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Archaeological Investigation Report



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Hampton Court Palace, Lower Orangery Garden

NGR TQ 1560 6850

ARCHAEOLOGICAL INVESTIGATION REPORT

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SUMMARY

Between the 26th of February and the 7th of March 2007 Oxford Archaeology (OA) carried out an archaeological investigation within the Lower Orangery Garden, at Hampton Court Palace. The work was commissioned by Historic Royal Palaces (HRP) during the re-ordering of the garden in front of the Lower Orangery. Remains were found of a set of brick steps descending into a sunken east-west garden dating to the period of William and Mary. A single brick wall was also found showing that one of the earlier pond gardens was extended northwards at the same time. Following Mary's death in 1694, these short-lived structures (which appear on a Talman plan of 1699) were swept away by the construction of the Lower Orangery, c 1700. Debris from this operation was excavated and contained Dutch floor tiles, probably from three Glass Cases (greenhouses) which preceded the Orangery. A brick-built culvert was uncovered and is considered to be part of the drainage system constructed by Wren. No conclusive evidence was found for the early 18th-century layout of the garden in front of the Lower Orangery.

1 INTRODUCTION

1.1 Location and scope of work

1.1.5 Between the 26th of February and the 7th of March 2007, Oxford Archaeology (OA) carried out a watching brief (on drainage trenches) followed by an archaeological excavation within the Lower Orangery Garden at Hampton Court Palace, Surrey. The work, commissioned by Historic Royal Palaces (HRP), was designed to provide information on archaeological deposits and structures revealed during ground works for the laying out of a new Exotics Garden.

1.1.6 The purpose of the overall project was to reinstate the Exotics Garden in front of the Lower Orangery, creating a display area for a new collection of exotics. A detailed historical analysis of the area in front of the Lower Orangery was undertaken by Jan Woudstra as part of the project (Woudstra, 2000).

1.2 Geology and topography

1.1.7 The site lies on the First Terrace drift geology of the River Thames, which overlies London Clay at 9 m above OD.

1.3 Archaeological and historical background

1.1.8 Hampton Court Palace is a Scheduled Ancient Monument (Surrey No. 83). The palace, gardens and grounds form an archaeological and historical site of national importance.

1.1.9 The historical background to the Hampton Court site is well documented and widely available. Specific written and cartographic information pertinent to the area of research was prepared and supplied by the Assistant Curator's Department. Below is a short summary of the main developments of the buildings at Hampton Court.

- 1.1.10 The Knights Hospitallers acquired the manor of Hampton in 1236 and used the land as a grange. The only known buildings at this time were a great barn or hall and a stone *camera*. The first known occupant, other than the Knights, was John Wode who obtained a lease for the court, the exact date of which is unknown. Alterations to the building during his time may have included the extension of the residential part of the dwelling by means of a tower. Wode died in 1484 with no heir and it was not until 1494 that the manor was re-leased.
- 1.1.11 The next occupant of Hampton Court was Sir Giles Daubeney, who in 1494 acquired an eighty-year lease. The freehold of Hampton Court was unobtainable by Daubeney, but he did however obtain a new ninety nine-year lease in 1505. This new lease was much improved allowing him to enlarge the property. Daubeney died in 1508. When his son came of age in 1514 he immediately gave up the lease to Thomas Wolsey.
- 1.1.12 As with Daubeney's lease Wolsey's gave permission for alterations to be made to the fabric of the buildings. During his time at the palace Wolsey carried out many alterations and new builds. Henry VIII, who acquired Hampton Court in 1529 continued this rebuilding of the palace.
- 1.1.13 Further major alterations were carried out by William III, who commissioned Sir Christopher Wren to rebuild Hampton Court in 1689. Wren's original plan was to rebuild the whole of the Tudor palace, keeping only the Great Hall. Lack of time and money meant that Wren concentrated his efforts on rebuilding the King and Queen's main apartments on the south and east sides of the palace.
- 1.1.14 The triangle west of the Privy Garden, bounded by the palace to the north and the palace precinct wall parallel to the river Thames to the south, was known in the Tudor period as Pond Yard. Wolsey had ponds at Hampton Court which were famous, but their location is unknown. Work in the Pond Yard under Henry VIII began around 1536. Three ponds were built, each bounded by low walls with stone pillars supporting forty heraldic beasts. This situation can be seen on Wyngaerde's view of c. 1558-62 (Fig. 7). The ponds (which were at first filled by hand but a mechanical pump was then added) were ornamental but also functioned as stew ponds where fish were bred and stored. Oxygenation for the water came from a through-flow from the palace conduit.
- 1.1.15 We have only sparse knowledge of what happened in the Pond Yard after the Tudor period and before the Glorious Revolution of 1688. This is possibly because there was little change. There were, however, small improvements to the southern gardens under Cromwell, and a greater impact from the planting of a vineyard in the Pond Garden in 1672. It is not known exactly where within the Pond Garden the vines were planted - perhaps south of the ponds where Talman shows a planted area on his map of 1699 (Fig. 8).
- 1.1.16 As part of the sweeping changes made under William and Mary, Wren proposed schemes (drawn up by Hawksmoor) which would have swept away the ponds altogether, but William Talman, William III's Comptroller for both gardens and

buildings, retained at least elements of the ponds when he built three greenhouses in the pond garden in or after 1690. The garden became known as the Glass Case Garden, and the three greenhouses appear on Talman's 1699 plan (Fig. 8), lying just south of and parallel to the south facade of the palace. Changes to the ponds are discussed further in the conclusions of this report.

- 1.1.17 The original (Upper) Orangery was built facing the Privy Garden, on the ground floor of the King's Apartments. This was to house orange trees brought from Holland while Mary's extensive collection of exotic plants was kept in the three new greenhouses. After Mary's death in 1694 the interest in exotics declined and William had Talman replace the three greenhouses with the Lower Orangery (c. 1700) which now stands on the site. A rectangular area in front of the Lower Orangery was laid out for the display of orange trees during the summer, and is clearly shown being used in this way on the views depicted by Knyff from the south, c. 1702 (Fig. 9).
- 1.1.18 The treatment of the area in front (south) of the Lower Orangery is depicted c. 1710-13 on a plan held by the Soane Museum (Folio II, no.40). The area is not shown as being sub-divided, but is surrounded by a wall or hedge (perhaps both) on the same line as the existing wall around the lawn (Woudstra 2000, Plan 2). The same detail is shown on plans by Bridgeman of 1711 (Thurley, 2003, Fig.231) and on an anonymous Office of Works plan of c. 1714 (Ibid., Fig. 211). The 1711 drawing clearly shows a wall rather than a hedge.
- 1.1.19 By 1732, four areas had been laid out, with paths between (Fig. 10). Roque's map of 1736 shows no sub-divisions, but simply four east-west lines of exotics - this may have been intended to represent the summer situation, or he may have taken this detail from one of Knyff's views (Fig. 9).
- 1.1.20 By 1841 the layout had been altered - five rectangular beds are shown, each occupying almost the full north-south width of the garden, on a plan by Henry Sayer (Fig. 11). There are paths between the beds, aligned on the Orangery doors, and a border around the outside wall.
- 1.1.21 The Glass Case Garden was opened to the public in 1902, with the Great Vine being the main attraction.
- 1.1.22 Further changes to the area in front of the Lower Orangery were probably a result of the dispersal of the collection of exotics in the early 20th century. Four round beds were placed at regular intervals along the east-west axis, and straight and scalloped beds surrounded a lawn. A postcard of this period shows Pampas Grass growing in the round beds.
- 1.1.23 Gardens on the east front were used for growing vegetables in World War One, and this may have happened in the Glass Case Garden as well. In 1952 the central of the three gardens was restored as a 'Tudor' pond garden, based on some archaeological and historical research.

1.4 **Archaeological Background**

1.1.24 Oxford Archaeology excavated three trenches in the Lower Orangery Lawn in 2002 (OA 2002), following on from a geophysical survey of the area (GSB Propection 2002). Further trenching was carried out by Brian Dix (Dix 2005). All of this work was intended to investigate the historic detail of the garden, and, in the case of the 2002 project, to look for evidence relating to the Tudor palace. The results are discussed in Section 4 in the light of the results of the current project. Trench locations appear on Figure 2.

1.5 Acknowledgements

1.1.25 Oxford Archaeology would like to thank Kent Rawlinson, Assistant Curator at Hampton Court Palace. We are also grateful to Terry Gough, Head of Parks and Gardens, and to all the members of his gardens team for their help and support throughout the project, and to William Page of the Surveyor's department. Dr Jan Woudstra of the University of Sheffield was kind enough to give advice during the post-excavation work.

2 PROJECT AIMS AND METHODOLOGY

2.1 Aims

1.1.27 Following the discovery of brick walls, and fragments of architectural terracotta, during the watching brief, excavation aimed to improve our understanding of this part of the palace both from the period of the original 17th-century exotics garden, and from before this time.

2.2 Methodology

1.1.28 A watching brief was carried out initially, to mitigate the effects of the landscaping required for the new garden. This watching brief concentrated particularly on a narrow drainage trench excavated from east to west across the centre of the site.

1.1.29 Two trenches (Fig. 2) were excavated. Some upper deposits, mainly topsoil, had already been removed across the whole Orangery lawn area by the gardens team. Further deposits were removed under archaeological supervision in the areas of Trenches 1 and 2, using a mechanical mini-digger fitted with a 1m toothless bucket. All subsequent excavation was by hand.

1.1.30 Trench 8, to the south of the Orangery building, measured 3.20m (north-south) x 2.60m (east-west) x 1.60m wide (north-south) x 1.20m wide (east-west).

1.1.31 Trench 9, to the south of the Orangery building and of Trench 8, measured 8.20m (east- west) x 3m wide.

1.1.32 All archaeological features were planned at a scale of 1:20, excavated, and their sections drawn at scales of 1:20. All excavated features were photographed using colour slide, black and white print film and a digital camera. A general photographic

record of the work was made Recording followed procedures detailed in the *OAU Fieldwork Manual* (ed D Wilkinson, 1992). Bricks were recorded with reference to the Hampton Court brick typology.

3 DESCRIPTION OF THE ARCHAEOLOGY

3.1 Trench 8

- 1.1.33 The earliest deposit found in Trench 8 was a loose, light brownish yellow, silty sand, with occasional small stones (811). It was reached at a depth of 0.82 m below ground level (7.50 m OD). Overlaying it was a friable, dark brownish black sandy clay (805). Deposit 805 was the earliest layer to produce pottery, giving a date of late 17th or 18th century.
- 1.1.34 Cutting through 805 was a linear construction cut (806). The dimensions are unknown as it was not fully excavated. Within the cut was an arched brick culvert (808). This measured 3 m long and 0.40 m wide (visible width) and extended beyond the east and west edges of excavation. The bricks from which the culvert was built are consistent in size and colour with Wren Stock Brick (Type J, late 17th to 18th century in HCP type series), but this attribution cannot be definite, as the culvert was not dismantled. A loose, light brown clayey sand filled cut 806, containing a moderate amount of small stones and occasional building material fragments inclusions (807).
- 1.1.35 Above 807 was a loose, light brown clayey sand, with very occasional small stones and charcoal and frequent gravel inclusions (804). Fragments of a slate, probably architectural and of interest because of the implied 17th to 18th century date, were recovered from this deposit (see Section 3.11). Layer 804 was below a loose, pink-brown clayey sand, with frequent building material fragments and small stone inclusions (803). Deposit 803 produced five sherds of red terracotta flowerpot, together with seven fragments of architectural terracotta, clay pipe fragments and pantile fragments.
- 1.1.36 Layer 803 was overlain by a loose, reddish-brown clayey sand, with frequent building material and occasional stone fragments (802). This deposit produced a 17th-century clay pipe bowl fragment (c. 1600-1640).
- 1.1.37 In addition, to the north of the trench, and cutting through 803 was a modern cut (809), possibly for a pipe. This was not completely excavated and it was better seen in section (See Fig. 4). A friable, dark reddish brown clay sand (810) filled 809.
- 1.1.38 Above 810 was a loose, light brown sandy clay, with occasional gravel inclusions (801), and then a loose, dark brown clayey sand, with very occasional small stones inclusions (800). The uppermost deposit in the trench was a thin layer of loose, dark grey gravelly loam (812), the modern garden soil.

3.2 Trench 9

- 1.1.39 Trench 9 was located just off-centre in the Orangery Lawn (see Fig. 2) and was

rectangular in plan, measuring 8.20 m east-west and 3.40 m north-south.

