# A thorny affair: the Tyburn River and the prehistoric landscape at Abell House and Cleland House in Westminster

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## Introduction

Today positioned among the corridors of power, the sites of Abell House and Cleland House once lay in modest surroundings on the marshy floodplain of one of London's lost rivers: the Tyburn. One of the capital's smaller streams, springing in Hampstead from the sand-clay junction, it flowed south to the Thames. It split in two near to where Buckingham Palace now stands.[1] From there, the northern branch cleaved a path towards Westminster Abbey, dividing again to fork around Thorney Island.

The southern branch (referred to as the King's Scholars' Pond Sewer, or as the Tachbrook in some of the literature) debouched near Vauxhall Bridge. Between the two main branches of the Tyburn, directly to the south of Thorney Island, archaeological investigations recently took place at Abell House and Cleland House on either side of John Islip Street (Fig 1), a site now transformed into luxury apartments and penthouses – a long way from its murky and industrial history.[2]

Archaeological excavation was undertaken here to record the buried remains of a mid-19th-century gasholder (Fig 2). In addition, the work aimed to retrieve and examine the deeply buried floodplain sediments by coring. This would allow a picture of the landscape inhabited by people of the distant past to be explored, and would extend upstream the detailed work undertaken for the Jubilee Line Extension (JLE).[3]

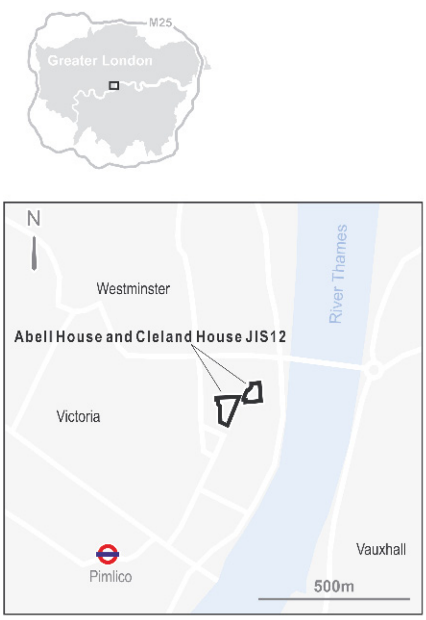


**Fig 1: site location plan**

## The prehistoric Tyburn and Westminster landscape

East of Buckingham Palace, the Tyburn floodplain was essentially a low-lying tract of land punctuated by 'islands' of sand and gravel. This topography was inherited from the turbulent close of the last Ice Age (the Devensian glaciation) when the rivers were wide, braided and rushing with glacial meltwater in the summer months. Channel bars were left as upstanding islands surrounded by deeper channel threads before the entire landscape was blanketed by alluvial deposits. Some of these islands – like Thorney – are well known, whereas others only became evident in the wake of geoarchaeological coring and deposit modelling.[4]

A recent wave of publications on the archaeology and topography of the Westminster area discuss the Tyburn course, giving rise to some debate.[5] Where did the stream split? And did the northern channel also bifurcate, nearer to the Thames? The topography underlying the floodplain can be mapped by picking out the horizon that marks the gravel or bedrock surface (Fig 3). This tried-and-tested technique, using information from boreholes,[6] had previously been performed for the Thorney Island area, producing similar results.[7]

By scrutinising sediment logs, the horizon at the interface between archaeological and 'natural' deposits (superficial Quaternary deposits or London Clay bedrock) can be digitally modelled as a contoured surface that estimates ground height between known points within a Geographic Information System (GIS).[8] This method effectively removes historic and the bulk of prehistoric deposits to disclose the base-Mesolithic terrain.

The contour plot (Fig 3) shows that both the northern and southern Tyburn branches were mainly characterised by deep channels. Where data points (the locations of heights derived from borehole logs) are numerous – for example around Thorney Island – the model shows deep channels, between -2m and -6m OD at the base of the channel.[9] Where there is a low concentration of data points, for example along Buckingham Gate, the surface interpolation is both less detailed and less reliable. However, given the evident depth and definition of the channels in the lower Tyburn reach, a manmade origin for the northern branch seems implausible. In addition, geoarchaeological investigations on each course demonstrate infilling from the Neolithic.[10]

The contour plot shows the northern branch splitting to encircle Thorney Island and an additional channel splitting off to the south (to join the Thames around Thorney

