

# Torre Abbey Phase II Evaluation



## Archaeological Evaluation Report

oxfordarchaeology



southsouthsouth

August 2011

**Client: Cyril Sweett Ltd**


Issue No: 1

OA Job No: 5041

NGR: centered on SX 907 638



Client Name: Cyril Sweett Ltd  
 Client Ref No:  
 Document Title: Torre Abbey Phase II Evaluation  
 Document Type: Evaluation Report  
 Issue/Version Number: 1  
 Grid Reference: centred on SX 907 638  
 Planning Reference:  
 OA Job Number: 5041  
 Site Code: TORRE 11  
 Invoice Code: TORREEV  
 Receiving Museum: Torre Abbey Historic House and Museum  
 Museum Accession No: TBC  
 Event No:

Issue	Prepared by	Checked by	Approved by	Signature
1	Robin Bashford Site Supervisor	J Munby Head of Buildings Archaeology	K Welsh Senior Project Manager	

Document File Location X:\Torre Abbey\Evaluation\Reports\Eval Rep  
 Graphics File Location \\Server1\invoice codes r thru z\T\_codes\TORREEV  
 Illustrated by Julia Collins

**Disclaimer:**

*This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of Oxford Archaeology being obtained. Oxford Archaeology accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person/party using or relying on the document for such other purposes agrees, and will by such use or reliance be taken to confirm their agreement to indemnify Oxford Archaeology for all loss or damage resulting therefrom. Oxford Archaeology accepts no responsibility or liability for this document to any party other than the person/party by whom it was commissioned.*

© Oxford Archaeological Unit Ltd 2011

Janus House

Osney Mead

Oxford OX2 0ES

t: +44 (0) 1865 263800

e: oasouth@thehumanjourney.net

f: +44 (0) 1865 793496

w: oasouth.thehumanjourney.net

Oxford Archaeological Unit Limited is a Registered Charity No: 285627



# Torre Abbey Phase II Evaluation

*Evaluation Report*

*Written by Robin Bashford*

*with contributions from John Cotter and Alison Kelly and illustrated by Julia Collins*

## Table of Contents

<b>Summary.....</b>	<b>3</b>
<b>1 Introduction.....</b>	<b>4</b>
1.1 Location and scope of work.....	4
1.2 Geology and topography.....	4
1.3 Archaeological and historical background.....	4
<b>2 Evaluation Aims and Methodology.....</b>	<b>5</b>
2.1 Aims.....	5
2.2 Methodology.....	6
<b>3 Results.....</b>	<b>8</b>
3.1 Introduction and presentation of results.....	8
3.2 Description of archaeological deposits.....	8
3.3 Description of historic building investigations.....	10
<b>4 Finds summary .....</b>	<b>12</b>
4.1 Pottery.....	12
4.2 Bottle glass.....	12
4.3 Wall plaster.....	13
4.4 Architectural Stone.....	13
4.5 Animal Bone.....	13
<b>5 Discussion.....</b>	<b>14</b>
5.1 Reliability of field investigation.....	14
5.2 Evaluation objectives and results.....	14
5.3 Interpretation by Test Pit.....	14
5.4 Test Pit 1 .....	14
5.5 Test Pit 2.....	14

5.6	Test Pit 3.....	15
5.7	Test Pit 4 .....	15
5.8	Test Pit 5 .....	16
5.9	Historic building investigations.....	17
<b>Appendix A. Test Pit Descriptions and Context Inventory.....</b>		<b>18</b>
<b>Appendix B. Bibliography and References.....</b>		<b>23</b>
<b>Appendix A. Summary of Site Details.....</b>		<b>24</b>
Fig. 1	Site location	
Fig. 2	Composite basement and ground floor plan showing test pit locations and opening up works	
Fig. 3	Test pit 1, photo and plan	
Fig. 4	Test pit 2, section	
Fig. 5	Test pit 3, photo and plan	
Fig. 6	Test pit 4, photo and plan	
Fig. 7	Test pit 5, photo and section	
Fig. 8	Watkins 1930s plan of Abbey with approx test pit locations	
Pls. 1-4	Areas of fabric opening and investigation	

## **Summary**

*In July 2011, Oxford Archaeology undertook a field evaluation at Torre Abbey, Torquay, Devon (centred on SX 907 638).*

*The evaluation revealed a possibly medieval metalled surface to the south of the South-East Wing, which was overlain by a sequence of later rudimentary surfaces, possibly representing construction horizons associated with the post-dissolution re-configurations of the South Range of the Abbey.*