- 1.1.40 A slot measuring 1.50 m east-west and 1.10 m north-south was dug in the south-west corner of the trench (Fig.5). The earliest deposit found within this slot was a compact, greenish grey pure clay (928). This was interpreted as natural, and it was found at 1.48m below ground level (6.92 m OD).
- 1.1.41 Above 928 was a firm and really sticky, dark blueish grey sandy clay, with occasional small stones (927). Overlaying it was a friable, dark to mid grey sandy loam, with occasional building material and mortar flecks (926). This was possibly an earlier garden soil.
- 1.1.42 Sealing most of the east side of trench, and above 926, was a thick deposit of friable, light brownish orange, gravelly sand, with frequent sub-rounded and sub-angular gravel and occasional building material fragments (902). Layer 902 produced pottery which was earlier than that found generally in the excavation, although it was only broadly datable (c. 1550-1700).
- 1.1.43 A cut through 902 was possibly a bedding trench (904). It had a sharp break of slope, concave sides and a flatish base. Filling 904 was a friable, dark reddish brown clay sand, with a moderate amount of building material fragments, charcoal flecks and gravel (905).
- 1.1.44 To the east of the trench, and also above 902 was a friable, dark brownish grey sandy clay, with frequent gravel, building material, and occasional charcoal flecks (916). It was overlain by a friable, dark brownish grey sandy clay, with a moderate amount of charcoal flecks and gravel and occasional building material fragments (911).
- 1.1.45 Also cutting through 902, but to the west of the trench, was a construction cut (908=923) for a wall. This was linear in plan, with a sharp break of slope, steep, almost vertical sides and flattish base.
- 1.1.46 Within construction cut 908=923 was brick wall 925. This was aligned north-south, measured 1.40m north-south x 0.40m east-west and continued underneath brick structure 906 (see below). Wall 925 had seven surviving courses; English bond was used for most of the courses apart from the lower course, where the bricks were laid as headers. The bricks were complete, with no mould defects. A soft, light brownish yellow sandy lime mortar was used as bonding material. The face of the wall was vertical and straight, with level courses. The bricks were very friable and brittle. They measured c. 0.20 x 0.10 x 0.08 m and possibly correspond with 'Place Brick' Type K (Hampton Court Palace Bricks typology) which are dated in that typology to the late 17th century to 18th century.
- 1.1.47 The backfill of construction cut 908=923, was a friable, dark greyish brown clay sand, with a moderate amount of building material, mortar fragments and charcoal flecks (907=924).
- 1.1.48 Immediately to the north of wall 925, and above it, was a brick structure formed by

wall 929, part of a set of steps, 906. This brick structure was housed in a construction cut (933). This was only visible to the west and remained un-excavated.

- 1.1.49 Within 933, to the south of the trench, and lapping over wall 925 was brick wall 929. This was not built in a regular bond, but some courses were entirely of stretchers and others only of headers. The bricks are largely complete, with only 5% being broken. Only one type of soft, red brick was used in the construction. The bricks measured 0.22 x 0.11 x 0.06m and were bonded with a light brownish yellow sand-lime mortar. They correspond to Type C Bricks in the HCP Brick typology – these are Henrician Stock Bricks, dated 1529-66, and in this context are likely to be re-used. The face of the wall was vertical and straight, with roughly-pointed joints. The foundation was less well finished than the standing wall, and it was offset from the standing wall by 0.08 m at the western end.. Wall 929 measured 2.20 x 0.22 m and it had eleven surviving courses. Wall 929 was the south facing wall for a set of steps, 906 (see below) and followed a gentle curve, giving a splay to the steps.
- 1.1.50 Also within cut 933 was a stepped structure made of sandstone and (mainly) broken brick (906). About 80% of the bricks were broken. The bricks were again Type C, soft, red and sandy with red cores, measuring 0.20 x 0.10 x 0.03 m on average.
- 1.1.51 There were four steps, each measuring 0.12 m high and 0.18 m wide. They were capped with limestone treads, which survived on part of the lowermost and uppermost steps only (Fig. 5). On the eastern side, the rubble core is faced with similar Type C bricks to those described for Wall 929, laid in English bond. All of this was set in a matrix of light brownish yellow sandy mortar, with occasional lime flecks (935).
- 1.1.52 On the south-west of the structure formed by steps 906 and wall 929, and integral to it, was a square base for a possible newel post or a similar structure. It was constructed of bricks identical to those used in structure 906 and Wall 929. It measured 0.21 x 0.47 m, and was three courses deep (0.21 m), with no regular bond.
- 1.1.53 The fill of construction cut 933 was a compact, dark brown clayish silt, with frequent small fragments of building material (934).
- 1.1.54 To the east of the trench, cutting through 911, was a north-south aligned construction cut (918) for a wall. This was linear in plan, with sharp break of slope, vertical sides and flat base. Wall 903, within cut 918, was made of soft, sandy red bricks with red core. The brick fabric was a fine, sandy, orange-red with some chalky flecks. Wall 903 was constructed in an English bond, and was one and a half brick-lengths wide. The bricks measured 0.23 x 0.11 x 0.06m and were mostly complete, although some of them were broken, or half brick. They correspond to Type C Bricks in the HCP Brick typology – these are Henrician Stock Bricks, dated 1529-66. A light brownish yellow soft sandy mortar with occasional flecks of lime was used as bonding material.
- 1.1.55 The fill of construction cut 918 was a friable, dark orange-brown clayey sand (917), with frequent gravel and a moderate amount of building material fragments. Above it was a friable, light brownish yellow sandy clay (915), with frequent mortar and

building material fragments.

- 1.1.56 To the north-west of the trench, and stratigraphically above 934 (see above), was a friable, dark brownish grey clay-sand, with a moderate amount of sub-angular gravel (914). This was possibly a garden surface, contemporary with stepped structure 903.
- 1.1.57 Layer 914 was below a friable, dark brownish-red clay sand, with frequent mortar patches, building material fragments and gravel (913), possibly another garden surface, contemporary with stepped structure 903. This was overlain by a friable, dark reddish brown clay sand, with a moderate amount of gravel (912).
- 1.1.58 Above 912 was a friable, light yellowish brown clay sand, with frequent gravel and occasional mortar flecks (910). Context 910 produced eleven pieces of Flemish floor tile fragments and a few pieces of 17th to early 18th century pipe stem. A piece of Frechen stoneware is of similar date. A thin layer of friable, dark reddish brown clay sand, with frequent angular and sub-angular gravel (922) lay over 910.
- 1.1.59 Above 922 was a friable, dark yellowish brown clay sand, with frequent gravel and a moderate amount of building material fragments (909). This deposit produced another clay pipe bowl fragment dated around c.1690-1710 and a tin-glazed drug-jar base (c. 1680-1750). Flemish floor tile was also found within this deposit. Above layer 909, was a friable, dark yellowish brown gravelly sand, with frequent sub-angular and sub-rounded gravel (921). All the deposits (912 to 921) above garden surfaces 913-4 were probably dumps intended to fill and raise the level of the garden to the top of brick stepped structure 903.
- 1.1.60 Cutting through 921 was a possible bedding trench (920=931). This had a sharp break of slope, steep sides, slightly concave and a flattish base. It was filled by a friable, dark reddish brown clay loam, with frequent sub-angular and sub-rounded gravel and charcoal flecks (919).
- 1.1.61 A friable, dark reddish brown sandy clay with a moderate amount of gravel and occasional building material small fragments (901) was over 919, followed by a friable, dark greyish brown sandy clay, with a moderate amount of gravel and occasional building material fragments (900). Finally, above it, was a thin layer of loose, dark grey gravelly silt (930).

4 ENVIRONMENTAL EVIDENCE AND FINDS

4.1 Introduction

- 1.1.62 Finds were recovered by hand during the course of the excavation and bagged by context. Finds of special interest were given a unique small find number. Where possible, samples of building material were collected from revealed structures for further analysis.
- 1.1.63 A summary and discussion of the different classes of environmental evidence and archaeological finds from the excavations is followed by a more general discussion of

the evidence. Detailed reports can be found in the appendices.

4.2 Pottery

1.1.67 Only a relatively small percentage of the 102 sherds of pottery from the site is actually from stratified contexts in Trenches 8 and 9. In combination with the limited dating evidence from the clay pipes and, to some extent, the ceramic building materials, the earliest layers containing pottery in both trenches (contexts 805 and 902) suggest a late 17th- or 18th-century date (although that for 902 is not impossibly earlier, 1550-1700). No pottery which is definitely of Tudor date was recovered. Although the sequence above these layers contains some residual pottery which is almost certainly of 17th-century date (BORD), the dating emphasis from the rest of the assemblage is in the late 17th to early 18th century.

1.1.68 Of the entire assemblage, 71 sherd were of red terracotta flower pot, reflecting the use of this area of the palace. A few small pieces of flowerpot and possible flowerpot were present in stratified contexts, including the earliest excavated contexts in both trenches.

1.1.69 None of the stratified pottery from these two trenches need be later than the 18th century. This accords well with the suggestion that some of the brick-built garden features excavated date from the time of William and Mary and the following century. Most of the other pottery recovered from the site is unstratified and consists largely of 19th- and 20th-century flowerpots and some late Staffordshire-type whitewares.

4.3 Clay pipe

1.1.70 The small assemblage is generally in a fresh condition with only slight wear visible on a few pieces. Four pipe bowls are present, of which three are complete - or very nearly so. Stem fragments comprise the remainder. Apart from milling on the rim, all the pipes are plain. All the pieces appear to be of 17th- or 18th-century date. As usual bowl typology provides the best guide to dating with stem thickness and stem bore diameter providing a more approximate guide (early pipe stems having a wide bore and later stem bores decreasing with time).

4.4 Ceramic Building material

1.1.71 Floor tiles are perhaps the most significant class of CBM from the excavations. The 16 fragments recovered represent a minimum of 6 floor tiles of which 2 are glazed and the remainder unglazed. On the whole the pieces are large and fresh with only moderate use-wear and post-deposition abrasion visible on one or two of the smaller pieces. Apart from two glazed two examples the tiles exhibit a remarkable degree of uniformity suggesting that they all come from the same floor and the same production centre. On most English sites these would be identified as late medieval or early post-medieval Flemish quarry tiles. These were imported into England from Flanders (including modern Holland) in vast numbers but particularly from the late 14th to the

16th century. Their dating here is unusually late - apparently late 17th to 18th century, and possibly late 17th to early 18th century (layers 909 and 910 - infill over brick steps 903).

- 1.1.72 The fresh condition of the tiles suggests they are probably contemporary with the pottery and pipes found, although this would make them some of the latest known examples of this class of tile to have been found on a British site. The fact that several tiles from the same floor are still associated in these make-up or in-filling dumps could suggest that the original tiled floor lay fairly close to the site.
- 1.1.73 Both flat roof tile and pantile were found, with some fragments of the latter being from stratified late 17th century to 18th century deposits.
- 1.1.74 Much of the brick assemblage is very fragmentary and abraded - in most cases little more than rubble. Two bricks which can be related to the Hampton Court brick typology are briefly described here. The first of these is a virtually complete handmade brick from wall 903 (numbered 18 in the watching brief). It is a Type C Henrician stock brick, ascribed to the period c. 1529-1566. The other piece of note is an end fragment from a Type M Dutch 'clinker' brick which is clearly very different from the rest of the assemblage on account of its small dimensions and different colour. It is securely stratified in the late 17th- to 18th-century layer sequence in Trench 9 (context 912), which is in perfect agreement with the accepted dating of this type in England.
- 1.1.75 Bricks from wall 925 were examined on site. They conform to the description of Type K in the HCP Brick typology, dating from the late 17th to early 18th centuries. Bricks from the steps 906 and their facing walls were also examined on site and were matched to Type C Henrician place bricks dated 1529-66. As steps 925 were built later than wall 925, the Henrician bricks appear to have been re-used. One other wall, 903, was built of Type C bricks (see above).

4.5 **Architectural terracotta**

- 1.1.76 There are eight fragments of this, all in the same fine pale cream to pale brown fabric. These are very worn and are almost certainly residual. These appear to be fragments from the sides of one or more moulded frame-like architectural features (or terracottas). These could be well be fragments of architectural terracottas derived from parts of the Tudor palace. More pieces of terracotta were recovered from the excavation but were retained at Hampton Court

4.6 **Slate**

- 1.1.77 Five pieces representing two original slates were recovered, one from Trench 8 (context 804) and one from Trench 9 (context 910), both being late 17th to early 18th century contexts. These are not necessarily roofing slates. The example from 910 is possibly complete but shows no evidence of nailholes for suspension and one slate appears to have be used (or re-used) as some sort of palette. Possible original uses could have included damp-coursing or some sort of weather-proofing, or shelving, or

perhaps even part of an ornamental garden feature. The character and petrology of both slates is almost identical and suggests a common source, probably Devon or Cornwall - the main source for early slate found in southern England.

4.7 Animal bone

- 1.1.78 The species represented by the 54 fragments of bone recovered are common food animals, and the bones probably derive from kitchen waste. The corvid bones are either crow or rook. These birds are not included in Tudor cook books, but young rooks have traditionally been eaten in Britain.
- 1.1.79 The number of identified bones is insufficient for an analysis of slaughter age for the main domesticates (cattle and sheep/goat). In general, it is evident that juvenile sheep/goats were present, but the majority of the animals seem to have been sub-adults and adults.
- 1.1.80 Butchering marks were found on a vertebra and rib of medium mammal/s and a cattle humerus. They derive from primary butchery of the carcass, filleting and marrow extraction respectively.