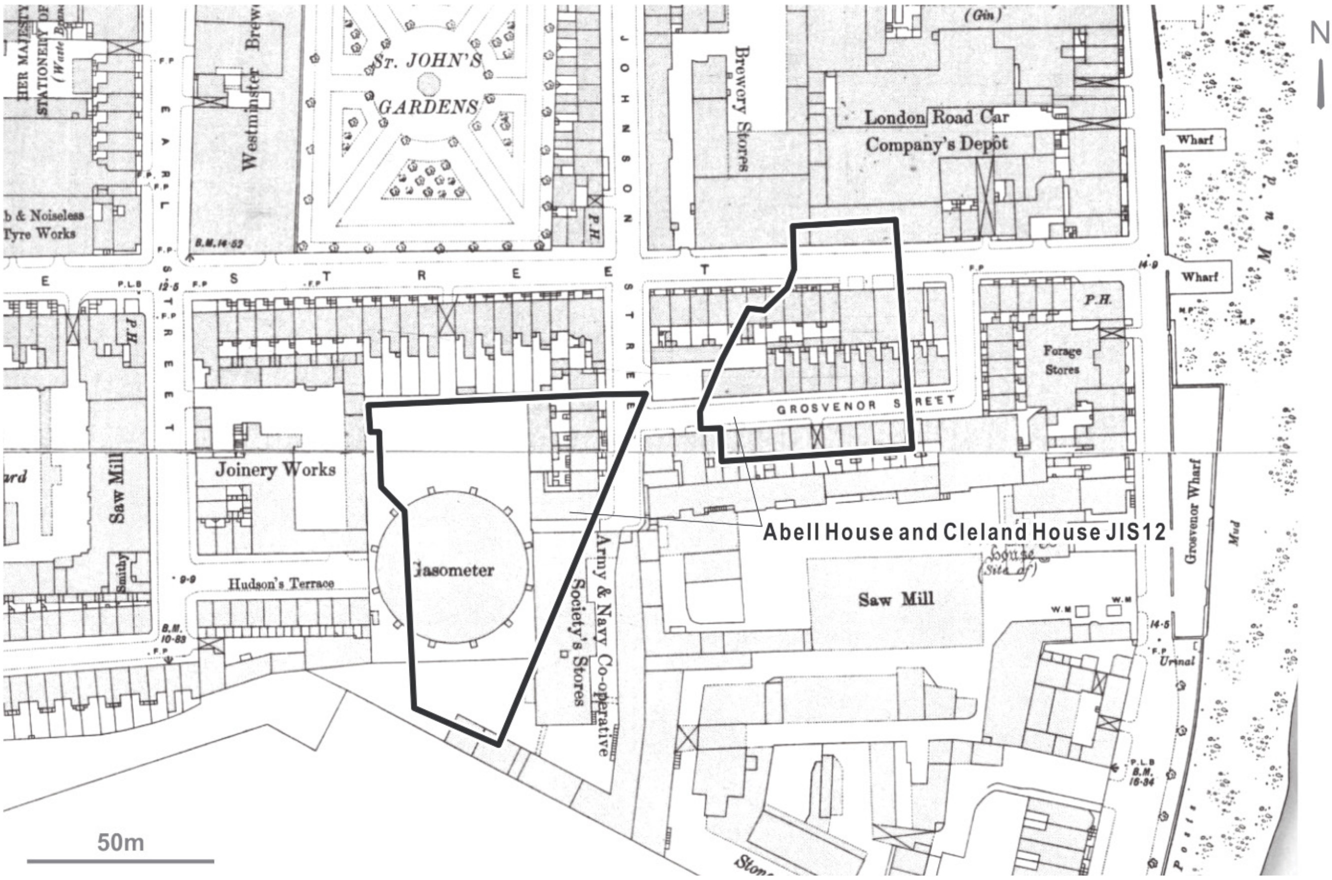


**Fig 2: 19th-century OS map showing Abell House (to the left; with the gasholder) and Cleland House (right)**[30]

Street). Abell House and Cleland House were situated on this southerly spur. It is certainly likely, however, that the proto-Tyburn stream (in earlier prehistoric periods) was actually more complicated and multi-threaded than currently supposed. A more even spread of borehole and deep trench data may cast light on this in the future.

**Dating the floodplain floor sands**

Sand deposits underneath the alluvial clays have been dated in several nearby locations to determine their age and therefore archaeological potential, as well as to gain a better understanding of processes at work on the floodplain. Dating has been carried out at the Chelsea Barracks (to the south on Chelsea Bridge Road) (Fig 3:10, CBV08), at Abell House and Cleland House, and at Thorney Island.[11] At the first two of these sites, dating was carried out directly on the sands by optically stimulated luminescence (OSL), and at Thorney Island a radiocarbon date was obtained from a twig found in a band of silty clay within the sands.

The OSL dates for Chelsea Barracks and for the Abell & Cleland project fall at the coldest part of the Devensian (around 24 and 19 thousand years ago respectively).[12] This may be an age overestimation, as is typical in fluvial environments,[13] with at least some sediment reworking likely in the late Devensian and early Holocene/ Mesolithic (*c.* 10 thousand years ago). Meanwhile, the evidence from Thorney Island suggests fluvial sands continued to accrete there well into the mid-Holocene/Bronze Age.

