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79-85 MONIER ROAD, LONDON BOROUGH OF TOWER HAMLETS

Geoarchaeological Deposit Model Report

NGR: TQ 3716 8416

Date: 1st April 2016

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DOCUMENT HISTORY:

REVISION	DATE	PREPARED BY	SIGNED	APPROVED BY	SIGNED	REASON FOR ISSUE
v2	06/04/16	Rob Batchelor				Second edition
v1	01/04/16	Rob Batchelor		Gem Lafferty		First edition

CONTENTS

1. NON-TECHNICAL SUMMARY

A program of geoarchaeological fieldwork and deposit modelling was carried out by Quaternary Scientific (University of Reading) in connection with the proposed development of land at 79-85 Monier Road, London Borough of Tower Hamlets. The work was commissioned by CgMs Consulting. The aims of the investigation were: (1) to clarify the composition, nature and distribution of the sediments beneath the site; (2) to evaluate the potential of these sediments for providing information on the environmental history of the site, and evidence of human activity.

In order to carry out the work, 14 geotechnical borehole logs were inspected and evaluated, together with records from nearby archaeological/geoarchaeological investigations. The depth, thickness and nature of each major sedimentary unit was extracted and entered into geological modelling software, from which a series of topographic surface and thickness maps were produced.

The results of the deposit modelling demonstrate a sequence of River Terrace Gravels (the Lower Lea Gravel), overlain by floodplain deposits of Alluvium (silts and clays). Whilst not recorded in the geotechnical records from the site itself, thin peat deposits are sporadically recorded beneath the neighbouring Neptune Wharf site. The arrangement of the deposits is consistent with those recorded during the larger Lea Valley (Corcoran et al., 2011) and Olympic Park (Powell, 2012) modelling exercises.

Since peat is recorded sporadically on the neighbouring site, it may be present at Monier Road. Such sediments have the potential to contain significant information on the past landscape and evidence of human activities, through the assessment/analysis of palaeoenvironmental ecofact remains (e.g. pollen, plant macrofossils and insects) and radiocarbon dating. Since peat is rare in the nearby area and the site is located adjacent to higher drier ground it is recommended that 2-3 geoarchaeological boreholes are put down in the first instance to establish the thickness, nature and age of any preserved peat deposits beneath the site. Not only will this work be of importance to understanding the history of the site, but it will contribute to our knowledge and understanding of the region as a whole.

2. INTRODUCTION

2.1 Site context

This report summarises the findings arising out of the fieldwork and deposit modelling undertaken by Quaternary Scientific (University of Reading) in connection with the proposed development of land at 79-85 Monier Road, London Borough of Tower Hamlets (NGR centred on: TQ 3716 8416; Figures 1 & 2). Quaternary Scientific were commissioned by CgMs Consulting to undertake the geoarchaeological investigations. The site is in the lower valley of the River Lea, approximately 4km from its confluence with the River Thames. The site is on the western side of the floodplain *ca*. 100m from the present-day River Lea Navigation; one of a number of waterways that flow southwards along the River Lea floodplain in this area. The Hertford Union Canal which joins the River Lea Navigation runs parallel to the site approximately 100m to the north. The British Geological Survey (http://mapapps.bgs.ac.uk/geologyofbritain/home.html) shows the site underlain by Lambeth Group bedrock overlain by Alluvium, described as comprising clay, peat, sand, silt and clay. In fact, the alluvial deposits of the Lower Thames and its tributaries are almost everywhere underlain by Late Devensian Late Glacial Gravels (in the Thames valley, the Shepperton Gravel of Gibbard, 1985, 1994; in the Lea valley, the Lea Valley Gravel of Gibbard, 1994), and this gravel is widely recorded in boreholes in the vicinity of the site.

The site lies within the area investigated as part of the Lea Valley Mapping Project (Corcoran *et al.,* 2011). In this project the Lea Valley has been divided into Landscape Zones characterised by their Quaternary landscape history, based largely on sedimentary evidence derived from borehole records. The Monier Road site is located in 'Map 2: the Bow Back Rivers' within Landscape Zone LZ 2.1 (Terrain 1; Figure 1) which is described as containing the deposits of the valley floor. Within this zone the surface of the Lea Valley Gravel undulates, lying at around 2-2.5m OD in the north and close to 0m OD in the south. Deeper gravel surfaces are recorded in places, indicting the course of the main channel, and the confluence with tributaries. More specifically, the site is projected as being located on the western side of Landscape Zone LZ 2.1. Here, a deep area of tributary or braided channel activity is identified, which dissects the low terrace (LZ 2.2), creating a mosaic of high and low gravel surfaces. The channel is thought to be of Pleistocene or Early Holocene age and of potential importance. Finally, the site is mapped within 100m of the high terrace (LZ 2.4) to the west and north; the northern island being the result of erosion by the aforementioned channel (Corcoran *et al*., 2011). Subsequent modelling carried out as part of the Olympic Park archaeological investigations indicate similar features in the gravel surface topography within the vicinity of the Monier Road site, to that recognised by Corcoran *et al*. (Powell., 2012).

