New Covent Garden Market Phase B

Palaeoenvironmental Assessment

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Summary

A programme of palaeoenvironmental assessment and scientific dating was undertaken on two borehole sequences from New Covent Garden Market, including WS1 from Phase A2 (Wessex Archaeology 2021a) and WA-16 from Phase B (Wessex Archaeology 2023). The assessment followed programme of borehole survey and deposit modelling at Phase B, undertaken as part of a staged approach to the geoarchaeological investigations. The assessment was undertaken in order to determine the depositional history and age of the deposits, the level of preservation and concentration of palaeoenvironmental remains, the archaeological and geoarchaeological potential of the deposits, and to make recommendations for any for further work.

The sequence of superficial geological deposits recorded overlying the London Clay bedrock at the site comprises Pleistocene fluvial sands and gravels, in places overlain by Holocene alluvium, and modern Made Ground. In one sequence, WA-16, the Holocene alluvial sequence includes a unit of peat directly overlying the gravel, whilst in WS1 the peat was recorded within a tripartite sequence of Holocene alluvium. The sands and gravels at the site comprise the Late Devensian Shepperton Gravel, formed within palaeochannels cut through the earlier Kempton Park Gravel terrace. The more substantial of these channels is more widely known as the Battersea Channel (Morley, 2009/10), which itself forms an important component of the Battersea Channel Project (BCP; EH 2014). The Battersea Channel underlies the western margin of the Phase B site, where the Gravel surface is recorded at levels between c. -1 and -3m OD.

In borehole WA-16 the Holocene alluvial sequence includes a unit of peat directly overlying the sands and gravels at between -1.17 and -2.12 m OD; at the Phase A2 site (Wessex Archaeology 2021a) peat was recorded in two boreholes, 2.1m thick in WS1 and 1.28m thick in WS4, varying in depth between -0.01 to -2.11 m OD (WS1) and -0.19 to -1.47 m OD (WS04). In WS1, the results of the radiocarbon dating indicate that the peat is of Late Neolithic through to Iron Age date. However, significantly older dates were obtained on the base of the peat in WA-16. The radiocarbon dates here range between Late Upper Palaeolithic (within the Lateglacial Interstadial) and Late Mesolithic/Early Neolithic. However, given the disparity between the dates on the peat in WS1 and WA-16, there is some uncertainty as to the chronology of the peat sequence in WA-16.

The results of the palaeoenvironmental assessment yielded variable results on the basis of preservation. Overall they were found to contain very limited pollen assemblages in WA-16, with variable plant macrofossil preservation also recorded in WS1. However, evidence is provided for a similar vegetation history to that recorded in other peat sequences within the Battersea Channel Project area, with an initially relatively closed landscape followed by an expansion of herbaceous taxa (and opening up of the landscape) in the Bronze Age. Large grass pollen grains, potentially providing evidence for cereal cultivation, are recorded and increase in abundance in later deposits, though such pollen grains may also represent wild grasses typical of estuarine influenced wetlands.

On the basis of an Iron Age date for the top of peat in WS1, this horizon represents a relatively rare occurrence of organic deposits of this date in the BCP project area. Further pollen analysis of samples from this horizon is recommended, primarily focussed on the organic alluvium overlying the peat, and the top of the peat. In addition, it is recommended that further analysis is undertaken on the samples in the lower (Neolithic/Bronze Age) part of the peat sequence in WS1 in order to provide more detailed information on the vegetation history of this part of the sequence and assess evidence for human activity (including cereal cultivation). Further analysis of the plant macroremains from WA-16 could also provide additional information on the local environment, and provide additional material for radiocarbon dating that could help to confirm the chronology of the peat sequence in this borehole.

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New Covent Garden Market Phase B

Geoarchaeological Borehole Survey and Deposit Modelling

1 INTRODUCTION

1.1 Project and planning background

1.1.1 Wessex Archaeology was commissioned by Vinci St Modwen (VSM) through their consultants Cumming Group (formerly Prosurv Consult Ltd), to undertake palaeoenvironmental assessment of two geoarchaeological boreholes obtained from a 2.2 ha parcel of land located within New Covent Garden Market (NCGM), Nine Elms Lane, London Borough of Wandsworth, SW8 5BH, centred on NGR 529505 177100 (**Figure 1**).

1.1.2 Planning permission was granted in February 2015 (ref 2014/2810), which is a joint venture between St. Modwen Properties PLC and Vinci PLC. This major, multi-phased project will modernise and secure the future of the iconic market whilst delivering one of the largest schemes in London's Nine Elms regeneration area. For the purposes of Environmental Assessment, the NCGM site was divided into five separate land parcels. These are the Market Site, the Apex Site, the Thessaly Road Site, the Northern Site and the Entrance Site (**Figure 1**).

1.1.3 The boreholes that were the focus of palaeoenvironmental assessment were retained during two previous phases of work at the Site, including WS1 during a borehole survey at the Main Market Site - Phase A2 (Wessex Archaeology 2021a) and WA-16 during recent work comprising a borehole survey and updated deposit modelling at New Covent Garden Market Phase B (Wessex Archaeology 2023). The previous phases of work at the Site are discussed in more detail in Sections **2.3** and **3.2**.

1.1.4 All works were undertaken in accordance with a written scheme of investigation (WSI) which detailed the aims, methodologies and standards to be employed in order to undertake the evaluation (Wessex Archaeology 2019a). The Historic England Advisor for South London from the Greater London Archaeology Advisory Service (GLAAS) approved the WSI, on behalf of the Local Planning Authority (LPA), prior to the work commencing.

1.1.5 The WSI detailed the aims, methodologies and standards to be employed in order to undertake the previous evaluation (Wessex Archaeology 2019a). An Updated Project Design (UPD) was issued in 2022 (Wessex Archaeology 2022b), following consultation with the Archaeological Advisor from Historic England, this UPD determined the scope for resolving the remaining part of the Market site (Phase B), given the results of the preceding evaluations and borehole surveys.

1.2 Scope of works

1.2.1 The palaeoenvironmental assessment being undertaken here forms part of a staged approached to the geoarchaeological investigations, as outlined within the Updated Project Design (UPD) (Wessex Archaeology 2022b):

- Stage A - purposive geoarchaeological boreholes and updated deposit modelling (completed);
- Stage B - archaeological evaluation (completed); and
- Stage C - post excavation assessment and analysis.

1.2.2 The results of the assessment being undertaken at Stage C are presented in this report. The work proposed at Stage A initially included a total of 21 targeted geoarchaeological boreholes (reduced to 19 following consultation with the client and Historic England Science Advisor) and a programme of deposit modelling, integrated the data arising from these with from various geoarchaeological and archaeological investigations, Ground Investigation (GI) logs and British Geological Survey (BGS) archive boreholes in the wider Battersea Channel Project (BCP) area. The results of this work are summarised in Section **2.3** and are reported in Wessex Archaeology (2023). The results of the archaeological evaluation (Stage B) are reported in Wessex Archaeology (2022a).

1.3 Scope of document

1.3.1 To help frame archaeological and geoarchaeological investigations of this nature, Wessex Archaeology has developed a four-stage approach, encompassing different levels of investigation appropriate to the results obtained, accompanied by formal reporting of the results at the level achieved. The borehole survey reported on here represents Stage 3 of this process (**Table 1**).

1.3.2 In format and content, the work follows the methodology set out within the WSI (Wessex Archaeology 2019a) and UPD (Wessex Archaeology 2022b), and conforms to current best practice, including the guidance in *Management of Research Projects in the Historic Environment* (MoRPHE, Historic England 2015a), the Chartered Institute for Archaeologists' (CIfA) *Standard and guidance for archaeological field evaluation* (CIfA 2014a), Historic England's technical guide to Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record (Historic England 2015b) and Deposit Modelling and Archaeology (Historic England 2020).

Table 1 Staged approach to geoarchaeological investigations

Stage 1: Geoarchaeological Desk-based Assessment (GDBA) and deposit modelling	A Geoarchaeological Desk-Based Assessment (GDBA) examines a range of data (published and unpublished ("grey literature"), LiDAR, historic maps) and models existing Ground Investigation (GI) data to inform on the possible Palaeolithic archaeological and geoarchaeological potential of a site. The GDBA may include, dependant on the site and complexity of a site, a Geoarchaeological Landscape Characterisation (GLC) which divides a study area into different zones (Geoarchaeological Characterization Zones – GCZs) based on variations in deposits and potential. The GDBA establishes the requirements for and scope of Stage 2 Palaeolithic archaeological and geoarchaeological field elevation. Geoarchaeological potential is defined as potential for paleoenvironmental and dating evidence. Should Stage 2 evaluation be required, appropriate and proportionate recommendations for each GCZ are provided.

Stage 2: Geoarchaeological monitoring of GI works and/or Geoarchaeological borehole survey	Field evaluation to establish the geoarchaeological and archaeological potential of Quaternary deposits within an evaluation area, which informs on the requirements and scope of further works at Stage 2 (e.g. purposive borehole survey), Stage 3 palaeoenvironmental assessment and/or Stage 4 mitigation. The principal methods of geoarchaeological evaluation are through monitoring of Ground Investigation (GI) works or targeted boreholes. A geoarchaeological evaluation report is produced, which includes deposit modelling (where sufficient data allows) and recommendations for further work at Stage 2 or Stage 3 if required. Further works may include additional interventions (stepped trenches, test pits or boreholes) to retain additional/suitable samples for assessment.
Stage 3: Palaeoenvironmental assessment	Palaeoenvironmental samples recovered during Stage 2 are assessed to inform on the archaeological and geoarchaeological potential of deposits and guide the scope and need for Stage 4 analysis. A report is produced outlining the palaeoenvironmental potential of the deposits including targeted and proportionate recommendations for Stage 4 analysis.
Stage 4: Palaeoenvironmental analysis	Based on the results of the Stage 3 palaeoenvironmental assessment, palaeoenvironmental analysis on selected deposits/samples may be required. In addition to full analysis of suitable samples identified during the assessment. work at Stage 4 may include additional scientific dating where appropriate/required. A final analysis report is provided on completion of mitigation program. Where appropriate, this may include recommendations for publication or other forms of dissemination.
Publication	The scope and location of a publication report will be agreed in consultation with the client and LPA advisor. The publication report may comprise a note in a local journal or a larger publication article or monograph, dependant on the significance of the archaeological and geoarchaeological work.

1.4 Location, topography and geology

1.4.1 The evaluation area is located in vacant units within the main market, mainly within units 24-75 in Blocks A and B (the 'Phase B' site). Existing ground levels are approximately 3.5m above Ordnance Datum (OD).

1.4.2 The solid geology at the Site is mapped by the British Geological survey (BGS) as the London Clay Formation, comprising sedimentary deposits formed approximately 48 to 56 million years ago in the Palaeogene Period. These are overlain by superficial deposits of Alluvium, described by the BGS here as clay, silt, sand and peat.

1.4.3 A more detailed description of the geoarchaeological background to the Site, and a summary of the results of the borehole survey and deposit modelling to date, is presented in Sections **2.2** and **2.3**.

2 GEOARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 The superficial deposits in the Site include deposits with geoarchaeological and/or archaeological potential of both Pleistocene and Holocene date. These epochs form parts

of the Quaternary, a period covering the last 2.6 Mya, and defined by repeated fluctuations between cold (glacial) and warm (interglacial) climate stages (**Table 2**).

2.1.2 Where age estimates are available for deposits these are expressed in millions of years (Mya), thousands of years (Ka) and within the Holocene epoch as either years Before Present (BP), Before Christ (BC) and Anno Domini (AD). Where radiocarbon dates are included, they are quoted as calibrated (cal) BC or AD. These dates are supplemented where relevant with the comparable Marine Isotope Stage (MIS) where odd numbers indicate an interglacial period and even numbers a glacial period.

Table 2 British Quaternary chronostratigraphy

Geological Period	Chronostratigraphy		Age (Ka)	MIS
Holocene	Holocene interglacial		11.7 – present	1
Late Pleistocene	Devensian Glaciation	Loch Lomond Stadial	11.7 – 12.9	2 – 5d
		Windermere Interstadial	12.9 – 15	
		Dimlington Stadial	15 – 26	
		Upton Warren Interstadial	40 – 43	
		Early Devensian	60 – 110	
	Ipswichian interglacial		115 – 130	5e
Middle Pleistocene		Unnamed cold stage	130-374	6
		Avery interglacial		7
		Unnamed cold stage		8
		Purfleet interglacial		9
		Unnamed cold stage		10
	Hoxnian interglacial		374 – 424	11
	Anglian glaciation		424 – 478	12
	Cromerian Complex		478 - 780	13 – 19

2.2 Geoarchaeological background

2.2.1 The most significant aspect of the archaeological potential of the Site is the presence of the Battersea Channel, a previous (now silted up and infilled) course of the River Thames. This palaeochannel would have been a major landscape feature, containing many interweaving channels, between which would have been islands (or eyots) of higher, drier ground. It is these areas of higher ground, as well as those at the edges of the channel area, which would have a very significantly increased probability of occupation and activity throughout prehistory, specifically in the Mesolithic, Neolithic and Iron Age periods (EH 2014, 2015).

2.2.2 The potential for well-preserved environmental data make this a key area for the study of London's prehistoric past. As a result, the area has been targeted for special attention by Historic England, who have set up the Battersea Channel Project (EH 2014), a collaborative project involving the various archaeological units, practitioners, and curators currently or

previously involved in archaeological investigations within the Battersea Channel Project area. The Battersea Channel Project identifies key aspects of the channel and surrounding area which are of greatest archaeological potential and provides a useful research framework for work at the NCGM sites.

2.2.3 Mapping by the British Geological Survey (BGS) (1:50,000 Sheet 270 South London 1998) shows a broad (0.75 km) area of Alluvium extending southward across the Nine Elms area in which the Site is located. This mapped area of Alluvium narrows in a south-westerly direction, parallel with and slightly to the north of the Wandsworth Road.

2.2.4 Recent investigations within or close to the present area of interest (Morley, 2009/10; Branch et al 2010; Green & Young 2011; Young et al 2012, 2013) have shown that the alluvium is everywhere underlain by sand and gravel which can be regarded as the Late Devensian (MIS 2; 23-11.7 Ka) Shepperton Gravel of Gibbard (1985, 1994). The surface of this gravel is uneven reflecting its origin as the deposit of an actively braiding river with gravel bars separated by low-water channels. The gravel surface is recorded by Young et al (2012) at levels up to -0.3m OD to the west of Battersea Power Station and down to below -4.5 m OD within the Battersea Channel to the east of the Power Station. In general, low points recorded within the Battersea Channel lie between -2.0 m and -4.0 m OD.

2.2.5 These sand and gravel deposits, assumed to be of Pleistocene date, effectively form the topographic template upon which all later (i.e. Holocene) activity occurs. This template – the inherited Devensian topography – to a large extent determines the probability of different types of archaeological activity being present, informs the distribution of that activity, and can be the driving force between variations in sediment accumulation and soil formation across a landscape. Broadly speaking, sand and gravel highs will have an increased potential for prehistoric dryland archaeological activity, whilst lows will be wetland or channel areas. In reality of course the situation can be far more complex.

2.2.6 The surface of the sand and gravel in the area of the Site, and the wider Battersea Chanel Project, is highly variable, showing an uneven surface with highs and lows. This reflects the depositional history of the area; a region of active river channels interweaving between islands (or eyots) of higher, drier ground. Situated largely in the northeast of the evaluation area, where the areas of elevated ground together with zones along the channel edge are of particular interest to the study of this area as a whole. They mark probable regions of prehistoric occupation and activity, primarily during the Mesolithic, Neolithic and Iron Age periods, and therefore have an increased potential for the presence of archaeological remains (EH 2014, 2015). Previous deposit models these elevated areas also mark the thickest deposits of Sand and Gravel across the NCGM site (e.g. see Wessex Archaeology 2020).

2.2.7 The finer grained alluvium and peat deposits, found within the lower lying areas, span the Holocene period, and can be considered the focus of archaeological and palaeoenvironmental potential for the project as a whole. Any non-Pleistocene archaeological evidence present will be either sealed by or lie within these strata. It is within these deposits within the low-lying areas of the sand and gravel surface that organic remains are often preserved. Peat is occasionally recorded overlying a lower, silt or sand-rich alluvium, which in turn is often overlain by a silty mineral-rich upper alluvium largely devoid of organic remains.

2.3 Previous geoarchaeological borehole survey (Wessex Archaeology 2023)

2.3.1 A programme of geoarchaeological borehole survey and deposit modelling was undertaken at the New Covent Garden Market (NCGM) Phase B site in 2022, in tandem with an

archaeological trial trench evaluation (Wessex Archaeology 2022a). The work was undertaken in order to provide an updated site-wide geoarchaeological deposit model that brings together data from multiple phases of work at the New Covent Garden Market (NCGM) site, as well as informing on the nature of the superficial deposits within the Phase B area. A selection of the deposit models prepared as part of this work presented in **Figures 3** to **12**.

2.3.2 The results of the borehole survey and subsequent deposit modelling confirmed that the sequence of superficial geological deposits recorded overlying the London Clay bedrock at the Phase B site comprises Pleistocene fluvial sands and gravels, in places overlain by Holocene alluvium, and modern Made Ground. In one sequence, WA-16, the Holocene alluvial sequence includes a unit of peat, directly overlying the Pleistocene sands and gravels.

2.3.3 The Pleistocene sands and gravels at the site comprise the Late Devensian (MIS 2; c. 17-11.7 Ka) Shepperton Gravel, formed within palaeochannels cut through the earlier Kempton Park Gravel terrace (c. 160-26 Ka). The more substantial of these channels is more widely known as the Battersea Channel (Morley, 2009/10), which itself forms an important component of the Battersea Channel Project (BCP; EH 2014). A second possible palaeochannel, in which the Gravel surface is recorded at a level of -1.2m OD, may be present cutting through the Kempton Park Gravel terrace towards the centre of the Site, although evidence for this channel is limited and its chronological relationship to the Battersea Channel is unclear. No organic deposits were identified within the alluvial sequence in this possible channel.

2.3.4 Within the Phase B site Holocene alluvium was recorded in seven of the 16 boreholes, generally in areas of lower gravel topography (including within the Battersea Channel) at levels between c. -3 and 1m OD. In higher areas of gravel topography, particularly where it lies above 1m OD, no alluvium is recorded; in places the contact between the Made Ground and the Gravel lies at levels below c. 1m OD, and here the alluvial sequence may have been entirely truncated during later ground works at the Site. In one borehole (WA-16) peat was recorded within the Holocene alluvial sequence, directly overlying the Shepperton Gravel at between -1.17 and -2.12m OD.

2.3.5 In combination with a wider review of the BCP stratigraphic dataset, the work at the Phase B site resulted in a better understanding of the topography of the gravel surface within both the Phase B site and the wider area of the BCP. The resultant model represents the most up-to-date model for the BCP area, and can be used to inform both archaeological and palaeoenvironmental potential.

2.3.6 Other previous investigations relevant to the geoarchaeological and archaeological background for the site are described in Section **3**.

3 ARCHAEOLOGICAL BACKGROUND

3.1 Introduction

3.1.1 The following section is based on that presented in the archaeological evaluation report for the Site (Wessex Archaeology 2022a).

