Archaeological Investigations at Buckingham Palace

by Time Team &
Oxford Archaeology

by Jonathon Hiller &
Richard Brown

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ARCHAEOLOGICAL INVESTIGATIONS AT BUCKINGHAM PALACE BY TIME TEAM WITH OXFORD ARCHAEOLOGY

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SUMMARY

Over August Bank Holiday 2006, Oxford Archaeology (OA) carried out archaeological investigations with Channel 4 TV's Time Team at Buckingham Palace, Westminster, London (NGR TQ 290 796). The project was designed with Channel 4 as a contribution to Her Majesty the Queen's 80th birthday celebrations.

Five investigative trenches were opened in the Palace Gardens. South-west of the Palace, evidence was found of Henry Wise's early 18th-century canal, built for the 1st Duke of Buckingham. Finds and cartographic evidence show that it had been abandoned and filled by c 1750. North-east of the canal, natural gravel was overlain by soil layers containing clay pipe and pottery dated to the mid-late 17th century, perhaps Civil War occupation evidence. These layers were then overlain by a thick deposit of brick rubble dating to the 18th and 19th centuries, possibly construction or demolition material from a staircase that once descended to the canal from Buckingham's garden terrace. In a trench to the north-east of the lawns, at of depth of 2.6 m, natural gravel was cut by a deep feature filled with brick, tile and `bottle bricks' of late 18th-early 19th-century date and other architectural stonework. This is likely to be the robber trench from the demolition and removal of Buckingham's garden terrace walling in the late 18th/early 19th century. West of the Palace, excavations revealed that the once formal gardens here had been cleared to natural and re-laid with flint cobbles and gravel (presumably to aid drainage) and finally consolidated with clay and soil for the present landscaped lawns. This operation probably occurred after 1820, under plans initiated by architect John Nash and carried out by successive head gardeners into the 1860s. A remarkable diamond studded gold earring was found here. Landscaping evidence and Victorian garden features were also observed in a trench at the west corner of the Gardens.

Gradiometer survey by GSB Prospection Ltd. west of the Palace produced anomalies that may be associated with the Civil War defences and the Goring Great Garden Wall, while a block of high resistance was proved by excavation to be associated with the base of steps leading to the ornamental canal. GPR survey within the Quadrangle revealed modern services and historic structures. High amplitude responses appear to correspond with planned walls found during excavations carried out here by Henry Flitcroft in 1744 and include walls of buildings sited within the early 17th century Mulberry Garden. Tentative traces were found to the south-east of the Quadrangle of structures which may relate to some part of the sequence of buildings (Blakes/Goring/Arlington House) which occupied the site until Buckingham's House was constructed at the turn of the 18th century; a central fountain known from this period was also identified.

INTRODUCTION

The 2006 August Bank Holiday investigation at Buckingham Palace (Fig. 1) formed part of a three-night series of programmes that also included archaeological investigations at Windsor Castle and Holyrood House in Edinburgh; much of the daily work at the sites was also broadcast live by More 4 Television. OA prepared a detailed project design for Wildfire TV (for Channel 4) outlining the known history of the Palace and proposals for trench excavation and site surveys (OA 2006). Time Team commissioned Geophysical surveys from GSB Prospection Ltd. and a geo-archaeological and palaeoecological auger survey carried out by Emma Tetlow, Ben Gearey and Jane Sidell. For the programme, Time Team undertook historic plan and map analysis, produced reconstruction drawings and presented a forum for discussion by specialist contributors.

GEOLOGY AND TOPOGRAPHY

The underlying geology of the site is Kempton Park Terrace gravels with occasional capping pockets of Langley Silts. The River Tyburn, a lost river of London (now below ground) crossed the site of the present Palace on a north-west/south-east alignment towards the river Thames. The site slopes gradually from the west façade of the Palace down to the ornamental lake, with a pronounced slope downward to the west corner of the gardens. Episodes of landscaping have led to this rather undulating topography across the site, which varies in height from *c* 6.5 m above Ordnance Datum by the Palace buildings to *c* 4 m above Ordnance Datum in the west corner of the Gardens. Overall the Palace complex comprises 16 ha (39 acres).

Figure 1: Site location

HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

The historical background to, and development of, the Palace is extensively covered in *The History of the King's Works, V* (Colvin *et al*. 1976) and *The History of the King's Works, VI* (Crook and Port 1973). OA's Project Design included a map regression analysis of the site and a gazetteer of NMR locations within a 1000 m radius of the site.

In summary, the Palace site appears to have lain outside the historic core of London, in an area of marsh crossed by the ancient river Tyburn, with a settlement recorded at Eye Cross (located approximately beneath the present Palace) in the early medieval period (Wright 1996, 38-39). The first known house on the site built by William Blake (1623) was situated south of James I's famous Mulberry Gardens and was expanded by the 1st Earl of Norwich (Lord Goring) in 1630, including the twenty-acre walled 'Great Goring Garden'. Goring House and garden formed part of London's defences during the Civil War. By 1674, Goring House had burnt down and Arlington House took its place, this building being replaced by a grander structure built for Lord Buckingham between 1703 and 1705. Buckingham House was built further to the north-west than the previous structures and orientated to face St James's Park. In the process of construction, leasehold land owned by the Crown (the Mulberry Gardens) and part of St James's park were encroached upon. Elaborate gardens and an ornamental canal completed the site layout. George III acquired Buckingham House for Queen Charlotte (the Queen's House) in the 1760s. Two surveys: An excavation and survey of Buckingham House Courtyard carried out by Henry Flitcroft in 1743/4 and a survey of the whole Palace site and historic title deeds by the Surveyor General in 1760 were carried out in order to clarify the convoluted history of land ownership on the site and to establish the Crown's clear legal ownership over all previous title holders at the time of purchase. The present Palace is the result of extensive remodelling by John Nash (1826-1830) and Edward Blore (1830-1857).

Archaeological investigations since Flitcroft's plan of archaeological excavations in the Quadrangle (1744) have been few. In recent times they have concentrated on the present Palace buildings and include, among others, test pits recorded during maintenance works under the auspices of English Heritage from 1995-1998 (EH 1998). OA undertook watching briefs and evaluations at the Palace as Term Contractor for the Royal Household between 1998-2005 (OA 2000, 2003, 2004 and 2005). Findspots of all archaeological periods are known within a 1-km

radius of the Palace, though the site appears to have been only occasionally occupied until the turn of the 17th century (OA 2006).

INVESTIGATION METHODOLOGY

GSB Prospection Ltd. undertook the Geophysical Survey. Five areas within the Palace grounds were selected for investigation using a combination of techniques: gradiometer survey was carried out using a Bartington Grad 601-2 instrument and a Geoscan FM256; resistance survey employed a wheeled square array, incorporating a Geoscan RM15 meter; and Ground Penetrating Radar (GPR) survey used a Sensors & Software Noggin ^{plus} system. The survey grid was set out by GSB Prospection Ltd**.** and tied in to the Ordnance Survey (OS) grid by Dr Henry Chapman using a Trimble Differential GPS system. The locations of the survey areas are detailed in the archive report prepared by GSB for Time Team (GSB 2007).

Three trenches and a contingency fourth trench were initially proposed to investigate the Gardens (OA 2006, Section 7). Five trenches were eventually excavated following consideration of the geophysical and geo-archaeological results and after full consultation with the Palace authorities. The trenches were supervised by OA and Time Team Archaeologists (Brigid Gallagher, Phil Harding and Mick Aston) and opened by Kubota-type excavator equipped with a 1.5 m wide toothless bucket. Archaeologists from OA, the Museum Of London (MoLAS) and Wessex Archaeology (WA) undertook the excavation and recording. All site work was carried out in accordance with the *OA Fieldwork Manual* (ed. D Wilkinson, OAU 1992).

THE QUADRANGLE AND GARDENS: GEOPHYSICAL SURVEY

Dr John Gater, GSB Prospection Ltd. (Figs 2 and 5)

The majority of the survey areas were found to be magnetically disturbed due to services, drains and previous landscaping, such that these responses will have masked many features of archaeological interest, if present. GPR survey within the Quadrangle revealed a complex of modern services and historic structures. Within the deeper time-slices, high amplitude responses correspond to walls revealed during excavations by Flitcroft in 1744 (relating to structures within the Mulberry Gardens) and traces of a fountain known in Buckingham's Quadrangle. In the south-east of the present Quadrangle, traces of structures might relate to either Blakes/Goring or Arlington House, which had occupied the site until the construction of Buckingham House in the