Two strands of evidence from the JLE work (at Palace Chambers South; Fig 3:7) support this: the radiocarbon date on the twig of 3090–2770 cal BC[14] and the fact that elsewhere at the Palace Chambers South site, fluvial sand layers were found to include Late Neolithic or Early Bronze Age pottery and a fragment of a Neolithic axe.[15] Hence, on the low-lying floodplain the Westminster sands appear to have first been laid down in the Devensian period with some Mesolithic reworking during times of seasonal melt. Where higher islands existed (or were created), sands continued to build up as coarse material was plastered across their surfaces. The island sand gradually accreted under a meandering, freshwater river regime probably right up to the end of the Bronze Age,[16] while the adjacent channels suffered net erosion.

Present evidence suggests that both the northern and southern arms of the Tyburn have their origins in the deep past, most likely carved out at the end of the Devensian and opening of the Holocene period and flowing freely until the Neolithic period when they began to infill with fine-grained sediment. So, while the northern branch has been described as an 'unsubstantiated watercourse',[17] borehole data show that ancient channels did exist.[18]

**Environmental conditions on the Tyburn floodplain and in historic Westminster**

Through the sediments retrieved from Abell House and Cleland House, the rest of this article reviews the environmental conditions across the area from the early historic period onwards and, given the general shortage of this type of study in the Chelsea/Pimlico/Westminster area, delivers an important addition to understanding London's environmental history. This is one interpretation of the available information, as it is recognised that sediment archives are often only viewed in small trenches or boreholes, making it difficult to reproduce the complexity of the past.

*Borehole sampling evidence*

Basements at Abell House and Cleland House largely removed historic and all but the most recent prehistoric remains, but in places an alluvial archive did survive. Across the site, eleven boreholes were drilled between 2012 and 2013, nearly all of which yielded sediments of archaeological interest.[19] One core from each site was chosen as a focus for this environmental study (from borehole WS2 at Abell House and borehole WS7 at Cleland House).[20] These were selected on the basis of their length and the quality of sediment recovery. In the laboratory, sediment from the boreholes was looked at in detail and subsampled for the extraction of microscopic environmental remains. Ostracods (bivalve crustacea), diatoms (siliceous algae), pollen grains and other macroscopic plant remains were extracted and analysed and, together with the sediment type, are used to describe the history of the landscape.

The sediments and ostracods show that initially freshwater, sandy channels (probably Mesolithic in date, as discussed above) evolved into silty sandy freshwater flats as river levels rose. The height of the sands (coarse yellow to orange sand and fine gravel) ranged from *c.* -0.6m to -1.5m OD at Abell House and was slightly lower, *c.* -2.5m OD, at Cleland House. Above this, at Cleland House, there were brackish tidal mudflats (bluish grey silts/clays) that subsequently became weathered and mottled as increased local drainage led to drying out. At Abell House the stratigraphy was more varied, with the development of a peaty soil followed by a clean, shallow, freshwater pool (shown by highly compact light grey calcareous silt clay) that dried out before a marshy land surface formed. This then developed into tidal mudflat as at Cleland House.

Ecofacts were marginally better preserved within the deposits from Abell House, but preservation was overall fairly poor, particularly for diatoms and plant remains (as a result of silica dissolution and small sample sizes respectively). Nevertheless, useful