3.1.2 The archaeological and historical background was assessed in a prior desk-based historic environment assessment (HEA; MoLA 2014), which considered the recorded historic environment resource of the development. A summary of this is outlined below in terms of known archaeological and historical assets relevant to the Main Market Site. In addition to

this, Wessex Archaeology produced a Stage 2 geological assessment (Wessex Archaeology 2015) and a Palaeoenvironmental Assessment (Wessex Archaeology 2017b) of the whole development site and the results of this and other relevant geological studies in the area are also discussed below.

3.2 Previous investigations related to the proposed development

Entrance Site (2016)

3.2.1 Following a trial trench evaluation and geoarchaeological investigations, Wessex Archaeology undertook an archaeological excavation and watching brief on the Entrance Site (NCGM), with the excavation focusing on the location of the demolished Church of St George the Martyr and associated cemetery. It was clear during the original evaluation (Wessex Archaeology 2016a and b) that the 1966 cemetery clearance operation had not recovered all the human remains, and that specifically a zone up to 3 m wide immediately inside the cemetery wall had not been fully cleared of human remains.

3.2.2 A total of 95 coffined burials were recovered from 86 earth cut graves within this zone. The majority of the graves had been truncated by the cemetery clearance. The excavation found two distinct phases of building for the church, with the earlier phase of the church being contained within the later phases.

Main Market Site – Garden Heart and Fruit Market (2016)

3.2.3 Wessex Archaeology carried out an archaeological evaluation comprising of the investigation and recording of six two metre deep stepped archaeological trial trenches on part of the proposed redevelopment site of NCGM known as the Garden Heart and Fruit Market Site (Market Site). The Garden Heart and Fruit Market Site is located in the eastern portion of the main Market Site of NCGM.

3.2.4 A depth of Made Ground comprising of building material and rail works was identified across the Site. Surviving in situ buried soil was confidently recorded in the north-western portion of the Site. These soils were underlying the modern over burden and overlaying the natural deposits, indicating potential for archaeological preservation for remains from the pre-medieval periods is most likely in this area. In situ walls and footings, presumably from the carriage works and machine shops of LSWR Nine Elms Works, were noted during the course of the evaluation. The nature of the former railway works was demonstrated by the contaminated ground discovered in the course of the evaluation.

3.2.5 The depth of Made Ground meant that for health and safety reasons most if the trenches were unable to successfully locate the upper natural deposits. Five of the six trenches were test pitted to test the geoarchaeological potential and to ascertain the depth and nature of the deposits.

3.2.6 The evaluation was successful in locating one post-medieval feature. The geoarchaeological test pits were successful in locating the depths of the gravels in four of the six test pits, one test pit located London clays and the sixth test pit was abandoned when ground water flooded it (Wessex Archaeology 2016c).

Main Market Site – Southern Car Park (2018)

3.2.7 Wessex Archaeology carried out a seven trench evaluation in the Southern Car Park at New Covent Garden Market. The southern car park area covers approximately 1.6 hectares of the 23 hectare site, centred on NGR 529651 176911.

3.2.8 The evaluation demonstrated that the ground has been made up significantly over the past 200 years. The trenches all contained a minimum of 2.5 m of Made Ground above the natural geology. The Made Ground comprised the current concrete carpark surface, overlaying a brick rubble levelling layer. These layers overlay either dumps of deposits, all containing 19th and 20th century artefacts, or granite sets and brick floors which in turn overlay brick and concrete structures, presumed to relate to an early phase of the Nine Elms Railway depot, and further dumps and deposits of Made Ground in the form of redeposited heavily mixed garden soils. Due to the depth of the Made Ground the natural deposits could only be examined through machine-excavation, and thus were inaccessible for field staff.

3.2.9 The natural deposits recorded were consistent with channel edge sequences with deposits of peat, upper alluvium and lower alluvium all being recorded. The natural deposits generally fitted with the sequences anticipated by the deposit model, however no evidence of the sand and gravel high predicted in the south-east part of the Site was found. No archaeological remains were observed during the evaluation (Wessex Archaeology 2018a).

Main Market Site - Security Lodge (2018)

3.2.10 Wessex Archaeology conducted an Archaeological Watching Brief on two trial holes excavated to investigate the ground conditions prior to the construction of a new security lodge and associated services at New Covent Garden Market. The watching brief formed part of the mitigation strategy employed to fulfil the archaeological planning condition for the redevelopment of New Covent Garden Market.

3.2.11 The watching brief monitored the excavation of two trial holes, each measuring 4 m by 2 m which were between 3.25 and 3.90 m deep. A service trench was observed to the south as being excavated wholly in Made Ground. Natural geology was recorded in both trial holes with deposits possibly relating to a post-medieval mill pond being recorded. The uppermost of the natural deposits were recorded as being at 0.85 and 1.15 m OD respectively which corresponds with the general trends from the boreholes recorded within the vicinity of the watching brief.

3.2.12 No archaeological features were encountered during the watching brief, which took place between the 14th and 16th May 2018 (Wessex Archaeology 2018b).

Northern Site (2019)

3.2.13 Though not covered under the Vinci St Modwen contract, Wessex Archaeology is currently also commissioned to carry out archaeological and geoarchaeological watching brief during the ongoing redevelopment of the Northern Site (formerly New Covent Garden Market flower market). The work on the Northern Site is ongoing, an interim statement concluded that the works monitored so far have had little impact on the natural deposits, the widespread truncation noted in the previous evaluations continues within the Northern Site, however, a small area of peat was identified, overlying minerogenic clay deposits, as is typical of the channel edge deposits predicted by the geoarchaeological assessment (Wessex Archaeology 2019a).

Main Market Site - NCGM Phase A2 Interim Statement (2019)

3.2.14 An interim statement was submitted to observe the excavations of trenches 49 and 51 under watching brief conditions. The watching brief successfully noted deposits from the deeper parts of the Battersea Channel, confirming the Rockworks deposit model for this part of the Site (Wessex Archaeology 2019b).

Main Market Site – NCGM Phase A2 Borehole Survey (2021a)

3.2.15 The geoarchaeological borehole survey comprised of 13 boreholes. The deposits recorded were relatively consistent with regard to the sequence of deposits, though varying marginally in thickness and elevation. The typical sequence recorded consisted of bedrock (London Clay) overlain by River Terrace Deposits of sands and gravels, in turn overlain by coarse and fine grained alluvium, occasionally interbedded with peat in the eastern half of the Site, all capped by up to 2.9 m of Made Ground. Deposits with palaeoenvironmental potential were recorded in two boreholes (Wessex Archaeology 2021a).

Main Market Site – NCGM Phase A2 Evaluation and Watching Brief (2021b)

3.2.16 The evaluation comprising 11 trial trenches was undertaken intermittently between 25th May 2019 and 4th December 2020, three further areas were monitored under watching brief conditions during this period.

3.2.17 Remains of infrastructure relating to the 19th century railway yard which previously occupied the site were uncovered in all of the evaluation trenches. These remains comprised concrete platforms, and brick structures, including two possible wells or soakaways. Possible evidence of the Battersea Channel was recorded in three of the trenches, with a sand and gravel eyot present in the central portion of the evaluation area. The natural geology was not at a uniform depth, this inconsistency being the result of the long-term heavy use of the site and consolidation of the ground over the paleochannel. The natural geology varied between an eyot of sands and gravels in the central portion of the site with channel edge deposits being recorded to the north, east and south of this eyot and peat deposits noted to the east and south (Wessex Archaeology 2021b).

New Covent Garden Market Phase B – Archaeological Evaluation (2022a)

3.2.18 An evaluation comprising two trial trenches (Wessex Archaeology 2022a) was targeted on an area of higher sands and gravels. Features dating to the 19th and 20th centuries were recorded in both trenches, with a floor surface possibly relating to a small building from the late 19th century, the other structures recorded were all made from concrete and appear to vary from 19th to 20th century in date.

3.2.19 The natural geology was recorded in both trenches as a yellowish grey clay lying at 2.1 m OD. Within both trenches the deposits above the natural comprised modern made ground, although a lens of buried soil was tentatively noted in one of the trenches. The made ground comprised lenticular deposits of very dark grey silty clays overlain by dumps of sands and gravels, and this made ground is consistent with the deposits recorded across the market site during previous evaluations and indicative of the former railway works and consolidation works prior to the construction of the current market buildings.

4 AIMS AND OBJECTIVES

4.1.1 The investigations being undertaken at the Phase B site form part of a staged approached to the geoarchaeological investigations, as outlined within the UPD (Wessex Archaeology 2022b). The work presented here forms part of Stage C, comprising palaeoenvironmental assessment of boreholes retained during a previous borehole survey at the Phase A2 site (WS1; Wessex Archaeology 2021a) and the Phase B site (WA-16; Wessex Archaeology 2023). The aims and objectives of the borehole survey follow those outlined within the Updated Project Design (Wessex Archaeology 2022b), and are presented below.

4.2 Overarching aims and objectives

4.2.1 The specific aims and objectives of the palaeoenvironmental assessment, building on those of the previous geoarchaeological borehole survey, were as follows:

- Determine the nature, depositional history and age of the accumulated deposits at the Site, in particular the peat an associated alluvial deposits;
- Determine the level of preservation and concentration of palaeoenvironmental remains (pollen, plant macrofossils, ostracoda, foraminifera and diatoms) within the deposits;
- Interpret the results to inform reconstructions of past environment and landscape change;
- Assess the archaeological and geoarchaeological potential of the deposits; and
- Assess the requirement for further work, including palaeoenvironmental analysis.

4.2.2 The aims were addressed by achieving the following objectives:

- Undertake radiocarbon dating of the peat deposits in boreholes WS1 and WA-16;
- Undertake pollen assessment of subsamples form the peat in boreholes WS1 and WA-16;
- Undertake diatom assessment of subsamples from the alluvium/peat interface in boreholes WS1 and WA-16;
- Undertake ostracoda and foraminifera assessment of the alluvial sequence in boreholes WS1 and WA-16;
- Make suitable, proportionate recommendations for further work where appropriate with a commitment to undertake these works, which may include palaeoenvironmental analysis.

5 METHODS

5.1 Plant macrofossil assessment

5.1.1 Six subsamples were submitted from boreholes WS1 and WA-16 for the recovery and assessment of palaeoenvironmental evidence to provide material for radiocarbon dating. The aim of the assessment is to determine the nature and significance of the palaeoenvironmental remains (plant macroremains, wood) preserved at the site, and to identify suitable material for radiocarbon dating. This assessment has been undertaken in accordance with the guidance outlined in Historic England's *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (English Heritage 2011).

5.1.2 The subsamples ranged between 20 ml to 70 ml in volume and they were processed by wet sieving using a 0.125 mm mesh. The processed samples were kept wet and stored in a refrigerated unit prior to assessment.

5.1.3 The samples were examined using a stereomicroscope at up to x40 magnification for uncharred and charred botanical remains, including organic/vegetative material, herbaceous epidermal tissues, wood remains, mosses, and plant macroremains ('seeds'), as well as other material (e.g., insects/invertebrates, molluscs, etc.). Plant macroremains were identified through comparison with modern reference material held by Wessex Archaeology and relevant literature (Cappers *et al.* 2006). Selected wood fragments were identified through examination of the transverse, tangential longitudinal, and radial longitudinal sections at up to 400x magnification. Wood identifications were undertaken through comparison with Wessex Archaeology's reference collection and relevant literature (Gale and Cutler 2000; Hather 2000; Schweingruber 1990). Nomenclature follows Stace (1997) for wild taxa, with additional habitat information taken from Preston *et al.* (2002).

5.1.4 Remains were recorded semi-quantitatively on an abundance scale: C = <5 ('Trace'), B = 5-10 ('Rare'), A = 10-30 ('Occasional'), A* = 30-100 ('Common'), A** = 100-500 ('Abundant'), A*** = >500 ('Very abundant/Exceptional').

5.2 Radiocarbon dating

5.2.1 Samples for radiocarbon dating were selected following the guidance outlined in Historic England's *Radiocarbon Dating and Chronological Modelling: Guidelines and Best Practice* (Bayliss and Marshall 2022). Extracted remains were stored in a small quantity of de-ionised water in glassware and refrigerated prior to submission.

5.2.2 Six samples of waterlogged remains (wood, plant macroremains) were submitted for radiocarbon dating to Beta Analytic, Florida. The samples were pre-treated and measured following standard procedures, with full details of analytical methods available online at https://www.radiocarbon.com/ (ISO/IEC 17025:2017 accreditation).

5.2.3 The results are presented as conventional radiocarbon ages (Stuiver and Polach 1977), together with calibrated and modelled (posterior density estimates) date ranges. The calibrated dates have been calculated using the probability method (Stuiver and Reimer 1993) and are reported at the 95% probability level with end points rounded outwards to the nearest 10 years. Modelled dates (posterior density estimates) are reported at the 95% probability and with end points rounded outwards to the nearest 5 years; they are derived from Poisson deposition models, which assumes an ununiform deposition rate (Bronk Ramsey 2008) with the cm as the unit of change (interpolation value = 1 and variable k = 10) (Bronk Ramsey and Lee 2013).

5.2.4 All date ranges have been calculated in OxCal 4.4 (Bronk-Ramsey 2009) with the atmospheric calibration curve for the northern hemisphere, IntCal 2020 (Reimer *et al*. 2020). The $\delta^{13}C$ values were measured separately by Isotopic Ratio Mass Spectrometry (IRMS).

5.3 Pollen assessment

5.3.1 A total of 26 samples were submitted for pollen assessment, extracted from boreholes WS1 and WA-16 (**Table 3**). Pollen subsampling generally focused upon the peat units encountered within these boreholes, although a selection of samples was derived from the overlying alluvial deposits. In addition, a discrete sand and gravel horizon within WA-16 was also sampled for an assessment of potential. **Table 3** summarises the pollen subsampling strategy and associated lithological descriptions of the deposits.

5.3.2 Pollen preparation will vary depending on the organic/minerogenic content, and broadly follows the methodology outlined by Campbell et al (2016) which includes (1) sampling a standard volume of sediment; (2) adding one tablet of the exotic clubmoss *Lycopodium*

clavatum to provide a measure of pollen concentration in each sample; (3) treatment with hydrochloric acid and potassium hydroxide to remove carbonates and humic acids respectively (4) sieving of the sample to remove coarse mineral and organic fractions (>180µm); (5) density separation (sodium polytungstate) (6) removal of finer minerogenic fraction; (7) acetolysis and (8) mounting of the sample in glycerol jelly and onto microscope slide.

5.3.3 Upon completion of preparation, a total of 10 microscope slide traverses are undertaken, or a count of at least 100 total land pollen grains (TLP) excluding aquatics and spores, to undertake an assessment of potential. During assessment, comments of other visible microfossil features (charcoal, pre-Quaternary pollen and spores, other identifiable non-pollen palynomorphs such as dinoflagellate cysts, testate amoebae etc) will be provided, if encountered.

Table 3 Samples submitted for pollen assessment from WS1 and WA-16

Sequence	Depth (m bgl)	Stratigraphy
WS1	3.25	Grey-brown organic clay
	3.68	Dark brown peat with visible organic remains (rootlets)
	3.84	
	4.00	
	4.16	
	4.32	
	4.48	
	4.64	
	4.80	
	4.96	
	5.10	
	5.26	
	5.42	
	5.58	
WA-16	3.24	Dark brown silty clay
	3.36	
	3.48	Brown-grey silty clay
	3.60	
	3.72	Green-grey sands and gravels
	4.36	Dark brown silty peat
	4.48	
	4.60	Dark brown silty peat (with sandy lenses)
	4.72	
	4.84	Dark brown silty peat
	4.96	
	5.08	

5.4 Diatom assessment

5.4.1 Subsamples for diatom assessment were extracted from the upper and lower peat/alluvium interface in borehole WS1m and the alluvial sequence overlying the peat in WA-16. **Table 4** summarises the diatom subsampling strategy and associated lithological descriptions of the deposits.

Table 4 Samples submitted for diatom assessment from WS1 and WA-16

Sequence	Depth (m bgl)	Stratigraphy
WS1	3.32	Grey-brown organic clay
	3.40	
	3.48	
	5.62	Grey silty clay
	5.70	
	5.78	
WA-16	3.06	Blue grey silty clay
	3.18	
	3.30	Dark brown organic silty clay
	3.46	Brown-grey Silty clay
	4.18	Dark brown organic silty clay

5.4.2 Diatom preparation followed standard techniques (Battarbee et al 2001). Two coverslips were made from each sample and fixed in Naphrax for diatom microscopy. A large area of the coverslips on each slide was scanned for diatoms at magnifications of x400 and x1000 under phase contrast illumination.

5.4.3 Diatom floras and taxonomic publications were consulted to assist with diatom identification; these include Hendey (1964), Werff & Huls (1957-1974), Hartley et al (1996), Krammer & Lange-Bertalot (1986-1991) and Witkowski et al (2000). Diatom species' salinity preferences are indicated using the halobian groups of Hustedt (1953, 1957: 199), these salinity groups are summarised as follows:

- Polyhalobian: >30 g l-1
- Mesohalobian: 0.2-30 g l-1
- Oligohalobian - Halophilous: optimum in slightly brackish water
- Oligohalobian - Indifferent: optimum in freshwater but tolerant of slightly brackish water
- Halophobous: exclusively freshwater
- Unknown: taxa of unknown salinity preference.

5.5 Foraminifera and ostracoda assessment

5.5.1 Subsamples for foraminifera and ostracoda assessment were extracted from the upper and lower peat/alluvium interface in borehole WS1m and the alluvial sequence overlying the

peat in WA-16. **Table 5** summarises the foraminifera and ostracoda subsampling strategy and associated lithological descriptions of the deposits.

5.5.2 Samples ranged between 20g and 35g wet weight. Each sample was washed in water through a 125µm sieve, the resulting residue being dried in an oven at 100°C. Different size fractions of the residue were examined separately on a gridded tray under a binocular reflected light microscope. An overall assessment of the abundance of each species observed was made and representative specimens selected for later confirmation of identification and placed on standard cardboard micropalaeontology slides.

Table 5 Samples submitted for foraminifera and ostracoda assessment from WS1 and WA-16

Sequence	Depth (m bgl)	Stratigraphy
WS1	3.32	Grey-brown organic clay
	3.40	
	3.48	
	5.62	Grey silty clay
	5.70	
	5.78	
WA-16	3.06	Blue grey silty clay
	3.18	
	3.30	Dark brown organic silty clay
	3.46	Brown-grey Silty clay
	4.18	Dark brown organic silty clay

6 RESULTS

6.1 Introduction

6.1.1 The results of the previous geoarchaeological borehole survey at the Site, and a programme of deposit modelling incorporating this data with those from the wider area of the BCP, were reported in Wessex Archaeology (2023) and are summarised in Section **2.3** and **Figures 3** to **11**.

6.1.2 The results of the palaeoenvironmental assessment of boreholes WS1 and WA-16 are presented below, with the lithostratigraphy of these sequences, the location of the various subsamples, and the results of the radiocarbon dating shown in **Figure 12**.