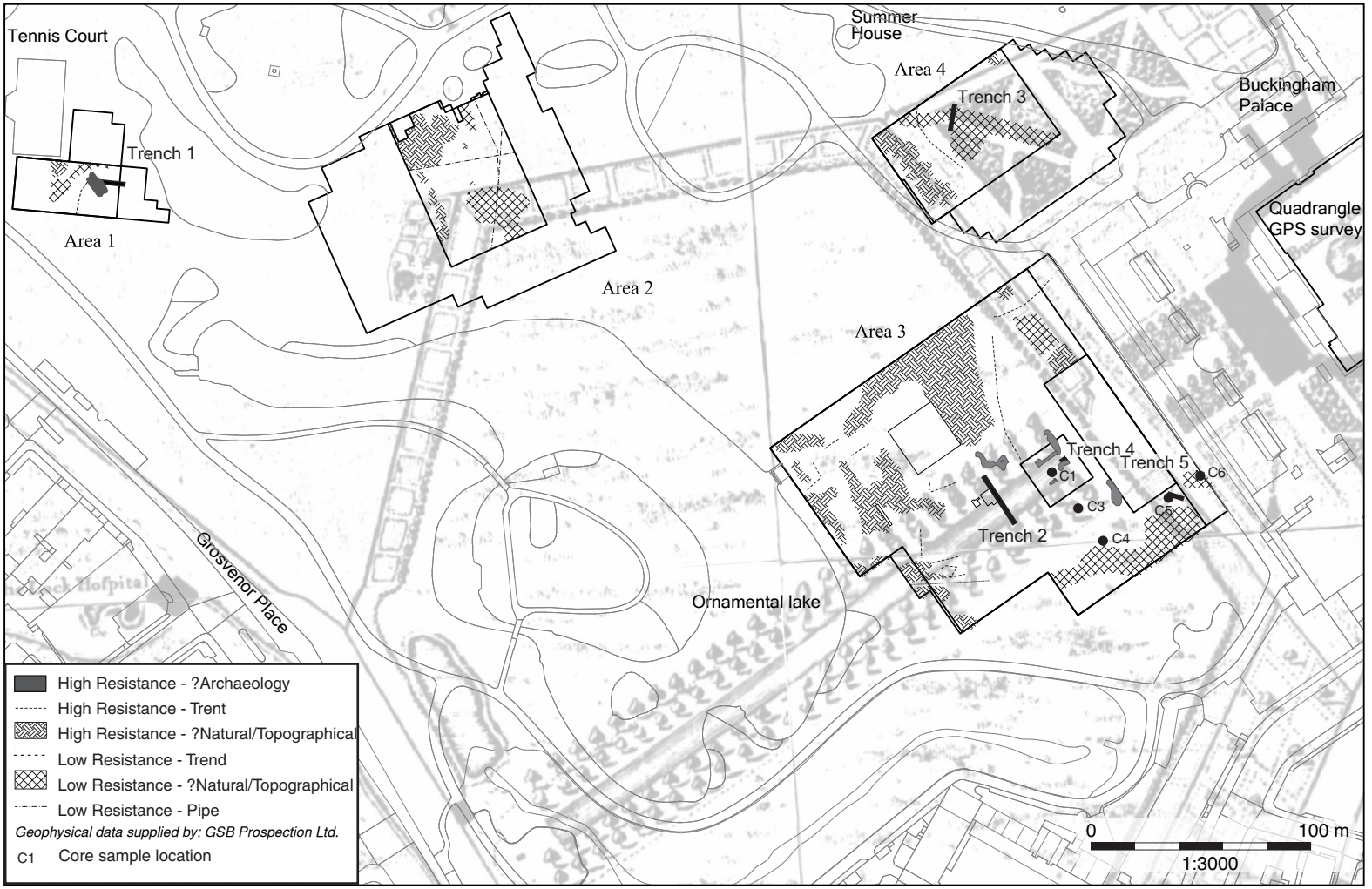

Figure 2: Trench locations, interpretive resistance results and gradiometer survey areas shown on Rocques Map of 1746 with present Ordnance Survey Map

Trade token - inscribed (obverse)'CHARLES STVRTON AT . . .
(reverse) THE SWAN IN THE STRAND'.
This token dates from the mid to late 17th century.
From Trench 2.

Button - inscribed 'G.A.GREEN *
HIGH RD, KNIGHTSBRIDGE'.
George A. Green and Son - tailors - had premises at
19 High Road, Knightsbridge in the 19th century.
From Trench 2

Diamond studded gold earring. 19th century

2:1

Bottle brick - circular-shaped brick
used for building roof vaults
in the late 18th-early 19th centuries.
Recovered from Trench 5 near the Palace.

1:3

Figure 5: Finds

early 18th century. While the survey responses confirm the presence of structures recorded by Flitcroft they do not further clarify the character of these and so are not illustrated here. Full geophysical survey results are given in GSB 2007.

On the lawns south-west of the Palace (GSB Survey Area 3), magnetic and resistance responses revealed features associated with Buckingham's ornamental canal. Natural responses were also located, which may suggest geological or landscaping features.

West of the Palace, gradiometer survey produced anomalies that may be associated with the Civil War defences and the Goring Great Garden Wall (GSB Survey Areas 1 and 2). By overlying the recent results over Rocque's plan of the site (1746), it is possible that linear responses here relate to a rectangular `garden' feature mapped by Rocque and located at the north-west salient angle of the Great Garden Wall. Though not conclusive evidence, the structure could be associated with the Civil War, as could the responses. Regrettably, this part of the site was unavailable for excavation to test the anomalies and cartographic evidence. The resistance results were slightly more informative (especially in GSB Survey Area 3), where a block of high resistance proved to be the steps associated with the ornamental canal.

THE GARDENS: ARCHAEOLOGICAL DESCRIPTION

Trench 1

The 12 m long east-west aligned trench (not illustrated) was opened in the western part of the gardens near to the tennis court. The trench targeted potential anomalies revealed on gradiometer plots, to establish whether they related in any way to the line of the Civil War defences thought to have extended into the Gardens from the north.

Above natural gravel (113), the earliest deposits comprised red-brown sandy gravel layers with substantial inclusions of broken bricks and tile (111 overlain by 105) to the west and 112 to the east. Lenses of dark brown clay (114, 115) were present within layer 112, possibly trampled material, together with a large metal bar that extended some distance into the trench section. The combined depth of the mixed sandy clay deposits was between 0.25 m and 0.54 m. A field drain (109/110) at the west end of the trench was probably inserted at the same time as the layers were deposited, as no cut could be discerned.

Layers 112 and 105 were overlain by a 0.4 m thick layer of very compact yellow sandy clay (101). A single musket ball (sf. 102) was recovered from the top of this layer together with pottery of 18th/early 19th century date. The layer had three shallow shrub or tree holes set into it (features 106, 107, 108), each filled with fine dark sandy soil. Fill 103 in feature 107 contained a piece of decorated clay pipe with maker's name `BROWN/WESTMINSTER', dated to a maker active in the first half of the 19th century (sf. 101). Fill 102 in feature 108 contained Victorian pottery. Topsoil (100) and grass sealed the trench. A copper alloy rivet was recovered from the topsoil (sf. 100) together with a piece of clay pipe of 17th-18th century date. Building materials, including brick and roof tile dating between the 17th and 19th centuries, were recovered from contexts throughout the trench. These are likely to have been imported to this part of the site from building works elsewhere, as there are no documented structures nearby.

Trench 2

The 21 m long trench (Fig. 3) was opened on the line of Lord Buckingham's canal, as suggested by historic plans and from anomalies identified by geophysical survey. Natural gravel (204) at the base of the trench was cut by a broad feature (212 - the canal cut) that was approximately 14.5 m wide. On the north side of the canal were traces of a brick wall (210) that presumably acted as a revetment to the canal side. The bricks appeared to be un-bonded, but little of the structure had survived later demolition works and disturbance from an adjacent tree pit (209) to elucidate its form. The base of the canal on the north and south sides had been lined with clean grey-brown 'puddling' clay (203) to a depth of 0.3 m. Pottery dated *c* 1675-1775 and clay pipe pieces of late 17th/early 18th century date were recovered from this layer, together with a Purbeck marble pavior fragment. The centre of the canal contained no clay and came down to natural gravel. No contemporary ground surface associated with the canal was identified.

The canal appears to have been abandoned and then infilled (event context 213). The revetment walls were dismantled or demolished, clay layer 203 was covered by a thick layer of large rounded gravels and limestone rubble (205); a tree hole containing pottery dated *c* 1675-1800 was formed on the north side of the canal (211) adjacent to wall 210 and all deposits on the north side of the former canal were overlain by a layer of gravel (214). Presumably the puddling clay (203) at the centre of canal was scoured away by labourers to allow the water to drain when demolition took place and overlying the centre of the abandoned canal was a layer of grey-brown silty clay (202) with brick fragments, stone and flint gravel to a depth of 0.4 m. Pottery dated *c* 1675-1775 was recovered from this layer.