*A potentially medieval wall was also revealed to the east of the South-East Wing. The wall was aligned north-south, and is likely to correlate to the west wall of the building identified as the infirmary by Hugh Watkin in the early 20<sup>th</sup> century. This wall was truncated by a later wall on a perpendicular alignment which appeared to be overlain by the footings of the standing wall of the South-East Wing.*

*A test pit excavated to the north of the South-East Wing revealed a wall footing which almost certainly formed part of an early 19<sup>th</sup> century brewhouse. This overlies a lead pipe of uncertain, but probably post-medieval, date.*

*A layer of stone rubble was recorded within a test pit excavated within the South-East Wing itself. The small size of the test pit means that the interpretation and date of this deposit is uncertain.*

*A trench was excavated on the mid 18<sup>th</sup> century terrace, adjacent to the porch of the South Range. This revealed a large block of masonry which may be associated with the blocking of one or more of a series of archways leading from the refectory undercroft of the abbey to the inner courtyard to the south.*

*As part of the evaluation phase there were three areas of opening up to the building fabric. The external removal of render to the South-East Wing revealed the location of former and inserted openings in the north and east walls. The internal opening up revealed the primary phase walling for the abbey building onto which the 18<sup>th</sup> century extension was added.*

## 1 INTRODUCTION

### 1.1 Location and scope of work

- 1.1.1 Oxford Archaeology (OA), were commissioned by Cyril Sweett Ltd on behalf of Torbay District Council to undertake an archaeological evaluation at Torre Abbey (SAM 24840) (Fig. 1).
- 1.1.2 Torbay District Council propose to instigate a series of refurbishment and repair works at Torre Abbey, details of which can be found in the *Justification and Access Statement* (Architecton 2010), for which an application for Scheduled Monument Consent has been submitted.
- 1.1.3 A Written Scheme of Investigation (Oxford Archaeology 2011) was therefore produced in support of an application for Class 7 Scheduled Monument Consent – '*works of archaeological evaluation carried out by or on behalf of a person who has applied for consent under section 2 of the act...in order to supply the Secretary of State with information required by him for the determination of that application*' (Ancient Monuments Order 1994). Consent for the proposed works was granted by English Heritage in a letter dated 7/7/2011 (ref: S00006371).
- 1.1.4 The Written Scheme of Investigation (WSI) outlined the procedures for the proposed evaluation, specifically to provide additional information regarding five of the proposals contained within the *Justification and Access Statement*, namely:
- the stabilisation of the south porch on a new footing;
  - the reduction of floor levels in the Education suite, South-East Wing;
  - the provision of new drainage run to the east and south of the South-East Wing;
  - the provision of drainage runs and footings for brick steps and canopy, South-East Wing courtyard;
  - the provision of a platform lift to provide wheelchair access to the South-East Wing ballroom.
- 1.1.5 All work was undertaken in accordance with local and national planning policies including:
- Ancient Monuments and Archaeological Areas Act (1979);
  - Planning Policy Statement 5: Planning for the Historic Environment;
  - Adopted Torbay Local Plan (1995-2011).

### 1.2 Geology and topography

- 1.2.1 The site is located approximately 2.5 km from Torquay city centre at the head of a natural valley (Rhodes 2010, 9).
- 1.2.2 The geology of the area is Head deposits overlying Torbay Breccia Formation (BGS Sheet 350, 2004).

### 1.3 Archaeological and historical background

- 1.3.1 The archaeological and historical background of the site has been described in detail in the Torre Abbey, Torquay: Conservation Management Plan (Draft of 5 October 2010) (Rhodes 2010), and the following is a brief summary of the salient points.



- 1.3.2 Torre Abbey was founded in 1196 by Canons of the Premonstratensian Order from Welbeck, Nottinghamshire. When the house was dissolved in 1539 some of the religious buildings were demolished or allowed to decay and the remainder of the site used for residential or agricultural use. During the 16th, 17th and 18th centuries the abbey underwent a series of conversion and refurbishment works until, in the 1740s, the house was adapted to its current Georgian appearance. It was during this phase of building that the terrace and wings, which this phase of works is concerned with, were likely to have been constructed. In 1930 the Abbey was sold to the present owners, Torquay Borough Council (Rhodes 2010, 20 and 23-28).

## 2 EVALUATION AIMS AND METHODOLOGY

### 2.1 Aims

#### ***General aims***

- 2.1.1 The general aims of the evaluation were:

- To establish the presence/absence of archaeological remains within the site area (within the depth of impact of the proposed work);
- To determine the extent, condition, nature, character, quality and date of any archaeological remains present;
- To establish the significance of the archaeological remains;
- To establish the ecofactual and environmental potential of archaeological deposits and features;
- To assess the nature and extent of any existing disturbance on the site and comment on the potential for archaeological deposits to survive across the site of the proposed works;
- To make available the results of the investigation.