6.2 Plant macrofossil assessment

6.2.1 The results of the palaeoenvironmental assessment are summarised in **Table 6**. Varying quantities of waterlogged plant macroremains and wood fragments are present in the samples, together with occasional remains of invertebrates including *Daphnia* sp. (water-fleas) egg cases and Coleoptera (beetle) fragments. The condition of the waterlogged remains is particularly poor in WS1 and consequently the wood fragments could not be identified to species. In comparison, the waterlogged remains in WA-16 are in excellent condition. Charred plant material is recorded in the samples from WA-16 with evidence for wood charcoal, herbaceous stems and ‘seeds’.

Borehole WS1

6.2.2 The samples are primarily composed of small, degraded fragments of wood and herbaceous stems. A single seed of an *Alisma* species (water-plantains) is present at 5.46-5.48 m bgl. Bark fragments at 4.48-4.50 m bgl derive from a Betulaceae (Birch family) species, although the wood fragments were too degraded to be securely identified.

6.2.3 At 3.54-3.56 m bgl, the sample contains a few *Daphnia* sp. egg cases, earthworm egg cases, and small (<4 mm) fragments of clinker/cinder which is formed from burning coal. The presence of clinker/cinder suggests that there is some recent contamination within the deposits.

Borehole WA-16

6.2.4 At 5.06–5.08 m bgl, the sample is composed primarily of fine rootlets, together with small quantities of herbaceous stems. The plant macroremain assemblage contains species indicative of aquatic and damp/wet conditions, with particularly large numbers of seeds from *Schoenoplectus* (club-rushes) and *Carex* spp. (sedges). Other species include *Potentilla* sp. (cinquefoils), bugle *Ajuga reptans* (bugle), cf. *Sparganium* sp. (probable bur-reeds), and Charophytes (stoneworts). There are occasional Coleoptera (beetle) fragments.

6.2.5 The sample taken at 4.36-4.38 m bgl produced occasional *Alnus glutinosa* (alder) wood fragments/twigs, together with abundant herbaceous stems and plant macroremains. The assemblage is again dominated by *Schoenoplectus* sp. and *Carex* spp., which occur alongside species indicative of aquatic conditions such as *Nymphaea alba* (white water-lily), *Menyanthes trifoliata* (bogbean), *Potamogeton* spp. (pondweeds), and Charophytes. There are occasional *Daphnia* sp. egg cases which also suggest areas of still or slow-moving water were present in the local environment. Charred plant material (<2 mm) is abundant, with evidence for wood charcoal, herbaceous stems, and sedge (*Carex* sp.) nutlets.

6.2.6 At 3.62–3.64 m bgl, the processed subsample is primarily composed of sand. It contains a few well-preserved wood fragments, including a complete *Alnus glutinosa* twig which is approximately 10 mm in diameter.

Table 6 Results of the palaeoenvironmental assessment

Borehole	Sample depth (m bgl)	Sample vol. (ml)	Flot vol. (ml)	Sample composition
WS1	3.54–3.56	60	5	Mainly wood fragments, poor condition; few fine herbaceous stems; *Daphnia* sp. egg case C; earthworm egg cases C; small (<4 mm) clinker/cinder fragment
WS1	4.48–4.50	50	3	Small diameter twigs, poor condition – some bark present (Betulaceae). Few herbaceous stems.
WS1	5.46–5.48	50	5	Few wood fragments, poor condition - some bark present; few fine herbaceous stems; Plant macroremains C - *Alisma* sp.
WA-16	3.62–3.64	20	10	Mainly sand, few wood fragments inc. *Alnus glutinosa* twig (approx. 10 mm diameter, pith to bark); Coleoptera frags

WA-16	4.36–4.38	80	70	Abundant herbaceous stems (*Phragmites*-sized); Few wood fragments, inc. compressed *Alnus glutinosa* twig; Plant macroremains A** - Cyperaceae (inc. *Schoenoplectus* sp., *Carex* spp.), *Menyanthes trifoliata*, *Nymphaea* sp., *Potamogeton* spp.; Characeae oospores; Charred plant material <1mm A** inc. herbaceous stems, wood charcoal, *Carex* sp. seed; Coleoptera frags, *Daphnia* sp. egg cases; Preservation condition excellent
WA-16	5.06–5.08	70	50	Dominated by fine rootlets, few herbaceous stems; Plant macroremains A** - Cyperaceae (mainly *Schoenoplectus* sp., some *Carex* spp.), *Ajuga reptans*, *Potentilla* sp., cf. *Sparganium* sp.; Characeae oospores; Coleoptera frags; Preservation condition excellent.

6.3 Radiocarbon dating

6.3.1 The results of the radiocarbon dating of samples from borehole WS1 and WA-16 are presented in **Table 7** and in **Figures 13** and **14**.

6.3.2 The three radiocarbon dating results from WS1 are conformable (appear in the correct stratigraphic order) and have been successfully modelled (**Figure 13**), with an overall agreement of 102.5. The model is considered more reliable for the peat sequence, given that the radiocarbon dates are concentrated on this unit. The period of stabilisation and peat formation (5.6–3.5 m) starts by *2455–2290 cal BC* and ends by *400–235 cal BC*. The model indicates that final alluvium deposition (at 2.34 m) takes place between *15 cal BC* and *cal AD 800.*

6.3.3 The three radiocarbon dates for WA-16 are also conformable and have been successfully modelled (**Figure 14**). According to the model, a deposit of fluvial sands and gravels deposits formed above the London clay starting at some point between *12875–12100 cal BC.* Following this, peat started forming between *12205–12120 cal BC* (see further details about this measurement in **Section 7**). Peat stopped forming by *4330–4170 cal BC*, when a layer of alluvium was deposited, beneath a second alluvium layer deposited in turn from *1400–1290 cal BC* and ending by *1310–135 cal BC.*

Table 7 Results of the radiocarbon dating of samples from borehole WS1 and WA-16

Laboratory number	Borehole	Sample depth (m bgl)	Sample details	Radiocarbon age (BP)	$\delta^{13}C$ ‰*	Calibrated date (95% probability)	Posterior density estimates (95% probability)
-	WS1	2.34	Top of upper alluvium	-	-	-	*15 cal BC – cal AD 800*
Beta-656512		3.54–3.56	Top of peat - Waterlogged wood: indet. fragments x3	2280 ± 30	-28.2	410–200 cal BC	*400–235 cal BC*
Beta-656513		4.48–4.50	Middle of peat - Waterlogged wood: Betulaceae (birch family) bark fragment x 1	3630 ± 30	-25.2	2130–1890 cal BC	*2030–1945 cal BC*
Beta-656514		5.46–5.48	Bottom of peat - Waterlogged	3870 ± 30	-27.6	2470–2200 cal BC	*2455–2290 cal BC*

			wood: indet. fragment x1				
-		6.70	Bottom of lower alluvium	-	-	-	*3805–2520 cal BC*
-	WA-16	2.65	Top of upper alluvium	-	-	-	*1310–135 cal BC*
Beta-656516		3.62–3.64	Bottom of upper alluvium - Waterlogged wood: *Alnus glutinosa* (alder) twig, 10 mm diameter, pith and bark present	3070 ± 30	-32.6	1400–1230 cal BC	*1400–1290 cal BC*
Beta-656517		4.36–4.38	Bottom of lower alluvium - Waterlogged wood: *Alnus glutinosa* (alder) twig, compressed/ flattened	5380 ± 30	-27.1	4340–4060 cal BC	*4330–4170 cal BC*
Beta-656518		5.06–5.08	Bottom of peat - Waterlogged plant macroremain: *Schoenoplectus* sp. (club-rushes) seeds x8	12220 ± 40	-28.1	12360–12090 cal BC	*12205–12120 cal BC*
-		5.30	Bottom of fluvial sands and gravels	-	-	-	*12875–12100 cal BC*

**Measured by IRMS*

6.4 Pollen assessment

6.4.1 Pollen abundance and floral diversity was found to vary considerably between samples and sequences, but overall pollen abundance and diversity was found to be limited. Of the 26 samples under assessment, only eight samples, all derived from borehole WS1, yielded sufficient pollen for assessment purposes. All other samples displayed low to moderate pollen abundance and diversity, restricting the palaeoenvironmental potential of both sedimentary archives.

6.4.2 **Appendix 2** summarises the results obtained from the assessment of pollen from boreholes WS1 and WA-16. The results are summarised by borehole below, with general comments and recommendations for further analysis discussed below and in Section **8**.

WS1

6.4.3 A total of 14 pollen samples were assessed from borehole WS1, comprising samples derived from a dark brown peat (n. 13), overlain by alluvium (n. 1). Of the 14 samples under evaluation, eight samples returned assemblages suitable for assessment (where over 100 Total Land Pollen (TLP) were encountered during slide traverses). The majority of these samples derived from the lower section of the borehole (4.32m to 5.58 m bgl), although the uppermost sample (3.25 m bgl) also yielded a full assessment pollen assemblage.

6.4.4 The basal sample (5.58 m bgl), derived from the bottom of the peat unit, contained a relatively diverse floral signal, with a mixture of trees, shrubs, herbs and aquatics all

encountered. In the arboreal realm, *Pinus* (pine) was most abundant, but grains of *Ulmus* (elm) and *Corylus* type (e.g. hazel) were also common, in addition to *Alnus* (alder), *Betula* (birch) and *Quercus* (oak) were also common.

6.4.5 Isolated grains of *Tilia* (lime), *Salix* (willow) and *Hedera helix* (ivy) were also noted. Herbs were typified by Cyperaceae (sedges) and Poaceae (wild grasses). Aquatics were encountered, with *Typha latifolia* (bulrush) and *Myriophyllum* (watermilfoils) most common. The only spore of note is Pteropsida (monolete) *undif*. (ferns). The overlying sample (5.42m) is broadly similar to that encountered below, except for *Tilia* and *Alnus* being more abundant, and there being an absence of aquatics.

6.4.6 A very restricted assemblage is encountered at 5.26 m bgl. Above this, at 5.10 m bgl, there appears to be a shift in assemblage composition, with arboreal taxa almost wholly absent, except for isolated grains of *Quercus*, *Corylus-Myrica* type, *Tilia*, *Pinus*, *Ulmus* and *Alnus*. In its place, herbs are much more common, typified once again my Cyperaceae, supported by Poaceae. Larger Poaceae grains (>37microns) are also common. There is also a slightly more diverse herbaceous signal, with Lactuceae (dandelions etc), Asteraceae (daisies etc), Caryophyllaceae (Pinks) encountered, in addition to a single grain of *Centaurea cyanus* (cornflower). Spores continue to be typified by Pteropsida (monolete) *undiff*., whilst aquatics continue to be present, but restricted to *Typha latifolia*.

6.4.7 Between 4.96m to 4.32 m bgl, the pollen record shifts once again, with arboreal taxa becoming more abundant, namely through the presence of *Pinus*, *Quercus*, *Ulmus*, *Tilia* and *Alnus*, although there are fluctuations in abundance of each within this section of the sequence. *Pinus* for example remains broadly stable through the section, whereas *Ulmus* and *Quercus* appear to reduce in number with height. In contrast, *Tilia* and *Alnus* become more abundant with height. *Corylus-Myrica* type fluctuates between samples considerably. Herbs are present but in lower numbers and continue to be typified by Cyperaceae and Poaceae, with a restricted supporting assemblage including Apiaceae undiff. (umbellifers), Chenopodiaceae (goosefoot) and Asteraceae. The spore signal remains dominated by Pteropsida (monolete) undiff, but *Pteridium* (bracken) and *Polypodium* (common polypody) are also encountered, albeit in relatively low numbers. Aquatics are much more restricted.

6.4.8 The uppermost section of the borehole (4.14 to 3.68 m bgl) yielded very poor pollen assemblages. Only the uppermost sample (3.25 m bgl) yielded sufficient pollen for assessment purposes. However, although low, the pollen encountered between 4.14m to 3.68 m bgl was broadly similar to that encountered at 3.25 m bgl and hence will be summarised together. The upper section of the borehole was typified by a shift to the dominance of herbs, with trees and shrubs contributing a much lower proportion of assemblages when compared to that encountered beneath. Cyperaceae continues to dominate, supported by Poaceae and a continued presence of larger Poaceae grains. In addition, there is a moderately diverse herbaceous supporting assemblage including Lactuceae, Asteraceae, Chenopodiaceae, Brassicaceae and *Plantago* (plantains). Shrubs are restricted to *Corylus-Myrica* type, whilst trees are encountered in low number, with *Alnus* most common, supported by occasional grains of *Quercus*, P*inus*, *Tilia* and *Ulmus*. Spores are restricted to Pteropsida (monolete) *undiff* and *Pteridium* and aquatics continue to be rare (although *Typha latifolia* was more common in the uppermost sample.

6.4.9 With regards other microfossil evidence encountered within the sequence, charcoal was relatively rare, and when present, in low abundance. Grain corrosion and crumpling was often noted, particularly with the middle-lower section of the core (4.32-5.58 m bgl). It was noted that tentative dinoflagellate cysts were present in samples between 4.32-4.96 m bgl.

Other non-pollen palynomorphs were also encountered, including occasional zygospores, ascospores, pediastrum and *Diporotheca* sp.

WA-16

6.4.10 A total of 12 pollen samples were assessed from borehole WA-16, of which the upper five samples were derived from alluvium and a discrete sand/gravel horizon. The lower seven samples were derived from a c. 1.7 m thick peat unit, with some sandy lenses between 4.50-4.75 m bgl.

6.4.11 Pollen preservation was found to be very poor in all samples from this borehole sequence, with samples containing very few pollen grains, rarely exceeding 40 TLP. As a result, only brief comments will be made due to the restricted potential of this sequence.

6.4.12 When present, the pollen encountered was most often typified by herbaceous taxa. Cyperaceae was often the most abundant within these restricted assemblages, supported by Poaceae. The remaining herbaceous component varied between samples, but towards the base of the sequence, within the samples derived from the peat unit, the most common herbs included *Artemisia* type (mugwort) and Rubiaceae (Madder family). With height, from the samples derived from assumed alluvium, Chenopodiaceae, Lactuceae, *Plantago* and Asteraceae become more common. Larger Poaceae grains are also more typical towards the top of the sequence.

6.4.13 The arboreal signal is low and restricted to occasional grains of *Alnus*, *Corylus-Myrica* type, *Pinus*, *Quercus* and *Tilia*. Although pollen abundance was poor throughout the sequence, there appeared a slightly stronger arboreal signal within the alluvium, towards the top of the profile. Spores were again somewhat limited and most often encountered within the upper alluvium deposits, typified by *Pteropsida* (monolete) undiff, *Pteridium* and *Polypodium*. Aquatics are almost wholly absent.

6.4.14 Other microfossil evidence encountered during the assessment was also somewhat restricted. Charcoal was relatively rare and only encountered within the central section of the sequence, within the upper peat (4.84-3.60 m bgl). Occasional dinoflagellate cysts were tentatively identified in two samples (from one of the sandy horizons within the peat and one sample from the alluvium). Grain crumpling was very common, whilst corrosion of the grains was also encountered.

6.5 Diatom assessment

6.5.1 A summary of the results of the diatom assessment are shown in **Table 6**, with records of diatom taxa and their salinity classifications shown in **Appendix 3**.

Table 8 Summary of diatom evaluation results for boreholes WS1 and WA-16

Borehole and depth (m bgl)	Diatoms	Diatom numbers	Quality of preservation	Diversity	Assemblage type	Potential for % count
WS1						
3.32	-	-	-	-	-	none
3.40	-	-	-	-	chrysophyte cyst	none
3.48	+	v low	v poor	low	fw aero bk mar	ex low
5.62	-	-	-	-	-	none
5.70	-	-	-	-	-	none
5.78	+	ex low	ex poor	ex low	non-pk fw	none

WA-16						
3.06	+	ex low	ex poor	ex low	indet	none
3.18	+	ex low	ex poor	ex low	non-pk fw aero	none
3.30	+	ex low	ex poor	ex low	non-pk fw aero	none
3.46	-	-	-	-	-	none
4.18	-	-	-	-	-	none

Key: - diatoms absent; + diatoms present; fw – freshwater; bk – brackish; mar – marine; aero – aerophilous; ex – extremely; indet – indeterminate diatom fragment; non-pk – non-planktonic)

WS1 (samples 3.32 to 5.78m bgl)

6.5.2 Diatoms are present in two samples (3.48 and 5.78 m bgl) in core WS1. Diatoms are absent from samples 3.32, 3.40, 5.62 and 5.70 m bgl. A chrysophyte stomatocyst was recorded in the sample from 3.40 m bgl.

6.5.3 In the samples from 3.48 and 5.78 m bgl there are very low or extremely low numbers of diatoms, and the quality of preservation is very poor or extremely poor. Species diversity is low (3.48 m bgl) or extremely low (5.78 m bgl). There is no further potential for diatom analysis of this core. However, the diatom assemblages in the samples from 3.48 and 5.78 m bgl are informative.

6.5.4 Despite the poor quality of preservation, the diatoms identified in the bottom sample (5.78 m bgl) are all likely to be from freshwater habitats (*Cymbella* sp., *Pinnularia* sp.) and are non-planktonic. The freshwater diatom *Gyrosigma attenuatum* is a benthic (mud-surface) species and the fragment of *Surirella* sp. is also from a benthic, probably freshwater diatom. These diatoms therefore suggest a shallow, freshwater habitat.

6.5.5 The poor preservation of diatoms in the core indicates that conditions were unfavourable for diatom silica preservation (Flower 1993, Ryves *et al.* 2001). The poor condition, or absence, of diatom valves in the samples can be attributed to taphonomic processes. This may be the result of diatom silica dissolution and diatom valve breakage caused by factors such as high sediment alkalinity, acidity, the under-saturation of sediment pore water with dissolved silica, cycles of prolonged drying and rehydration, or physical damage to diatom valves from abrasion.

6.5.6 The sample from 3.48 m bgl contains a mixture of freshwater, brackish and marine diatoms. The most common group of diatoms are non-planktonic freshwater diatoms. These shallow water diatoms include *Opephora martyii, Amphora libyca*, the benthic species *Gyrosigma attenuatum* and the aerophilous species *Pinnularia major*.

6.5.7 In the sample from 3.48 m bgl brackish water benthic diatoms include *Navicula digitoradiata* and *Nitzschia navicularis*. Polyhalobous, marine plankton includes *Paralia sulcat*a and *Actinoptychus undulatus*. The diatom assemblage indicates that the environment may be one of shallow freshwater with occasional flooding from the estuary. Some mesohalobous and polyhalobous diatoms common in tidal habitats from the Thames Estuary are not present here.

WA-16 (samples 3.06 to 4.18 m bgl)

6.5.8 Diatoms are present in the top three samples from borehole WA-16 (3.06, 3.18 and 3.30 m bgl) and are absent from the bottom two samples (3.46 and 4.18 m bgl). The three diatomaceous samples contain extremely low numbers of diatoms that are

extremely poorly preserved, and the diatom assemblages are of extremely low diversity.

6.5.9 In the bottom sample (3.30 m bgl) there is a freshwater diatom assemblage comprised of species such as *Synedra ulna* and the aerophilous species *Pinnularia major*. Other probable freshwater diatoms include *Caloneis* sp., *Cymbella* sp. and *Navicula* sp. These non-planktonic diatoms represent shallow, freshwater habitats.