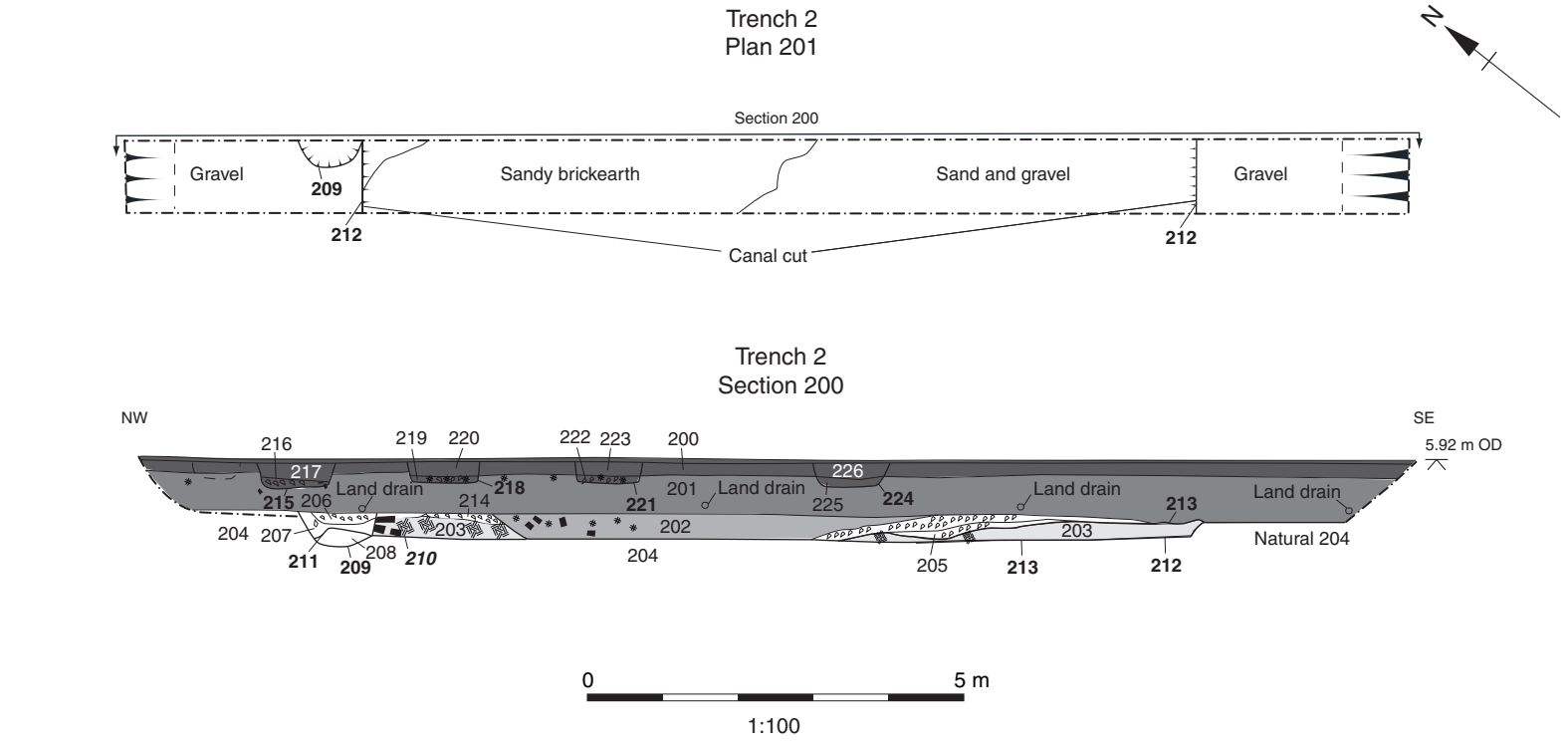

Figure 3: Trench 2, plan and section of Buckingham Canal

Layer 202 was covered to a depth of 0.6 m by an extensive layer of brown silty clay (201) that contained a series of drainage pipes aligned NE-SW: these appear to have been laid at the same time as the clay. Layer 201 contained pottery dated *c* 1770-1800, burnt stone and a sandstone slab. All of these actions seem to have been part of the same operation to consolidate the ground above the site of the former canal. A series of four square shaped holes (215, 218, 221 and 224) were observed in section cut into layer 201 - these presumably represent small tree or shrub planting beds and are probably of Victorian date. The features were overlain by the present topsoil and grass (200).

Trench 3

The 10 m long NNE-SSW aligned trench (not illustrated) was opened north-west of the Palace near to the summer house, to establish if any trace of the Goring Great Garden wall, Buckingham's Octagonal Garden wall or any earlier property boundary existed here, as suggested by initial historic map rectification. Natural flint gravel (312) was exposed at a depth of 0.85 m at the south end of the trench. The gravel had been truncated by a cut that was visible in the trench end (306), sloping perceptibly from south to the north against the gravel. Clearly not a ditch, as no corresponding cut line was visible further along the trench, the cut appears to represent a truncation event, presumably removing previous soil layers here, and above which layers of large rounded flint gravels were laid (layers 313, 303, then layers 307 and 305) to a depth of 0.65 m. All of these layers were clean with no soil or other inclusions present. The action was interpreted on-site as the replacement of the original soils/ground surface with materials that would provide better drainage. However refined map rectification was made possible by the location of Buckingham's canal, and this now suggests the gravel represents a pathway as seen on Rocque's map of 1746 (see Fig. 2).

Upper gravel layer (305) was overlain along the length of the trench by a compact 0.2 m thick layer of red/brown clay silt (302). A single linear feature (308) cut this layer, possibly a flower bed feature or defunct service/drainage trench: the fill contained brick fragments and modern glass. Above lay a grey-brown clay loam soil (301 = 304) with gravel, brick and tile fragments of 17th -19th century date to a depth of 0.25 m. Of note were the discovery in this deposit of a fine diamond (?) studded earring (sf. 300), a re-deposited flint scraper of probable Mesolithic or Neolithic date (sf. 301), and a clay pipe piece with faint traces of lettering of 19th century date (see finds reports below). A substantial quantity of 18th and 19th century pottery showing signs

of wear was also recovered from the layer. At the north end of the trench was an irregularly shaped tree hole (311) that measured 2.11 m across and 0.8 m in depth, with its fill sealed directly by the thin grass and topsoil (300). The removal of the tree appeared to have been a very recent event, so it may have been one of the trees in this part of the site depicted on the 1869 OS Survey.

Trench 4

The trench was excavated due south-west of the rear steps to the Palace, on the basis of high amplitude responses from Ground Probe Radar plots & gradiometer interpretation. The trench was positioned on the suggested site of the steps that once led down from the terrace of Buckingham's Garden to the north end of the ornamental canal. The trench was 2 m square and hand-excavated to a depth of 1.12 m (Fig. 4, Section 400).

At the base of the trench was a layer of clean yellow-brown sandy gravel (406), interpreted as the natural, overlain by a 0.42 m thick layer of grey-brown silty clay (405) that contained brick fragments and four pieces of clay pipe: a near complete bowl dated *c* 1640-1660 (or earlier) and two other bowls of early to mid-17th century date were recovered from the layer. Pottery dated between 1550-1700 was also recovered, giving a possible date for the context as around 1650. Layer 405 was overlain by a 0.05 m thick layer of sticky grey clay (404) that contained five pieces of clay pipe (probably from one pipe) including a plain bowl dated *c* 1660-1680. Pottery of 16th to 17th century date was also recovered from this deposit. The layer was very thin, and is likely to represent a trampled layer or a very thin former turf line.

Above 404 was 0.18 m thick layer of compacted mortar including broken bricks and stones (403) with three clay pipe pieces including a stem of 17th-18th century date and two stems of 18th/19th century date. Several examples of bricks from this layer were dated to the late 18th-early 19th century. Above was layer 402, a compact yellow-brown silty clay up to 0.4 m deep that contained pottery dated *c* 1820-1900, four clay pipe pieces dated 1800-1850, including a fluted bowl with maker's initials and brick, and roof tile fragments dating from the mid 18th to 19th century. A single 'bottle brick' (dated *c* 1785-1825) was present within this layer. A 0.2 m thick layer of clean compacted silty clay (401) sealed the underlying layers, in turn covered by topsoil (400). The build up of soil excavated here appears to be an intact sequence, with no later intrusive features, beginning with soil containing finds dated to the mid-17th century (possibly Civil War activity) and culminating with a clay sealing layer (401) overlying a mid-19th century soil horizon.

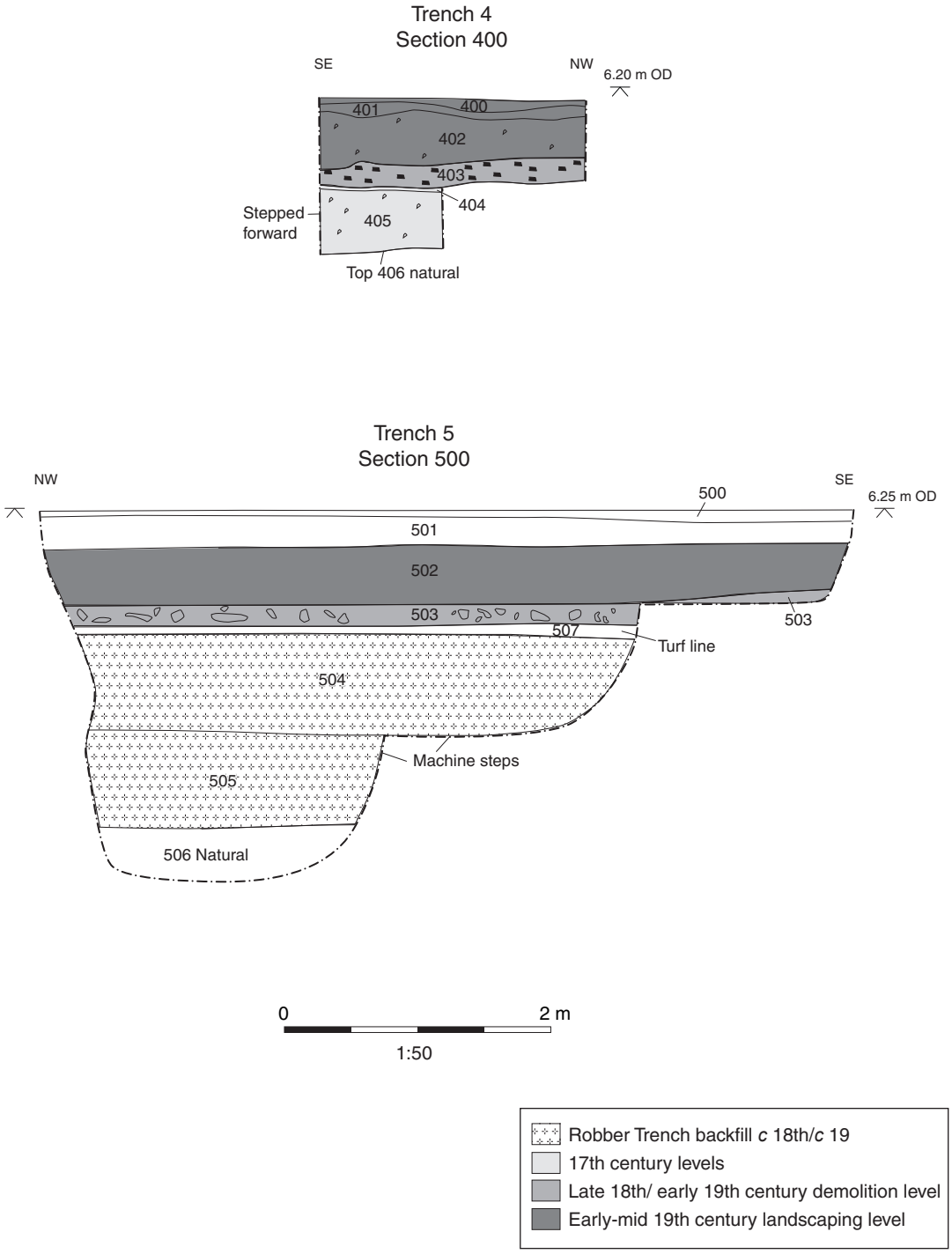

Figure 4: Trenches 4 and 5, sections

Trench 5

The trench was excavated in the east corner of the lawns, and was located here on the basis of auger cores that suggested clay and alluvial deposits at depth. Evidence from the resistance survey indicated a hollow or natural or topographical feature. The trench was 6.2 m in length and the depth of deposits meant that the trench was 2.8 m at its deepest point at the north-west end (Fig 4, Section 500). The top of the natural red-brown gravel (506) was reached at a depth of 2.4 m at the north-west end of the trench in a deep machine-cut sondage. The gravel was at least 0.4 m thick so at its deepest the trench was 2.8 m deep. Health and safety considerations prevented close inspection of the deepest parts of the trench. The gravel was overlain by a 0.7 m thick layer of loose grey sandy silt (505) containing substantial quantities of broken bricks, tile and mortar fragments. The layer was, however, undated.