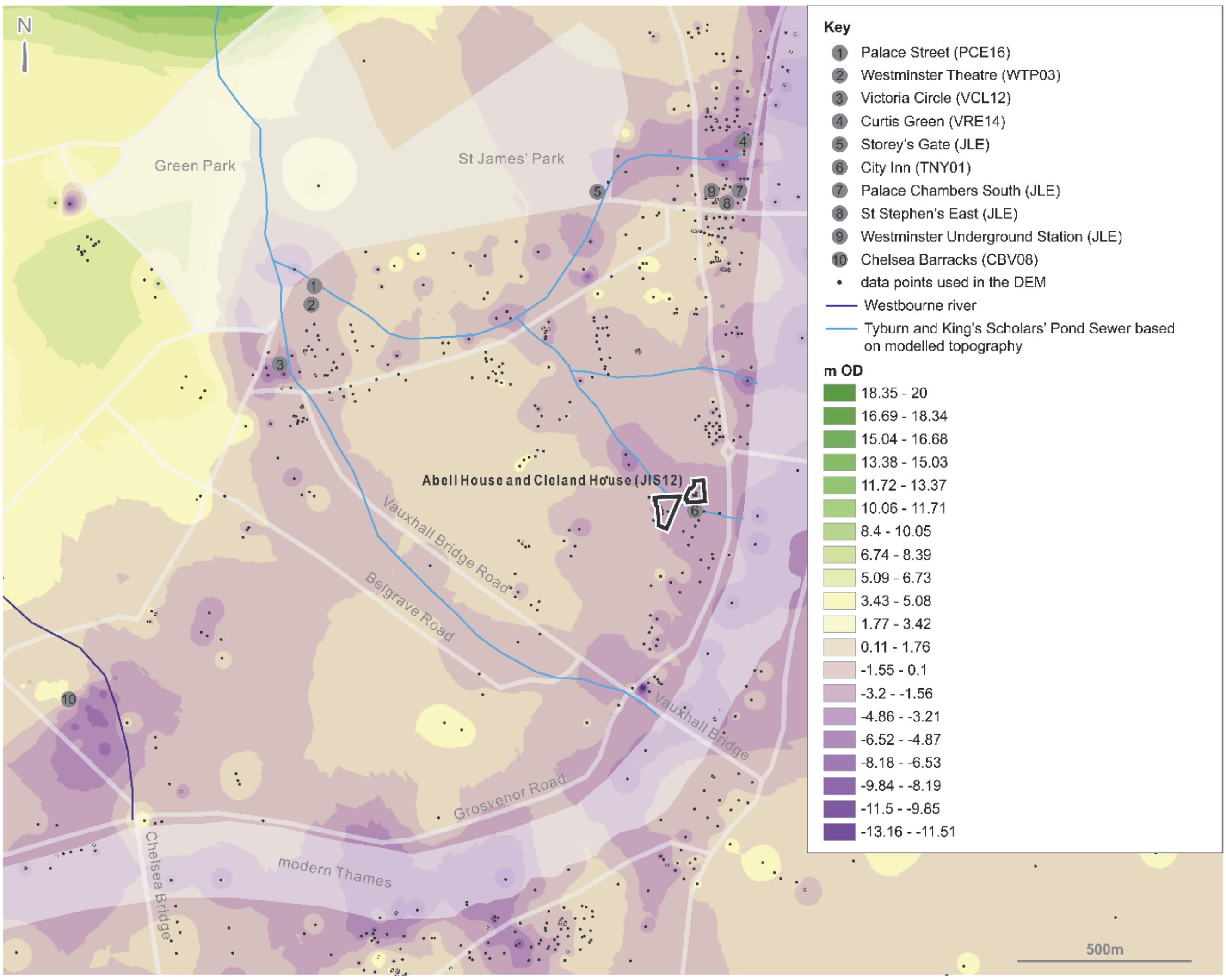


**Fig 3: contour plot of the Westminster area based on archaeological and borehole information, also showing sites mentioned in the text (including endnotes). It represents the base-Mesolithic terrain and shows the prehistoric Tyburn branching near Buckingham Palace and the northern branch splitting again to surround Thorney Island. Abell House and Cleland House lie at the mouth of a further spur of the northern stream.**[31]