The sediments overlying the gravels across LZ 2.1 typically consist of silty clays up to 3m in thickness, and representative of a range of different depositional environments that date from the late Glacial to late Holocene. Of note however, is the frequent absence of peat across the zone, which are typically recorded across the floodplain of the Thames and its tributaries. In the few locations where it is recorded, the peat tends to be located towards the edge of the floodplain and relatively thin (<1m). This includes the two western most boreholes represented in LZ 2.1 of Transect 2 (Figure 1), immediately to the north-west of the Monier Road site. Peat has also been recorded at the neighbouring Omega Wharf site, where it is dated to the middle to late Mesolithic period (ca. 9000-7000 cal Bp) (MoLAS, 2006).

2.2 Palaeoenvironmental and archaeological significance

The existing records therefore indicate considerable variation in the height of the Lea Valley Gravel surface, and the type, thickness and age of the subsequent Holocene deposits within the vicinity of the site. Such variations are significant as they represent different environmental conditions that would have existed in a given location. For example: (1) the varying surface of the Lea Valley Gravel may represent the location of former channels and bars; (2) the presence of peat represents former terrestrial or semi-terrestrial land-surfaces, and (3) the Alluvium represent periods of changing hydrological conditions. Thus by studying the sub-surface stratigraphy across the site in greater detail, it will be possible to build an understanding of the former landscapes and environmental changes that took place across space and time.

Organic-rich sediments (in particular Peat) also have high potential to provide a detailed reconstruction of past environments on both the wetland and dryland. In particular, they provide the potential to increase knowledge and understanding of the interactions between hydrology, human activity, vegetation succession and climate. Significant vegetation changes include the Mesolithic/Neolithic decline of elm woodland, the Neolithic colonisation and decline of yew woodland; the Late Neolithic/Early Bronze Age growth of elm on Peat, and the general decline of wetland and dryland woodland during the Bronze Age. Such investigations are carried out through the assessment/analysis of palaeoecological remains (e.g. pollen, plant macrofossils & insects) and radiocarbon dating. Therefore, due to the dominantly inorganic nature of the deposits of Landscape Zone LZ 2.1, any peat or organic-rich sediments present beneath the Monier Road site should be regarded as potentially significant.

Finally, areas of high gravel topography, soils and peat represent potential areas that might have been utilised or even occupied by prehistoric people, evidence of which may be preserved in the archaeological (e.g. features and structures) and palaeoenvironmental record (e.g. changes in vegetation composition). With the exception of Roman remains towards the west, archaeological remains tend to be limited in Landscape Zone LZ 2.1. Corcoran et al. (2011) argue that rather than being representative of limited human activity, it could be a consequence of limited archaeological investigation in the area. Such environments would have been rich in food resources (such as fish and fowl), whilst the marginal river environment provides elevated potential for the preservation of archaeological remains. However, they also state that such activity would be ephemeral in nature and leave limited tangible remains.

2.3 Aims and objectives

A desk-based geoarchaeological exercise was instigated to: (1) clarify the nature of the sub-surface stratigraphy, in particular the presence and thickness of Alluvium and Peat across the site, and (2) to evaluate the potential of the sedimentary sequences for reconstructing the environmental history of the site and its environs. In order to address these aims, the stratigraphic data from the new and existing stratigraphic records were used to produce a deposit model of the major depositional units across the site; of particular relevance were the borehole records from the neigbouring Neptune Wharf site (Young, unpublished data).