Above lay a 0.74 m thick layer of loose reddish-brown sand and gravel in a grey-brown loam (504) with up to 50% inclusions of brick fragments, mortar pieces, tile fragments and a fine tooled broken ashlar stone block. The layer contained numerous examples of `bottle bricks', hollow hard-fired ceramic bricks used for roof vaulting, some with central circular perforations. The bricks date to the late 18th to early part of the 19th century and were specifically used in the period *c* 1785-1825. Layer 504 was overlain along the deepest part of the trench by a 0.1 m thick layer of sticky grey clay loam (507) that was devoid of inclusions. The clean nature of the deposit suggests that this was a former turf line/soil accumulation. Above 507 was a distinctive 0.16 m thick horizon of white/grey mortar, silt and sand (layer 503) combined with numerous bottle bricks, London Stock bricks (dated to the late 18th -19th century), roof and floor tiles, broken Oolitic limestone ashlar blocks and York Stone paving slabs; several nails were also recovered. The artefacts give a general date of 1785-1825 for this deposit, though stratigraphically it post-dates the formation of the potential soil horizon, so the later date of its formation remains unclear. It is likely, however, to be either a layer formed during demolition works or the spreading of materials across this part of the site during construction works.

Layer 503 was overlain by a 0.42 m thick layer of compact slightly yellow-brown clay (502) with occasional stones that extended along the length of the trench. The layer was similar to and probably the same deposit as 402 in Trench 4, and represents grounds levelling after the building work campaign of the 1820s. Above 502 was a compact grey clay loam with occasional small brick fragments (501), overlain by the present topsoil and turf (500).

FINDS AND ENVIRONMENTAL

Pottery

John Cotter

A total of 100 sherds of pottery weighing 1008 g was recovered from the excavations. Nearly all of this is post-medieval (*c* 1500-1900) with two sherds of residual medieval pottery.

Overall the pottery assemblage is in a poor condition and is quite fragmentary and abraded, although a few sherds have survived in fairly good condition. A complete profile of an 18th-century London stoneware tankard can be reconstructed, although this is an exception to the general rule.

The pottery has an overwhelmingly 18th-century dating emphasis. Two thirds of the pottery assemblage (by sherd count) came from the lining and later back-filling of the known 18th-century canal (Trench 2). The remaining pottery sherds mostly came from garden soils and other horticultural features in the other excavated trenches. These included 16 definite 19th-century sherds.

The character and composition of the assemblage is fairly unremarkable and typical of post-medieval domestic pottery assemblages in the London area. Only the main types and a few residual earlier types, which are of some interest, need be mentioned here. Creamware, a refined tableware produced in the Midlands potteries and in Yorkshire, has a fairly restricted currency of *c* 1770-1830, especially the fairly plain types represented here. The commonest post-medieval types present include tin-glazed earthenwares and red earthenwares. Tin-glazed earthenwares (sometimes known as delftwares) were produced at several London potteries from the late 16th century until around 1840. The fabric and form variants present from this site however are mostly late types of the period *c* 1675-1800. These include a few plain white and decorated tablewares such as dishes, bowls and part of a possible ‘salt’ - a small goblet-like container for table condiments - and parts of two or more chamber pots. The latter, perhaps, may have been emptied into the open canal. One or two pieces of decorated 17th- or early 18th-century tin-glazed dishes (known as ‘chargers’) are also present, possibly as residual or curated pieces. The overall composition of the assemblage suggests back-filling of the canal ended during the period *c* 1770-1800.

Post-medieval red earthenwares were produced at numerous London and regional potteries over a very long period of time and can be difficult to date closely from small fragments. Most of the pieces from this site appear to be glazed storage and serving vessels of 17th- or 18th-century date. One or two pieces, from a 17th century context in Trench 4, may represent early flowerpots - as opposed to later mass-produced Victorian flowerpots. Three sherds of yellow glazed Surrey/Hampshire Border whiteware came from the same 17th-century context. The tankard profile from the canal backfill (context 201) is a typical 18th-century London salt-glazed stoneware tavern tankard and was produced at one of the many Thames-side stoneware potteries, such as Fulham, Lambeth or Vauxhall. Dated and inscribed examples known from museum collections span the whole of the 18th century but do not occur in exactly this form either before or after this date. Unfortunately this example is plain and cannot be closely dated, although the base moulding is one of the commonest mid to late 18th-century types. A single sherd of a Staffordshire white salt-glazed stoneware tankard (*c* 1720-1780) was found in the same canal context.

A single jug handle fragment in salt-glazed German Frechen stoneware and a small fragment of a Dutch red earthenware cauldron represent common imports of the period *c* 1550-1700, both residual in their contexts. Other residual wares include four sherds of probable Tudor date in a type of late medieval or early post-medieval London glazed red earthenware formerly known as Guy's Hospital ware (*c* 1480-1650). These include a bowl sherd with internal white slip and a probable bottle or jug sherd with traces of white slip decoration. The earliest pieces in the assemblage, also residual, are of medieval date (Trenches 1 and 2). These comprise two small sherds of South Hertfordshire Greyware dating to the 13th or 14th century. The sherd from Trench 1 is from the shoulder of a jar/cooking pot form and is in a fairly fresh condition. These few earlier pottery types are of some interest in that they indicate at least some level of human activity in the area from this date.

19th-century wares are uncommon from this site, probably because these areas were landscaped early in the century when the palace was under construction and little material was discarded on the grounds thereafter. These include a few pieces of common tablewares and stoneware bottles of the period and a few sherds of terracotta flowerpot. An unusual, flat, unglazed, biscuit whiteware or porcelain object from garden soils might be a gardener's label for marking the

position and identity of seedlings and other plants - the matt surface would be suitable for marking with a pencil.

Clay pipe

John Cotter

The excavations produced a total of sixty-three fragments of clay pipe (weight 304 g: full details are held in the archive). Nine almost complete bowls were recovered, all but one of which date to the 17th century. These mostly comprise pieces dated *c* 1660-1680 with one or two from *c* 1640-1660; the majority are plain and un-marked. No definite 18th-century pipes were identified.

Only one bowl dates to the 19th century, although other decorated stems are also of this date (see below). The shape of the bowls can be paralleled generally elsewhere in southern England (see Oswald 1975). A 'chinned' bowl (context 201) is a type more commonly found further west in central southern England and Bristol (*ibid*. fig. 8.4-6). The 17th-century pipe bowls associated with late 18th century pottery in contexts 201 and 202 (abandonment of Buckingham's canal, Trench 2) indicates that these are residual.

A near-complete bowl of *c* 1640-1660 from context 405 may contain a lump of burnt tobacco or charcoal mixed with soil. The single early-mid 19th-century pipe bowl from context 402 (Trench 4) is of characteristic fluted type with moulded foliage seams and an unclear maker's mark on the spur - the surname initial is certainly 'B', the forename is possibly 'C' or 'I'. No London maker with these initials can be identified.

Two decorated 19th-century stem fragments with makers' marks were also found: that from context 103 (Trench 1) is possibly of early 19th-century date and has running foliage decoration on both sides with gaps for the maker's name and place of manufacture which were written in full in relief. The words '(----) BROWN/WESTMINSTER' can be identified, and the piece may be identified as a product of either Sarah Brown of Great Peter Street, Westminster, who died 1828, or William Brown of Westminster, active 1805-44 (Oswald 1975, 132). A similar but very worn decorated stem fragment occurs in context 301 (Trench 3). This has foliage seams and side foliage. A possible forename initial 'H' can be identified and the letter 'N', which may be the last letter of the surname - again written in full.

Jewellery

A diamond (?-unconfirmed) and gold pendant ear-ring or necklace piece was retrieved from Trench 3 (Fig. 5). Photographs of the jewellery were sent to Daniella Mascetti, Senior Director of Jewellery at Sotherby's and Natasha Awais-Dean and Richard Edgcumbe at the British Museum. The comments received concur that the 'open-backed' style of the piece suggests a Victorian or later date for its manufacture. The piece has been deposited with the Royal Collection for further research.

Ceramic building material

Cynthia Poole

A total of 207 fragments of ceramic building material weighing 58.877 kg, and seven fragments of stone roofing weighing 351 g were recovered, representing both medieval and post-medieval material.