6.5.10 There is also a freshwater non-planktonic/aerophilous diatom assemblage in the sample from 3.18 m bgl. The aerophilous diatom *Pinnularia major* is present. Aerophilous taxa are desiccation-tolerant diatoms that can live in semi-terrestrial or ephemeral aquatic habitats, for example wet soil or temporary water bodies. Other, likely shallow, freshwater diatoms in this sample are the non-planktonic taxa *Cymbella* sp. and *Pinnularia* sp.

6.5.11 In the top sample (3.06 m bgl) only a fragment of an indeterminate diatom was recorded.

6.5.12 There is no evidence for estuarine influence in the diatom assemblages from core WA-16, and no potential for further analysis of this sequence.

Summary

6.5.13 In borehole WS1 diatoms are present in two samples (3.48 and 5.78 m bgl) and diatoms are absent from four samples (3.32, 3.40, 5.62 and 5.70 m bgl). Samples 3.48 and 5.78 m bgl contain poorly preserved diatom assemblages. The diatoms in the sample from 5.78 m bgl indicate shallow, freshwater habitats. The sample from 3.48 m bgl contains a mixture of freshwater, brackish and marine diatoms that suggest shallow freshwater environments with occasional flooding from the Estuary rather than fully tidal habitats. There is no further potential for diatom analysis of the samples from borehole WS1.

6.5.14 Diatoms are present in the top three samples from borehole WA-16 and are absent from the bottom two samples. However, only the samples from 3.30 and 3.18 m bgl contain diatom assemblages with fragments identifiable to the species or generic level. Both samples have very poorly preserved diatom assemblages.

6.5.15 The diatoms in the bottom sample (3.30 m bgl) are comprised of non-planktonic taxa that represent shallow, freshwater habitats. There is a freshwater non-planktonic or freshwater aerophilous diatom assemblage in the sample from 3.18 m bgl. The diatoms represent semi-terrestrial or ephemeral aquatic habitats or shallow freshwater environments. There is no evidence from the diatom assemblages in WA-16 for estuarine influence. There is no further potential for diatom analysis of the samples from borehole WA-16.

6.6 Foraminifera and ostracoda assessment

6.6.1 A total of 11 samples were assessed for foraminifera and ostracoda, including six from boreholes WS1 and five from borehole WA-16. The results of the assessment are summarised below.

Borehole WS1

6.6.2 No calcareous microfossils were recorded in the samples from 3.32, 3.40 and 3.48 m bgl in borehole WS1. The sample residues of the samples from 5.62, 5.70 and 5.78 m bgl comprised plant debris, woody fragments, seeds and anhydrite crystals. Each sample contained common ostracods, including *Iliocypris* cf. *gibba*, *Limnocythere inopinata*, *Candona* cf. *candida* and juvenile *Candona* spp. Charophyte oogonia were also common and branchiopod ephippia were rare.

6.6.3 All of these taxa are indicative of freshwater environments, although *Limnocythere inopinata* and some charophyte species can tolerate mildly brackish conditions. *Limnocythere inopinata* inhabits very shallow pools and lakes where it favours macrophyte detritus. *Iliocypris gibba* prefers small and shallow pools. The presence of anhydrite crystals indicates periodic evaporation and branchiopod ephippia can withstand periods of drying out of vernal pools.

Borehole WA-16

6.6.4 No calcareous microfossils were recorded in the samples form WA-16 (3.06, 3.18, 3.30, 3.46 and 4.18 m bgl).

7 DISCUSSION

7.1 Introduction

7.1.1 A programme of palaeoenvironmental assessment and scientific dating was undertaken on two borehole sequences from New Covent Garden Market, including WS1 from the Phase A2 site (Wessex Archaeology 2021a) and WA-16 from the Phase B site (Wessex Archaeology 2023). The assessment followed on from a programme of borehole survey and deposit modelling at Phase B, undertaken as part of a staged approach to the geoarchaeological investigations, as outlined within the UPD (Wessex Archaeology 2022b).

7.1.2 The principal aims of the palaeoenvironmental assessment were to determine the nature, depositional history and age of the accumulated deposits at the Site, to determine the level of preservation and concentration of palaeoenvironmental remains, to assess the archaeological and geoarchaeological potential of the deposits, and to assess the requirement for further work, including palaeoenvironmental analysis, in support of the ongoing mitigation works at the site.

7.2 Sedimentary sequence and depositional environment

7.2.1 The sequence of superficial geological deposits recorded overlying the London Clay bedrock at the Phase B site was reported in Wessex Archaeology (2023) and is summarised in **Figures 3** to **11**. The sequence comprises Pleistocene fluvial sands and gravels, in places overlain by Holocene alluvium, and modern Made Ground.

7.2.2 The Pleistocene sands and gravels at the site comprise the Late Devensian (MIS 2; c. 17-11.7 Ka) Shepperton Gravel, formed within palaeochannels cut through the earlier Kempton Park Gravel terrace (c. 160-26 Ka). The more substantial of these channels is more widely known as the Battersea Channel (Morley, 2009/10), which itself forms an important component of the Battersea Channel Project (BCP; EH 2014). The Battersea Channel underlies the western margin of the Phase B site, where the Gravel surface is recorded at levels between c. -1 and -3 m OD (**Figure 4**); elsewhere within the area of the BCP, the gravel surface has been recorded within the Battersea Channel and other, potentially contemporary channels at similar levels of between c. -2 and -4 m OD (Morley, 2009/10; Branch et al 2010; Green & Young 2011; Young et al 2012; 2013).

7.2.3 The topography of the gravel within the Phase B site and elsewhere within the BCP defines the nature of the Early Holocene land surface and forms the template upon which the subsequent Holocene alluvial deposits have accumulated. The nature of the Early Holocene land surface, interpreted based on the topography of the gravel surface, was presented in Wessex Archaeology (2021a) and is shown in **Figure 12**. In combination with a review of the BCP stratigraphic dataset, the work at the Phase B site has resulted in a better understanding of the topography of the gravel surface within both the Phase B site and the

wider area of the BCP. The resultant model represents the most up-to-date model for the BCP area, and can be used to inform both archaeological and palaeoenvironmental potential.

7.2.4 Within the Phase B site Holocene alluvium was recorded in seven of the 16 boreholes, generally in areas of lower gravel topography (including within the Battersea Channel) at levels between c. -3 and 1 m OD. In higher areas of gravel topography, particularly where it lies above 1 m OD, no alluvium is recorded; in places the contact between the Made Ground and the Gravel lies at levels below c. 1 m OD, and here the alluvial sequence may have been entirely truncated during later ground works at the Site.

7.2.5 The alluvial sequence at the site formed within the estuarine floodplain of the River Thames. Initially the accumulation of alluvium is likely to have been restricted to topographic lows formed during the Late Devensian, such as that of the Battersea Channel, followed by more widespread alluviation during the middle and late Holocene under the influence of relative sea level rise. Diatoms were poorly preserved in the majority of samples from WS1 and WA-16, but towards the base of the peat in both boreholes freshwater habitats are indicated, suggesting that estuarine influence was minimal at this time; at the top of the peat in these boreholes a mixture of freshwater, brackish and marine diatoms are present, suggesting shallow freshwater environments with occasional flooding from the Estuary rather than fully tidal habitats.

7.2.6 In one sequence within the Phase B site, WA-16, the Holocene alluvial sequence includes a unit of peat directly overlying the Pleistocene sands and gravels at between -1.17 and -2.12 m OD; at the Phase A2 site (Wessex Archaeology 2021a) peat was recorded in two boreholes, 2.1m thick in WS1 and 1.28m thick in WS4, varying in depth between -0.01 to -2.11 m OD (WS1) and -0.19 to -1.47 m OD (WS04). The peat deposits in boreholes WS1 and WA-16 form the focus of the palaeoenvironmental assessment presented here (see **Figure 13**).

7.2.7 In WS1, the results of the radiocarbon dating and age-depth modelling indicate that the peat is of Late Neolithic through to Iron Age date, with the transition to peat accumulation occurring by 2455–2290 cal BC (4405-4240 cal BP), and peat cessation by 400–235 cal BC (2350-2185 cal BP) (**Figure 14**). During previous work on borehole S111a, located only 20m away the peat was found to date from the Late Mesolithic to Neolithic, with a Bronze Age peat recorded in S052a (Wessex Archaeology 2017b) (see **Figure 2** for the location of these sequences and **Figure 8** for comparison of stratigraphy).

7.2.8 The relative abundance of lime and elm pollen towards the base of WS1 alludes to a mixed deciduous woodland consistent with a Late Neolithic date for the peat; the apparent loss of woodland, the presence of occasional larger monoporate pollen grains (potentially cereals) and overall inferred opening of the landscape later in the sequence is consistent with a later Holocene date (see **Section 7.3**). However, significantly older dates were obtained on the base of the peat unit in WA-16. The radiocarbon dates here range between 4340–4060 cal BC (6290-6010 cal BP) for the top of the peat, and 12360–12090 cal BC (14310-14040 cal BP) for the base, placing the base of the peat in the Late Upper Palaeolithic (within the Lateglacial Interstadial) and the top in the Late Mesolithic/Early Neolithic.

7.2.9 However, given the disparity between the dates on the peat in WS1 and WA-16 (on the basis of the broadly similar elevation, but varying thicknesses) there is some uncertainty as to the chronology of the peat sequence in WA-16. The dates on the peat sequence in WS1 are broadly consistent with other sequences in this part of the Lower Thames Valley, and indeed within the Battersea Channel (see below); however, the Lateglacial Interstadial date

on the base of the peat in WA-16 is earlier than might be expected given its stratigraphic position within the sequence, and a Late Mesolithic/Early Neolithic date at the top of the same peat unit.

7.2.10 Survival of a continuous peat sequence at this time would imply either a very slow accumulation of peat, continuing through the Loch Lomond Stadial (associated with glacial readvance of the British-Irish Ice Sheet), or a sedimentary hiatus unaffected by erosion associated within the fluvial regime that was likely to have existed within the valley of the Battersea Channel during that Stadial. Alternatively, the dated seeds may have been reworked from earlier (Lateglacial Interstadial) deposits and reincorporated in to the base of a later (Holocene) peat unit; however, on the basis of their preservation, the seeds appear unlikely to be significantly reworked (see **Section 7.3**). Alternatively, the seeds may be presenting erroneously early dates on the basis of early carbon. Although the pollen assemblage present towards the base of the peat in WA-16 was dominated by herbaceous taxa with a low arboreal (woodland) signal, consistent with environments likely to be present during the Lateglacial Interstadial, pollen preservation was poor and is not considered reliable enough to draw any conclusions as to the likely age of the deposit.

7.2.11 The date on the bottom of the peat in WA-16 was obtained on eight *Schoenoplectus* sp. (club-rush) seeds, which is an emergent aquatic species. It is thought that emergent aquatic species can be reliably radiocarbon dated since they fix carbon via photosynthesis (Bayliss and Marshall 2022). However, in the particular case of club-rushes, some species within the genus may absorb CO^2 from the sediment and therefore may contain old carbon present which is either present in freshwater calcareous basins (FRE) or in brackish waters where marine reservoir offsets may also apply (Marty and Myrbo 2014).

7.2.12 As such, there is uncertainty in the reliability of this measurement due to a possible source of old carbon. The uncertainty cannot be precisely measured due to the variability within the club-rush genus in the fixation of sediment CO^2 (Marty and Myrbo 2014) and due to the difficulty in estimating a rigorous FRE correction value (e.g., Keaveney and Reimer 2012). Further subsamples for plant macroremain assessment and radiocarbon dating could be taken from the sequence between 5.06–5.08 and 4.36–4.38 m bgl to confirm this. It would be of interest to obtain a paired date on a terrestrial species (e.g. *Alnus glutinosa*) and an emergent aquatic species (e.g. *Schoenoplectus* sp.).

7.2.13 A range of different dates and elevations have been recorded for peat deposits elsewhere within the BCP, indicating that conditions suitable for peat formation have occurred at various times during the accumulation of the Holocene alluvium, from the late Mesolithic through to the Iron Age, including within the New Covent Garden Market site during previous investigations undertaken by Wessex Archaeology (2017b). Here, a basal peat in borehole S111a (-1.46 to -1.56 m OD) was dated to 5530-5375 cal BC (7480-7325 cal BP), whilst separate peat units between -1 and -2 m OD in boreholes S111a & S052a were radiocarbon dated to 3350-3630 cal BC (5300-5580 cal BP) and 960-935 cal BC (2910-2885 cal BP) respectively.

7.2.14 At the 120-146 Stewarts Road site (Morley 2009/2010) a peat unit within the Battersea Channel was recorded at levels between c. -1.25 and -1.75 m OD, and was subsequently radiocarbon dated to 7670-7510 cal BP (Late Mesolithic). In contrast, at Wandsworth Road and Pascal Street (Batchelor et al 2018) peat recorded at elevations between *ca*. -1.0 and 0.5 m OD was of Bronze Age date (3460-3360 to 3150-2930 cal BP). During previous work at Battersea Power Station (Branch *et al*., 2010) relatively thin peat horizons radiocarbon dated to the early to late Neolithic were identified at -2.92 to -2.97 m OD (ABH8; 6310-6180

cal BP), -2.09 to -2.16 m OD (ABH2; 5320 to 4960 cal BP) and -1.52 to -1.56 m OD (ABH7; 4000 to 3690 cal BP).

7.3 Vegetation history

7.3.1 The results of the palaeoenvironmental assessment undertaken on boreholes WS1 and WA-16 yielded variable results on the basis of their preservation. Overall they were found to contain very limited pollen assemblages in WA-16, with variable plant macrofossil preservation also recorded in WS1. As such, the potential of the archives to reveal the landscape conditions that prevailed as these deposits developed is (in places) restricted.

7.3.2 The samples from WA-16 contained a relatively large assemblage of waterlogged plant macroremains and wood fragments. The sample taken from the base of the peat (5.06-5.08 m bgl) indicates an open, wetland habitat with areas of still or slow-moving freshwater (e.g., pools, streams, slow-moving rivers), although some of the plant species present can tolerate brackish conditions (e.g., Charophytes). Within this wetland habitat, there were vegetation stands dominated by *Schoenoplectus* and *Carex* spp. The large numbers of *Schoenoplectus* and *Carex* spp. seeds are unlikely to have been fluvially re-worked, and they probably reflect vegetation growing *in situ* on the surface of the peat.

7.3.3 At 4.36–4.38 m bgl, there appears to have been very little change in the composition of the local environment. The abundant remains of *Schoenoplectus* and *Carex* spp., alongside other aquatic species are indicative of an open wetland environment. There were probably some small areas of wet woodland composed of *Alnus glutinosa*. The quantities of herbaceous stems within the sample suggest the plant macroremains reflect *in situ* vegetation which was growing on the surface of the peat. High frequencies of charred plant material at 4.36–4.38 m could be associated with anthropogenic activity or natural wildfires. There were too few remains in the sample from 3.62–3.64 m bgl to provide additional information on the composition of the local environment.

7.3.4 WA-16 did not contain a single sample from which a full pollen assessment count was possible, and very little can be said with regards the vegetation and palaeoenvironments associated with this sequence. Whilst the abundance and diversity of pollen is low overall, there appears a contrasting signal when comparing the restricted assemblages encountered in the silty peat to that of the alluvium above. The silty peats are almost wholly dominated by herbs, with sedges and wild grasses most common, perhaps representing the extra local open landscape that prevailed during organic deposition. The overlying alluvium in contrast contains a slightly more diverse assemblage, to also include an arboreal signal in support of the herbaceous record. This may perhaps allude to the introduction of an upland woodland signal from the surrounding catchment, likely a consequence of taphonomic processes (fluvial/coastal reworking), introducing pollen grains from further afield.

7.3.5 In contrast, eight of the 14 samples borehole WS1 had sufficient pollen for assessment purposes. Whilst the poor overall floral abundance and diversity limits the palaeoenvironmental potential of this sequence at this stage, some broad preliminary interpretations can be made on the WS1 sequence, based on those samples in which pollen was encountered in sufficient numbers. The pollen encountered at the base of the peat unit (5.58 m bgl) contained a mixture of arboreal, herbaceous and aquatic taxa. It therefore suggests the initial presence of a relatively closed landscape, typified by pine and hazel. The aquatic signal may allude to the provisional infilling of an enclosed depositional basin which initially supported bulrush and watermilfoils, surrounded by grasses and sedges (such an interpretation would also be supported by the stratigraphy, in light of the shift from minerogenic to organic deposition). The aquatic signal is however brief, with the overlying

sample (5.42 m bgl) recording a potential expansion of trees, with pine continuing to dominate, but with alder and lime more common. This may therefore support a more localised signal being preserved.

7.3.6 With height, there is then a sample in which pollen was poorly preserved (5.26 m bgl), overlain by a more reliable assemblage (5.10 m bgl) in which arboreal pollen is almost wholly absent and herbs now dominate. On face value this would infer a significant shift in depositional setting and opening up of the landscape. But such a change appears very brief, with a sequence of overlying samples (4.96m to 4.32 m bgl) displaying assemblages in which trees and shrubs once again expand and dominate, at the expense of the herb signal. Pine is initially most common within this section of the core, supported by elm and oak, only for lime and alder to become more influential with height.

7.3.7 The uppermost section of the core then infers a return to a more open landscape, reflected through the fall in tree and shrubs and associated expansion of herbs. However, such a signal and associated interpretation is hindered by the much more restricted pollen assemblages encountered within the upper section of the stratigraphic sequence (4.16m to 3.68 m bgl). Only the uppermost sample (3.25 m bgl), derived from the overlying alluvium, contained a moderate pollen signal (sufficient in abundance) to support this interpretation, with trees and shrubs being very restricted in number, and an open landscape with sedges and grasses typical.

7.3.8 It is noted that larger grains (>37microns) of Poaceae are encountered within WS1 at various depth, increasing in frequency with height. Larger grains of Poaceae are often interpreted as cereal pollen (and hence evidence for cereal cultivation within stratigraphic archives). However, any such interpretation must be treated with caution at assessment stage investigations. This is partly due to the fact that certain species of wild grasses also produce larger monoporate grains >37microns in diameter, particularly wild grasses associated with coastal settings. Considering the proximity of the Site to the River Thames (a tidally influenced estuarine setting for much of prehistory), the presence of coastal grasses within the depositional setting may explain these larger monoporate grains, including grasses such as *Elymus*, *Spartina maritima* and *Hordeum maritimum* (Waller and Grant, 2012).

7.3.9 The results of the pollen assessment of borehole WS1 are broadly consistent with that of previous paleoenvironmental assessment of peat deposits undertaken at the New Covent Garden Market site and more broadly within the wider Battersea Channel Project area. During previous assessment of borehole S111A, c. 20m northeast of borehole WS1, the pollen assemblage indicated that the late Mesolithic and early Neolithic landscape was heavily wooded, with alder-dominated fen carr growing on the floodplain with mixed broadleaved-coniferous woodland on areas of dry ground. The pollen signal from the middle to late Bronze Age peat in borehole S052A, c. 50m to the southeast, showed a largely cleared landscape with evidence for arable and pastoral land in the vicinity.