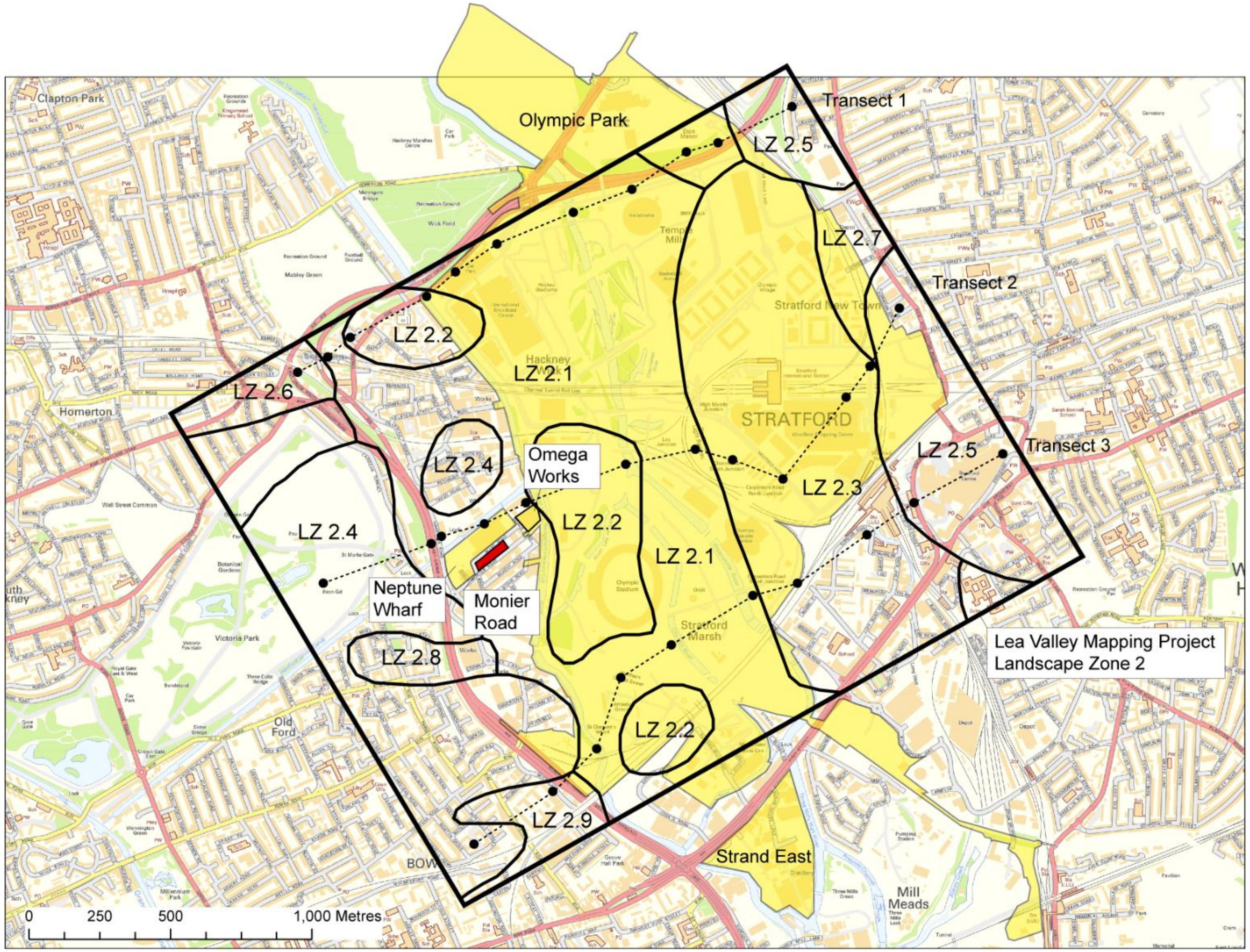

Figure 1: Location of 79-85 Monier Road, London Borough of Tower Hamlets and other local sites including: Neptune Wharf (Young, unpublished data), Omega Works (MoLAS, 2006), Strand East (Green & Batchelor, 2014) and the area encompassed by the Olympic Park (Powell, 2012). Also displayed are the interpreted Landscape Zones (LZ) of Map 2, investigated as part of the Lower Lea Valley Mapping Project (Corcoran *et al.*, 2011). *Contains Ordnance Survey data © Crown copyright and database right [2016]*.

Figure 2: Location of the geotechnical and geoarchaeological boreholes at the 79-85 Monier Road site, London Borough of Tower Hamlets

3. METHODS

3.1 Deposit modelling

The deposit model was based on a review of 14 borehole records, incorporating geotechnical boreholes from Monier Road and Fish Island, and two geoarchaeological boreholes from Neptune Wharf (formerly Fish Island) (Figure 2; Table 1). Sedimentary units from the boreholes were classified into four groupings: (1) Gravel, (2) Peat; (3) Alluvium and (4) Made Ground. The classified data for groups 1-4 were then input into a database with the RockWorks geological utilities software. Models of surface height were generated for the Gravel and Upper Alluvium (Figures 4 and 5). Thickness of the Alluvium and Made Ground (Figures 6 and 7) were also modelled (also using a nearest neighbour routine). No thickness model was generated for the Peat, since this was only recorded in one borehole; this borehole is highlighted in Figure 4 however. Because the boreholes are not uniformly distributed over the area of investigation, the reliability of the models generated using RockWorks is variable. In general, reliability improves from outlying areas where the models are largely supported by scattered archival records towards the core area of commissioned boreholes. Because of the 'smoothing' effect of the modelling procedure, the modelled levels of stratigraphic contacts may differ slightly from the levels recorded in borehole logs and section drawings.