4.8 Palaeoenvironmental material

- 1.1.81 Two samples of what appeared to be post-medieval garden soils were taken from the site with the aim of characterising the soils, identifying major inclusions, and establishing whether any plant remains survived that might assist in the understanding of the garden history. Sample <1> was taken from context (911) and sample <2> from context (927). Context 911 is from the east end of trench 9, and context 927 is from the west end.
- 1.1.82 Garden soils frequently contain a mixture of material. A variety of building rubble including ceramic building material and mortar was found and while these components could have been introduced to improve the drainage of the soil it is also possible that they represent limited dumping after building work. Cinders were also found, possibly added along with wood ash in an attempt to enrich the soil, while the fish and bird bone suggests that domestic midden material was worked into the soil to improve soil fertility.
- 1.1.83 The inclusion of more industrial wastes, however, is more unusual. Hammerscale is produced when a piece of hot metal is struck and can be flat 'scale' like or spheroidal (sometimes referred to as spheroidal hammer slag). Along with the hammerscale, cinders and some metalworking dross also signify metalworking debris. It is likely that the metalworking material originated from a nearby smithy, but it is not clear how this material became incorporated in the soil.
- 1.1.84 The paucity of plant remains in the samples is a reflection of the nature of garden soil - organic materials are quickly broken down in well-drained and fertile soil. The occurrence of freshwater snails in Sample <1> suggests that material derived from a wet or damp environment was incorporated into the soil at some point in the past,

possibly from cleaning out one of the nearby ponds.

5 DISCUSSION AND CONCLUSIONS

5.1 Tudor and pre-Tudor evidence

- 1.1.85 No definitely Tudor pottery was found in the excavations, although there were a few medieval sherds, all from residual contexts. Layer 902, which is stratigraphically one of the earliest excavated, contained pottery dated c 1550 – 1700 and also a small sherd of post-medieval red ware (c 1580 onwards), but it is more likely that this is a later context (see below).
- 1.1.86 A number of structures were constructed from Henrician place bricks (Type C in the HCP Typology) but none of these are thought to be Tudor structures, and the bricks are interpreted as reused. These structures are discussed further below.
- 1.1.87 Fragments of Tudor architectural terracotta were recovered, some of which were painted (Plate 3). This adds to the evidence from earlier work in this area, showing that a large amount of debris from the demolished sections of the Tudor palace was dumped in what became the Orangery Garden. The terracottas remain at Hampton Court Palace and are not reported on in detail here.

5.2 Evidence from the William and Mary period before c. 1700

- 1.1.88 A north-south wall at the western end of Trench 9 (925; Fig.5) was built from late 17th to early 18th century bricks. This wall aligns with the east wall of the western pond garden (see Fig. 2). The William Talman plan of 1699 (Fig. 8) shows that wall 925 is on the line of the east wall of an east-west garden which has now completely disappeared. This east-west garden is not apparent on the earlier view by Van Den Wyngaerde, confirming the archaeological evidence that it dates from the first phase of the William and Mary remodelling of the pond gardens in or after 1690, when William Talman was the Comptroller.
- 1.1.89 The set of wide brick steps with limestone treads (906; Fig. 5; Plates 1,2) was built from re-used Tudor brick. The presence of these steps shows that Talman's new east-west garden was sunken, and may therefore have been a pond garden. At the foot of the steps were two gravel/clay layers (913, 914) perhaps forming a path.
- 1.1.90 The north-south wall 903, at the east end of Trench 9 (Fig. 5; Plate 2) was also built of re-used Tudor brick. It aligns with the west wall of the easternmost pond garden (Fig. 2) and confirms the Talman plan which shows the easternmost pond garden as having been extended northwards. Whether it continued to be a pond garden is not certain. The detail on the Talman plan is inconclusive, and while the archaeology clearly showed that the garden did not drop in level immediately east of wall 903, it may have dropped further to the east and south.
- 1.1.91 A gravel layer 902 between walls 903 and 925 probably formed a path (or at least the base for a path) between the two gardens.

- 1.1.92 Fragments of six Dutch floor tiles were found in the later infill layers above steps 906. The tiles (two of which were glazed) were large and little-worn, and all apparently from the same floor (Cotter, above, Section 4.4). We know that three glass cases ‘greenhouses’ were built in the northern part of the pond Garden, which became known as the Glass Case Garden, and that they occupied the site of what is now the Lower Orangery. The glass cases appear on Talman’s 1699 plan (Fig. 8). These structures, heated by furnaces, were of Dutch design and housed Mary’s collection of exotic plants (Thurley 2003, 231). It seems reasonable to suggest that the tiles found in the excavation came from these Glass Cases, which were demolished by around 1700. The dating of the tiles is unusually late for examples found in Britain, and this is perhaps explained by the direct royal connection with Holland of this building project. A Type M Dutch ‘clinker’ brick was also found in the dump layers over the steps and it too may well have originally been part of one of the Glass Cases. A fragment from a slate used for mixing plaster probably relates to the construction of the Glass Cases and other slate fragments from late 17th to early 18th century contexts show that slate was used, possibly for roofing or in damp courses.
- 1.1.93 The presence of a sunken garden in front of the Glass Cases is of interest in that this would not be the expected arrangement if the area was intended for the summer display of exotics (Woudstra 2000).

5.3 The William and Mary period after c. 1700

- 1.1.94 All of the structures discussed above must have been demolished before c. 1700 when the new Lower Orangery was built – Knyff’s view from the south of c.1702 (Fig. 9) shows that the east-west garden and the extension northwards of the eastern pond garden had by then disappeared completely to create a new garden in front of the Orangery. This change in design was undertaken at William’s behest – he stopped the work in the gardens after the death of Mary in 1694, but restarted in 1698.
- 1.1.95 The infill layers over the brick steps (see Fig. 6) produced the best-dated sequence from the excavations. Context 910, the lower layer, produced most of the Dutch floor tile (discussed above) and a few pieces of 17th- to early 18th-century pipe stem plus a piece of Frechen stoneware of similar date. Separating the two layers was a thin make-up layer (922) which produced only two pipe stems of compatible date. Above this, context 909 produced a tin-glazed drug jar base of c. 1680-1750 and a pipe bowl of c. 1690-1710. Taken together this evidence is in perfect accord with the documentary history, showing that the revised layout of the pond gardens, and the three glass cases, were all short-lived, lasting less than 10 years.
- 1.1.96 Metalworking debris found at the east end of Trench 9 within loam layers 911 and 924 may have resulted from the construction work on the new Lower Orangery.
- 1.1.97 The new garden in front of the Lower Orangery, as built after c. 1700, has been the subject of a reconstruction project which occasioned the work reported on here. The reconstruction takes the form of narrow east-west parallel beds for spring flowers,

with breaks in the beds aligning with the Orangery doors. This reconstruction is partly derived from excavation work by Dix (2005) and the interpretation in that report of earlier work by OA (2002). The excavations reported on here do not substantiate this reconstruction, but this is not conclusive because excavation did not begin until some ground disturbance had already taken place. However, a close look at all the evidence does suggest that the reconstruction is not definitive. In terms of the archaeology, Dix interprets a cut feature which survives only 8 to 10 cm below ground level of the garden as being part of the William and Mary layout. This is not impossible, but the feature would have had to survive the digging of at least three subsequent bed layouts, as known from plans of 1732, 1841 and 1912 (Figs 10,11; Woudstra 2000). Also, the views by Knyff of c. 1702 (Fig. 9) and 1707 (Thurley 2003, 221), both of which are closely detailed, do not show beds in front of the Orangery, but an open area with the exotics arranged in rows. Taken altogether, it seems at least as likely, if not more so, that the feature identified by Dix belongs to a later layout.

- 1.1.98 In Trench 8, located to the south of the Orangery and to the north of Trench 9, a well preserved brick-built culvert was exposed. The bricks of the culvert and the pottery found in its foundation trench are all consistent with a late 17th century or early 18th century date. It is probable that the culvert forms part of the complex of such features which are attributed to Wren. Large sections of these have recently been excavated in Base Court.

5.4 Environmental and finds

- 1.1.99 Sampling of garden soils and processing the samples for plant remains was attempted, but proved to be of minimal use. Study of the small assemblage of animal bone showed that food waste (ie midden material) was incorporated into garden soils, as would be expected.
- 1.1.100 The pottery assemblage included at least two late 17th to early 18th century redware flower pots, and one possible earlier flower pot, but there was no evidence of the large elaborate pots used for exotics. These prized and valuable pots were probably rarely broken. A single later flower pot has an incised G, and may be a royal monogrammed example, from the reigns of George V or VI. Discussion of other classes of finds has been incorporated into the general discussion above.

APPENDICES

APPENDIX 1 ARCHAEOLOGICAL CONTEXT INVENTORY

<i>Context</i>	<i>Type</i>	<i>Depth</i>	<i>Width</i>	<i>Thickness</i>	<i>Comments</i>	<i> Finds</i>
800	Topsoil			0.20m	Topsoil	
801	Layer			0.20m	Gravel	
802	Layer			0.08-0.40m	Sandy deposit	
803	Layer			0.30m	Pink sandy deposit	
804	Layer			0.20m	Brown sand deposit	
805	Layer			0.20m	Dark brown clay-sand	
806	Cut				Construction cut for drain	
807	Fill			0.23m	Backfill for 806	
808	Drain/Culvert				Brick-made culvert	
809	Cut				Trench for modern pipe	
810	Fill			0.12-0.45m	Fill of 809	
811	Layer			0.32m	Orange sand	
812	Layer/Topsoil				Thin gravel layer/Topsoil = 930	
900	Topsoil			0.10m	Topsoil	
901	Layer			0.20m	Brown pebbly gravel	
902	Layer				Orange sandy gravel	
903	Wall				North-South brick made wall	
904	Cut				Cut in section	
905	Fill				Fill of 904	
906	Structure				Brick-made structure/ stair block	
907	Fill				Fill of 908	
908	Cut				Construction cut for 906	
909	Layer				Rubble/collapse deposit	
910	Layer				Sandy deposit	
911	Layer			0.20m	Sandy clay make up	

912	Layer				Orange grey sand deposit	
913	Layer/Floor?				Thin mortar deposit at base of steps 906	
914	Layer/Floor?				Thin mortar deposit at base of steps 906	
915	Layer			0.05m	Sandy clay deposit	
916	Layer				Sandy clay deposit	
917	Fill				Fill of 918	
918	Cut				Construction cut for 903	
919	Fill				Fill of 920=931	
920	Cut				Cut for bedding trench =931	
921	Layer				Sandy gravel deposit	
922	Layer				made-up ground	
923	Cut				Construction cut for 906	
924	Fill				Fill of 923	
925	Wall				Brick made wall, below 906	
926	Layer			0.30m	Sandy deposit	
927	Layer			0.23m	Sandy clay deposit	
928	Natural				Natural clay	
929	Wall				Facing wall of 906	
930	Topsoil				Thin gravel layer/Topsoil = 812	
931	Cut				Cut for bedding trench =920	
932	Layer				Clay patch	
933	Cut				Construction cut for 929 and 906	
934	Fill				Fill of 933	
935	Layer				Sand packing in 906	

APPENDIX 2 FINDS ASSESSMENTS

1 **REPORT ON THE POST-ROMAN POTTERY FROM THE LOWER ORANGERY GARDEN, HAMPTON COURT PALACE (HCP 52)***by John Cotter*1.1 **Introduction and Methodology**

A total of 102 sherds of pottery weighing 3057 g. were recovered from both the excavations and the watching brief. Apart from a single small sherd of residual medieval pottery, all of this is of post-medieval date - mostly late 17th to 19th century. The latest pottery types (19th and 20th century) are mostly unstratified finds from the watching brief. All the pottery was briefly examined and spot-dated during the assessment stage and catalogued in more detail at the analysis stage. The full catalogue contains, per context, a breakdown of fabric types present recorded by sherd count and weight and an extensive comments field recording any other attributes worthy of note (eg., vessel form, part, decoration etc.). The full catalogue remains in archive. Apart from some of the most recent pottery ('china', flowerpots etc) the condition of the material is generally rather poor and fragmentary, though not particularly abraded. These are all common domestic post-medieval pottery types which can all be paralleled in existing publications, particularly those from the London area (Orton 1988; Pearce 1992). A summary of pottery fabrics present, arranged in approximate chronological order, is shown in Table 1. Pottery fabric codes used here are those of the Museum of London Specialist Services (MoLSS).