7.3.10 Significantly, there was evidence in the pollen record for a possible elm decline in borehole S111a, closely associated with a radiocarbon date of 3629–3351 cal BC (Wessex Archaeology 2017b). The elm decline is a consistent feature in pollen sequences across Britain, where debate continues over causal factors for the decline including climate, disease and anthropogenic impact (Parker et al 2002). Elm was not recorded in the pollen assemblage from borehole WA-16 (not surprising given the poor preservation of pollen), and the peat sequence in WS1 appears to post-date this decline, with peat formation beginning at c. 2470–2200 cal BC.

7.3.11 Palaeoenvironmental assessment and analysis of peat deposits within the wider Battersea Channel Project area has revealed similar evidence for an environment dominated by sedge fen or reed marsh on the floodplain, with stands of wetland woodland such as alder and willow, with a decline of woodland taxa and an increase of microcharcoal and herbaceous taxa during the Bronze Age, indicative of a transition to more open conditions and agricultural activity. Approximately 500m to the northeast of the present Site, and within a similar topographic setting within the Battersea Channel, analysis of middle to late Bronze Age (3460-3360 to 3150-2930 cal BP) peat deposits (-0.79 to -0.22m OD) at Wandsworth Road and Pascal Street (Batchelor et al 2018) indicated alder carr dominated wetland with an understorey of herbaceous and aquatic taxa. The dryland was initially occupied by lime, oak and hazel, though woodland taxa declined mid-way through the peat sequence, potentially as a response to late prehistoric human activity (Batchelor et al 2018).

7.3.12 At the Battersea Power Station site (Branch et al 2010) peat horizons recorded at between -2.09 to -2.16 and -1.52 to -1.56m OD were radiocarbon dated to the Middle Neolithic (5320 to 4960 cal BP) and Middle Bronze Age (4000 to 3690 cal BP) respectively; here, the presence of mixed coniferous/deciduous woodland was indicated during the Late Mesolithic and Early Neolithic, with evidence for woodland clearance and cultivation at some point during the Late Mesolithic/Early Neolithic transition (Branch et al 2010). A transition to open, mixed oak and lime woodland was indicated on the dryland during the Middle Neolithic and through to the Early Bronze Age, with alder and willow on the wetland surface with evidence for periods of cultivation on the dryland (Branch et al 2010).

8 CONCLUSION AND RECOMMENDATIONS

8.1.1 A programme of paleoenvironmental assessment and scientific dating was undertaken on boreholes WS1 and WA-16 from the Phase A2 (Wessex Archaeology 2021a) and Phase B sites (Wessex Archaeology 2023) respectively.

8.1.2 Pollen preservation was found to be very poor in borehole WA-16 and variable in WS1, with eight of the 14 samples yielding pollen assemblages suitable for further analysis in the latter borehole. On the basis of an Iron Age date for the top of peat in WS1, this horizon represents a relatively rare occurrence of organic deposits of this date in the BCP project area. Further analysis of samples from this horizon is recommended, primarily focussed on the organic alluvium overlying the peat in which pollen was found to be well preserved, and the top of the peat where samples have not yet been extracted.

8.1.3 In addition, it is recommended that further analysis is undertaken on the samples in the lower (Neolithic/Bronze Age) part of the peat sequence in WS1 where pollen is better preserved, in order to provide more detailed information on the vegetation history of this part of the sequence and assess the evidence for human activity (including cereal cultivation).

8.1.4 There is no potential to undertake further analysis of the macrofossil subsamples from WS1 due to the poor preservation of the plant macroremains, wood, and insects/invertebrates, and there is no further potential for diatom analysis of the samples from boreholes WS1 or WA-16.

8.1.5 However, further analysis of the plant macroremains from WA-16 could provide additional information on the local environment, and provide additional material for radiocarbon dating. There is scope to undertake additional radiocarbon dating to examine the chronology of the sequence in more detail, particularly considering that a Late Glacial radiocarbon date of 12370–12090 cal BC has been obtained from the base of the sequence at 5.06–5.08 m

(12220 ± 40 BP; Beta-656518). Additional subsamples for plant macroremain assessment and radiocarbon dating could be taken from the sequence between 5.06–5.08 m and 4.36–4.38 m bgl in order to provide further information on the chronology of this sequence. It would be of interest to obtain a paired date on a terrestrial species (e.g. *Alnus glutinosa*) and an emergent aquatic species (e.g., *Schoenoplectus* sp.).

8.1.6 It was anticipated in the original Project Brief (EH 2014) that publication of the results of the work with the BCP area will be in the form of a monograph or book, and that the format and content of the publication will be reviewed as works within the BCP area progress. The suggested themes for these publications included landscape, vegetation and hydrological and cultural history. It is proposed that the results of the palaeoenvironmental assessment and any analysis, in combination with the deposit modelling presented here, contribute to a publication on the results of the investigations to date within the Battersea Channel Project area that can address each of these themes.

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APPENDICES

Appendix 1 Sediment description logs

Site Code: 107909	Site Name: NCGM Phase A2	Borehole ID: WS1
Coordinates (NGR) X: 529598.7	Coordinates (NGR) Y: 176975.8	Level (top): 3.49m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
107	Redeposited soil, cinder, brick rubble	Made ground	0.00 – 2.34	3.49 – 1.15	
106	Organic peaty clay, no visible structure, occasional small fragment of CBM	Alluvium	2.34 – 2.78	1.15 – 0.71	
105	Soft blue grey clay, no visible structure, very occasional small organic patches (Phragmites)	Alluvium	2.78 – 3.10	0.71 – 0.39	
104	Grey brown with dark brown mottles organic clay organic clay	Alluvium	3.10 – 3.50	0.39 – -0.01	
103	Dark brown peat with visible fine root remains	Channel edge/stabilisation zone	3.50 – 5.60	-0.01 – -2.11	
102	Soft grey silty clay, occasional fine dark banding	Alluvium	5.60 – 6.70	-1.51 – - 3.21	
101	Fine, medium, coarse sand with common small <0.04m SR/SA flint gravels	River Terrace deposits	6.70 – 7.00	-3.21 – -3.51	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA01
Coordinates (NGR) X: 529533.62	Coordinates (NGR) Y: 177139.83	Level (top): 3.23m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1001	firm dark grey / black OCC brown redeposited clay, gravel with brick fragments overlain by 300mm of concrete	Made Ground	0.00 to 2.70	3.23 to 0.53	
1002	firm light brown gravelly sand, occasionally sandy gravel, gravels are SA/SR,0	Fluvial sands and gravels	2.70 to 4.20	0.53 to -0.97	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA02

Coordinates (NGR) X: 529550.61	Coordinates (NGR) Y: 177153.44	Level (top): 3.20m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
2001	Firm dark grey / black redeposited clay, gravel, slag	Made Ground	0.00 to 3.50	3.20 to -0.30	
2002	light brown slightly gravelly sand, gravels are SA/SR poorly sorted and increase with depth	Fluvial sands and gravels	3.50 to 4.20	-0.30 to -1.00	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA04
Coordinates (NGR) X: 529601.99	Coordinates (NGR) Y: 177195.18	Level (top): 3.05m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
4001	dark grey rubble and brick. 2.0 - 2.7 intact masonry	Made Ground and foundation	0.00 to 2.70	3.05 to 0.35	
4002	light yellow brown gravelly sand, gravels poorly sorted SA\SR and increasing with depth.	Fluvial sands and gravels	2.70 to 3.05	0.35 to 0.00	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA06
Coordinates (NGR) X: 529603.39	Coordinates (NGR) Y: 177104.38	Level (top): 3.32m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
6001	0.30m of concrete over rubble, gravel and slag over redeposited clay with large brick fragments from 1.6 to 2.78	Made Ground	0.00 to 2.78	3.32 to 0.54	
6002	stiff grey silty clay no visible structure	Alluvium	2.78 to 4.20	0.54 to -0.88	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA09
Coordinates (NGR) X: 529553.37	Coordinates (NGR) Y: 177043.96	Level (top): 3.43m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
9001	0.30m of concrete over gravel, rubble and brick fragments with slag	Made Ground	0.00 to 2.55	3.43 to 0.88	
9002	Poorly sorted yellow brown gravelly sand and gravel	Fluvial sands and gravels	2.55 to 4.20	0.88 to -0.77	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA10
Coordinates (NGR) X: 529569.88	Coordinates (NGR) Y: 177056.92	Level (top): 3.45m OD
Length:	Width:	Depth: 3.10 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1001	0.3m of tarmac and concrete over a very mixed deposit of rubble and gravel with solid Insitu concrete from 2.0 -02.7m	Made Ground	0.00 to 2.80	3.45 to 0.65	
1002	firm orange brown clayey sand. some evidence of laminations sand to clay to sand clear lower boundary	Alluvium	2.80 to 3.05	0.65 to 0.40	
1003	brown gravelly sand, gravels SA/SR, poorly sorted	Fluvial sands and gravels	3.05 to 3.10	0.40 to 0.35	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA11
Coordinates (NGR) X: 529584.52	Coordinates (NGR) Y: 177069.26	Level (top): 3.44m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1101	0.3m of tarmac over a mixed deposit of rubble, gravel, CBM and slag	Made Ground	0.00 to 3.58	3.44 to -0.14	
1102	yellow brown poorly sorted gravelly sand SA/SR flint gravels, coarse sand	Fluvial sands and gravels	3.58 to 4.20	-0.14 to -0.76	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA12
Coordinates (NGR) X: 529630.55	Coordinates (NGR) Y: 177110.25	Level (top): 3.44m OD
Length:	Width:	Depth: 4.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1201	0.30m of concrete over a mixed deposit of rubble, gravel, CBM and slag	Made Ground	0.00 to 1.6	3.44 to 1.84	
1202	stiff dark brown silty clay loam granular structure, common small fragments of red CBM and charcoal. clear lower boundary	Garden soil	1.6 to 2.1	1.84 to 1.34	
1203	very stiff fe mottled orange brown clay, no visible structure	Alluvium	2.1 to 2.63	1.34 o 0.81	

1204	yellow brown gravelly sand, clayey at top of unit. occasional thick coarse sand lenses	Fluvial sands and gravels	2.63 to 4.20	0.81 to -0.76	

Site Code: 260640	**Site Name: NCGM**	**Borehole ID: WA13**
Coordinates (NGR) X: 529670.12	**Coordinates (NGR) Y: 177144.45**	**Level (top): 3.44m OD**
Length:	**Width:**	**Depth: 3.00 m**

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1301	0.3m of concrete over a very mixed deposit of concrete and brick rubble with gravel and slag	Made Ground	0.00 to 1.56	3.44 to -1.22	
1302	stiff brown silty clay, granular structure, common small fragments of red CBM and charcoal, clear lower boundary	post med garden soil	1.56 to 1.94	-1.22 to -1.6	
1303	firm light brown silty clay, no visible structure, very occasional flint gravel, clear lower boundary	Alluvium	1.94 to 3.00	-1.6 to -2.66	

Site Code: 260640	**Site Name: NCGM**	**Borehole ID: WA14**
Coordinates (NGR) X: 529725.10	**Coordinates (NGR) Y: 177191.24**	**Level (top): 3.45m OD**
Length:	**Width:**	**Depth: 4.20 m**

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1401	0.00-1.20 concrete hardstanding capping brick rubble with gravel and sand 1.20-1.30 white brick 1.3-1.56 dark grey clay and brick rubble. sharp to 1.56-1.7 orange brown well rounded to sub rounded gravel and coarse sand. sharp to 1.7-1.83 firm blue grey clay with trace fine gravel and brick fragments	Made Ground	0.00 to 1.83	3.43 to 1.60	
1402	1.83-2.05 brown sand and gravel with Made Ground. sharp to 2.05-3.5 very firm bluish grey clay and Made Ground fragments throughout. Disturbed Alluvium	Made Ground	1.83 to 3.50	1.60 to -0.07	
1403	3.5-3.7 grey sand and gravel well rounded to sub angular . diffuse contact with 3.7-4.2 brown, clean coarse sand and gravel. well rounded to sub angular up to 30mm	Fluvial sands and gravels	3.50 to 4.20	0.07 to -0.77	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA16
Coordinates (NGR) X: 529791.16	Coordinates (NGR) Y: 177141.73	Level (top): 3.18m OD
Length:	Width:	Depth: 6.60 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1601	0.0-0.4 concrete hardstanding 0.4-2.1 mixture of gravel and rubble with brick and concrete	Made Ground	0.00 to 2.10	3.18 to 1.08	
1602	2.1-2.25 brown coarse sand and gravel, clasts generally sub rounded up to 20mm. diffuse contact with 2.25-2.4 dark grey gravel and dark tar-like residue 2.4-2.65 dark grey/blue silty clay with trace of brick throughout	Made Ground	2.10 to 2.65	1.08 to 0.53	
1603	2.65-3.02 blue/grey silty clay with trace of well humified organic residue throughout. 3.2-3.37dark brown organic silty clay with occasional small fibrous woody fragments 3.37-3.66 brown/grey silty clay with fibrous woody inclusions. Sharp to	Alluvium	2.65 to 3.66	0.53 to -0.48	
1604	3.66-3.89 greenish grey well rounded and sub rounded gravel and coarse sand 3.89-4.16 greenish grey fine sand. Sharp to 4.16-4.20 dark brown organic silty clay with woody frags 4.2-4.35 greenish grey coarse sand and fine gravel. Very sharp erosive contact with	Alluvium	3.66 to 4.35	-0.48 to -1.02	
1605	4.35-5.1 brown to dark brown silty peat. well humified, occasional sandy lenses present such as 4.5-4.62 and 4.7-4.75	Peat	4.35 to 5.10	-1.17 to -1.92	
1606	5.1-5.3 loose, wet sand and gravel. likely collapsed material	Fluvial sands and gravels	5.10 to 5.30	-1.92 to -2.12	
1607	5.3-6.6 London clay	London clay bedrock	5.30 to 6.60	-2.12 to -3.22	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA17
Coordinates (NGR) X: 529652.98	Coordinates (NGR) Y: 177109.06	Level (top): 3.44m OD

Length:	Width:	Depth: 4.20 m			
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
1701	0.3m of concrete over rubble, gravel and slag to 1.2 from 1.2 to 3.79 redeposited brown clay with occasional large fragments of brick, sharp lower boundary	Made Ground	0.00 to 3.79	3.44 to -0.35	
1702	dark yellow brown gravelly sand poorly sorted SA SR flint gravel	Fluvial sands and gravels	3.79 to 4.20	-0.35 to -0.76	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA18			
Coordinates (NGR) X: 529696.95	Coordinates (NGR) Y: 177055.38	Level (top): 3.27m OD			
Length:	Width:	Depth: 7.20 m			
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
1801	0.0-2.4 concrete hardstanding capping tar, ash. gravel, sand and brick rubble. 2.4-2.7 dark bluish gray silty clay - Disturbed Alluvium 2.7-3.6 wood. stake? diagonal contact with 3.6-3.8 organic grey/brown silty clay 3.8-4.2 dark brown silty clay. occasional woody fragments	Made Ground Alluvium/Made Ground	0.00 to 4.2	3.27 to 0.93	
1802	4.2-5.1 dark brown organic Alluvium. organic and woody fragments throughout. sharp to 5.1-6.25 blue/grey soft slightly fine sandy silt. trace organics 6.25-6.8 sand and gravel, well rounded, clean. coarse sand. yellow brown 6.8-7.2 London clay	Alluvium Fluvial sands and gravels bedrock	4.20 to 7.20	0.93 to -2.07	

Site Code: 260640	Site Name: NCGM	Borehole ID: WA19			
Coordinates (NGR) X: 529556.44	Coordinates (NGR) Y: 177026.91	Level (top): 3.25m OD			
Length:	Width:	Depth: 3.00 m			
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
1901	firm dark grey occasionally black brick rubble with gravel and OCC pieces of slag	Made Ground	0.00 to 2.36	3.25 to 0.89	

1902	stiff medium grey sultry clay, no visible structure clear lower boundary	Alluvium	2.36 to 2.88	0.89 to 0.37	
1903	firm orange brown gravelly sand, gravels are flint SA/SR poorly sorted ≤0.04m	Fluvial sands and gravels	2.88 to 3.00	0.37-0.25	

Site Code: **260640**		**Site Name:** **NCGM**		**Borehole ID:** **WA20**	
Coordinates (NGR) X: **529520.00**		**Coordinates (NGR) Y:** **177110.00**		**Level (top):** **3.20m OD**	
Length:		**Width:**		**Depth:** **4.30 m**	
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
2001	0.0-2.0 backfill from trench 2.-2.8 no retention, but some sand and gravel in base of liner. 2.8-3.2 dark brown coarse gravel, sub rounded to sub angular and coarse sand. diffuse into 3.2-3.85 orange brown fine and coarse sand with trace of fine gravel. diffuse into 3.85-4.3 greenish grey fine and coarse sand with fine sub rounded gravel	Made Ground Fluvial sands and gravels	0.00 to 4.3	3.20 to -1.10	

Site Code: **260640**		**Site Name:** **NCGM**		**Borehole ID:** **WA21**	
Coordinates (NGR) X: **529710.07**		**Coordinates (NGR) Y:** **177156.24**		**Level (top):** **3.25m OD**	
Length:		**Width:**		**Depth:** **3.60 m**	
Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
2101	0.3m of concrete over a very mixed deposit of rubble with gravel and slag	Made Ground	0.00 to 2.20	3.25 to 1.05	
2102	soft light yellow brown silty clay v occasional SR flint gravel and common fe mottling, clear lower boundary	Alluvium	2.20 to 3.19	1.05 to 0.06	
2103	dark grey silty clay, granular structure, some evidence of rooting, gradual lower boundary	Possible soil formation on silty clay	3.19 to 3.50	0.06 to -0.25	
2104	firm grey brown clayey sandy gravel, gravels are flint SR/SA	Fluvial sands and gravels	3.50 to 3.60	-0.25 to -0.35	

Appendix 2 Pollen assessment data

		Depth (mbgl)													
		WS1													
		3.25	**3.68**	**3.84**	**4.00**	**4.16**	**4.32**	**4.48**	**4.64**	**4.8**	**4.96**	**5.10**	**5.26**	**5.42**	**5.58**
Trees	*Alnus*	1	2	8	7	3	20	25	7	2	14	1	1	25	3
	Betula		1	1					2		1				3
	Fagus														
	Fraxinus														
	Pinus	1			3		11	31	25	20	26	1		41	54
	Quercus	2	1	3	1	3	3	5	8	1	10	2		3	2
	Tilia			1	6	1	21	15		2	1	1	7	13	1
	Ulmus	2		1	1	1	1	4	8	2	11			8	7
Shrubs	*Corylus-Myrica* type	3	4	1	4	2	10	8	28	6	19	2	1	9	14
	Ericaceae undiff.														
	Hedera helix					1	1		2						1
	Salix								2	1	5				1
Herbs	Poaceae	21	6	5	14	1	9	1	2	6	11	21		1	13
	Poaceae >37mic	12	3	2	1	1	4				2	18	1		1
	Cyperaceae	79	46	6	6	7	29	22	14	5	14	53	5	9	16
	Apiaceae (Umbelliferae) undif.	1			1		3		2						1
	Artemisia type			1						1	1				
	Asteraceae	2	3	2	2			1	2	2		3		2	1
	Brassicaceae			2	1						1	1		1	
	Caryophyllaceae		2	2	2		1				1	2			
	Centaurea cyanus														
	Centaurea nigra	1										1			
	Chenopodiaceae		1	2	4		2	1						1	1
	Cirsium type														1
	Filipendula									1	2				
	Hippophae		1												
	Lactuceae	12	3	1			1					8		2	