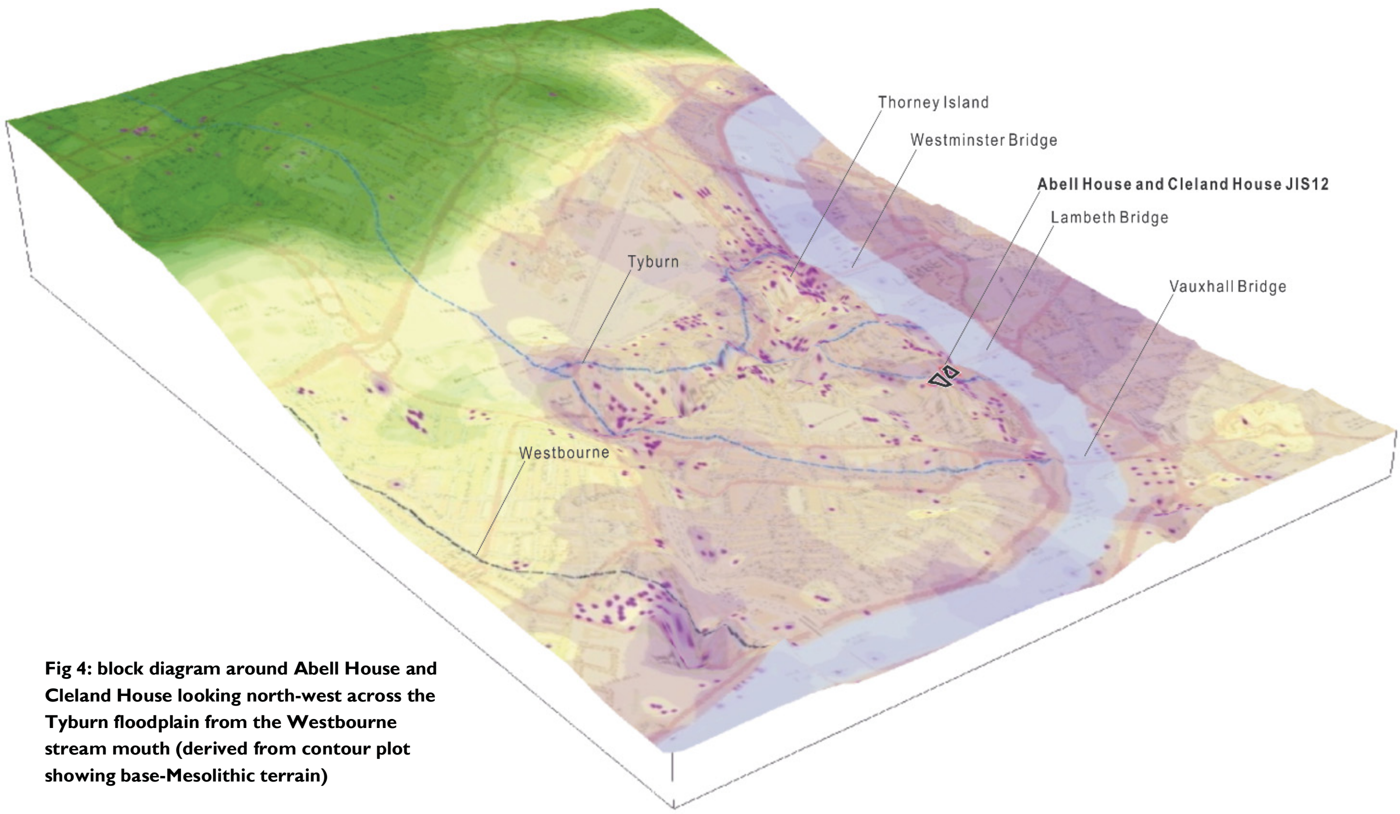


**Fig 4: block diagram around Abell House and Cleland House looking north-west across the Tyburn floodplain from the Westbourne stream mouth (derived from contour plot showing base-Mesolithic terrain)**

information was derived from pollen and ostracod analysis, despite some disturbance from the borehole drilling process (as indicated by the presence of coal, slag and brick in some samples and by the incidence of buddleia, an 1890s introduction from China, at the base of the Abell House borehole). The ostracod fauna and organic remains in the samples (such as insect remains and water flea eggs (*cladoceran ephippia*)) from the sands and silts at the base of the cores reflect prehistoric freshwater environments (almost certainly pre-Iron Age).

Freshwater gave way to saline and brackish conditions with continued Holocene river-level rise, as indicated by species in the mudflats. The few samples with diatom remains, all from Cleland House, corroborate this, showing mixed assemblages typical of the tidal Thames upwards from -2m OD. The dating for these deposits is uncertain, but, as the Thames is known to be a brackish (salty) tidal river in the City from around the Late Bronze Age,[21] saline indicators suggest a late prehistoric *terminus ante quem*, an earliest possible date for the mudflats. As the sites were upstream of the City, brackish conditions would have encroached slightly later. Additionally, the blanket of estuarine silts and clays typically above *c.* -2m OD in the east London Thames valley appears to have accreted from the Iron Age (with the Roman high tide level, derived from City waterfront sites, estimated at +1.25m OD).[22]

Pollen describes the vegetation in the wider environment and can also be used as a biostratigraphic tool. An assortment of airborne and river-transported pollen grains was recovered from the cores, derived mainly from the surrounding landscape but also from the onsite vegetation. Both arboreal and shrub pollen was identified in the samples, with a diverse range of herbs suggesting grass, sedge and reed habitats. The dominant tree species were oak and hazel, and these probably formed small stands of woodland in the local surrounds.

The mix of species throughout the cores is typical of the historic period and is thought to be of Iron Age to Romano-British date, although an age was not independently established (such as by radiocarbon dating) as the samples were not suitable, and finds were absent from the sediment cores. Certainly pottery, clay pipes and building material found in trenches from the upper horizons of the alluvial clays indicate a post-medieval date for those layers. The lower prehistoric freshwater parts of the profiles (below -1m OD at Abell House and -2m OD at Cleland House) were devoid of pollen.

Thus, the majority of environmental information dates from the late Iron Age to the Roman period. It shows that at this time the low-lying tract of land that was the Tyburn floodplain would have been a patchwork of wetland habitats with small interconnecting freshwater streams and pools. This was fringed by wet woodland and surrounded by open marshy grassland.