Fabric	Name/Description	Date range	Sherds	Weight
KING	Kingston-type ware (Surrey)	c. 1240-1400	1	2
FREC	Frechen stoneware (Germany)	c. 1525-1750	2	76
BORDG	Surrey/Hampshire border whiteware, green-glazed	c. 1550-1700	1	2
BORDY	Surrey/Hampshire border whiteware, yellow-glazed	c. 1550-1700	3	43
BORDB	Surrey/Hampshire border whiteware, brown-glazed	c. 1620-1700	1	27
RBOR	Surrey/Hampshire border redware	c. 1550-1900	1	2
TGW	English tin-glazed ware (London etc)	c. 1575-1825	6	85
PMR	London area post-medieval redware	c. 1580-1900	12	361
WEST	Westerwald stoneware (Germany)	c. 1590-1750	1	8
PMR FLP	Post-medieval redware flowerpot	c. 1675-2000	71	2417

PEAR	Pearlware (Staffs. etc)	c. 1780-1830	1	12
TPW	Transfer-printed refined whiteware (Staffs. etc)	c. 1780-1900	1	12
REFW	Plain refined whiteware (Staffs. etc)	c. 1805-1900	1	10
TOTAL			102	3057

Table 1. Summary of pottery fabrics present

1.2 Description

1.1.106 A high proportion of the sherds recovered were unstratified, mostly from the watching brief stage that preceded the excavation (67% sherds, 77% weight) and most of this consisted of fairly recent flowerpot and the few pieces of 'china'. Apart from the flowerpots, with their obvious horticultural connection, the rest of the pottery assemblage has little or no meaningful connection with the Lower Orangery Garden and most probably represents domestic rubbish casually (or deliberately) dumped in this area from other parts of the palace. Most of it may well have arrived in barrows of earth and building rubble dumped on the site to level-up the ground surface and in-fill earlier garden features. If any of the non-horticultural wares were once intimately connected with the site or its adjacent buildings - gardeners' possessions perhaps? - there is no obvious way of demonstrating this. Nevertheless, a few pieces, including the flowerpots themselves (see below), are of some slight interest and are deserving of some comment.

1.1.107 The earliest piece in the assemblage (unstratified) is a small fairly worn body sherd of ?Kingston-type ware (c. 1240-1400) with internal green glaze suggesting it could come from a jar/cooking pot or a bowl (Pearce and Vince 1988). Given the small size of the sherd an alternative identification as one of the other medieval Surrey/Hampshire whitewares, perhaps Coarse Border ware (CBW: c. 1270-1500), cannot be ruled out, but it is certainly the only medieval piece from the excavations. Although the start-date for some of the pottery industries represented here commences in the 16th century there is nothing definitely 'Tudor' in the assemblage which could all date from the 17th century onwards.

1.1.108 The small Surrey/Hampshire border whiteware assemblage mostly comprises types of dishes or bowls but includes an unusual small hollow pedestal base in yellow-glazed border ware (BORDY), probably from an upright candlestick (Pearce 1992, fig. 41.340-5, 42.346-52). This however is quite abraded and evidently somewhat residual in its context (context 802). London area post-medieval red earthenwares (PMR) are reasonably common, mainly as glazed storage jars and dishes or bowls. The profile of a small simple porringer-like bowl (form as *ibid.*, fig. 27.133), probably of late 17th- or 18th-century date, was recovered from one of the layers in-filling the brick stepped structure in Trench 9 (context 912). English tin-glazed earthenwares, probably London products, include small sherds from dishes and three joining sherds from the

base of a fairly large late Lambeth-style drug jug decorated with typical horizontal pale blue banding externally and dating to *c.* 1680-1750 (context 909) (Orton 1988, fig. 155.1612).

1.1.109 At least two vessels in brown salt-glazed Frechen stoneware are present including the plain base of a 'bellarmine' jug, a typical 17th-century German import (context 910). However, the latter occurs in a cream-coloured rather than the more usual grey stoneware fabric and is not impossibly a product of John Dwight's Fulham Pottery (established 1672). A single unstratified body sherd of grey Westerwald stoneware might come from a Selters mineral water bottle dating to the second half of the 18th century. The few remaining classes of non-horticultural pottery mostly comprise 19th-century 'china' tablewares and do not merit individual description.

1.1.110 As already mentioned, the 71 sherds of red terracotta flowerpot (PMR FLP) comprise the bulk of the pottery recovered (70% sherds, 79% weight) and one or two undiagnostic sherds of unglazed PMR might be from flowerpots too. Of this total only 11 sherds came from excavated contexts, the rest being unstratified. Six of the stratified sherds came from a watching brief context (context 13, sub-topsoil) which included a flowerpot sherd with a rouletted band bearing part of the maker's name [S]ANKE[YS], a Nottingham firm and one of the main suppliers of flowerpots in England during the late 19th and 20th centuries. The other five stratified sherds are from context 803, a layer whose stratigraphic position and dating associations (pipes and pantile) suggest a late 17th- or 18th-century dating. The sherds represent a minimum of two wheel-thrown red flowerpots including one with a simple thickened/flat-topped rim. Almost at the base of the sequence in Trench 8, context 805, the earliest layer to produce pottery (late 17th to 18th century), included a small coarse unglazed body sherd of PMR which may well be from a flowerpot but is otherwise lacking in diagnostic features. Similarly the lowest deposit in Trench 9 to produce pottery (context 902), though only broadly datable (BORDG *c.* 1550-1700), also produced a small PMR sherd which may be from the base of a flowerpot. If these last two re-identifications are correct this registers the presence of flowerpots very early on in the archaeological sequence on this site. The unstratified collection of flowerpot sherds, many large and fresh, includes a range of subtle fabric variations as one might expect from various consignments of pots acquired probably from many sources - though mostly probably quite local - over a couple of centuries or more. These include fine sandy orange-red fabrics and some coarser sandier fabrics. Traditional wheel-thrown flowerpots with simple rims predominate and some of these could include quite early (late 17th- or 18th-century) examples but most are probably of 19th century date. The only base perforations noted were central ones (early flowerpots often had perforations though the lower walls or the basal angle). One reduced (grey-surfaced) sherd has a splash or drip of clear brown glaze internally; this is a feature of some early flowerpots which were often fired in the same kilns as glazed domestic wares. The very latest examples include 17 sherds (497 g.) from machine-made flowerpots with collared rims which have a very modern-looking smooth pale orange-pink fabric. These examples could date as late as the second half of the 20th century.

1.1.111 Apart from the SANKEYS stamp above, three other wheel-thrown 19th- or early 20th-century flowerpots bear markings of note. One of these is a body sherd from a fairly large flowerpot in a fine light orange-pink fabric which bears a fragmentary stamp including a stylized crown flanked on the left by a large letter G - quite possibly part of the royal monogram. The G lacks serifs and is quite deep and modern-looking suggesting, perhaps, a connection with one of the later King Georges - either George V or VI? - though an earlier attribution cannot entirely be ruled out. If correct this would suggest that, on occasion, flowerpots were made to order for the royal estates. Too little research on these rather late commonplace ceramics has been carried out to be sure of this. One other piece, also a body sherd, has a fragmentary horizontal rouletted band of stylized foliage (or just a sinuous/syncopated band) flanked by faint square-cogged rouletting. Decorative bands such as this have been noted on other late 19th-century flowerpots, forcing pots and chimney pots in southern England. The final flowerpot sherd, again a body sherd, has external traces of possible faint white slip-painted decoration but the design is intelligible.

1.3 Conclusions

1.1.112 Only a relatively small percentage of the pottery from the site is actually from stratified contexts in Trenches 8 and 9. In combination with the limited dating evidence from the clay pipes and, to some extent, the ceramic building materials, the earliest layers containing pottery in both trenches (contexts 805 and 902) suggest a late 17th- or 18th-century date (although that for 902 is not impossibly earlier). Although the sequence above these layers contains some residual pottery which is almost certainly of 17th-century date (BORD), the dating emphasis from the rest of the assemblage is in the late 17th to early 18th century. The few small pieces of flowerpot and possible flowerpot present in these contexts (not in themselves closely datable) do not contradict this interpretation. None of the stratified pottery from these two trenches need be later than the 18th century. This accords well with the suggestion that some of the brick-built garden features excavated date from the time of William and Mary and the following century. Most of the other pottery recovered from the site is unstratified and consists largely of 19th- and 20th-century flowerpots and some late Staffordshire-type whitewares.

2 THE CLAY TOBACCO PIPES (HCP 52)

by John Cotter

2.1 Introduction

The excavation produced a total of 28 fragments of clay pipe weighing 129 g. These have been catalogued and recorded on an Excel spreadsheet (details in archive). The catalogue records, per context, the spot-date, the quantity of stem, bowl and mouth fragments, the overall sherd count, weight, and comments on condition and any makers' marks or decoration present. Oswald's simplified typology (Oswald

1975) has been used to date the pipes.

2.2 Date and nature of the assemblage

1.1.113 The assemblage is generally in a fresh condition with only slight wear visible on a few pieces. Four pipe bowls are present, of which three are complete - or very nearly so. Stem fragments comprise the remainder. Apart from milling on the rim, all the pipes are plain. All the pieces appear to be of 17th- or 18th- century date. As usual bowl typology provides the best guide to dating with stem thickness and stem bore diameter providing a more approximate guide (early pipe stems having a wide bore and later stem bores decreasing with time).

1.1.114 The earliest bowl fragment (with 100% rim but not much bowl left) appears to date from *c.* 1600-1640 but is almost certainly residual in its context (802). Complete stubby spurred bowls of *c.* 1640-1670 were found in two contexts (803, 804) although a narrow-bored stem fragment in one of these (803) suggests the context date could be as late as the 18th century (other finds suggest a late 17th- or 18th-century context date). A more slender bowl of *c.* 1690-1710 (with short-spur or narrow oval heel) is the latest example found (909). Stem bores from the excavation are all compatible with a 17th- or 18th-century dating. The bowls appear to have been used. Two pipe stems have been burnt post-deposition, probably in a bonfire or fireplace. The material generally has the character of ordinary domestic rubbish. Little else can be said besides.

3 THE CERAMIC AND OTHER BUILDING MATERIAL (HCP 52)

by John Cotter

3.1 Introduction and methodology

The site produced a total of 93 fragments of ceramic and some non-ceramic building material weighing 19.810 kg. This was catalogued in a similar way to the pottery (see above) but by type or form rather than fabric. Some attempt, however, has been made to relate the few measurable bricks recovered with the Hampton Court brick typology. All complete dimensions were routinely recorded for all material types and comments on fabric, glaze and condition also recorded where appropriate. The full catalogue remains in archive. All the ceramic building material (CBM) appears to be of post-medieval date, and by association the few pieces of stone building material probably are too. Apart from one or two late types none of this material can be closely dated owing to the longevity and utilitarian nature of the material concerned as well as its broken condition. In order to date these types any more closely one has to consider their context and associated finds, but on this site these have their limitations too. Table 2 gives a breakdown of the types and quantities recovered.

Type	No. Frags	Weight (g)
Flat roof tile	32	2863
Pantile	2	155
Floor tile	16	8199
Wall tile	1	58
Architectural ceramic	8	1280
Brick	24	6168
Drain pipe	3	339
Land drain	1	122
Slate	5	548
Stone	1	78
Total	93	19810

Table 2. Types and quantities of ceramic building material

3.2 Description

1.1.115 The condition of the CBM assemblage is very variable but in nearly all cases fragmentary. Apart from one almost complete brick the rest of the brick collection consists of smaller end and corner fragments and smaller fragments of brick rubble. The same can be said of most of the other types. The floor tiles, however, though fragmentary, exist as large fairly fresh pieces. Less of the CBM assemblage than the pottery assemblage is unstratified (22% fragments, 24% weight) but this includes three of the 19th-20th century categories (wall tile, drain pipe and land drain) plus some brick and roof tile. As with the pottery there is no reason to suppose that the stratified CBM from Trenches 8 and 9 need be any later than the 18th century.

3.3 Flat roof tile

1.1.116 This category comprises fragments of flat rectangular red roof tiles with a pair of nail holes for suspension at one end (peg tiles). A variety of fairly smooth or slightly sandy post-medieval type fabrics were noted. These are all probably of relatively local manufacture. Thicknesses are in the 11-17 mm. range, mainly 12-15 mm. No complete lengths survived but the complete upper end of a tile with a width of 153 mm. was recovered (context 802). The latter tile shows an eccentric positioning of the nailholes - with one in the centre 35 mm. below the upper edge and the other (37 mm. away) towards the side of the tile only 17 mm. from the upper edge. The roughly circular nailholes are 8 mm. in diameter. Nailhole diameters of between 5 mm. and 16 mm. were recorded although some of these were surprisingly crudely executed. A single fairly large corner fragment from context 902 has a square nailhole 13 mm. across. Square nailholes are generally considered a post-medieval characteristic. Traces of white mortar survive on a few tiles.

3.4 Pantile

- 1.1.117 Two joining fragments from the edge of a pantile in fine red terracotta fabric. Pantiles were introduced to England in the late 17th century. Associated pottery and pipe dates for this example suggest a late 17th- or 18th-century date (context 803).