		Depth (mbgl)													
		WS1													
		3.25	**3.68**	**3.84**	**4.00**	**4.16**	**4.32**	**4.48**	**4.64**	**4.8**	**4.96**	**5.10**	**5.26**	**5.42**	**5.58**
	Papaver														
	Plantago sp.	4		2	4										
	Polygonum sp.														
	Rubiaceae											1			
	Ranunculus										2				
	Rumex		1												
	Thalictrum		3		2	1						1			
Spores	*Dryopteris*														
	Polypodium					1	9	3	1			1	1		
	Pteridium	1	3	8	3	2	4	1		3	2	2	2	1	
	Pteropsida (monolete) undif.	2	2	11	10	5	85	15	21	79	17	19	5	29	29
	Sphagnum						1								
	Thelypteris														
Aquatics	*Hydrocotyle*														
	Myriophyllum									1	3				3
	Potemogeton														
	Sparganium				2		2								2
	Typha angustifolia					1					1				1
	Typha latifolia	5									8	5			11
Charcoal			x	x						x		x			x
Testate amoebae													x		
Pre Quaternary pollen and spores															
Dinoflagellate cysts							x	x		x	x				
Other NPPs		xx	xx		x		x			x	xxx				
Grain/spore crumpling		x	x	x	x		x	x	xx	x	xx	xx		x	x
Grain/spore corrosion							x	xxx	x	xx	xx	x	xxx	xxx	x
Abundance		high	low	low	low	low	mod	mod	mod	low	mod	high	low	high	mod

	Depth (mbgl)													
	WS1													
	3.25	**3.68**	**3.84**	**4.00**	**4.16**	**4.32**	**4.48**	**4.64**	**4.8**	**4.96**	**5.10**	**5.26**	**5.42**	**5.58**
Diversity	mod	low	low	low	low	mod	mod	mod	low	mod	mod	low	mod	high
Suitable for further analysis?	y	n	n	n	n	y	y	y	n	y	y	n	y	y

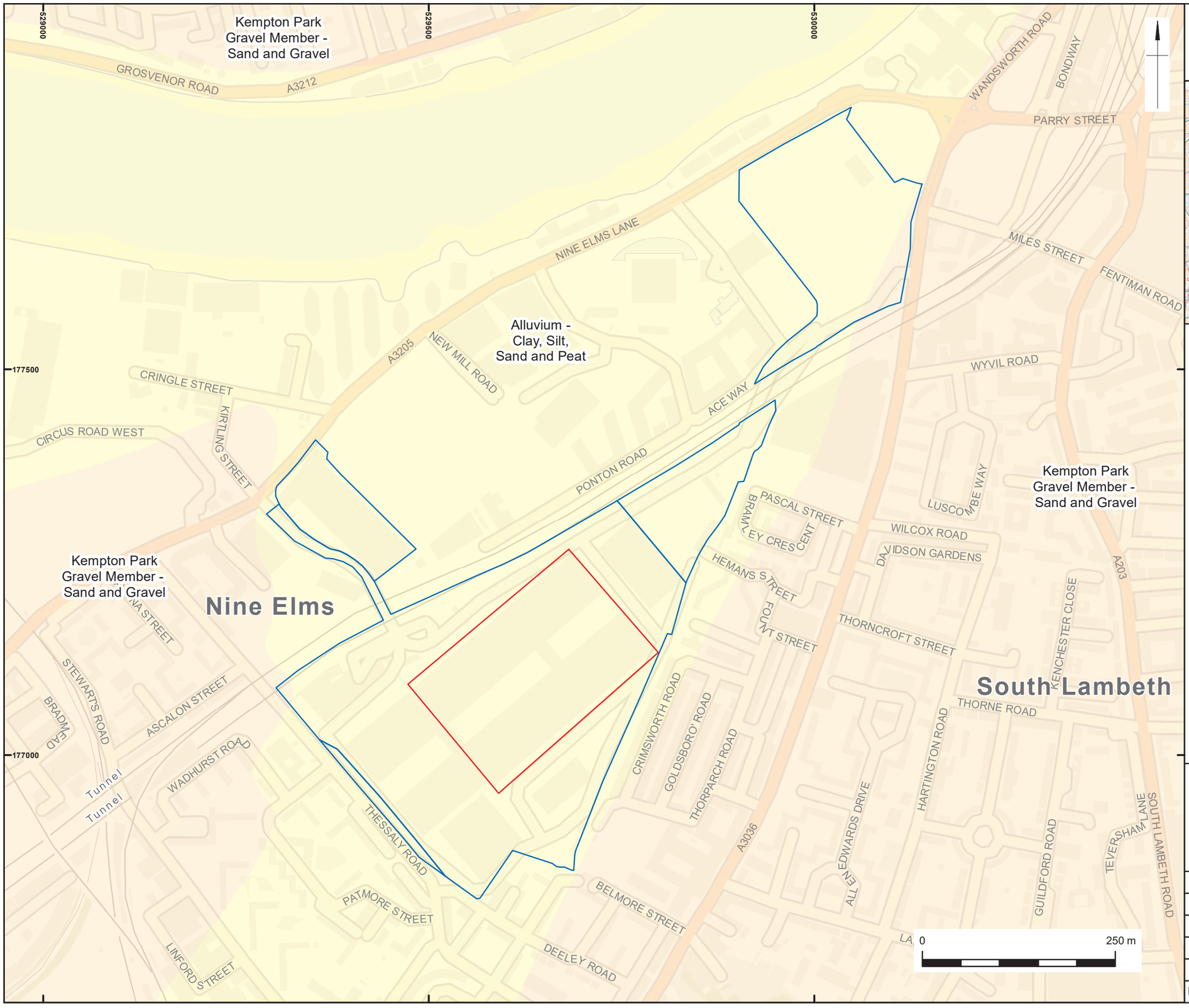
		Depth (mbgl)											
		WA-16											
		3.24	**3.36**	**3.48**	**3.60**	**3.72**	**4.36**	**4.48**	**4.60**	**4.72**	**4.84**	**4.96**	**5.08**
Trees	*Alnus*	10	6	9	1				1				
	Betula										2	1	
	Fagus												
	Fraxinus			1									
	Pinus	1	1				2						
	Quercus	1	2	2									
	Tilia		5	1									
	Ulmus												
Shrubs	*Corylus-Myrica* type		5	1	3		3				2		1
	Ericaceae undiff.												
	Hedera helix		1										
	Salix									1			
Herbs	Poaceae	6	6	11			7	6	3	8	6	3	3
	Poaceae >37mic	1	2	6	3		1	1				1	
	Cyperaceae	3	14	19	10		14	18	1	23	9	19	26
	Apiaceae (Umbelliferae) undif.	1		1						1			1
	Artemisia type			1						1	1	2	3
	Asteraceae		2	5									1
	Brassicaceae										1		
	Caryophyllaceae												
	Centaurea cyanus			1									

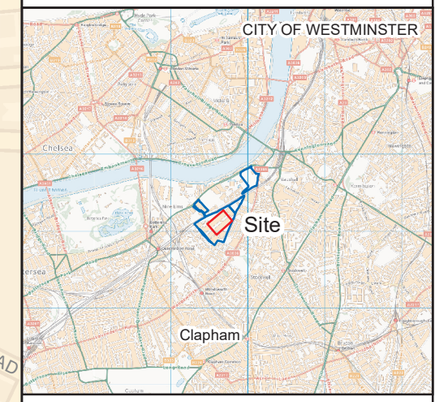
		Depth (mbgl)											
		WA-16											
		3.24	3.36	3.48	3.60	3.72	4.36	4.48	4.60	4.72	4.84	4.96	5.08
	Centaurea nigra												
	Chenopodiaceae		2	2	1							1	
	Cirsium type		1		1		1						
	Filipendula	1											1
	Lactuceae	4	3	3			1						
	Papaver												
	Plantago sp.	1	1	3	1		1				1		
	Polygonum sp.		1										
	Ranunculus		1	1								1	
	Rubiaceae							1		1		2	1
	Rumex			1									
	Thalictrum										1	1	
Spores	*Dryopteris*												
	Polypodium		2	3									
	Pteridium	6	14	8	6								
	Pteropsida (monolete) undif.	3		6	3		1	1	1	1			2
	Sphagnum				1								
	Thelypteris												
Aquatics	*Hydrocotyle*												
	Menyanthes								1		2		
	Sparganium			1									
	Typha angustifolia	1											
	Typha latifolia			1									
Charcoal					x		x	x	x	x	xx		
Testate amoebae													
Pre Quaternary pollen and spores													x
Dinoflagellate cysts				x						x			

	Depth (mbgl)											
	WA-16											
	3.24	3.36	3.48	3.60	3.72	4.36	4.48	4.60	4.72	4.84	4.96	5.08
Other NPPs							x					
Grai crumpling	x	x	xx	x			xx	xx	x	xx		xx
Grain corrosion		x	xx	x		xx						xx
Abundance	low	low	low	low	n/a	low	low	low	low	low	low	low
Diversity	low	mod	mod	low	n/a	low	low	low	low	low	low	low
Suitable for further analysis?	n	n	n	n	n	n	n	n	n	n	n	n

Appendix 3 Diatom assessment data

Diatom taxa/Sample number	3.40	3.48	5.78	3.06	3.18	3.30
Polyhalobous						
Paralia sulcata		1				
Polyhalobous to Mesohalobous						
Actinoptychus undulatus		1				
Mesohalobous						
Navicula digitoradiata		1				
Nitzschia navicularis		1				
Oligohalobous Indifferent						
Amphora libyca		1				
Gyrosigma attenuatum		1	1			
Opephora martyii		2				
Pinnularia major		2			1	1
Synedra ulna						1
Unknown Salinity Group						
Chrysophyte cysts	1	2				
Caloneis sp.						1
Cymbella sp.			1		1	1
Inderminate centric sp.		1				
Inderminate pennate sp.		1		1		1
Indeterminate Naviculaceae		1	1		1	
Navicula sp.		1				1
Pinnularia sp.			1		1	
Surirella sp.			1			
Unknown diatom fragments		1			1	





New Covent Garden Market

Phase B

Superficial Geology

Alluvium - Clay, Silt, Sand and Peat

Kempton Park Gravel Member - Sand and Gravel

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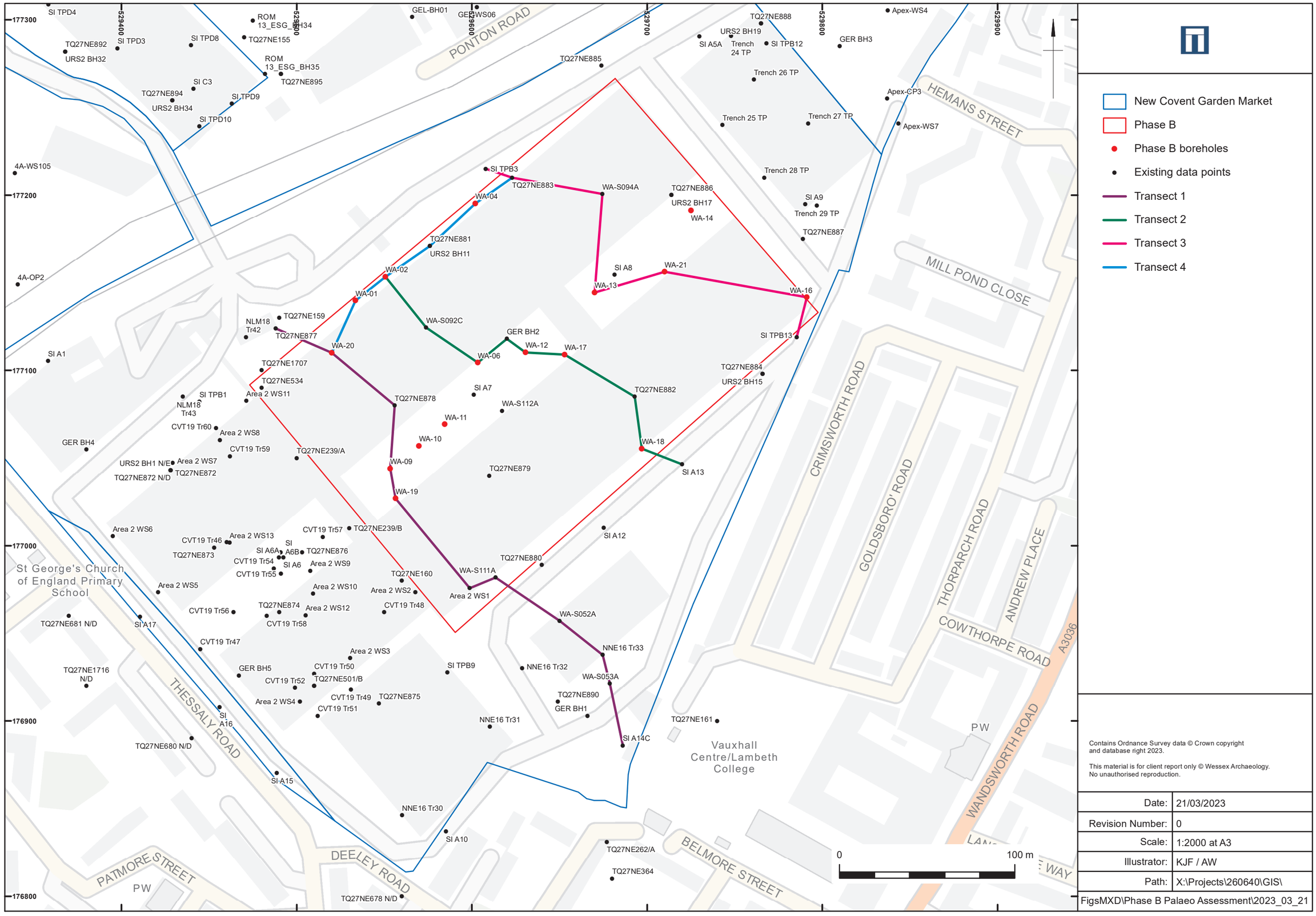
Location of site and superficial geology

Figure 1



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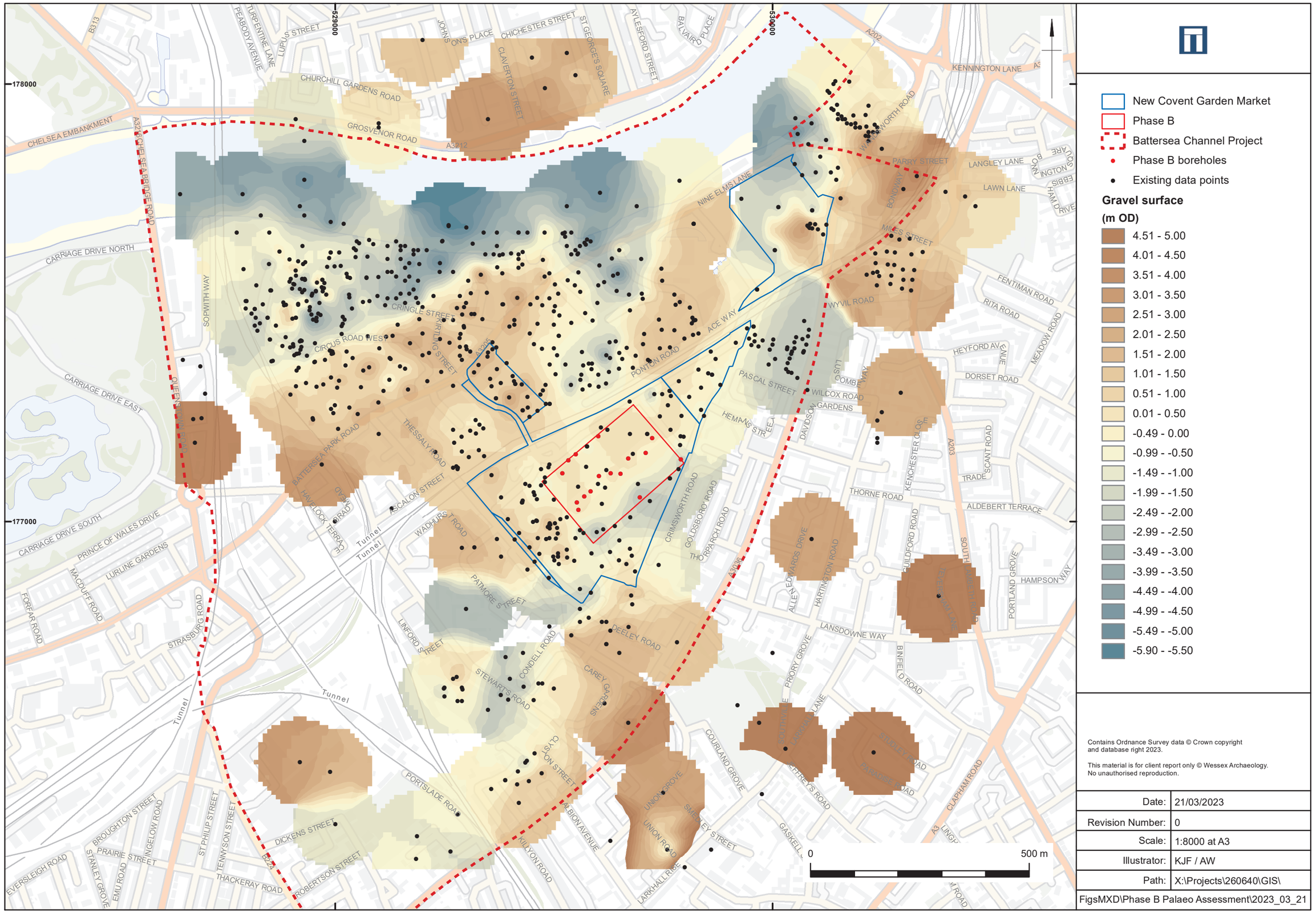
Location of new geoarchaeological boreholes WA-01 to WA-21 and existing data points, showing Transects 1-4

Figure 2



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Wider Gravel surface across the Battersea Channel Project area

Figure 3

New Covent Garden Market
Phase B
Phase B boreholes
Existing data points

Gravel surface
(m OD)

- 4.51 - 5.00
- 4.01 - 4.50
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.01 - 0.50
- -0.49 - 0.00
- -0.99 - -0.50
- -1.49 - -1.00
- -1.99 - -1.50
- -2.49 - -2.00
- -2.99 - -2.50
- -3.49 - -3.00
- -3.99 - -3.50
- -4.49 - -4.00
- -4.99 - -4.50
- -5.49 - -5.00
- -5.90 - -5.50

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Gravel surface

Figure 4

New Covent Garden Market
Phase B
Phase B boreholes
Existing data points

Peat thickness

(m)

- 5.51 - 6.00
- 5.01 - 5.50
- 4.51 - 5.00
- 4.01 - 4.50
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.00 - 0.50