The medieval assemblage

The medieval assemblage is small, comprising mainly roofing. One fragment of glazed peg tile can be dated between the 13th and 15th century. The stone roofing comprises slate of pale greenish or bluish grey colour of Devonian origin, which was being shipped to London between the 12th and 16th centuries. A very worn, probably reused, fragment of decorated glazed medieval floor tile dates broadly to the 13th -15th century. The pattern of decoration was unclear, but two inscribed lines were visible together with remnants of cream pipe clay and brown glaze. The character of this material indicates the most likely source is one of the medieval hospitals known from historical records to have existed in the area of Westminster and Victoria, such as that underlying St James's Palace, though the possibility of a medieval building associated with the Ebury estate should not be entirely rejected.

The post-medieval assemblage

The roofing material was predominantly flat ceramic roof tile, sometimes identifiable as peg tile, together with small quantities of pantile and ridge tile. The majority broadly dates to 17th-19th century, but the pantile is likely to belong to the latter half of this range. All the stone roofing is of slate, dark grey Welsh slate, probably of 18th century or later date.

Four pieces of curved brick of slightly different sizes came from Trench 5, with an internal curved surface; both width and thickness tapered. The outer surface has been shaped to a chamfer to create a polygonal shape and a V-groove impressed in one end. Some of the curved surfaces had sooting or a black residue: this and their form suggests they were used in chimney construction and a dribble of brown glaze on one suggests this curved surface may have been originally glazed.. All had part of the makers stamp, of which only part survived as: (--)[T or I or H]ORT **:** | (P)[A]TENT. Patents were not established until after 1836, suggesting these are of mid-19th century date or later.

All the bricks equate broadly with British Standard Size indicative of a post-medieval date of 17th -19th century. Variation in size and characteristics may reflect chronological variation. Diagonal pressure marks found on the stock bricks are typical of the 17th and 18th centuries and start to be superseded at the end of the 18th century by longitudinal pressure marks. Two examples had an incipient shallow frog, in one case hand made and in another impressed, both likely to represent early examples of this feature, possibly of late 17th century date. All the bricks from Trenches 4 and 5 were made in the 'London stock' fabric. London Stock bricks were first produced in the Sittingbourne area of Kent *c* 1708 (Twist 1984), but they were not produced in quantity until the late 18th and throughout the 19th century. A high proportion of the bricks were overfired or refired, this could derive from the manufacturing process or as a result of an intense house fire.

A significant number of bottle bricks were found in Trench 5 and a single fragment from Trench 4 (Fig. 5). These are hollow wheel-thrown bricks with a flared profile cut square at the base. The base and top are flat and the top usually has a small central perforation. In some cases, two small square perforations have been made in the sides of opposed basal corners. In this group several half-bottle bricks have been formed pre-firing by slicing whole ones in half leaving them open-backed, but some appear to be moulded differently and are totally enclosed. Two blocks of bottle bricks set in mortar were also recovered showing the method of construction. Bottle bricks were designed for use as light-weight vaulting and invented in France in 1785 by Eustache St Far (Davey 1961). They were used for a relatively short period, between 1785 and *c* 1825.

A small quantity of flooring was found including a quarry tile, probably of late 16th to 17th century date, and two brick pavers probably of 18th to early 19th century date.

Two examples of drainage pipe comprise one small fragment from a typical glazed 19th century sewer pipe and a complete open topped drain pipe with a U-shaped cross-section, which would have been capped with some sort of brick or tile. Calcium carbonate deposits were present along the base of the latter, precipitated from water flowing though the pipe. A makers stamp on the exterior read: W. SOAMES. | DRAIN. This type of drain was in use *c* 1820-1830.

Discussion

The stratified deposits in Trenches 1 and 3 have been interpreted as landscaping activity and the variety of forms and date of building material from these contexts suggests it incorporated pieces derived from several phases of buildings. The burnt brick and pavior from Trench 1 may derive from the conflagration of Lord Goring's House in 1674, whilst a pantile must derive from a later 17th or 18th century building. Ceramic building material from Trench 3 dated broadly between the 17th and early 19th century with drain pipe and pantile attributable to the latter end of this date range.

Most of the ceramic building material from the ornamental canal in Trench 2 comprised bricks found in the clay lining (203) or within the backfill following its disuse. It seems likely that material assigned to 203 relates to the backfilling, becoming embedded in the clay, unless the canal was actually lined with a brick wall. Roof and floor tile was found ranging in date from medieval to late 18th/early 19th century indicating backfill materials came from a variety of sources. The bricks which dominated the group may be subdivided into two or more groups on the basis of size and finish; the first no earlier than the early 19th century, whilst a few London Stock bricks are unlikely to date much earlier than the late 18th-19th century. It is possible therefore that the rubble of the infill layers was drawn from a number of sources. The quantity suggests these were derived from demolition of associated structures when the canal went out of use, possibly including revetment wall 210, traced at the side of the canal. The majority of the bricks are possibly of late 17th or 18th century date and some may have been reused from one of the earlier buildings, as supported by the presence of burnt (or overfired) brick as well as an architectural brick with chamfered edge.

The assemblage from Trench 4 comprised mainly mid 18th - 19th century material. The bricks from the layer of demolition debris (403) were all made in a fabric similar to London Stock and most appeared to be overfired. One had a shallow incipient frog, that may indicate a date soon

after 1760. From the overlaying clay make-up all the material was late 18th or early 19th century.

The layers of demolition debris (503 and 504) in Trench 5 produced a large quantity of bottle bricks, which were associated with ordinary bricks very similar to those found in Trench 4. Bottle bricks have also been found at Hampton Court (Poole 2006), where it was suggested they were used in the construction of a garden wall. The mortar used with the bottle bricks was of the same type at both palaces. No major construction work is recorded at Buckingham Palace during the short period of their production between 1785 and *c* 1825. It is unlikely that they had been utilised in construction work in the early 1820s such as the Royal Mews or in the alterations carried out by John Nash between 1826 and 1830, as the deposits containing the bottle bricks are immediately overlain by layers attributed to Nash's landscaping of the gardens. This suggests they come from demolition of structures associated with Nash's work, possibly garden walls or raised terraces, which had small cellars or recesses constructed below. However in the same deposits fragments of peg and ridge tile and the stamped chimney bricks, as well as a floor pavior implies the demolition debris was from a building or buildings of late 18th - mid 19th century date.

Architectural stone

Julian Munby

Pieces of worked stone from the excavation mostly consist of parts of ashlar blocks in fine limestone, presumably from the building activities on the site including demolition and construction works. There are also fragments of slabs (probably paving stones) in sandstone, Purbeck marble, and York Stone, mostly from layers in Trench 5. The pieces are dateable only in association with other finds; the stone is catalogued fully in the project archive.

Small finds and glass

Ian Scott

A total of sixty-eight small finds were recovered, with full details held in the site archive. Trench 1 produced a copper alloy cast fragment with screw thread, possibly a fuse from an artillery shell of World War II date. Also recovered were a plain flat button and a stud or rivet, both copper alloy. Trench 2 finds included a copper alloy cartridge case, possibly from a pistol, and a small

lead toy horse (context 200). The horse is clearly galloping although its legs are largely missing. Most finds came from the layer over the line of Buckingham's defunct canal and include a probable spud or hoe, a heel iron, and a small horseshoe-shaped object of uncertain function. Finds recovered from the machined spoil include a lead musket ball for a smoothbore musket, a small off-cut of lead, a copper alloy tack with large domed head, possibly for upholstery or harness use, and a copper halfpenny, probably of George III. There is also small trading token (Fig. 5) inscribed: (obverse) CHARLES STVRTON AT . . . (reverse) THE SWAN IN THE STRAND. The obverse has the initials 'CS' in the field, while the reverse has an image of a swan. This token dates to the mid to late 17th century (cf Burns 1855, No. 1123). Also found was a button (Fig. 5) inscribed on the front: G.A.GREEN * HIGH RD, KNIGHTSBRIDGE. George A. Green and Son, tailors, had premises at 19 High Road, Knightsbridge (The Business Directory of London, 1884, Alphabetical Section, 266). The back of the button has the maker's name: FIRMIN & SONS, LONDON. They had premises in London, in the Strand, Warwick Street and Regent Street, in Dublin and in New York and had manufactories in London and Birmingham. According to the same Business Directory (Alphabetical Section, 223), this firm were:

Army contractors, naval, military & general button mfrs, die sinkers, & medalists (sic), accoutrement makers, gold and silver lacemen and embroiderers, sword cutlers, and wholesale trimming & woollen warehousemen.

The glass assemblage comprised 28 fragments, including 11 fragments of window glass. All the window glass is of 19th- or 20th-century date. The remaining glass comprises sherds from bottles or jars, and possibly other vessels. With exception of one possible 18th-century wine bottle base, none of the vessel glass dates earlier than the 19th century.

Flint

Hugo Lamdin-Whymark

Three flint flakes (contexts 101, 301, 402) and a bladelet (SF 301, context 304) were recovered from the excavations. The flints exhibit heavy post-depositional edge-damage and are clearly redeposited in later archaeological contexts. Two of the three flakes were struck using a hard hammer percussor, such as a quartzite pebble, and one exhibits platform-edge abrasion. The flakes exhibit few technological traits to assist with dating, but a Neolithic or Bronze Age date is most probable. The bladelet is of narrow proportions measuring 32 mm long by 10 mm wide.

The dorsal surface of the bladelet exhibits the scars of previous blade removals indicating it was struck from a core aimed at blade production; a technological technique most typical of the Mesolithic and early Neolithic.

Other finds

A small quantity of animal bone was recovered from the excavations, but is of limited value for interpreting the site. Details of the assemblage are held in the project archive.