As a consequence of this the modelling procedure has been manually adjusted so that only those areas for which sufficient stratigraphic data is present will be modelled. In order to achieve this, a maximum distance cut-off filter equivalent to a 50m radius around each record is applied to all deposit models. In addition, it is important to recognise that multiple sets of boreholes are represented, put down at different times and recorded using different descriptive terms and subject to differing technical constraints in terms of recorded detail including the exact levels of the stratigraphic boundaries. Of the records used in the deposit model, the cores from the boreholes put down by Quaternary Scientific (NW-QBH1 and QBH2) represent the most detailed record of the sediment sequences.

4. RESULTS AND INTERPRETATION OF THE LITHOSTRATIGRAPHIC DESCRIPTIONS & DEPOSIT MODELLING

A summary of the geotechnical data is shown in Table 1. The results of the deposit modelling are displayed in Figures 3 to 7; Figure 3 is a 2-dimensional southwest-northeast transect, Figures 4 to 7 are surface elevation and thickness models for each of the main stratigraphic units. The results of the deposit modelling indicate that the number and spread of the logs is sufficient to permit modelling with a high level across the entire area under investigation.

The full sequence of sediments recorded in the boreholes comprises:

Made Ground
Alluvium – widely present
Peat – sporadically present
Gravel (Lower Lea Gravel)

4.1 Lower Lea Gravel

The Lower Lea Gravel was present in all the boreholes that penetrated to the bottom of the Holocene sequence. It was deposited during the Late Glacial (15,000 to 10,000 years before present) and comprises the sands and gravels of a high-energy braided river system which, while it was active would have been characterised by longitudinal gravel bars and intervening low-water channels in which finer-grained sediments might have been deposited. Such a relief pattern would have been present on the valley floor at the beginning of the Holocene when a lower-energy fluvial regime was being established.

The Lower Lea Valley Gravel rests on a Lambeth Group bedrock surface that slopes downwards from east (-1.9m OD; FI-BH7) to west (-4.25m OD; FI-BH5) across the site (Figures 2 & 3). This is consistent with the findings of Corcoran *et al* (2011) which indicated that the Gravels infilled a deep trough in the bedrock to this approximate depth on the western side of Landscape Zone LZ 2.1. The sand and gravel deposits range between *ca*. 2.5 and 4.5m in thickness; no lenses of fine grained sediments with palaeoenvironmental potential are recorded.

The surface of the Gravel (Figure 4) is relatively even across the Monier Road and Neptune Wharf sites generally varies between -1 and +1m OD. In one record (FI-BH1), a higher surface of +1.85m OD is recorded. This is potentially anomalous as it is recorded adjacent to geoarchaeologically monitored borehole NW-QBH1 which records the same surface at -1m OD. Nevertheless, the general surface heights are consistent with those recorded by Corcoran et al (2011) in the nearby boreholes of Transect 2 (Figure 2).

4.2 Peat

Peat is not recorded in any of the three geotechnical records from the Monier Road site, although the alluvium is sometimes described as 'black', possibly implying an organic-rich/peaty component.

Occasional peat units are recorded nearby however; a single thin unit was recognised in one geoarchaeological borehole from the neighbouring Neptune Wharf site (NW-QBH2; Figure 4), whilst a thick peat horizon dating to the middle to late Mesolithic was recorded on the neighbouring Omega Works site (MoLAS, 2006), demonstrating the potential for such deposits to exist beneath the site.

The limited presence and thickness of a distinct peat horizon recorded across the modelled area corresponds with the findings of Corcoran et al. (2011). These ephemeral peat units are recorded immediately on top of the Lea Valley Gravel and are suggestive of a transition towards semi-terrestrial (marshy) conditions supporting the growth of sedge fen/reed swamp and/or woodland communities. The inconsistent presence/thickness of the peat may suggest its formation was either of limited extent/duration, or has been truncated by subsequent processes.

4.3 Alluvium

The Alluvium rests directly on the Gravel or Peat and was recorded in all records across the two sites. The deposits of the Alluvium are described as predominantly silty or clayey which are very occasionally organic-rich (e.g. MR-BH3) or with sporadic bands of peat (e.g. FI-BH2, FI-BH4 and FI-BH5). The surface of the Alluvium (Figure 5) is highly variable, resting between 2.5m and 6m OD and ranges in thickness from 1m to 5m, but is mainly between 2m and 3m (Figure 6).

The sediments of the Alluvium are indicative of deposition within low energy fluvial and/or semi-aquatic conditions during the Holocene. The high mineral content of the sediments may reflect increased sediment loads resulting from intensification of agricultural land use from the later prehistoric period onward, combined with the effects of rising sea level.

4.5 Made Ground

Between 0.5 and 6m of Made Ground caps the Holocene alluvial sequence (Figure 7).

Table 1: Borehole attributes for those records used in the deposit model, 79-85 Monier Road, London Borough of Tower hamlets.