The contoured surface and environmental remains for this period have been considered together and form the basis of the landscape reconstruction illustrations developed as part of this geoarchaeological analysis. The River Thames as represented on the block diagram (Fig 4) is merely a topographic marker to help orientate the viewer; the landscape reconstruction (Fig 5) shows the Thames water level at -1m OD, the mid-Iron Age mean high water (MHW) or early Roman mean low water (MLW) for the area of the City of London.[23]

Interestingly, the City Inn site less than 50m from the Cleland House boundary (see Fig 3:6), demonstrates a complex range of wetland environments of much deeper antiquity.[24] Although the height of the

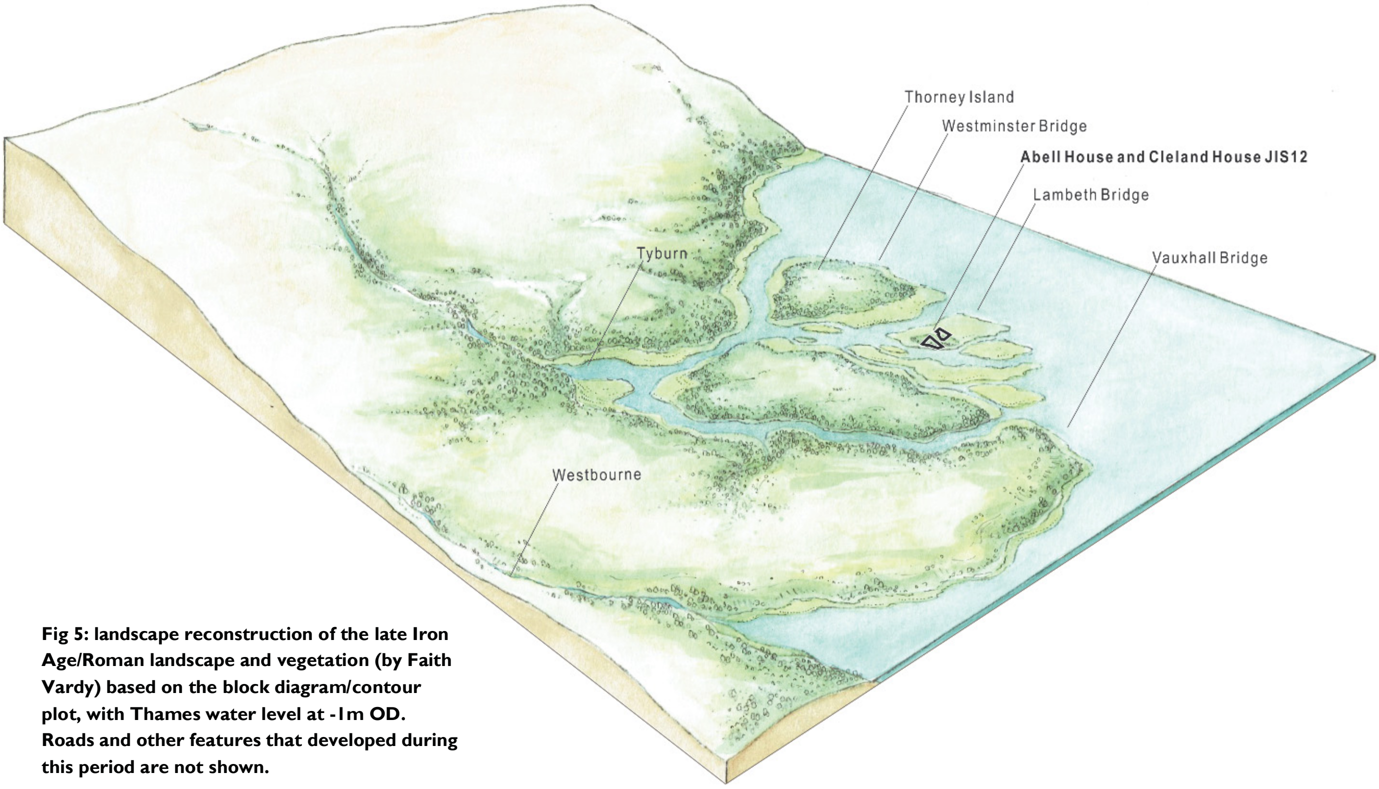


**Fig 5: landscape reconstruction of the late Iron Age/Roman landscape and vegetation (by Faith Vardy) based on the block diagram/contour plot, with Thames water level at -1m OD. Roads and other features that developed during this period are not shown.**

sand beds on that site ranges from *c.* -1.75m to -2.7m OD, comparable to Abell House and Cleland House (*c.* -2.5m OD and -2.6m OD respectively), prehistoric sediments are well-represented there, capped by the familiar brackish and estuarine tidal mudflats. Perhaps prehistoric remains survived on that site because the City Inn location was sheltered from erosion by a natural barrier.

The reason for the difference between these neighbouring sites remains open to conjecture, but exposure to storm erosion may explain the lack of Neolithic and Bronze Age sedimentation at Abell House and Cleland House. Storm events are increasingly registered in prehistoric sedimentary sequences, such as at the nearby Palace Chambers South (see Fig 3:7) and at Union Street in Southwark (sitecode UNS91).[25]

By the medieval and post-medieval periods, brackish and estuarine tidal mudflats covered the landscape. As with other areas of the Thames floodplain, from the early historic period, management – drainage and land-raising for pasture – would have changed the scenery. Development increased through the medieval period, particularly on areas of higher ground like Thorney Island (with the foundation of Westminster Palace)[26] even though much of the area was still prone to flooding and some locations remained largely undeveloped.[27]

The Tyburn may have been diverted along conduits, partly as early as the 11th century, for the benefit of the monks and abbot.[28] This could have been the beginning of manipulation that stemmed the original channel flow, leading to parts being completely cut off or culverted. An example of such water tapping is documented for the western arm of the Walbrook, a stream which once ran through the centre of the City of London.[29] Later medieval and post-medieval channels and drains may have exploited Westminster's relict topography, but essentially cannot be relied upon to represent the prehistoric or early historic landscape.