3.5 Floor tile

- 1.1.118 This is perhaps the most significant class of CBM from the excavations. The 16 fragments recovered represent a minimum of 6 floor tiles of which 2 are glazed and the remainder unglazed. On the whole the pieces are large and fresh with only moderate use-wear and post-deposition abrasion visible on one or two of the smaller pieces. Apart from the glaze on two examples the tiles exhibit a remarkable degree of uniformity in their general character suggesting very probably that they all come from the same floor and the same production centre. On most English sites these would be identified as late medieval or early post-medieval Flemish quarry tiles. These were imported into England from Flanders (including modern Holland) in vast numbers but particularly from the late 14th to the 16th century. Contrasting brown- or black-glazed Flemish tiles and plain white-slipped (yellow- glazed) tiles or green-glazed tiles were often laid in chequerboard patterns. Although the tiles here are almost certainly Flemish their dating here is unusually late - apparently late 17th to 18th century, and possibly late 17th to early 18th century. The tiles come from two layers (909 and 910) in Trench 9 both apparently part of a sequence of dump layers or made-up ground intended to raise the level of the garden to the top of the stepped brick stepped structure 903. There are several cross-joins between fragments of tile from these two layers. The collective dating for this sequence, provided by pottery and pipes, is probably the best that the site has produced. Context 910, the lower layer, produced most of the tile (11 pieces) and a few pieces of 17th- to early 18th-century pipe stems plus a piece of Frechen stoneware of similar date. Separating the two layers was a thin make-up layer (922) which produced only two pipe stems of compatible date. Above this context 909, described as a rubble/collapse deposit, produced a tin-glazed drug jar base of *c.* 1680-1750 and a pipe bowl of *c.* 1690-1710. The fresh condition of the tiles suggests they are probably contemporary with the pottery and pipes - although this would make them some of the latest known examples of this class of tile to have been found on a British site. Generally the importation of Flemish floor tiles tailed-off in the second half of the 16th century. Of course it is not impossible that the tiles were uprooted from an original 16th-century floor elsewhere in the palace and were simply dumped here a century or so later, but their relatively fresh condition suggests they were not very old when they came to be deposited in this area alongside pottery and pipes of the late 17th to 18th century. The fact that several tiles from the same floor are still associated in these make-up or infilling dumps could suggest that the original tiled floor lay fairly close to the site. The dating too would fit with suggested improvements to the hot houses by William and Mary. It is unusual furthermore to find such a high proportion of plain unglazed

Flemish tiles and this perhaps emphasises their functional rather than decorative character.

1.1.119 In the catalogue the two glazed tiles are identified as GT1 and GT2 and the four unglazed tiles UGT1-4. The tiles are in a light orange-red silty-sandy fabric with a uniform texture typical of Flemish floor tiles. One example is fired a duller orange-brown and one of the glazed tiles (GT1) has a grey core. Some inclusions of coarse yellowish marl and fine marly streaks are visible in most tiles and one or two have rare coarse flint pebbles up to 15 mm. across. The upper surface of the unglazed tiles is smooth and the underside rougher and slightly sanded with occasional small flint grits. Parallel smoothing marks are visible on the undersides of a couple of tiles. The edges have been neatly bevelled, probably with a bladed tool. The only tile for which a complete side dimension or width can be measured is UGT1 which is 255 mm. wide (Pl. UGT1). Tile thicknesses range from 25-33 mm. with a 2-4 mm. variation common in most tiles. In the upper surface corners of the four unglazed tiles (UGT1-4) are small nailholes (Pl. UGT1-2). These are often said to be a characteristic of Dutch or Flemish tiles (including tin-glazed tiles) but are less frequently observed on floor tiles, although glaze and wear sometimes obscure this. On the unglazed tiles however the nailholes, though small (3-4 mm. diam.) are clearly visible. They vary in depth from 7 to 13 mm. deep and are sometimes flanked by a thin blade-like stab or slash of similar depth (UGT2-3). The nailholes result from the manufacturing process - apparently they held the tile in place on the wooden mould while it was being cut to shape. This process is briefly described in relation to tin-glazed ('delft') tiles by Dingeman Korf (Korf 1963, 12-13). Curiously the two glazed tiles (GT1-2, Pl. GT1-2) do not show this feature. These survive as four relatively small fragments. Both have a clear orange-brown lead glaze. On GT1 the glaze has reduced greenish patches towards the centre and is fairly worn or abraded. On both tiles the glaze flows over the sides to varying extents with small pools or patches extending to the underside. On GT2 the glaze can be seen to be pooling along one edge of the tile, suggesting it was fired stacked on its edge or in a sloping position. A small kiln-stacking scar can also be seen on the latter. Traces of white chalky mortar are visible on the sides or undersides of a few tiles. The underside of UGT1 is partly bedded in the same mortar to a depth of 6mm with a film of rusty-coloured brown sand on the outside of this.

3.6 Wall tile

1.1.120 A single small fragment, possibly a wall tile, in a very dense red industrial-type fabric. Probably late 19th or 20th century (unstratified).

3.7 Architectural ceramic

1.1.121 There are eight fragments of this, all in the same fine pale cream to pale brown fabric. These are very worn and in one or two cases are little more than shapeless rubble. They are almost certainly residual. All but one piece is from context 803, a layer of pink sand and rubble containing pottery and pipes suggesting a late 17th- or 18th-century date. The other piece is from the watching brief (context 19). These appear to be fragments from the sides of one or more moulded frame-like architectural features (or terracottas). The longest piece has a surviving length of 95 mm. Of the three main pieces two have a flat outer surface and a concave inner surface or chamfer (one is less concave than the other piece) and one is again from a frame-like edge but apparently has an S-shaped section. Traces of white or pinkish mortar - including crushed brick - occur on the rough reverses of most fragments but as this also occurs on the broken edges of some it may not be original. These could well be fragments of architectural terracottas derived from parts of the Tudor palace.

3.8 Brick

1.1.122 The brick assemblage is mostly very fragmentary and abraded - in most cases little more than rubble. Only one brick is relatively complete with all its dimensions intact. A few other broken bricks ends provide original width and thickness measurements and other fragments just thickness measurements while many others are just scraps. Of the total 24 fragments recovered 16 are from Trenches 8 and 9, 2 are from the watching brief and 6 are unstratified. There is little point in describing all of this except to say that they are mostly typical handmade red-firing bricks probably dating between the 16th and 18th centuries. Nothing later than this was observed. Full details for these remain in archive but two bricks which can be related to the English Heritage brick typology for Hampton Court are briefly described here. The first of these is a virtually complete brick from a 'Tudor' wall (context 18) recorded during the watching brief (wall 18 is equivalent to wall 903 in the excavation). This is complete except that one of its long sides is badly chipped but the main dimensions are still recordable. It is 225 mm. in length, 110 mm. wide and 53 mm. thick. It is handmade, unfrogged and, where visible, has crinkled sides. It has a fine sandy orange-red fabric with some chalky flecks. Most of the brick is coated in a chalky white mortar. The dimensions and description correspond quite closely with Type C bricks in the typology - these are Henrician stock bricks and are ascribed to the period c. 1529-1566. The other piece of note is an end fragment from a Dutch 'clinker' brick which is clearly very different from the rest of the assemblage on account of its small dimensions and different colour. It is securely stratified in the late 17th- to 18th-century layer sequence in Trench 9 (context 912), which is in perfect agreement with the accepted dating of this type in England. This has a typical dirty yellow fabric with crinkled edges and a roughened underside. There are traces of white mortar on the underside and edges. It has a width of 70 mm., a thickness of 37 mm. and a surviving length of 65 mm. Clinkers, because of their hardness and small size, were often used as paving bricks being commonly laid edge-on in a herringbone pattern. Dutch clinkers are assigned to Type M in the Hampton Court typology.

3.9 Drainpipe

- 1.1.123 Three pieces, including two joining rim fragments, of brown salt-glazed stoneware drainpipe. 19th or 20th century (unstratified).

3.10 Land drain

- 1.1.124 A single rim fragment from a corrugated machine-made land drain in a fine pale cream fabric. 19th or 20th century (unstratified).

3.11 Slate

- 1.1.125 Five pieces representing two original slates were recovered, one from Trench 8 (context 804) and one from Trench 9 (context 910). These have a crude pre-modern appearance unlike the vast bulk of 19th-century Welsh roofing slate. This rough indicator of date is supported by their archaeological contexts as both slates are securely stratified in late 17th- to 18th-century layer sequences. The slate from context 910 was associated with the deposit of Flemish floor tiles (see above). These are not necessarily roofing slates. The example from 910 is possibly complete but shows no evidence of nailholes for suspension and one slate appears to have been used (or re-used) as some sort of palette. Possible original uses could have included damp-coursing or some sort of weather-proofing, or shelving, or perhaps even part of an ornamental garden feature. The character and petrology of both slates is almost identical and suggests a common source, probably Devon or Cornwall - the main source for early slate found in southern England. The possibly complete slate from 910 (Pl. slate) is quite small and sub-rectangular with a maximum length of 156 mm and a width of 137 mm. It varies widely in thickness from just 4 mm. in one corner to 17 mm. in another corner. All the edges (certainly three and possibly four) appear to have been worked. The thickest corner bears a crude chisel or tool mark on the edge. The slate itself is fairly soft and dark grey with a fine silvery-grey banding diagonal to the main axis. The more convex face of the slate is completely clean but the flatter face is covered patchily by two thin deposits. The first of these is a thin film of limey yellowish percolation deposits resembling limescale, perhaps resulting from long term contact with mortar or limestone. Over this are extensive patches of a fine pink material - probably plaster - which contains a few small flecks of a reddish ochre-like material. The surface of this pink plaster has clearly been worked in places with a brush or a trowel giving the impression that the slate was used (or re-used) as some sort of palette. The other slate from Trench 8 (not illustrated) is very similar petrologically but much thinner and therefore more like a modern slate in appearance. This comprises four joining pieces forming a rough rectangle with surviving dimensions of 127 mm. x 95 mm. with a maximum thickness of 6 mm. Two worked

edges survive suggesting this could represent the lower corner of a larger rectangular slate. Both faces are fairly flat and one, again, has patches of a limey yellowish film (also partly over the break) exactly as the slate in context 910 but in this instance without plaster. Nevertheless the slates are significantly similar enough to suggest they both came from the same structure - whatever that might have been.

4 ASSESSMENT OF WORKED STONE FROM HAMPTON COURT PALACE ORANGERY

by Ruth Shaffrey

4.1 Summary and Quantification

Five pieces of stone were retained during the excavations at Hampton Court Palace, of which two are worked.

4.2 Methodology

1.1.126 All the stone was examined with the aid of a x10 magnification hand lens

4.3 Description

1.1.127 Unworked stone includes two pieces of chalk (U/S, 803) and a piece of red mudstone (912); none of these are of interest. Two pieces of stone are worked and both are structural blocks.

1.1.128 A single block of fine-grained Greensand with tool marks surviving on two faces, was recovered from layer 803. This is almost certainly Reigate stone, which was used for internal dressings at Hampton Court during the 16th century and into the 17th century (Tatton-Brown 2001, 201). The end date of its usage appears to be placed only vaguely during the 17th century (ibid.) in which case the evidence suggests a 17th century *terminus ante quem*, or possibly earlier for its deposit here.

1.1.129 The only other significant item is a tooled block of oolitic limestone, ashlar but otherwise of indeterminate function. This was recovered from make up layer 910. It is a creamy coloured fine-grained oolitic and slightly shelly limestone which seems most likely to be Portland stone. Portland stone was used extensively in the construction of Hampton Court Palace (Thurley 2003, 18) and is thus not closely dateable. However, given the problems with supply of Portland stone to the site during the 17th century, it seems unlikely that large blocks of this stone would have been casually discarded. There is therefore a hint that this block is probably not of 17th century discard date.

Catalogue

Ctx	Descrip	Notes	Lithology	L_Notes	Cont_Type
803	Tooled block	Fragment of tooled block with two surviving edges, square to one another, each of which retains fine tool marks. In three adjoining fragments	Greensand, probably Reigate stone	A fine grained pale green slightly glauconitic Greensand	layer, sandy deposit
0	Tooled fragment	Small sherd of stone with tool marks on one side but otherwise with no discernible features	Jurassic limestone, probably Portland stone	cream coloured fine grained oolitic and slightly shelly limestone	
910	Architectural block	Damaged or incomplete block of stone with two oblique angled faces a further edge at right angles to one of these and a recess cut into the angled edge. The angled face retains some coarse tool marks but the other face and the edge are smooth - perhaps more on show	Jurassic limestone, probably Portland stone	cream coloured fine grained oolitic and slightly shelly limestone	above garden floors 913-4 - probably made-grounds or dumps intended to fill and raise the level of the garden to the top of brick stenned structure

5 ANIMAL BONE REPORT

By Lena Strid

5.1 Introduction

The animal bone assemblage derives from a series of garden deposits and some redeposited Tudor material. Only 54 fragments were recovered, of which 15 (28.8%) could be determined to species. While most of the identified fragments were retrieved by hand, some bones were recovered by wet sieving to 4mm. The majority of bones belonged to sheep/goat, but cattle, rabbit, hare, fowl, indeterminate corvid and indeterminate fish were also present (see table 1). Gnaw marks on bones indicate the presence of dogs. A full record of the assemblage, documented in a Microsoft Access database, can be found with the site archive.