Name	Easting	Northing	Elevation	Top of Alluvium	Top of Peat	Top of Lower Lea Gravel	Top of London Clay
Geotechnical boreholes from Monier Road							
MR-BH1	537135.326	184131.853	6.55	2.1		6.3	9.9
MR-BH2	537186.952	184175.481	6.6	0.5		5.5	10
MR-BH3	537149.28	184145.487	6.4	3.9		6.5	9
Geotechnical boreholes from Fish Island							
FI-BH1	537,035.26	184,176.01	8.15	5.3		6.3	12
FI-BH2	537,093.81	184,221.87	7.6	3.7		*6.5*	10.5
FI-BH3	537,141.71	184,276.73	6.65	2.8		6	9.6
FI-BH4	537,211.72	184,325.46	7.3	4.4		7.3	9.6
FI-BH5	537,029.93	184,092.90	7.75	5.8		7.6	12
FI-BH6	537,107.73	184,184.20	7.55	4.7		7	10.7
FI-BH7	537,231.38	184,234.56	6.5	4.5		6.1	8.4
FI-BH8	537,229.74	184,270.59	7.6	5.6		7.7	10.6
FI-WSI	537,230.15	184,311.54	7.1	4.3		6.55	
Georchaeological boreholes from Neptune Wharf							
NW-QBH1	537,039.76	184,161.68	6	4		6.98	
NW-QBH2	537,242.02	184,238.25	6.5	3.8	6.77	6.88	

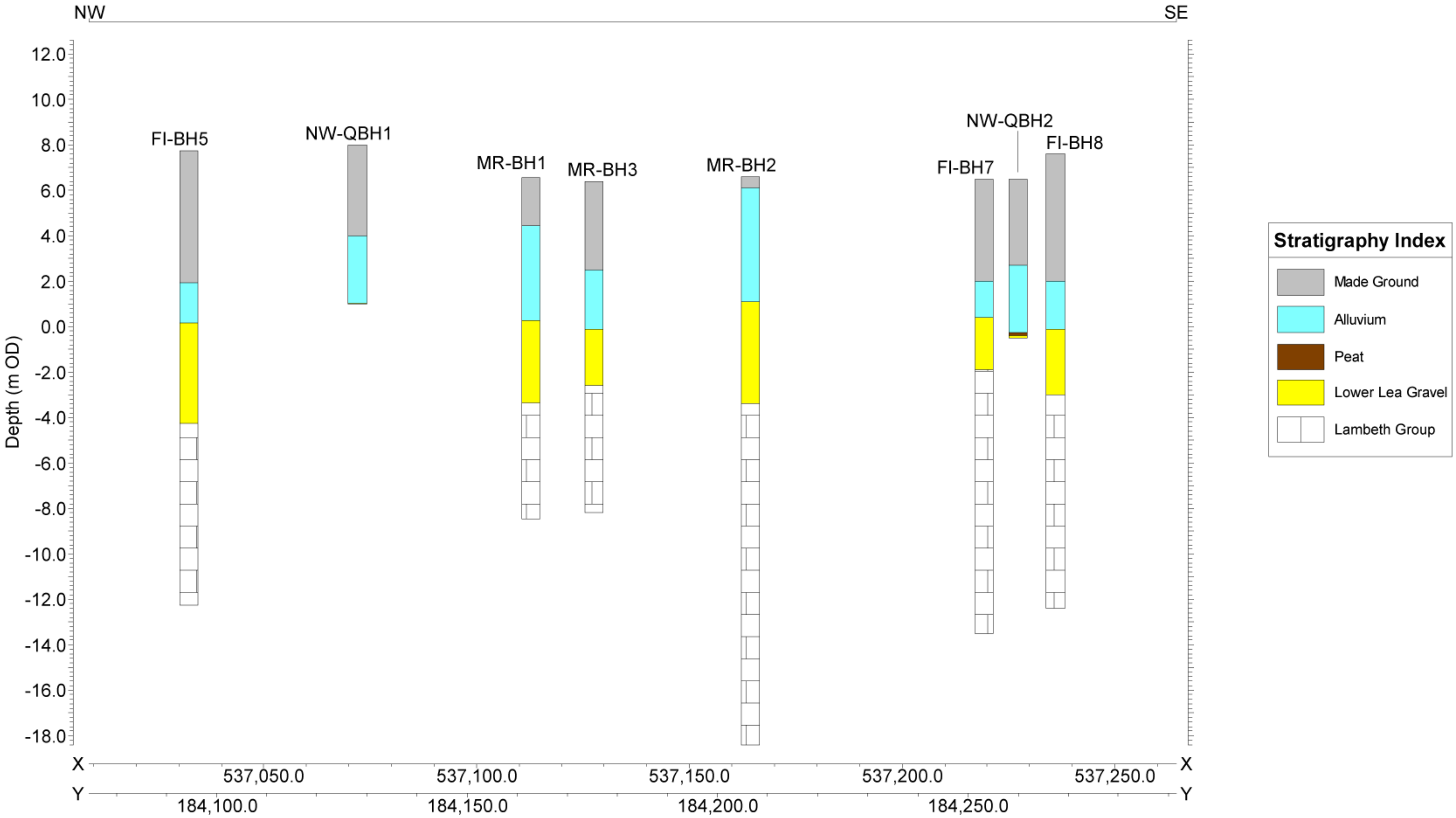

Figure 3: South-west to north-east borehole transect across the 79-85 Monier Road and Neptune Wharf sites