**Conclusions**

Geoarchaeological work at Abell House and Cleland House has enabled reconstruction of the landscape and environment of the Iron Age and Roman periods. The ecofactual evidence from these properties shows that a mosaic of sandy channels, shallow pools and wetland existed, but this was gradually engulfed by tidal mudflats from the medieval period until post-medieval drainage and development took hold. The underlying topography is inherited from the Devensian Lateglacial floodplain, or braidplain, and the sediment accumulation was driven by rising Holocene river levels perhaps with significant episodes of storm erosion.

Deposit modelling the surroundings reveals that the prehistoric Thames-Tyburn river system was very different in nature from the historic manmade drainage network described in recent papers. The northern Tyburn branch encircles Thorney Island, and a further spur appears to the south descending towards the Thames at Abell House, Cleland House and the City Inn. Both the northern and southern Tyburn branches are ancient in origin, silting up from the Neolithic period onwards.

Thus, with recent debate in mind, the historic streams must be distinguished from their natural precursors because, while the historic watercourses may in some places have inherited previous landforms, they at least partly represent the efforts of medieval engineering rather than the original drainage pattern.

Topographic borehole digital elevation models, such as the one shown here, evolve as data are added and the work is therefore continually 'in progress'. Nevertheless, the Tyburn model is considered accurate in terms of reflecting the low-lying nature of the entire area and the identification of major channel routes. These landscape features, confirmed by previous geoarchaeological investigation, will continue to be scrutinised into the future. Thus, this study makes a substantial contribution to understanding the environmental and landscape history of this prestigious stretch of floodplain, particularly given that the area has enjoyed less attention than some other boroughs.

## Acknowledgements

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1. N Barton and S Myers *The Lost Rivers of London*, 3rd Edition (2016).

2. The paper and digital archives and the finds from the site have been archived by the Museum of London under the site code JIS12. The archive may be consulted by prior arrangement at the London Archaeological Archive (LAA), Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED.

3. J Sidell, K Wilkinson, R G Scaife and N Cameron *The Holocene Evolution of the London Thames: archaeological excavations (1991–1998) for the London Underground Limited Jubilee Line Extension Project*, MoLAS Monogr 5 (2000).

4. *Ibid.;* C Thomas, R Cowie and J Sidell *The royal palace, abbey and town of Westminster on Thorney Island: archaeological excavations (1991–8) for the London Underground Limited Jubilee Line Extension Project*, MoLAS Monogr 22 (2006); MoLAS 'City Inn, Thorney Street, London, SW1; A report on the geoarchaeological evaluation and watching brief', unpub MOLA rep (2002); V Yendell and R Scaife 'Invisible people next to a river that does not exist: geoarchaeology and the Tyburn River north of Victoria Station' *London Archaeol* **15** (2) (2017) 25–29.

5. Recent articles in *London Archaeologist* have included: Yendell and Scaife *op cit* fn 4; T Tatton-Brown 'Westminster Topography' *London Archaeol* **14 (**2) (2014) 45–8 and D Donovan 'The river Tyburn and Thorney Island' *London Archaeol* **14** (9) (2016) 231–5. See also *op cit* fn 1.

6. As described in C Corcoran, C Halsey, G Spurr, E Burton and D Jamieson *Mapping Past Landscapes in the Lower Lea Valley: a geoarchaeological study of the quaternary sequence*, MOLA Monogr 55 (2011) 8–20.

7. B Sloane, H Swain and C Thomas 'The Roman road and the river regime' *London Archaeol* **7 (**14) (1995) 359–70.

8. ArcGIS 10.3.1 was used for the plot presented here.

9. For example, MOLA geoarchaeological work has shown a deep channel (*c.* -4m OD and subject to infilling in the Neolithic period) at the northern end of Thorney Island on the Curtis Green site (VRE14, see Fig 3:4); see MOLA 'Curtis Green Building, London SW1, City of Westminster: Geoarchaeological post-excavation assessment and updated project design,' unpub MOLA rep (2015). The encirclement of Thorney Island is also shown on British Geological Survey 1:50,000 Series Sheet 270.