5.2 Methodology

1.1.130 Identification of the mammal and bird bone was undertaken at Oxford Archaeology with access to the reference collection and published guides. All the animal remains were counted and weighed, and where possible identified to species, element, side and zone (Serjeantson 1996). Ribs and vertebrae were only recorded to species when they were substantially complete and could accurately be identified, or were from an identifiable articulated skeleton in which there could be no doubt as to their species. Undiagnostic bones were recorded as small (small mammal size), medium (sheep size) or large (cattle size). The separation of sheep and goat bones was undertaken

using the criteria of Boessneck (1969) and Prummel and Frisch (1986), in addition to the use of the reference material housed at OA. Where distinctions could not be made, the bone was recorded as sheep/goat.

- 1.1.131 The condition of the bone was graded on a 6-point system (0-5), grade 0 equating to very well preserved bone and grade 5 indicating that the bone had suffered such structural and attritional damage as to make it unrecognisable.
- 1.1.132 The minimum number of individuals (MNI) was calculated on the most frequently occurring bone for each species, using Serjeantson's (1996) zoning guide, and taking into account left and right sides. For the calculation of the number of identified fragments per species (NISP) all identifiable fragments were counted, although bones with modern breaks were refitted.
- 1.1.133 For ageing, Habermehl's (1975) data on epiphyseal fusion was used. Three fusion stages were recorded: unfused, in fusion, and fused. In fusion indicates that the epiphyseal line is still visible. Tooth wear was recorded using Grant's tooth wear stages (Grant 1982), and correlated with tooth eruption (Habermehl 1975), as well as the wear rate of the mandibular M3 (Benecke 1988, in Vretemark 1997), in order to estimate an age for the animal/s.

5.3 The assemblage

- 1.1.134 The assemblage is well preserved, almost 50 % scoring grade 1 (see table 2). No bones were burnt, and only one bone showed traces of gnawing, the latter indicating a rather rapid covering of waste.-
- 1.1.135 The species present are common food animals, and the bones likely derive from kitchen waste. The corvid bones are either crow or rook. These birds are not included in Tudor cook books, but young rooks have traditionally been eaten in Britain (cf British Food Fortnight, Scottish recipes.com).
- 1.1.136 The number of identified bones is insufficient for an analysis of slaughter age for the main domesticates (cattle and sheep/goat). In general, it is evident that juvenile sheep/goats were present, but the majority of the animals seem to have been sub-adults and adults.
- 1.1.137 Butchering marks were found on a vertebra and rib of medium mammal/s and a cattle humerus. They derive from primary butchery of the carcass, filleting and marrow extraction respectively.

	Cattle	Sheep/goat	Rabbit	Hare	Fowl	Corvid	Bird	Fish	Medium mammal	Large mammal	Indeterminate
Mandible		1									
Loose teeth	1										
Vertebra									2	1	
Rib									5	6	
Scapula		2									
Humerus	1	1									
Radius		2									
Ulna						1					
Metacarpal		1									
Carpometacarpus					1		1				
Pelvis		1									
Tibia		2	1								
Tibiotarsus						1					
Metatarsal				1							
Tarsometatarsus							1				
Long bone							1		1		
Indeterminate								2			17
Total (NISP)	2	10	1	1	1	2	3	2	8	7	17
MNI	1	2	1	1	1						
Weight (g)	84	146	3	0	0	1	2	2	19	73	51

Table 1. Anatomical distribution of all species, including NISP, MNI and weight.

	N	0	1	2	3	4	5
HCP52	54	13.5 %	48.1%	30.8%	3.8%	0.5%	0.0%

Table 2. Bone preservation level for the HCP52 assemblage.

6 ASSESSMENT REPORT OF ENVIRONMENTAL AND ECONOMIC INDICATORS FROM TWO SOIL SAMPLES.

By Luke Howarth.

Introduction:

Two samples of post-medieval garden soil were taken from the site with the

aim of characterising the soils and identifying major inclusions. The samples were processed by the flotation method outlined below. Sample <1> was taken from context (911) and sample <2> from context (927), they were of 10 L. and 30L. volume respectively.

Methodology

1.1.138 Both samples were processed by water flotation in a modified Siraf-type machine, with the sample held on a 500µm mesh and the flot collected on a 250µm mesh. After air-drying, the residues were sorted by eye and any ecofactual or artefactual remains removed and recorded. The flots were passed through a 2mm sieve and fragments of wood or CPR extracted and identified where possible.

Results:

1.1.139 **Flots:** Both flots contained few plant remains. The flot from sample <2> contained four fragments of undiagnostic dried wood. Both flots contained relatively high proportions of fragmentary coal. The flot from sample <1> also contained some freshwater snails.

1.1.140 **Residues:** The residual material from both samples contained small quantities of snail shells, bird bone and some fish (though less common), in addition to fragments of coal, cinder, ceramic building material, mortar and occasional nails. Some hammerscale was found in the finer residue fraction.

Discussion and Conclusions:

1.1.141 Garden soils frequently contain a mixture of material. A variety of building rubble including ceramic building material and mortar was found and while these components could have been introduced to improve the drainage of the soil it is also possible that they represent limited dumping after building work. Cinders were also found, possibly added along with wood ash in an attempt to enrich the soil, while the fish and bird bone suggests that domestic midden material was worked into the soil to improve soil fertility.

1.1.142 The inclusion of more industrial wastes, however, indicates a degree of general dumping, since neither coal nor smithing waste would benefit the soil. Hammerscale is produced when a piece of hot metal is struck and can be flat 'scale'-like or spheroidal (sometimes referred to as spheroidal hammer slag). Along with the hammerscale, cinders and some metalworking dross also signify metalworking debris. It is likely that the metalworking material originated from a nearby smithy, but it is not clear how this material became incorporated in the soil.

1.1.143 The paucity of plant remains in the samples is a reflection of the nature of garden soil - organic materials are quickly broken down in well-drained and fertile soil. The only two pieces of wood were undiagnostic fragments, these were dried and probably modern. The occurrence of freshwater snails in Sample <1> suggests that material derived from a wet or damp environment was incorporated into the soil at some point in the past, possibly from cleaning out a nearby pond or lake.

1.1.144 No further work is recommended on these samples.

APPENDIX 3 BIBLIOGRAPHY AND REFERENCES

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APPENDIX 4 SUMMARY OF SITE DETAILS

Site name: Hampton Court Palace, Orangery Gardens

Site code: HCP52

1.1.148 Grid reference: NGR TQ 1560 6850

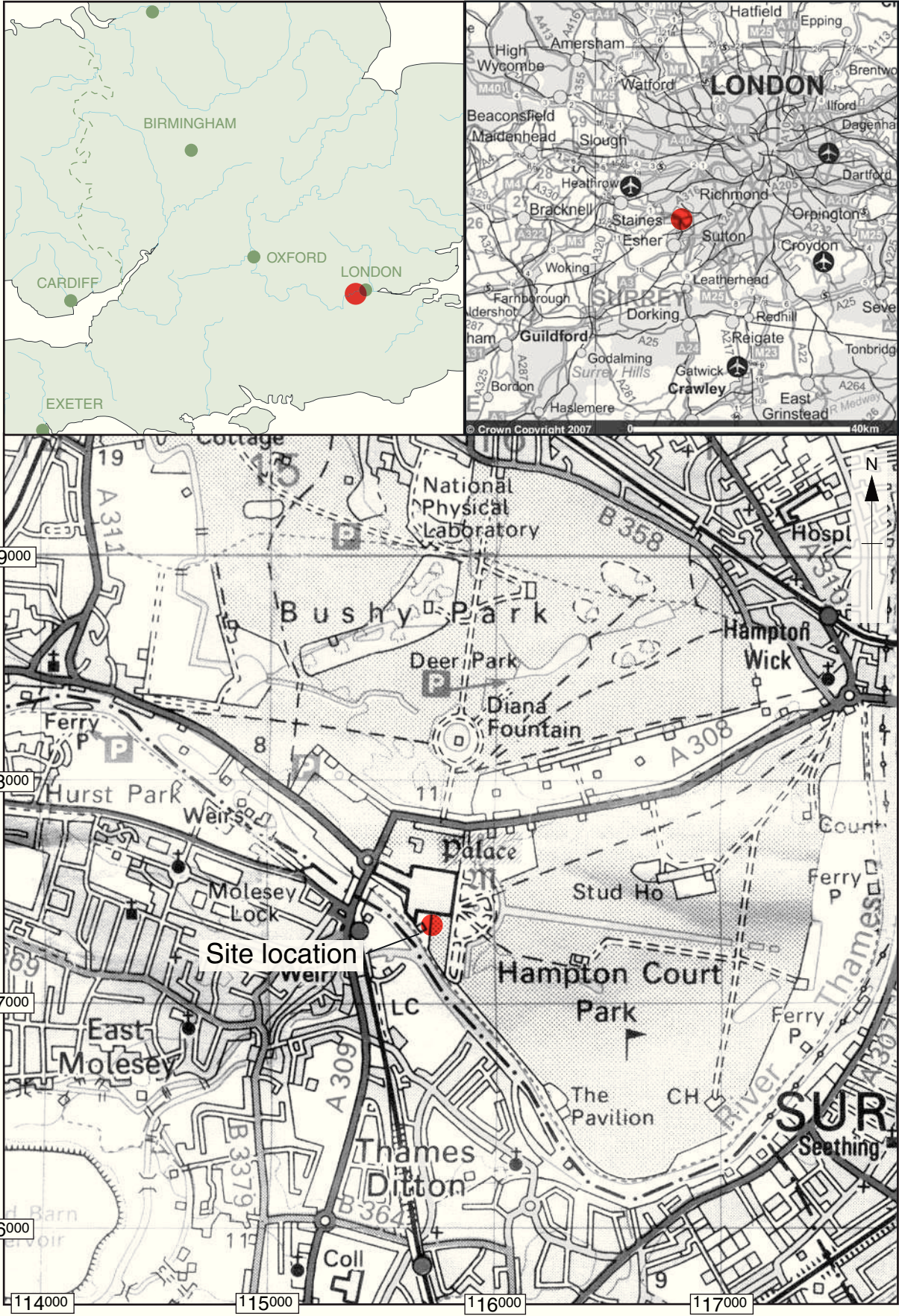
Type of archaeological work: Excavation

Date and duration of project: 26th February - 7th March

Area of site:

Summary of results: see summary above

Location of archive: The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES, and will be deposited with Historic Royal Palaces (at Hampton Court Palace) in due course, under the following accession number:



Scale 1: 25,000

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Figure 1: Site location

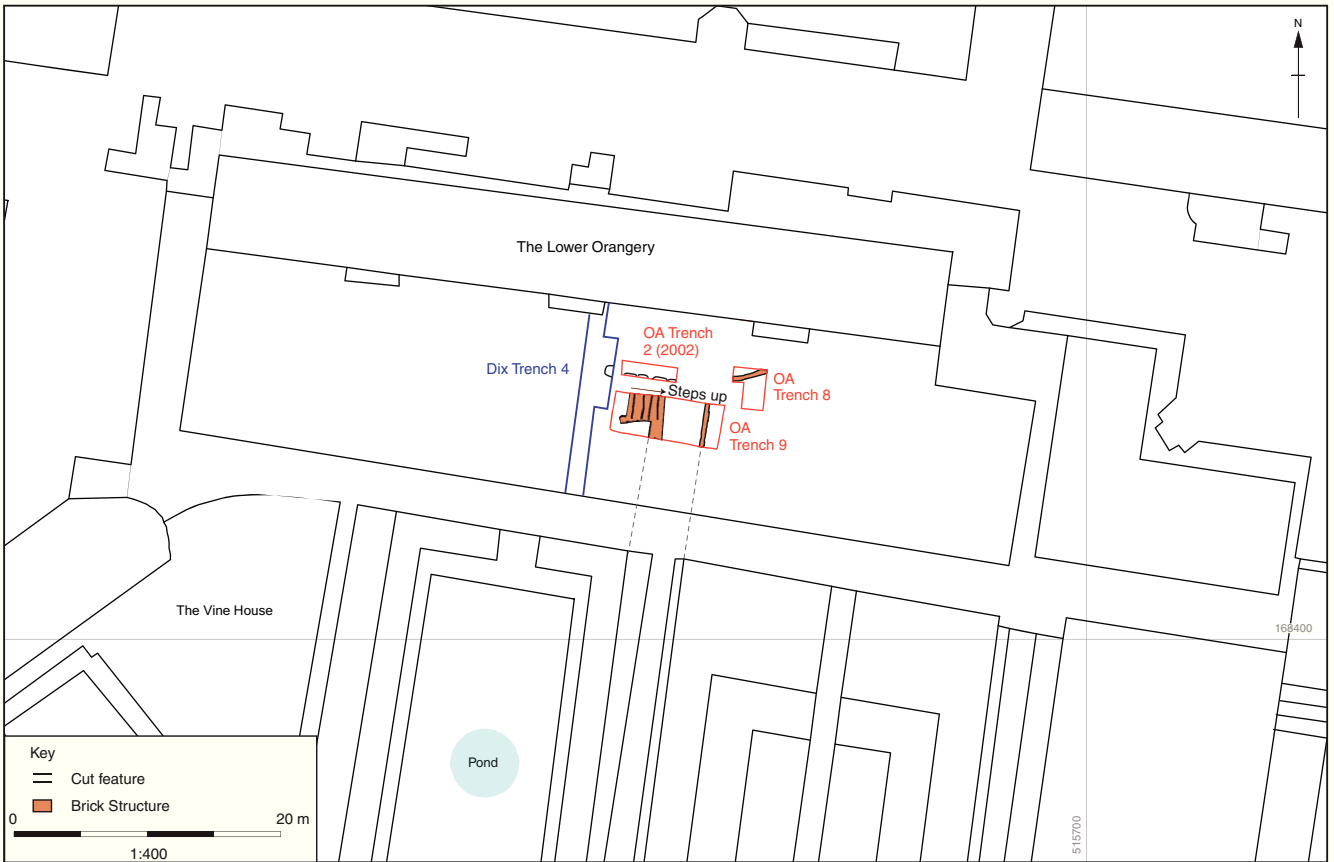


Figure 2: Trench plan

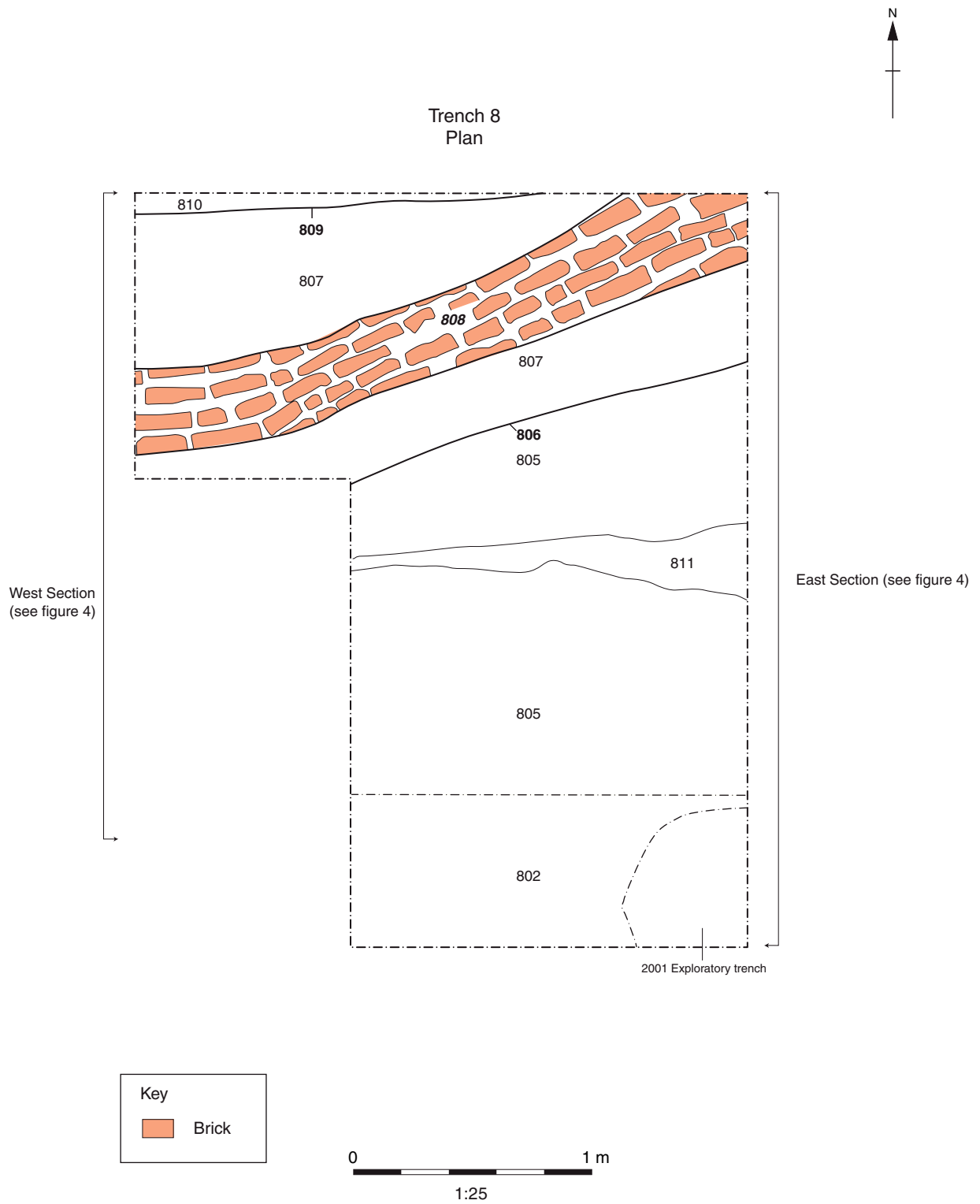


Figure 3: Trench 8, plan

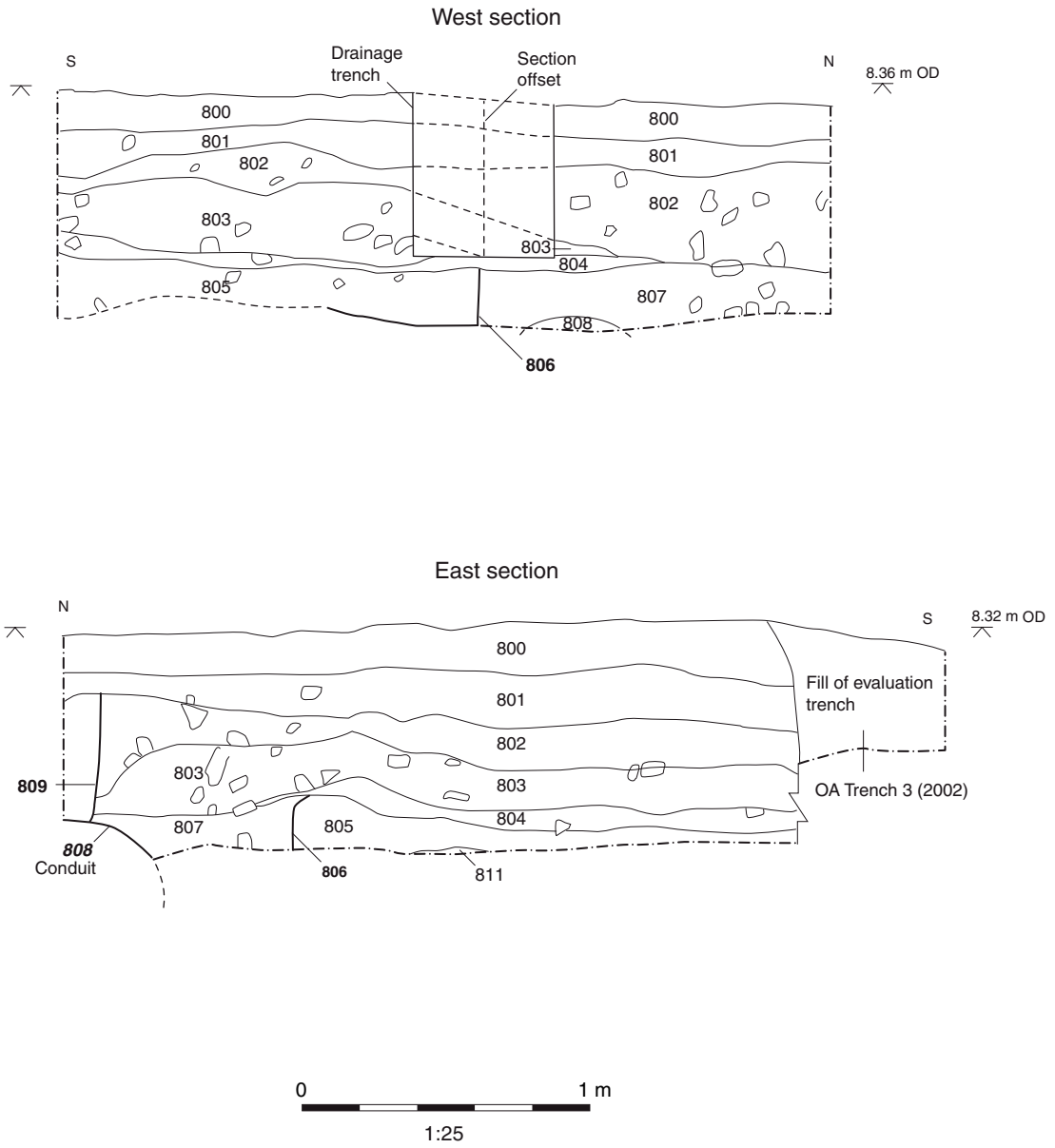


Figure 4: Trench 8, sections (see Figure 3 for locations)

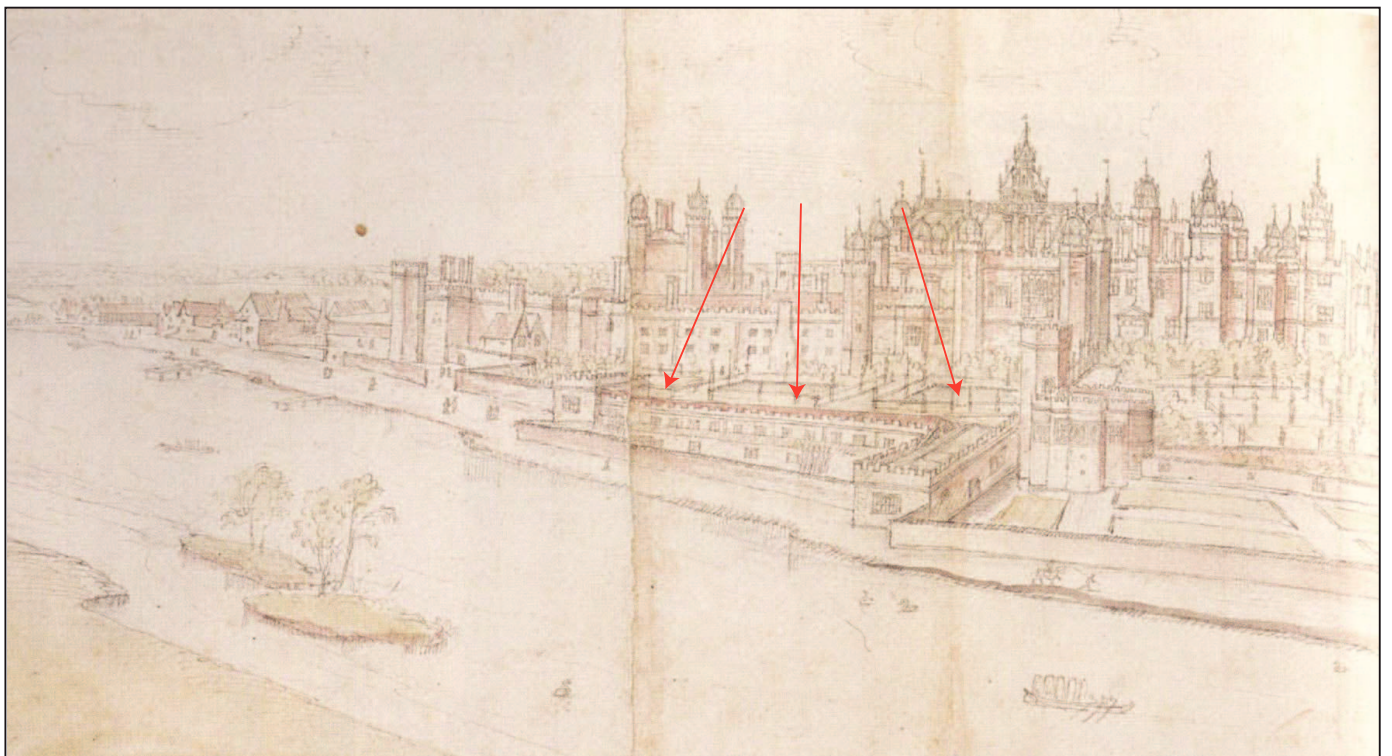


Figure 7: Pond gardens (Pond Yard) as shown on Anthonis van den Wyngaerde's view of Hampton Court from the south, c.1558-62