Figure 4: Top of the Lea Valley Gravel (m OD) (site outline in red; presence of Peat highlighted in yellow).

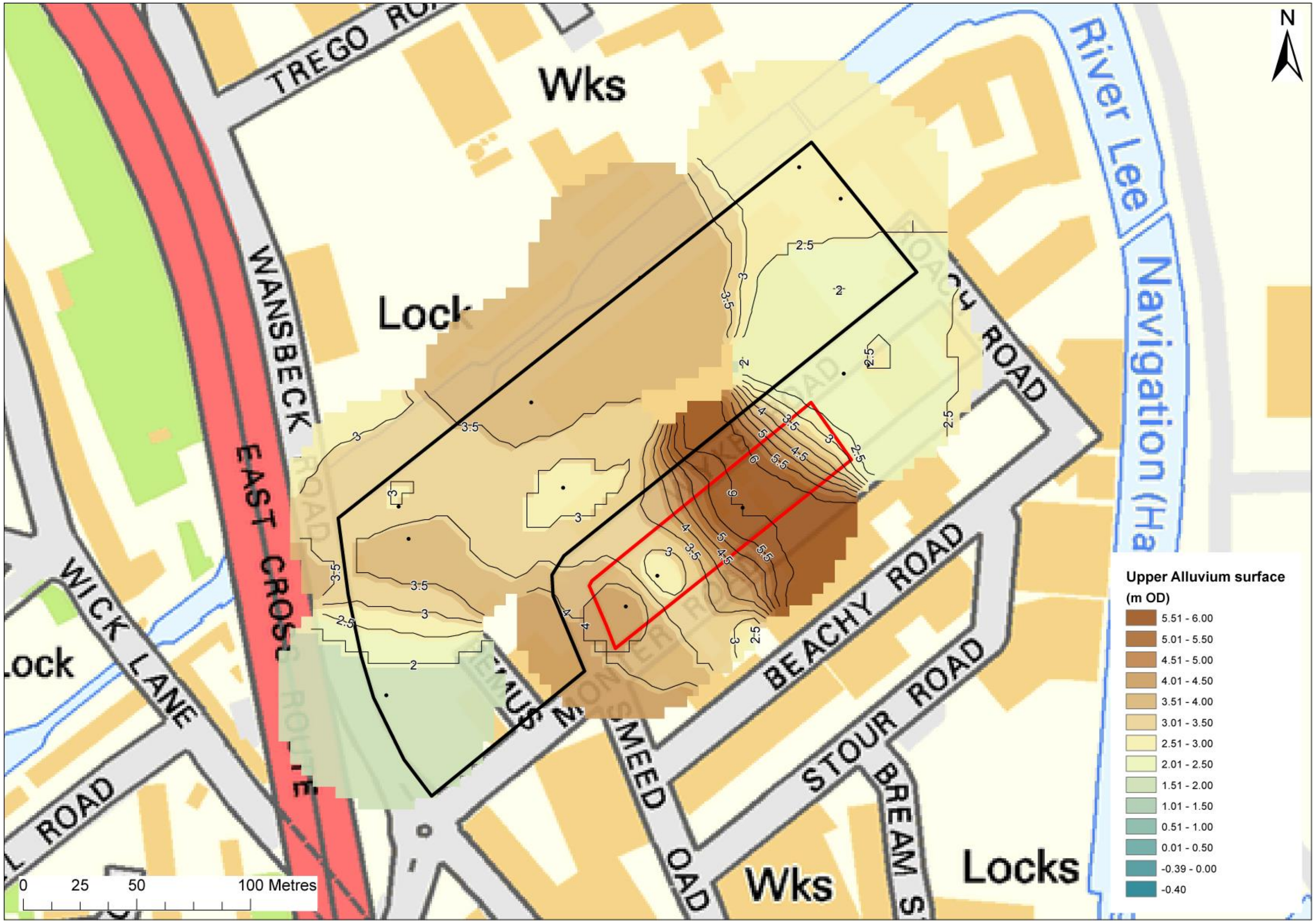

Figure 5: Top of the Alluvium (m OD) (site outline in red)