10. Evidence for the southern branch, from the Victoria Circle site (VCL12, see Fig 3:3) is in Yendell and Scaife *op cit* fn 4. Three important sites for the northern channel, additional to the aforementioned VRE14, are the following: Storey's Gate, one of the Jubilee Line Extension (JLE) sites (see Fig 3:5), was dominated by a major palaeochannel, probably the northern branch of the Tyburn (*op cit* fn 3, 32). Palace Street (PCE16; see Fig 3:1) yielded evidence for a riparian environment adjacent to the Tyburn and which silted up over time from the late Neolithic (Beta 433867 conventional radiocarbon age 3800±30; MOLA '1 Palace Street, Westminster SW1E, City of Westminster: geoarchaeological evaluation report', unpub MOLA rep (2016)). A mid-Neolithic date of 2910–2670 cal. BC (Beta 201902 conventional radiocarbon age 4210±40) came from the basal sediments (-1.25m OD) in the channel at Westminster Theatre (see Fig 3:2, WTP03; MoLAS 'Westminster Theatre, Palace Street SW1, City of Westminster: a geoarchaeological assessment', unpub MOLA rep (2005). See below, fn 14, for a discussion of the presentation of radiocarbon dates in this article.

11. For Chelsea Barracks, see MOLA 'Former Chelsea Barracks, Chelsea Bridge Road, London SW1: an archaeological evaluation report' (CBV08; see Fig 3:10) unpub MOLA report (2009). For Thorney Island sediment dating see *op cit* fn 3, 39.

12. OSL date for Chelsea Barracks (lab code GL09002): 22,000–26,000 years before 2009 at 1∂ confidence, including combined systemic and experimental error; OSL date for Abell House (lab code GL14062): 17,000–21,000 years before 2014 at 1∂ confidence, including combined systemic and experimental error. Abell House sample taken at -0.63m OD from Evaluation Trench 1, section 2.

13. Reflecting the sub-aqueous reworking of older sand material and incomplete 'zeroing' of the OSL signal. See J Wallinga 'Optically stimulated luminescence dating of fluvial deposits: a review' *Boreas* **31**.4 (2002) 303–22; J M Olley, T Pietsch, and R G Roberts 'Optical dating of Holocene sediments from a variety of geomorphic settings using single grains of quartz' *Geomorphology* **60** (2004) 337–58.

14. Lab code: Beta 122929; conventional radiocarbon age 4300±60. 'Cal' indicates that this is a calibrated radiocarbon date. All radiocarbon dates quoted in the text are calibrated from conventional radiocarbon ages in accordance with the international standard known as the Trondheim convention (see M Stuiver and R S Kra, 'Editorial comment,' *Radiocarbon* **28.**2B (1986)). Calibrations relating the radiocarbon measurements directly to the calendrical time scale are calculated using the computer program OxCal v4.2 and the datasets published by Reimer *et al* in *Radiocarbon* **55**.4 (2013). The ranges have been calculated according to the maximum intercept method and are quoted with the end points rounded outwards.

15. *Op cit* fn 3, 38–9.

16. Until the formation of a marsh (Storey organic mud bed) in *c.* 1550 cal BC: *op cit* fn 3, 61–3.

17. Donovan, *op cit* fn 5.

18. The route shown in this article is offset slightly from the previously mapped route (see *op cit* fn 1).

19. These were logged and entered into a geoarchaeological database (using RockWorks15) for incorporation into the GIS model alongside pre-existing data.

20. MOLA 'Abell House and Cleland House, London SW1, City of Westminster: Post-excavation assessment and updated project design', unpub MOLA report (2015).

21. *Op cit* fn 3, 109–110.

22. B Watson, T Brigham and T Dyson *London Bridge 2000 years of a river crossing* MoLAS Monogr 8 (2001) 25.

23. *Op cit* fn 3, 109–110.

24. A full suite of prehistoric Late-glacial to Holocene sediments including Devensian, Mesolithic, Neolithic, Bronze Age and Iron Age were found at TNY01. See MoLAS 'City Inn, Thorney Street, London SW1: A report on the geoarchaeological evaluation and watching brief', unpub MOLA rep (2002).

25. *Op cit* fn 3, 41, 79.

26. C Thomas, R Cowie and J Sidell *op cit* fn 4.

27. MOLA 'Abell House and Cleland House, John Islip Street, London SW1, City of Westminster: Historic Environment Assessment' unpub MOLA report (2011).

28. See *op cit* fn 5, 48.

29. The western arm of the Walbrook was hijacked in the 15th century by the Carthusian priory at Smithfield, leading to this branch completely drying up (*op cit* fn 1, 32).

30. (Fig 2) The map comprises OS Five feet to the Mile, London sheet VII. 93 (revised 1893–4) (published 1895) and OS Five feet to the Mile, London sheet XI. 3 (revised 1893) (published 1895).

31. (Fig 3) This digital elevation model (DEM) was achieved by migrating spot heights from the Rockworks 15 borehole database to ArcGIS 10.3 and using the spatial analyst tools to model surfaces by inverse distance weighting (IDW).