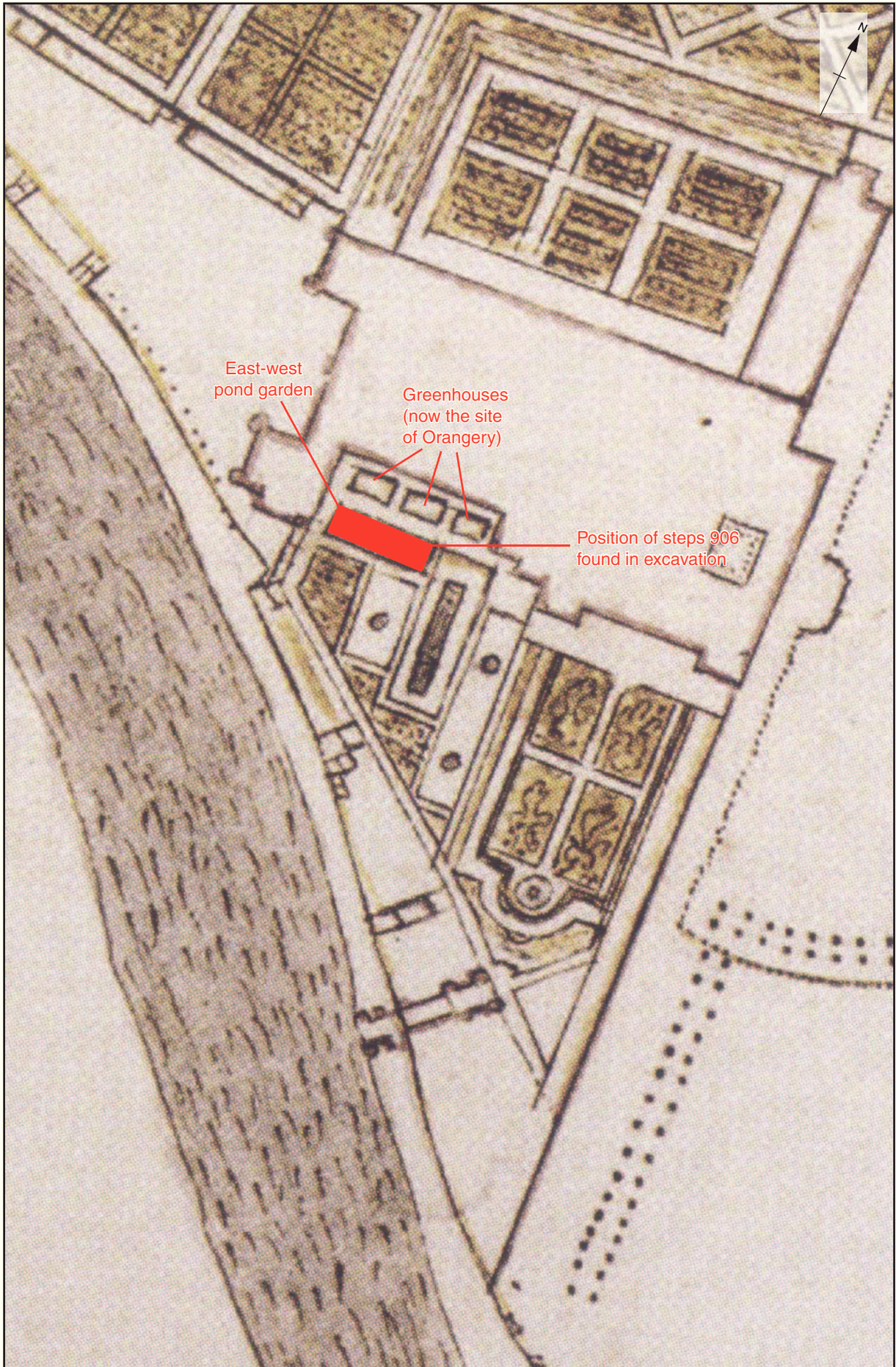


Figure 8: Detail from William Talman's plan, 1699

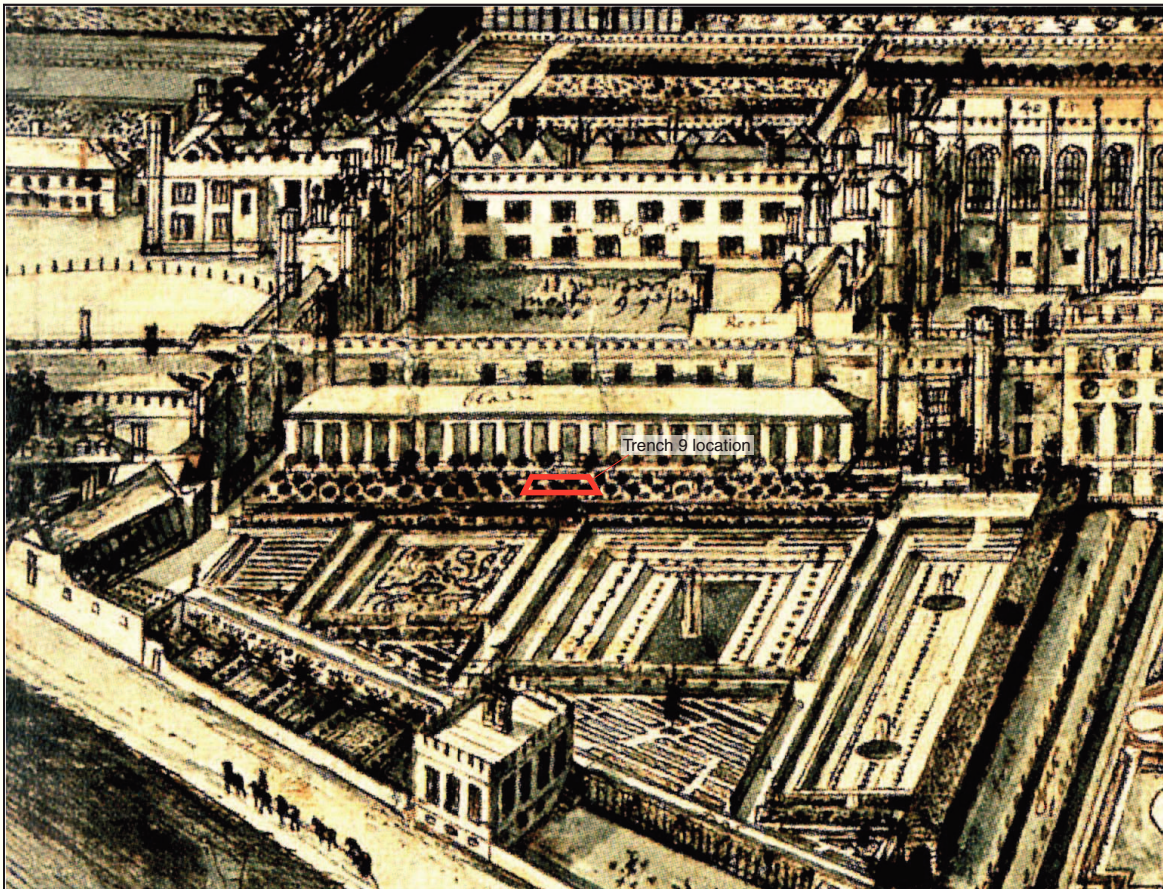


Figure 9: Pond garden, 1702, with the newly-built Lower Orangery. Detail from Leonard Knyff's view of Hampton Court from the South. The east-west pond garden, (see figure 8), has been removed by the remodelling

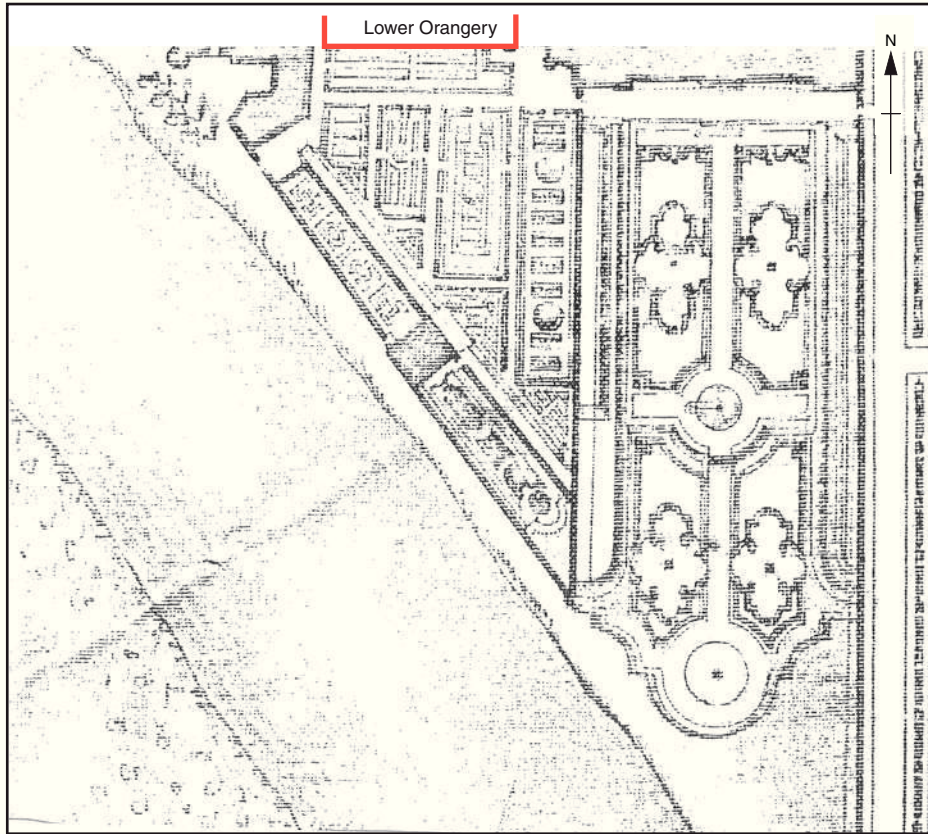


Figure 10: Detail from a plan of c.1732 (PRO M.R/1454)

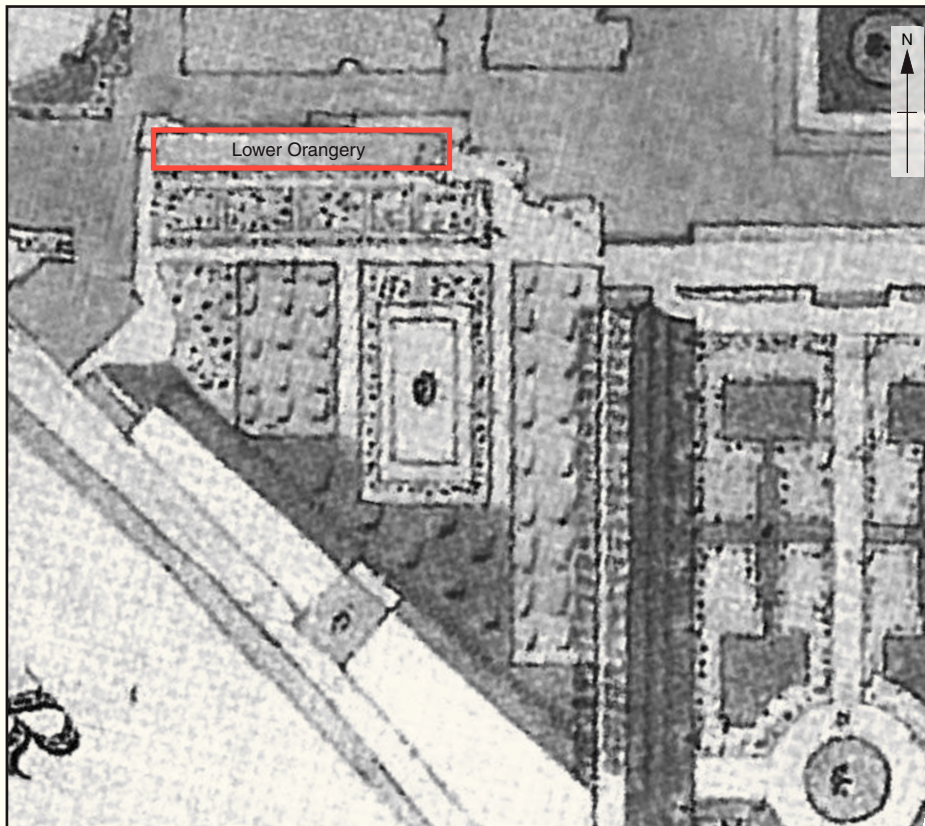


Figure 11: Detail of a plan by Henry Sayer, 1841



Plate 1: Steps 906, looking north



Plate 2: Steps 906 and wall 925 (foreground) and wall 903 (background), looking east



Plate 3: Painted fragment of architectural terracotta

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