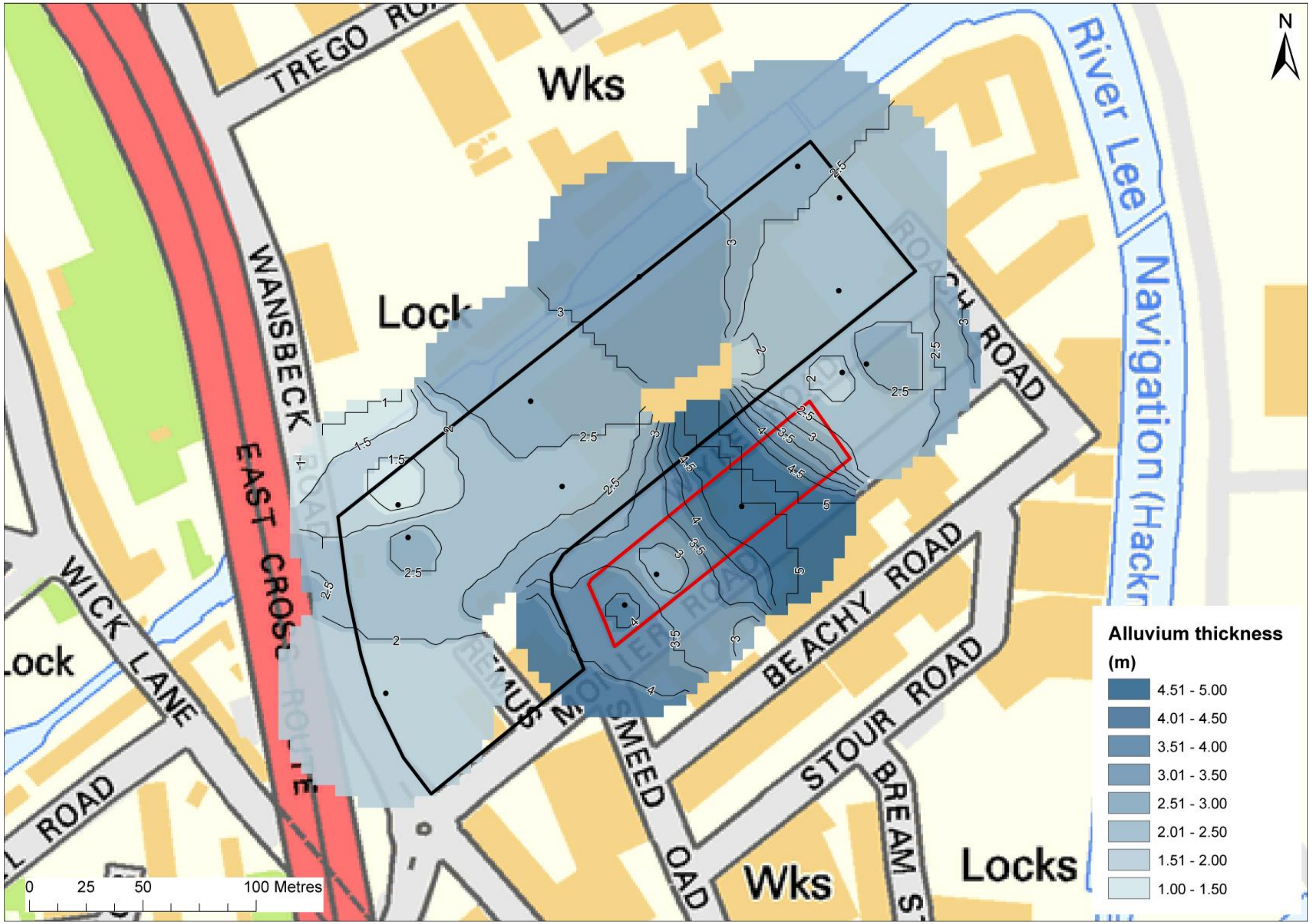

Figure 6: Thickness of Alluvium (m) (site outline in red)

Figure 7: Thickness of Made Ground (m) (site outline in red)

5. DISCUSSION & CONCLUSIONS

A desk-based geoarchaeological exercise was instigated to: (1) clarify the nature of the sub-surface stratigraphy, in particular the presence and thickness of Alluvium and Peat across the site, and (2) to evaluate the potential of the sedimentary sequences for reconstructing the environmental history of the site and its environs. In order to address these aims, the stratigraphic data from the new and existing stratigraphic records was used to produce a deposit model of the major depositional units across the site; of particular relevance were the borehole records from the neighbouring Neptune Wharf site (Young, unpublished data).