Environmental (bulk) samples

Dawn Irving

Three bulk samples were analysed: two shrub/tree hole soils and the clay lining the base of the canal. Samples from the tree holes contained little apart from coal pieces (possibly used as a fertiliser) and modern grass contaminants. The clay lining the canal proved to be a clean deposit with no inclusions.

Auger survey summary

Emma Tetlow, Ben Gearey, Jane Sidell

The auger survey at Buckingham Palace was undertaken to establish the existence of fluvial deposits relating the former course of the River Tyburn (see Fig. 2 for survey locations). It was also hoped that this survey would identify the former course of the man-made canal, known as the Duke of Buckingham's Canal, constructed in 1703 by Henry Wise. The detailed results are contained in the site archive.

Stratigraphy

With the notable exception of Core 1, the auger survey provided little evidence of stratigraphic variation across the site. A matrix of sands and gravels with some finer silts, supported larger clastic material which varied from angular to sub-rounded. At approximately 1.42-.7 m, the depth was inconsistent across the site, this gave way to subsoil containing large quantities of crushed brick, mortar and other construction detritus before finally giving way to topsoil.

Core 1 was more complex and consisted of four intercalated layers of redeposited London Clay, sands and gravel. This was interpreted as the possible course of the Duke of Buckingham's canal. The significant stratigraphic variance between this core and the other four would suggest a different management strategy was employed in this part of the garden. Documentary evidence also links this section of the garden to the location of the canal.

The Duke of Buckingham's Canal – Trench 2 and Environmental Survey

Evidence of the canal in the stratigraphic log record was limited, Core 1 produced several layers of clay interpreted as re-deposited London Clay (1.39-1.46 m and at 1.55 m). On the basis of this auger core, Trench 2 was opened to establish the exact nature of this stratigraphy. Whilst any direct evidence of the canal was absent, a sample of the clay was removed for environmental analysis. The material was sieved using the standard procedure for waterlogged plant remains (Kenward *et al*. 1980). Whilst no insect remains were recovered, several birch seeds (*Betula* spp.) and spindles of *Sphagnum* moss were extracted from the sample. These will be discussed in greater detail below. Overall, environmental evidence from this trench is limited and precluded further meaningful interpretation.

The River Tyburn

Sedimentary evidence of the River Tyburn was ambiguous in all three cores (4, 5 and 6) sunk to establish the location of the River. Distinctly organic deposits strongly associated with relict palaeochannels (eg Brown *et al.* 2007; Howard and Macklin 1999; Passmore *et al*. 2006), were absent. Fine grained alluvium, deposited as a result of over-bank flooding, was observed in Core 5 (2.2 m), and on the basis of this Trench 5 was opened to further establish the stratigraphy. This band of alluvium proved to be extremely fine (>50 mm), overlying 0.2 m of silt which gave way to medium sand. A small sample of this alluvium was extracted for environmental analysis, small quantities of both seeds and insects were recovered from this sample, and these are discussed in greater detail below.

Biostratigraphic evidence from the Canal and Tyburn trenches

Palaeoenvironmental evidence from both trenches was extremely limited. The list of herbaceous and coleopteran taxa recovered from each trench and their environmental implications are outlined below

Canal - Trench 2

Birch (*Betula* spp.) seeds.

Several seeds were recovered from the clay deposit. It seems unlikely that the presence of these seeds is a result of modern contamination. Birch is found on light soils in heathland, scrub, woodland margins and gardens (Nicholson and Clapham 1975).

Sphagnum moss.

Sphagnum is a moss associated with acidic raised bogs and mires, eg Cors Caron and Cors Fochno, both in West Wales. Probably the most interesting environmental find, this may indicate that the clay from which this was recovered had been transported to the site. *Sphagnum* spp. is associated with very specific acidic environments, such as raised bogs and mires. Such environments are unlikely to have existed in London or its environs during the historic period.

Trench 5 – Prehistoric Trench

Otiorhynchus spp. – common name 'vine weevils'.

A single head capsule of this family was recovered, speciation is not possible using the sclerite recovered. The family lives in a wide variety of habitats (Koch 1992).

Plateumaris spp. – common name 'reed beetles'.

A fragment of the elytra (wing case) was recovered. There are four members of this family and they are all associated with wetland grasses, sedges, reeds and tall, emergent, aquatic plants such as yellow flag (*Iris pseudocorus*) (Menzies and Cox 1996).

Sedge (*Carex* spp.) seeds.

Several seeds were recovered the preservation of which was fair. Sedge is difficult to identify to species level. Sedges are found in all types of habitat and are often found in floodplains and other damp environments (Fitter *et al*.1984).

The biome indicated by these species is commensurate with typical floodplain vegetation, lush and tussocky with tall emergent reeds at the edges of the river.

Discussion

Stratigraphy and sedimentology

The deposits beneath the gardens of Buckingham Palace have been subject to intensive anthropogenic manipulation since the post-medieval period. This renders the interpretation of these deposits problematic, particularly any attempt to define the extent of the canal or conclusively establish any former palaeochannels of the River Tyburn through auger sampling.

Beneath the modern topsoil, a deposit of mixed alluvium containing large quantities of crushed brick, mortar and other artefacts underlies the entire site. It seems likely that the inclusion of this material within the alluvium was an effort to stabilise the boggy, infilled palaeochannel or wetlands surrounding the channel which would allow the successful establishment of ornamental gardens on previously unusable wetter areas. Similar activity has been observed in the medieval district of the modern City of Coventry. At Spon St. the primary function was to reclaim marshlands, associated with the River Sherbourne, and render them useable for the expansion of industry into the area from the 12th century onwards (Soden 2005, Tetlow *et al.* 2006).

The most extensive 'natural' alluvial deposit, recovered from Cores 4 and 5, suggest subtle changes to the flow regime of the River Tyburn during the earliest episodes of deposit formation. Sedimentary evidence suggests that the flow regime was relatively rapid, probably associated with periglacial activity, depositing sands and gravels; over time the speed of flow decreased depositing coarse sand. The stratigraphic evidence reflects further 'fining up' and ultimately a transition to very slow moving, tranquil waters, with the deposition of very fine-grained alluvium composed of silts and clays, apparent in Trench 5 and Core 5.

With no organic material to submit for radiocarbon dating, establishing an exact chronostratigraphy for the deposition of these facies is difficult. It is unlikely that the flow regime of the Tyburn was strong enough to transport such coarse grained material (Sidell pers. comm.), hence the alluvial architecture at the site is more closely associated with River Thames (Sidell pers. comm.). The early Pleistocene evolution of the middle and lower Thames Valley remains open to some debate (e.g. Bridgland 1994, 1995; Gibbard 1985, 1994), although both authors do agree on the later stages of development, post Ipswichian interglacial (OIS5e, *c* 250-125ka BP). The sands and gravels which underlie the site are likely to be part of the of Kempton Park gravels, deposited during OIS3, *c* 17,000 BP, the Langley Silt complex caps this deposit, traces of which were possibly found in Core 5 (Sidell *et al.* 2000). The course of the River Tyburn would have incised these sands and gravels, not deposited them (Sidell pers comm.).

The sands and silts which cap these coarser deposits are likely to be re-worked Pleistocene sands, entrained in relatively high energy condition as the river channel migrated across the floodplain during the Loch Lomond stadial (*c.* 11ka BP) and the early Holocene (>10ka BP). (Sidell *et al*. 2000). With the final termination of glacial activity, fine grained, alluvial sediments are deposited across the floodplain, limited evidence of this activity was recorded in the auger transect at Buckingham Palace. This finer band of silt and clay which overlies the early Holocene sand was deposited in more tranquil waters sometime during the early to late Holocene.

Biostratigraphy

The limited nature of the biostratigraphic evidence, particularly from the canal trench, severely restricts environmental interpretation. It is, however, not unfeasible to suggest that the environment surrounding the River Tyburn was typical of that of many British Rivers during the early Holocene. In the Trent catchment, environmental evidence from early Holocene deposits suggests floodplains were composed of a mosaic of vegetation types with climatic amelioration at the end of the Loch Lomond stadial. The area was initially colonised by predominantly low growing, tussocky sedges and taller reeds in the floodplain wetlands, and by birch and heather on the drier terraces (Howard *et al*. 1999; Tetlow *et al*. 2000; Greenwood and Smith 2005; Smith and Howard 2004). This eventually gave way to mixed 'climax' woodland composed of oak (*Quercus* spp.), ash (*Fraxinus* spp.) and holly (*Ilex* spp.) (Sidell *et al.* 2000).

Conclusions

Human agency has all but obliterated any further evidence of mid to late Holocene floodplain dynamics at Buckingham Palace. The chronostratigraphy extrapolated from the sedimentary and stratigraphic evidence is extremely broad and by no means conclusive, the absence of any substantial material suitable for radiocarbon dating precludes any firm conclusions about the date of deposit formation. The site clearly lay at the very periphery of the floodplain exploited by the River Tyburn during the early to mid Holocene.

Limited environmental evidence suggests vegetation across the floodplain of the Tyburn during the early Holocene was similar to that of many British rivers.

INVESTIGATION DISCUSSION

The recent investigations represent probably the largest body of archaeological investigation at the Palace in recent times. The details of Flitcroft's work of 1744 are unclear, and were likely intended only to establish historic land boundaries (specifically the Mulberry Gardens Crown leasehold boundary over which Buckingham House had been built), while work over the last twenty years has tended to comprise small-scale test pits and watching briefs. Aside from flints and residual pottery, no archaeological evidence was recovered for the prehistoric through to the post-medieval periods.

