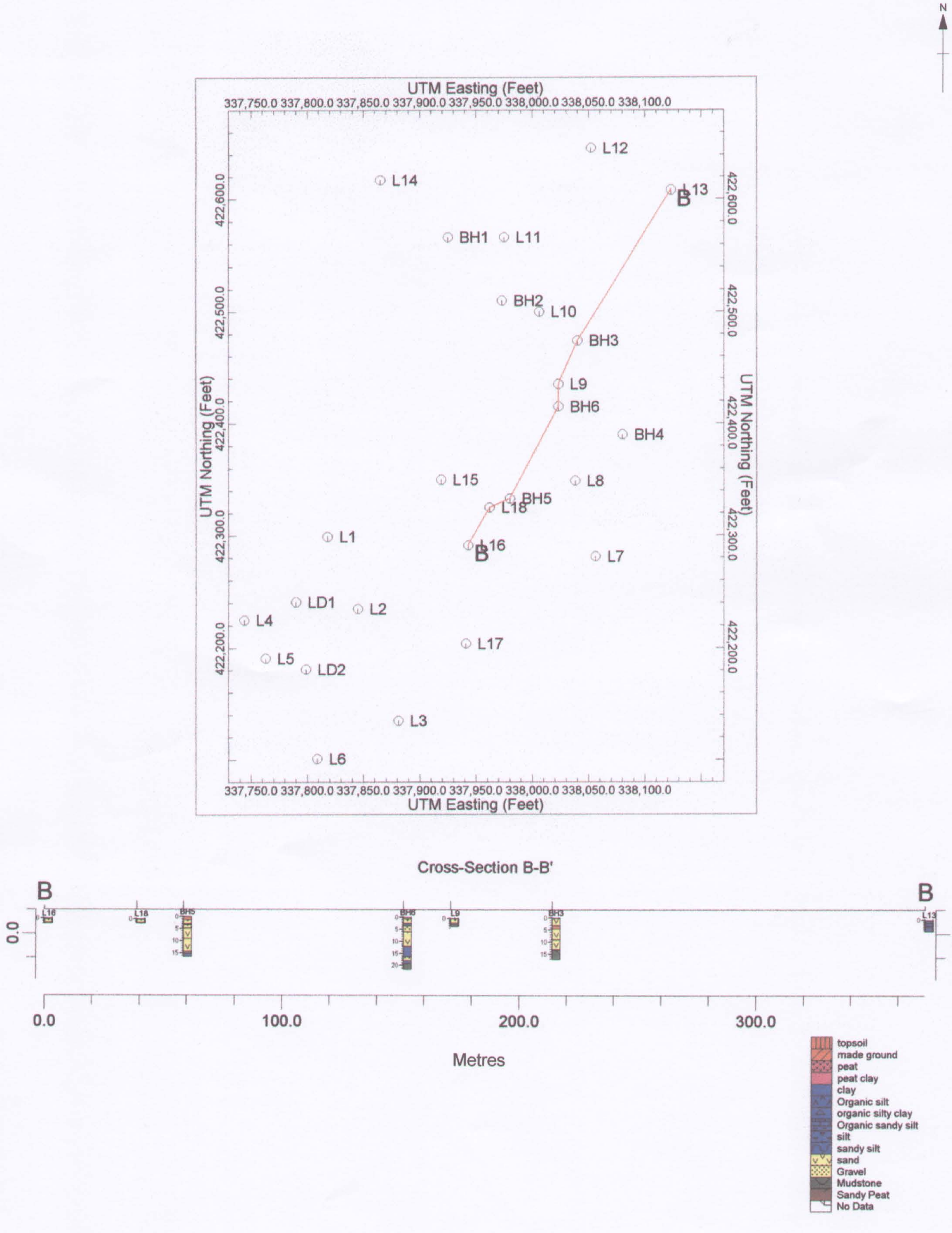

Figure 6: Section showing deposits from the south-west to north-east

Plate 1: Trench 8, north-west-facing

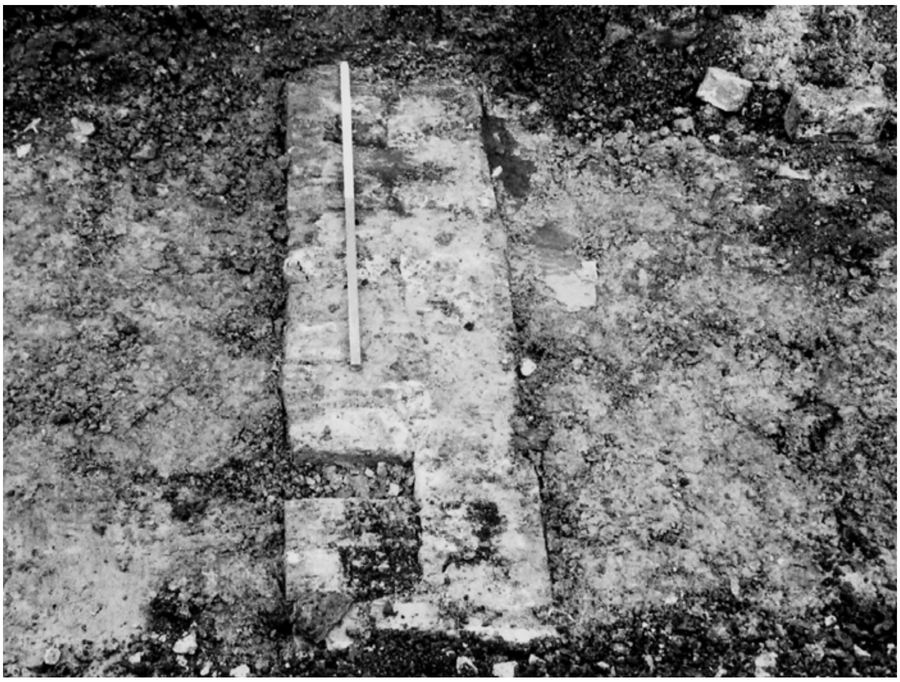

Plate 2: Wall ***65*** within Trench 11, north-facing

Plate 3: Floor ***76*** within Trench 14, north-west-facing

Plate 4: Sondage within Trench 23, east-facing