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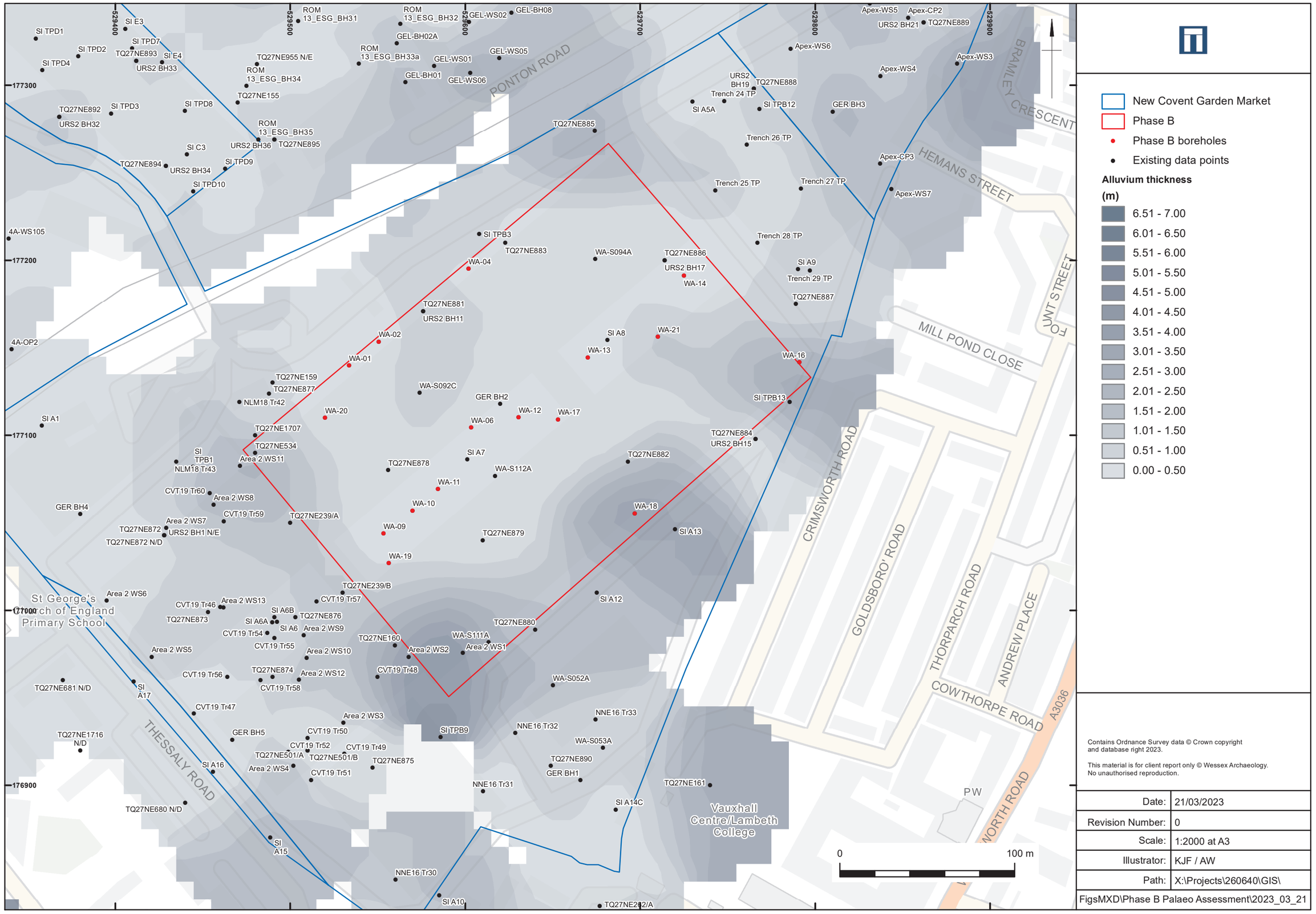
0 100 m

Peat thickness

Figure 5



New Covent Garden Market
Phase B
Phase B boreholes
Existing data points

Alluvium thickness (m)

- 6.51 - 7.00
- 6.01 - 6.50
- 5.51 - 6.00
- 5.01 - 5.50
- 4.51 - 5.00
- 4.01 - 4.50
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.00 - 0.50

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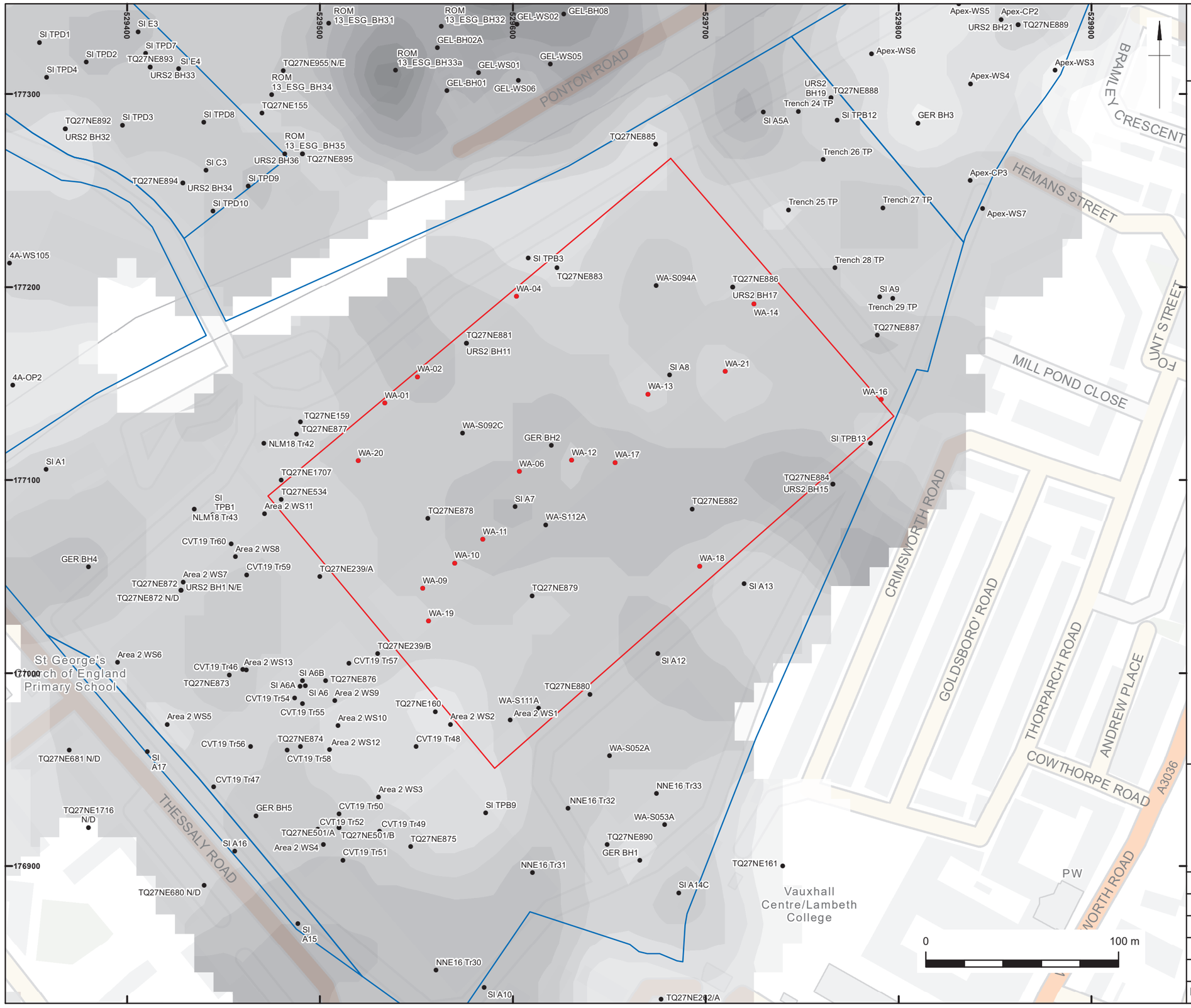
Alluvium thickness