17th century levels and other evidence

Trench 4 revealed evidence that could suggest the depth of the ground levels at the time of the Civil War, when the Goring Great Garden formed part of London's western defences. Clay pipes dated *c* 1640-1660 together with pottery that *could* be attributed to this period were located within a soil layer 0.7 m below the present ground level overlying natural gravel and lying beneath layers containing slightly later but still clearly 17th century finds. It is tempting to think of this lower soil layer and the apparently trampled soil layer above as having formed at the time when defence construction works were in progress and as Wright notes '..the disturbance was enormous, and there can have been little garden left after oxen and people swarmed everywhere in wet spring weather, building them' (Wright 1996, 98).
Regrettably no excavations could take place in the area of geophysical responses that might have clarified the nature of the structure depicted on Rocque's plan, located at the north-west salient angle of the Garden wall. It must remain speculative whether this is the site of '...a redoubt and battery....At the corner of Lord Goring's brick wall next the fields...' (City Resolution of 1643, quoted in Wright 1996, 98).

Likewise the outline of the Goring Great Garden wall - later Buckingham's Octagonal Garden wall - remained elusive and could not be definitively ascertained either through geophysical evidence or by the trenching. It may well be that the structure was largely removed during landscaping works. Time Team were, however, able to confirm that an extant 19th century parish boundary stone to the south-west of the present lake near Grosvenor Place marked one of the corners of the 17th/18th century boundary wall. This and the location of the Canal has served to more accurately place Rocque's map of 1746 over existing OS mapping.

Buckingham House: the ornamental canal

The canal dates to the period *c* 1703-1705 when works began at the new house for Lord Buckingham. The new building, complete with ornamental canal, is depicted on contemporary paintings, most famously Adriaen van Diest's oil on canvas (dated *c* 1703). The new house and the canal were aligned on the Mall - rather than replicating the sites of Goring and Arlington Houses that preceded it and which faced James Street to the south-east. Buckingham also extended his property to the north into the area of the former Mulberry Gardens and encroached on land in St. James's Park. The canal appears to have been revetted with brick walls, presumably in keeping with the construction materials of the new house. Documentary references and plans show us that it was flanked with lime trees. Little can be said about its period of use although the finds of pottery and clay pipe within the clay lining are certainly contemporary.

The canal was apparently a short-lived feature and the reason behind its demolition is unclear - the cost of maintaining the canal might have been a factor. Following the death of the Duke of Buckingham in 1721, the House and its grounds were maintained by his Duchess until her departure in 1742. Thereafter the house was used by Sir Charles Sheffield, the 1st Duke's illegitimate son, who sold (possibly reluctantly; but the impending reversion to the Crown of the Mulberry Gardens over which Buckingham House had been built left little choice) at the start of the 1760s. Gradual decline appears to have set in over these years, combined with changes in garden fashion that emphasised the English landscape style rather than the more formal arrangements of the previous century. Maps held by the PRO (detailed in Brown 2004, 44-45) reveal that in *c* 1725, when Charles Bridgeman composed his watercolour, the canal was extant and lined with maturing lime trees, with the gardens in high state of formality.

But by 1743, however, a survey drawing (RCIN 1150274) shows the site of the canal as two rows of trees only - the site is annotated as *Field* and no canal is shown. The key plan is, however, *A Plan of the Queen's Pal*ace (RL 29587), a watercolour on vellum survey for George III prior to his acquisition of the Palace from Sheffield in *c* 1760-2. The canal has clearly gone by this time, the lime trees are shown in rows but the plan is annotated *Pasture Ground* over the line of the canal. It would appear, therefore, that between 1740 and 1760 the canal had gone out of use and the project abandoned. Nothing is shown of the canal/tree avenue on Faden's map of 1813 so the abandonment of the scheme certainly pre-dates the massive rebuilding campaign on the site from the mid-1820s.

The distinctive layer of brick materials located above the 17th century soil levels in Trench 4, combined with the geophysical results, would appear to indicate the site of the steps leading from the terrace to the north end of Buckingham's Canal. Van Diest's painting portrays a flight of about six steps, while the steps are portrayed on Bridgeman's 1725 watercolour but not on subsequent plans, suggesting that they were demolished when the canal was infilled in the mid-18th century.

Late 18th/19th century demolition evidence

The depth and fills of Trench 5 suggest that this is the site of a deep robber trench relating to removal of the garden terrace walls. There is little in the documentary record to corroborate the archaeological finds from Trench 5 that imply demolition works, but the activities could pre-date Nash's building campaign. The garden terrace wall is clearly not depicted on Faden's map (1813). The period leading up to the re-modelling of the site in the 1820s saw great expenditure: in 1793, colonnades were enclosed to form a 'dry and commodius passage between the Palace and its offices' (HKW, VI, 261) and extensive building works between 1799-1807 included a new range on the north side of the House for servants (HKW, VI, 261). Either of these operations could give a context for the presence of the bottle-bricks on the site, usually used for lightweight roof vaulting, and found at depth within the robber trench fills and in layers above. It is also possible that the garden terrace wall had lightweight vaults for recesses.

Landscaping of the new grounds from the 1820s

The excavated evidence in all of the investigative trenches shows that thick layers of clay brickearth were imported to consolidate the ground, in places laid over layers of imported gravel to aid drainage, prior to the new lawns being laid in the early-middle 19th century. The evidence from Trenches 1 and 3 indicates that the former ground levels were removed wholesale in this process and reinstated with new materials. The OS map of 1869 shows the Palace grounds more or less as they are today.

Geophysical evidence from the Quadrangle and digital mapping: current state of knowledge

As part of the Time Team survey, analysis of historic maps was undertaken in conjunction with geo-physical survey in the area of the Palace main building and Quadrangle. Using rectified mapping it has proved possible to transcribe the Historic maps of 1744 (Flitcroft excavation plan) and 1760 (the Queen's House Survey) onto modern outlines of the Palace Buildings, thereby allowing comparison with geophysical survey results (Fig. 6).

The outline of the Mulberry Gardens was planned on the 1760 Survey prepared for George III. The survey was based on the Indenture Plan of 1743, and clearly shows the original area of the Mulberry Gardens (A) extending over the north-west part of Buckingham House and forecourt, with the south-east corner of the Gardens at the octagonal fountain in the forecourt. To the immediate east is a further strip of ground 'adjoining the Mulberry garden' (B). The east part of Buckingham's forecourt comprised land annexed from St. James's Park (D). Crucially, the 1760 Survey marks out a small rectangular area of land (C) leading from the octagonal fountain beneath the steps to Buckingham House. The plan is annotated 'C: - the piece of ground at the back door of Lord Goring's House'.

This almost certainly implies that the original Goring House frontage faced south-east towards James Street and that Buckingham House was indeed a radical change of alignment to face south-west towards the Great Goring Garden. The geophysical results within the Quadrangle, though not conclusive, appear to show the remains of the octagonal fountain, and in the south part of the Quadrangle, apparently linear anomalies that could be the remains of Blake's/Goring/Arlington House. This would then tie in with the suggested location of land at the '…back door of.....Goring's House'. Flitcroft's plan shows walls of small buildings within the Mulberry Gardens in what is now the north-west part of the Palace Quadrangle which may relate to the Mulberry Garden House or its ancillary buildings. Walls plotted in the south part of the Quadrangle clearly were not within the Gardens, and combined with the recent geophysics results and historic map analysis, appear to suggest a different building - i.e. most likely some part of the of the Blake's/Goring/Arlington House sequence.

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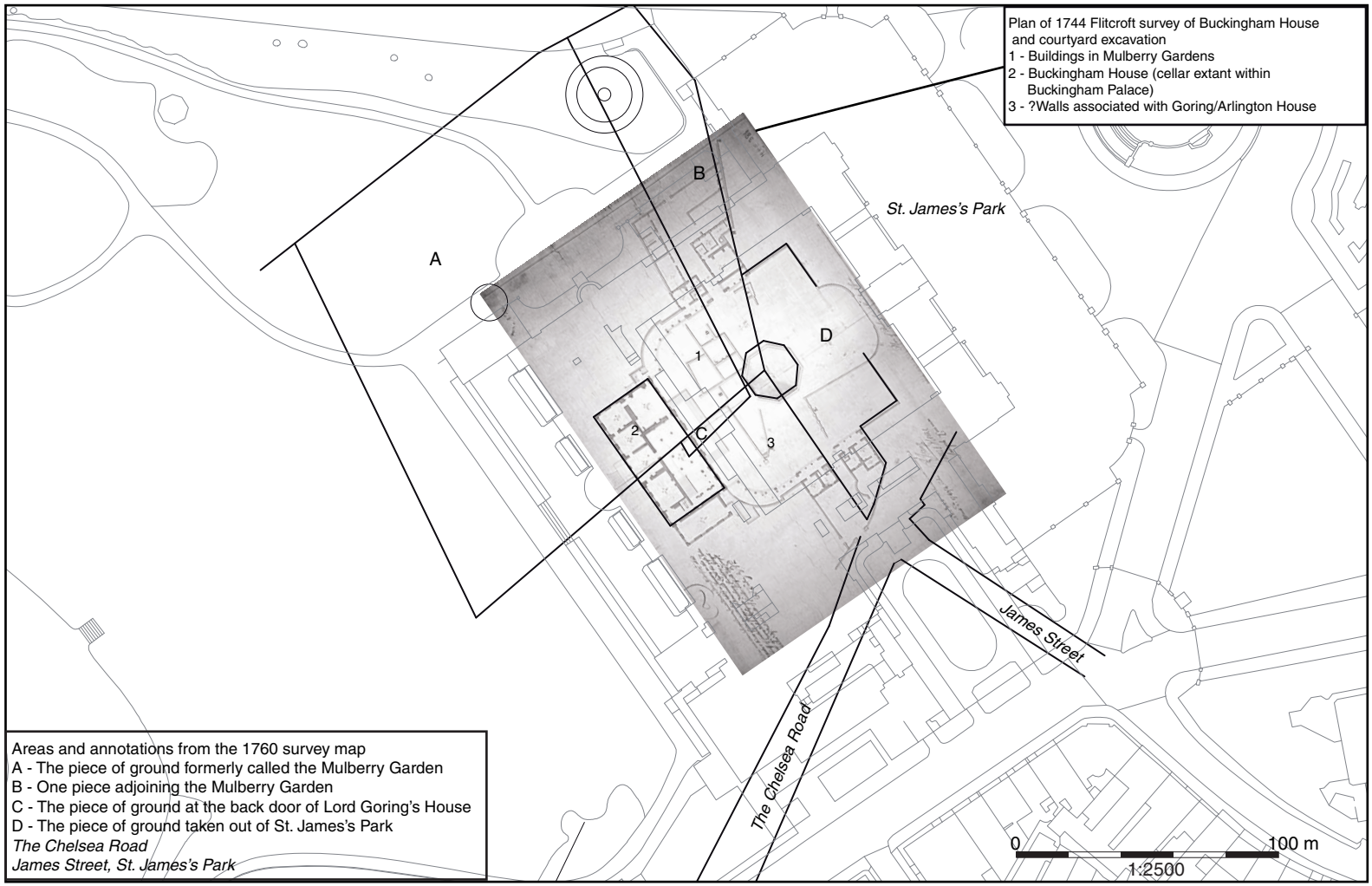