The results of the geoarchaeological deposit modelling have contributed to our understanding of the Holocene stratigraphic sequence in this area of the Lea Valley. Overlying the London Clay bedrock at the site is a sequence of Late Devensian Lea Valley Gravel, Holocene alluvial deposits and variable thicknesses of Made Ground. The site lies within Corcoran *et al.*'s (2011) Landscape Zone LZ 2.1 (Terrain 1; Figure 1) which is described as containing the deposits of the valley floor. More specifically, the site is mapped towards the western margins of LZ 2.1, where a deep area of channel activity has been identified, dissecting the neighbouring low terrace (LZ 2.2) a few hundred metres to the east. The high terrace (LZ 2.4) is mapped to the west and north; the northern island being the result of erosion by the aforementioned channel (Corcoran *et al*., 2011). These features have also been identified during modelling for the Olympic Park archaeological investigations (Powell., 2012).

The results of the current desk-based exercise concur with the findings made by Corcoran *et al*. (2011) and Powell (2012), enabling the model for the Lea Valley to be enhanced further. The results also indicate the ephemeral presence of peat deposits in the nearby area. No peat was positively identified beneath the Monier Road site, although the description of 'black' alluvium in certain boreholes, might possibly imply an organic-rich (peaty) element, Furthermore, peat has been found to form a thin basal unit overlying the Lea Valley Gravel and as bands within the alluvium in several of the boreholes from the neighbouring Neptune Wharf and Omega Works sites, demonstrating the potential for such deposits to exist. In the latter case, a thick peat horizon was recorded in association with a deep palaeochannel located towards the northern part of the Omega Works site; this was radiocarbon dated to the middle-late Mesolithic (ca. 9000 to 7000 cal BP; Figure 1; MoLAS, 2006). Due to the potential of organic-rich/peat sediments for palaeoenvironmental reconstruction (as outlined in sections 1.2 and 6), they should be regarded as significant; particularly bearing in mind the specific position of the site near to the higher drier environments of LZ 2.2 and 2.4.

Although Upper Palaeolithic people may have visited the area, evidence for such activity is rarely found (Corcoran *et al*., 2011), and thus the potential to record remains within the river terrace gravels is considered low. However, whilst limited later prehistoric archaeological remains have previously been recorded in the deposits of LZ 2.1, and in the nearby area generally (CgMs Consulting, 2016), such environments would have been rich in food resources (such as fish and fowl), whilst the marginal river environment provides elevated potential for the preservation of archaeological remains, even if only ephemeral in nature (Corcoran et al., 2011; CgMs Consulting, 2016).

The western part of LZ 2.1 where it is dissected by the low terrace of LZ 2.2, is well represented in Roman remains, particularly because of the settlement at Old Ford and the conjectured Roman Road (Corcoran *et al*., 2011). The findings of the geoarchaeological deposit modelling exercise are thus considered to concur with those made during the archaeological desk-based assessment: 'It is likely that during this period the site lay on the edge of any settlement activity within the floodplain of the Lea tributary. The archaeological potential of the study site for evidence of Roman activity on the site is therefore considered to be low. If present any remains are likely to reflect water management such as drainage ditches, timber revetments located at depth within the site' (CgMs Consulting, 2016).

6. RECOMMENDATIONS

As outlined above, the site can be considered to have some potential to contain ephemeral peat deposits. Such deposits represent potential areas that might have been utilised or even occupied by prehistoric and historic people, evidence of which may be preserved in the archaeological record (e.g. features and structures). Even in the absence of the archaeological remains, the sediments have the potential to contain a wealth of further information on the past landscape, through the assessment/analysis of palaeoenvironmental remains (e.g. pollen, plant macrofossils and insects) and radiocarbon dating. So called environmental archaeological or palaeoenvironmental investigations can identify the nature and timing of changes in the landscape, and the interaction of different processes (e.g. vegetation change, human activity, climate change, hydrological change) thereby increasing our knowledge and understanding of the site and nearby area. In the case of human activity, palaeoenvironmental evidence can include: (1) decreases in tree and shrub pollen suggestive of woodland clearance; (2) the presence of herbs indicative of disturbed ground, pastoral and/or arable agriculture; (3) charcoal/microcharcoal suggestive of anthropogenic or natural burning, and (4) insect taxa indicative of domesticated animals. Such investigations are routinely carried out where required as part of planning conditions across the Lower Thames Valley and its tributaries, instructed by the LPA Archaeological Advisor. The limited number and potential to uncover such sequences in this area of the Lea Valley (especially if they date to the Late Glacial / Early Holocene periods), and increased knowledge/understanding of the historic/prehistoric environment that they could provide, only increases the importance of undertaking such work (see Corcoran *et al*., 2011).

If further works are to be progressed, it is recommended that they consist of 2-3 geoarchaeological boreholes, put down to clarify the presence, thickness and age of any Peat deposits. However, the nature of the geoarchaeological field investigations should be determined by the need and nature of any archaeological fieldwork that is required. It is therefore recommended that any further required archaeological/geoarchaeological works should be the subject of discussion with the LPA's Archaeological Adviser.

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