Figure 6



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Made Ground thickness

Figure 7

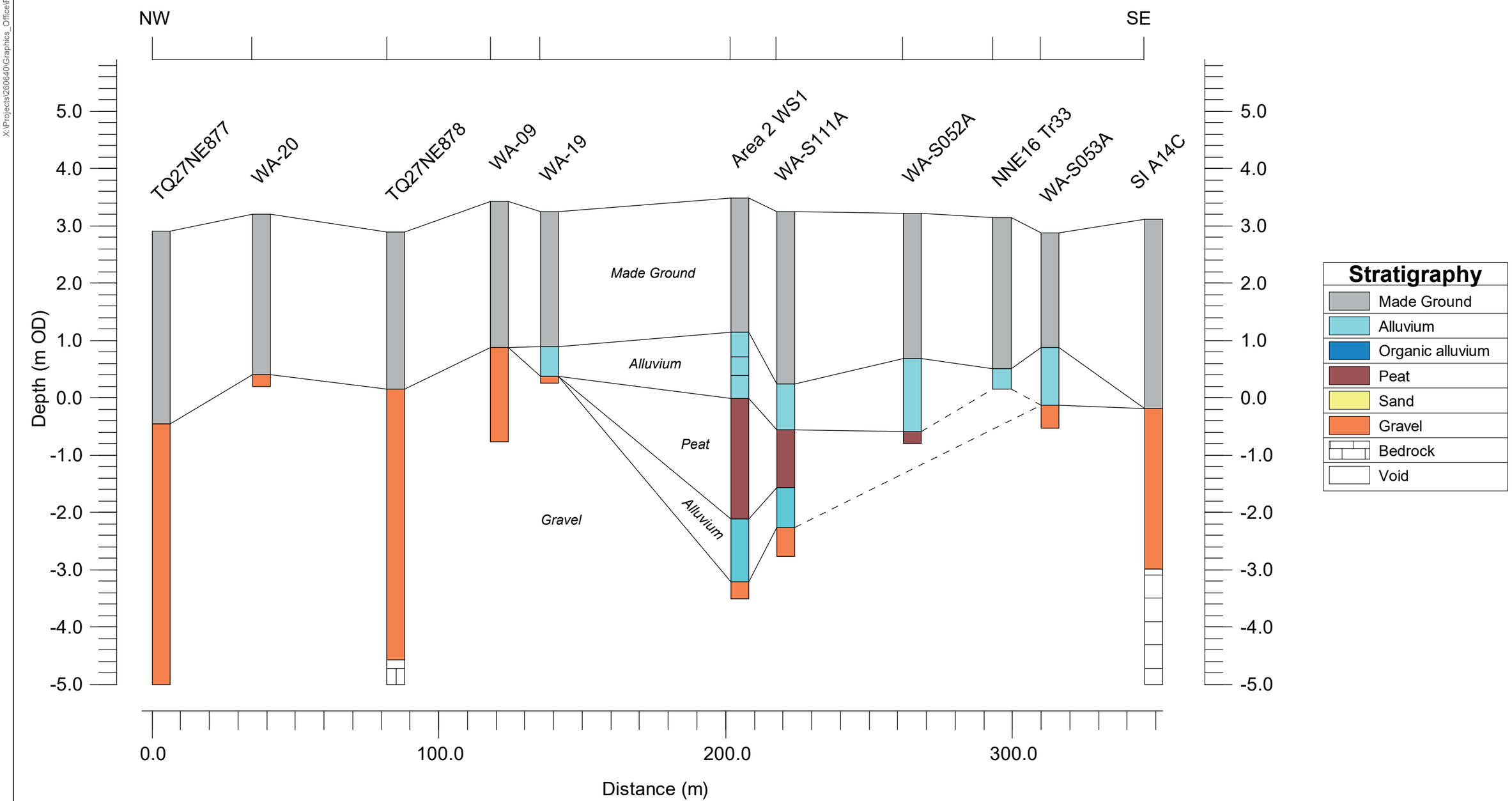

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Figure 8: Transect 1

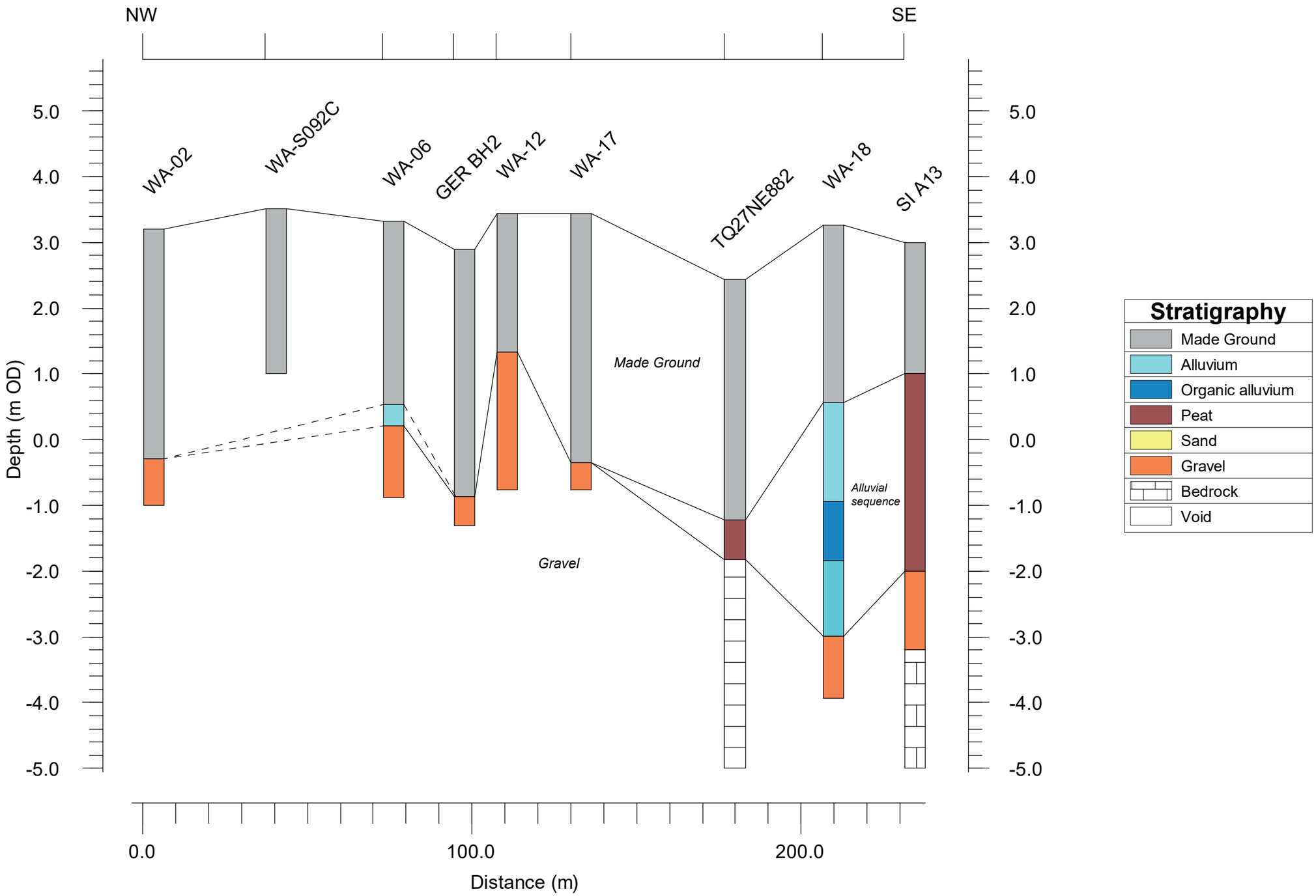

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Figure 9: Transect 2

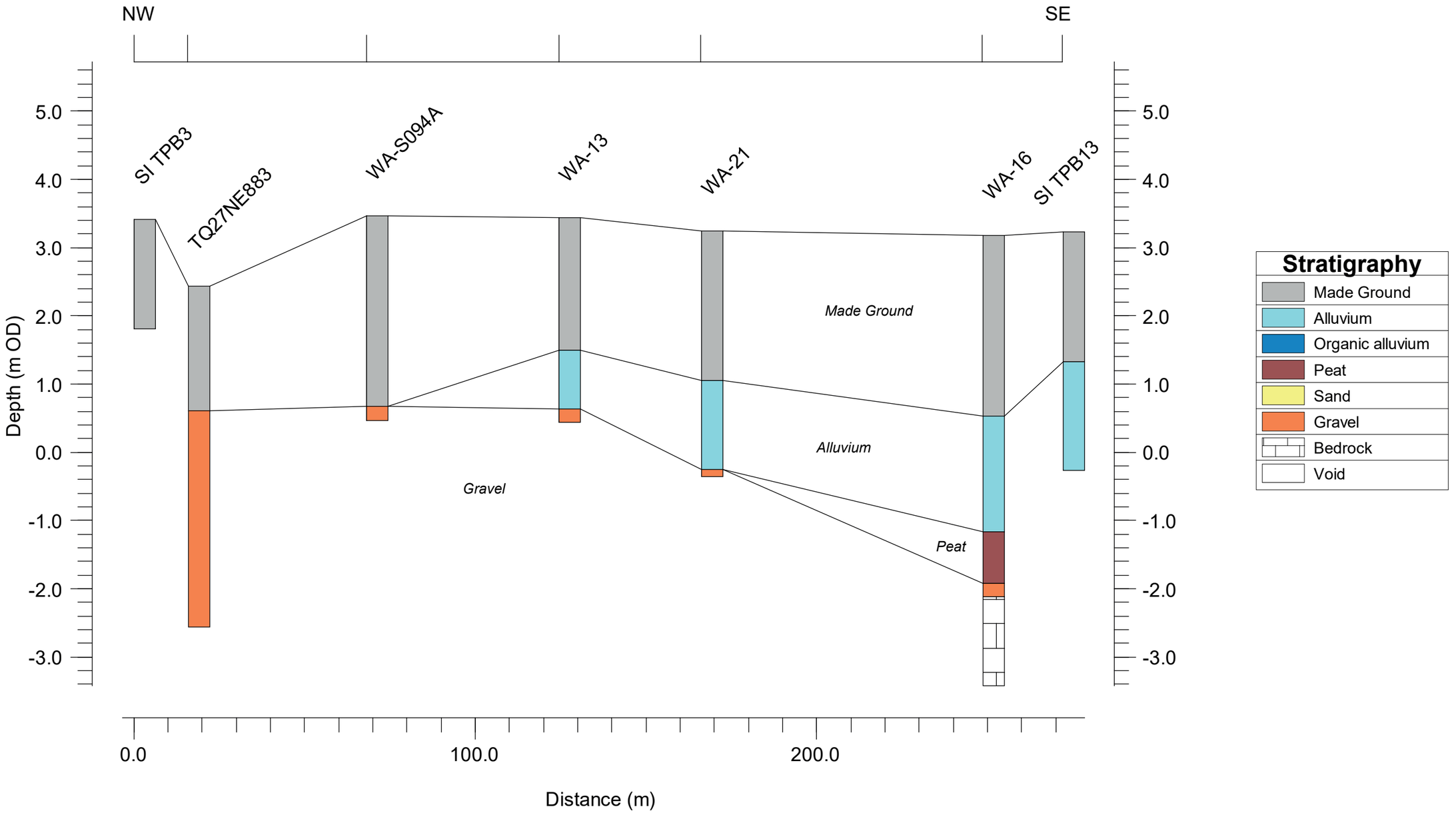

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Figure 10: Transect 3

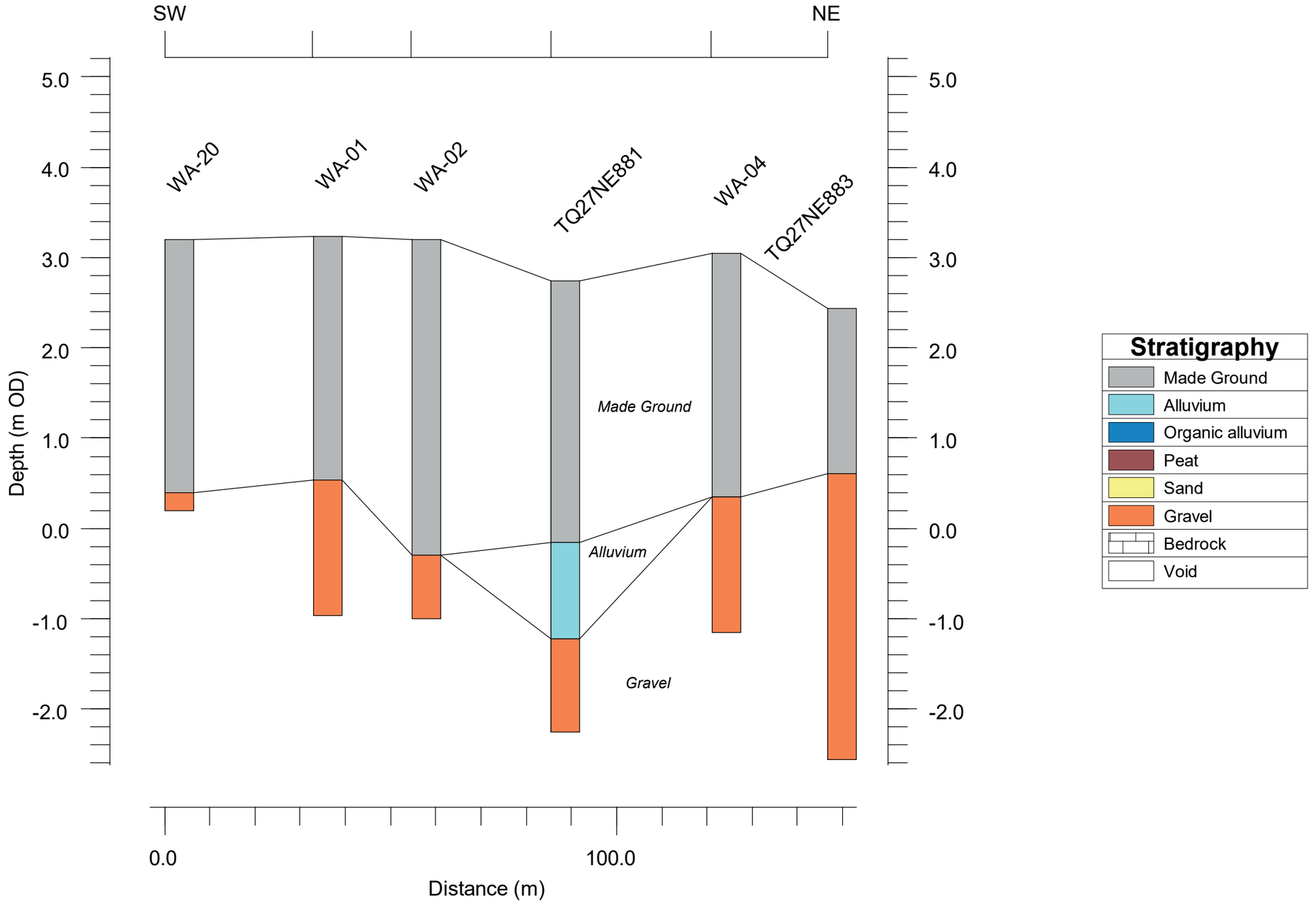

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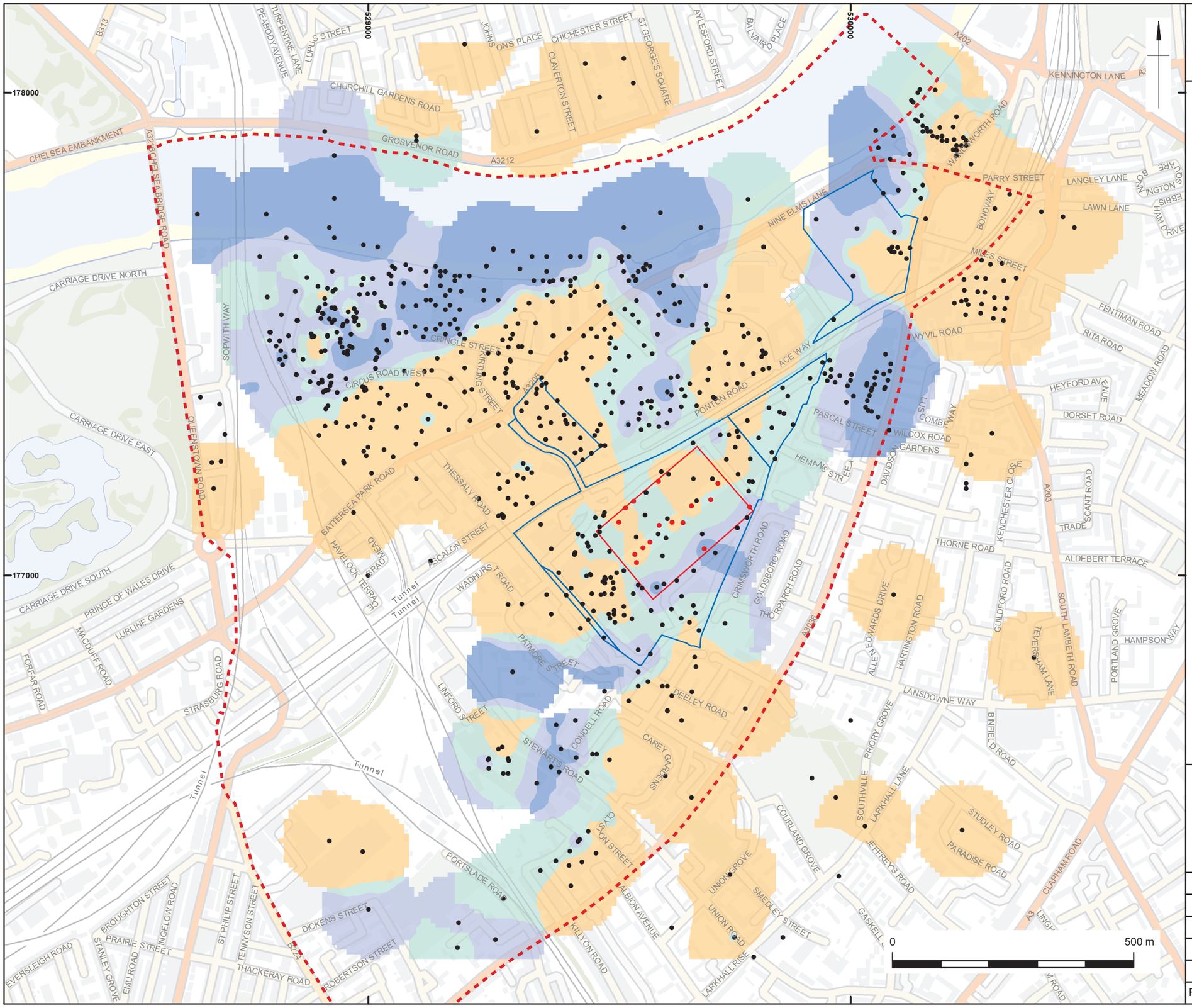
Figure 11: Transect 4



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Reconstructed Early Holocene land surface

Figure 12

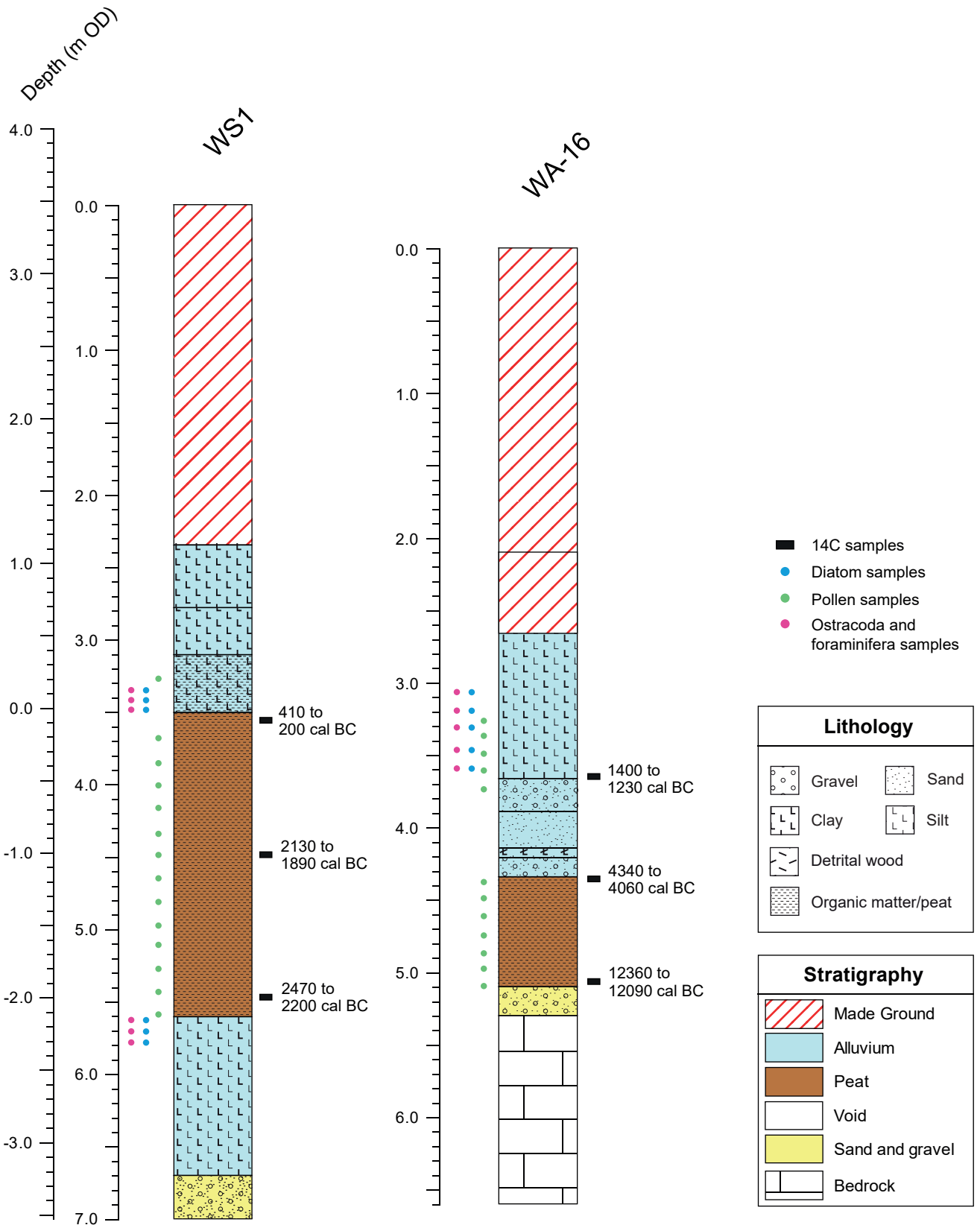

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Figure 13: Lithostratigraphy, subsamples and results of the radiocarbon dating of boreholes WS1 and WA-16

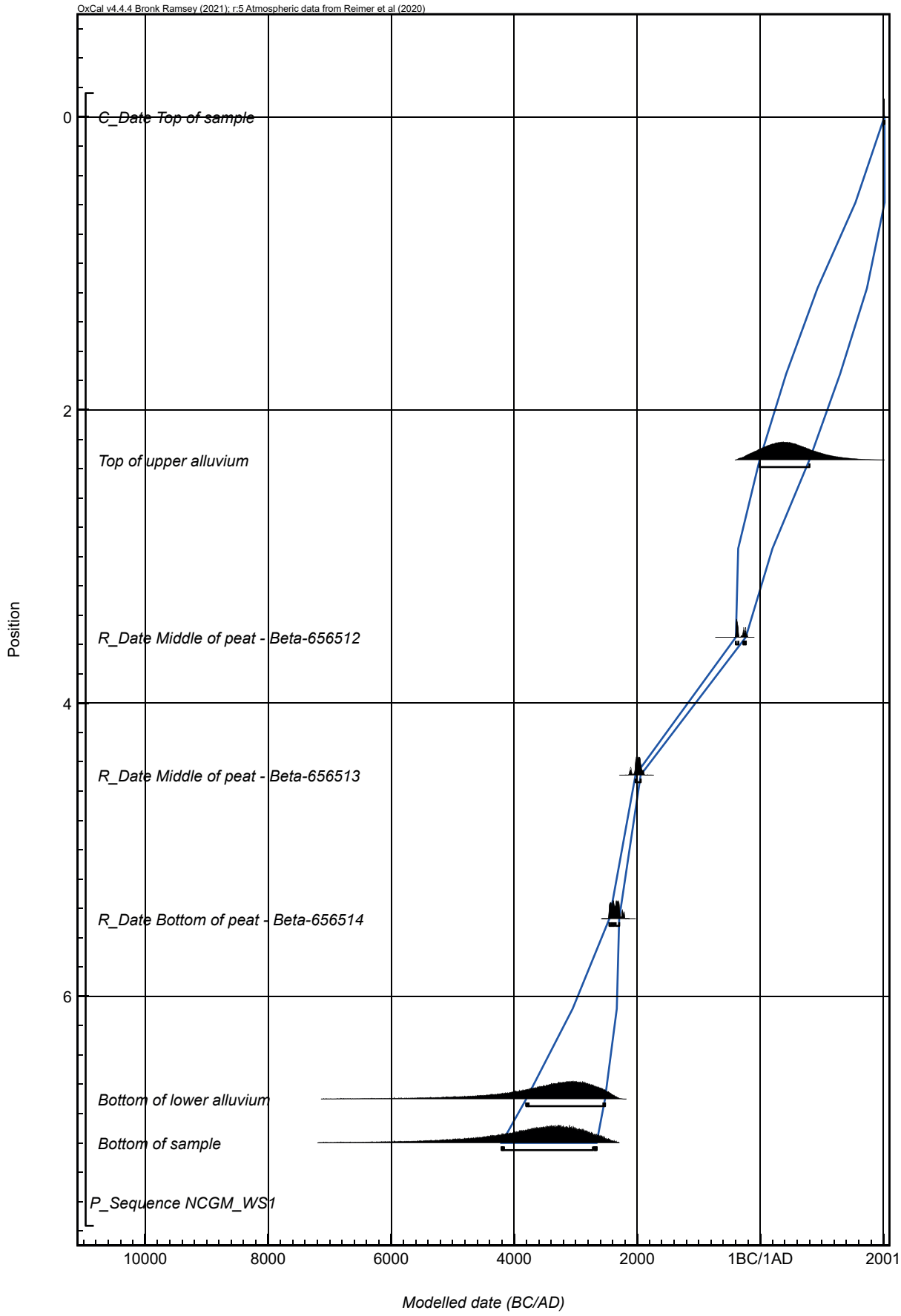

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Figure 14: Age depth model for WS1

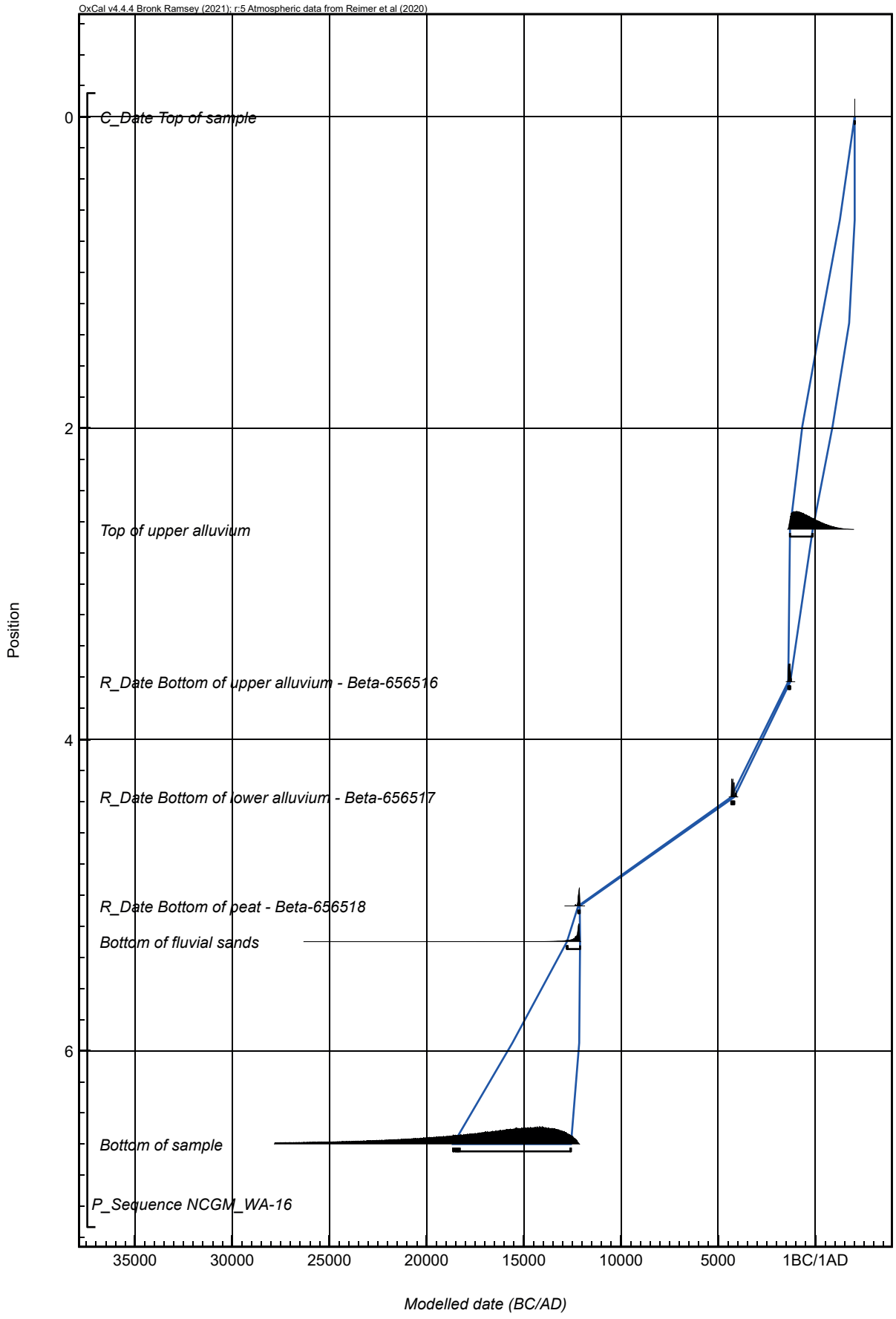

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Figure 15: Age depth model for borehole WA-16

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