Figure 6: Flitcrofts Plan of 1744 and survey areas from 1760 over modern OS Map

and to all archaeologists from OA, the Museum of London and Wessex Archaeology who worked tirelessly throughout the hectic excavation and transmission schedules.

David Wilkinson of OA directed the project in conjunction with Time Team in the field; Richard Brown of OA provided overall project management, project design and liaison with Wildfire TV and Time Team/Channel 4. GSB Prospection's Project Co-ordinator was Emma Wood, assisted by James Adcock, Dr John Gater, Gill Taylor and Dr Roger Walker. The report illustrations were prepared by Amy Hemingway, Julia Moxham and Magdalena Wachnik. The text was edited by Alex Smith. The site archive comprising the records and finds has been deposited with The Royal Archives at Windsor Castle.

APPENDIX 1

Pottery table

Ctx	Date	No.	Wt(g)	Comments
TR2	C18th-eC19th	1	2	U/S. Worn bs white tin-glazed earthenware (TGE). Yellow fabric.
TR3	C18th-C19th	1	13	U/S. Burnt plate rim. Probably English porcelain with blue enamelled floral decoration in relief outlined with gilding. Gently scalloped rim edge also with gilded edge.
TR5	C17th-C18th?	1	5	U/S. Worn bs post-med red earthenware (PMRE) with greenish-brown glaze on ?internal surface.
101	C18th-eC19th	4	44	3x worn bss TGE, yellow fabric, only largest has vestige of white tin glaze - latter heavily coated in grey-brown ground salts or cessy deposits. Latter possibly a basal sherd but form unrecognisable. Also in context 1x bs (13 g) from shoulder of jar/cooking pot in medieval 13-14C South Hertfordshire Greyware in fairly fresh condition, dense, well-fired, wheel-thrown.
102	*c*1775-1900	1	2	Scrap of mass-produced Yellow ware (Midlands) possibly Victorian?
201	*c*1770-1800	32	574	3x Creamware incl plate rim (potentially to *c* 1830) but profile London salt-glazed stoneware tankard (*c* 1700-1800) suggests pre-1800. Tankard (13 sh) typically with iron-dipped upper half, lacking handle & frontal area. 7x PMRE. 1x black glazed 17-18C PMRE cup/mug base. 1x bs Staffs white salt-glazed stoneware tankard (*c* 1720-1780). 2x thick-walled white TGE sherds probably from the pedestal base of a chalice-shaped 'salt' (condiment dish) 18C. 1x bs London TGE charger dish with traces int blue floral dec 17-E18C. 2x sherds early PMRE (formerly Guy's ware) *c* 1475-1625 incl thick-walled ?dish sherd with int white slip under clear glaze & 1x sherd from thin-walled closed form ?jug etc with trace of white slip-painted dec (scrolling vegetal dec?) under patchy clear glaze - latter probably *c* 1475-1550 in style of Cheam redwares etc.
202	*c*1675-1775	8	63	2x joining white TGE chamberpot handle, prob London. 2x Surrey/Hants yellow Border ware dish bss. 1x Frechen stoneware 'bellarmine' jug handle *c* 1550-1750. 2x bss early PMRE (Guy's ware) prob 1475-1550 poss jug bss incl 1 white slipped under greenish-brown glaze (less likely both 13-14C London-type ware). 1x scrap poss 13-14C South Herts Greyware?
203	*c*1675-1775	15	24	Bss or scraps from 1-2 soft crumbly TGE vessels mostly with flaked-off glaze. Incl 1x rim poss from bowl. Other bss poss incl jar/chamberpot form. 1 with slight trace of blue painted dec. All yellow late London fabric.
205	*c*1675-1800?	1	76	Large beaded/hooked PMRE jar rim and trace of neck with ext decayed clear brown glaze but unglazed int - possibly an early flowerpot? Fairly worn. Prob 18C.
207	*c*1675-	9	5	8x scraps from 2x TGE vessels, only 1 vess (1 sherd) retaining glaze and trace

	1800			blue painted dec - prob from a dish. 1x bs Staffs/Midlands-type brown mottled glazed ware with yellowish fabric - poss jug/jar etc. Prob 18C.
301	C19th?	13	98	2x worn Creamware incl jar/chamberpot rim. 5x fresh modern-looking flowerpot in unglazed terracotta incl base with central hole - these poss take date well into 19C? 5x joining sherds in unglazed biscuit white Creamware or pipeclay from odd plate-like object 5 mm thick with straight-sided edge/rim which is tapered. Odd v regular zone of rusty discolouration - object poss of industrial/horticultural function - ?chemical apparatus/kiln-furniture etc or poss a gardener's planting label? 2x PMRE incl v worn jar rim. 18C sherds mostly v worn - perhaps from garden soil?
402	*c*1820-1900?	7	58	4x joining bss from brown salt-glazed modern ?English stoneware blacking or ink bottle. Latter with dense pale grey ?Derbyshire fabric but slight poss a German mineral water bottle. 1x v burnt purplish sherd ?PMRE with int bubbly glaze. 1x prob 17-18C bs Dutch red earthenware ?cauldron with stump of rod handle, traces of bold horiz rilling on body. 1x small bs prob green glazed Border ware from thin-walled neck area of small bottle/costel - prob *c* 1550-1650?
404	16-18C	2	11	Joining bss (recent break) from PMRE dish or bowl with int brown glaze. Poss fairly early - 16-17C? as hard-fired and good quality, not unlike Guy's ware.
405	*c*1650-1750?	5	33	3x small bss yellow Border ware (*c* 1550-1700) from 2-3 vess poss incl closed form and bowl. 2x PMRE poss taking date into 18C? These incl 1 unglazed bs poss from an early flowerpot & 1x thicker bs from lower wall jar form with int clear glaze and trace of perforation through wall - also poss an early flowerpot?
TOTAL		**100**	**1008**	

APPENDIX 2

Clay pipe table

Ctx	Spot-date	Total	Comments
u/s	*c*1640-1660	9	One stem Trench 5, ?C17th. From Tr. 2, three separate pipe bowls, all C17th. Most complete bowl *c* 1640-1660. Includes two plain broad circular heels
100	C17th18th	1	Small weathered stem fragment. Stem bore *c* 3 mm
103	eC19th	2	Includes SF. 101, stem decorated with plant sprays on either side and gaps between sprays containing maker's name in relief (one side) and place of manufacture (other side): (----) BROWN/WESTMINSTER. The 'N' reversed, and the MINSTER barely visible due to defective mould. Other stem plain. Stem bores *c* 2 mm makers
201	*c*1660-1680	18	Three almost complete bowls, *c* 1660-1680, with plain circular heels includes one 'chinned' bowl (?central southern England or ?Bristol). Minimum of six pipe bowls represented. One mouthpiece. Stem bores *c* 2-3 mm. Probably all C17th
202	*c*1660-1680	11	Two near complete bowls *c* 1660-1680, one with plain circular heel other with slight spur; one other slight spurred type. One mouthpiece. Stem bores *c* 3 mm
203	C17th-e18th	2	Stem bores *c* 2 mm
301	C19th	3	Three stems includes worn decorated stem fragment from near bowl - foliage seams & traces of foliage on sides plus faint traces of lettering. Initial 'H' one side & terminal 'N' other side. Two stem bores (incl. decorated one), one ?C17th/18th
304	C19th?	1	Worn stem, bore *c* 1.5 mm
402	*c*1800-1850	4	Complete bowl (two joining) early-mid C19th, fluted bowl with oak leaf seams & maker's initial on short squared spur '(C? or I?) B'. Fresh condition, stem bore *c* 1 mm. Two worn C17th stems
403	C18th-C19th?	3	2x stem bores *c* 2 mm, one burnt. Others incl 17-18C stem weathered
404	*c*1660-1680	5	Probably all one pipe, fresh breaks. Plain bowl *c* 1660-1680 with trace of small circular heel, stem bore *c* 3 mm
405	Mid-C17th?	4	One near complete bowl *c* 1640-1660 (or earlier?). Traces one other bowl attached to stem. Rim fragment from another bowl of narrow diameter - possibly early-mid C17th in all cases? Complete bowl ?contains lump burnt tobacco or else charcoal?
TOTAL		**63**	

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Over August Bank Holiday 2006, Oxford Archaeology carried out archaeological investigations with Channel 4 TV's Time Team at Buckingham Palace, Westminster, London. The project was designed with Channel 4 as a contribution to Her Majesty the Queen's 80th birthday celebrations.