#### ***Specific aims***

- 2.1.2 The specific aims and objectives of the evaluation were:

- To inform the Scheduled Monument consent application;
- To inform proposals for further archaeological investigations within the site prior to the works and to identify possible requirements for certain elements of the works (e.g. excavation of drains under archaeological supervision);
- To establish the depth, nature and extent of surviving medieval archaeological deposits beneath post-medieval and modern layers adjacent to the South Range and South-East Wing;
- To establish the phasing and character of historic fabric in areas of the South-East Wing;

#### *For Test Pit 1:*

- To inform the design of the proposed new porch foundations;

*For Test Pits 2, 3 and 4:*

- To establish the presence or absence of walls recorded in this area during Hugh Watkins investigations in the early 20th century;
- To provide a better understanding of the cause of a structural crack in the east wall of the South-East Wing.

*For Test Pit 5:*

- To establish the presence or absence of walls recorded in this area during Hugh Watkins investigations in the early 20th century;

*For the strips of removed render:*

- To establish the presence of former door and window openings in the South-East Wing;

*For the platform lift location:*

- To determine the character of the stone jambs covered by modern board lining.

## **2.2 Methodology**

- 2.2.1 Prior to excavation, the client-appointed structural engineer was consulted in order to assess the viability of the proposed test pit locations (Fig. 2) and, in particular, that of Test Pit 1 adjacent to the porch.
- 2.2.2 In order to assess the potential impact of the proposed south porch wall footings, a trench (Test Pit 1) was excavated immediately to the east of the existing porch. The test pit measured approximately 1.2 m by 1.4 m in plan, and was excavated to a maximum depth of 1 m below ground level (bgl). In consultation with Phil McMahon of English Heritage, the test pit was extended slightly to the east in order to provide a better understanding of the deposits revealed. It was also agreed to excavate a second test pit (Test Pit 1A) immediately to the west of the porch in order to explore further the nature of the deposits underlying the porch.
- 2.2.3 In order to assess the potential impact of the proposed lowering of the ground level within the South-East Wing basement, the base of an existing drainage inspection chamber within the former toilet block was broken out to reveal the underlying deposits.
- 2.2.4 In order to assess the potential impact of the proposed drainage run exterior to the South-East Wing, two test pits were excavated immediately outside the south and east walls of the wing (Test Pits 3 and 4, respectively). The test pits each measured 2 m by 1 m in plan.
- 2.2.5 A redundant service trench was revealed within Test Pit 3 and, consequently, the sequence of deposits through which the service trench was cut was revealed to a depth of 1.10m bgl. The part of this sequence which survived within the test pit was excavated stratigraphically down to the maximum depth of the test pit.
- 2.2.6 Test Pit 4 was excavated to the first significant archaeological horizon to a maximum depth of 0.75m bgl.
- 2.2.7 In order to assess the potential impact of the proposed drainage runs and footings for brick steps and canopy in the South-East Wing courtyard, a test pit was excavated in the central area of the courtyard (Test Pit 5). It was necessary to re-locate the test pit 1m to the south of its original location due to the presence of manhole covers. Test Pit 5 also measured 2 m x 1 m in plan and was hand excavated to the first significant archaeological horizon.

- 2.2.8 On completion of the below-ground archaeological evaluation, the test pits were backfilled by hand in reverse order of excavation and hand compacted. No allowance was made for specialist reinstatement, and the trenches which were excavated through tarmac were finished with hand compacted stone.
- 2.2.9 There were three areas of opening ups works to the historic building fabric as part of the evaluation works. Render was removed from each of the east and north elevations of the South- East Wing and the revealed masonry was recorded. A strip of render (c.300-400 mm high) across the wall below the level of the window sills on the north wall of the South-East Wing was removed. This was recorded photographically and a drawing at scale 1:10 was produced as well as an additional description within the written record of the findings. Removal of render on the east wall of the South-East range involved a test strip of render (c.300 mm high) being removed across the wall at first floor level. Two smaller patches of render were removed below this to determine the extent of the infill. This was opening up recorded photographically with additional detailed description within the written record.
- 2.2.10 In order to examine the fabric of the door jambs at the site of the proposed platform lift, a small area of the modern wall boards, one either side, were removed to provide information to inform the design of the wall fixings. The opening up of the boards was carried out using a modelling knife to cut cleanly through the modern dry lining, the removed sections measured 300mm square and 500mm square respectively. Following inspection and recording the boards were taped back into place and repairs will be carried out during the internal refurbishment of the ground floor South-East Wing works.

### 3 RESULTS

#### 3.1 Introduction and presentation of results

- 3.1.1 Detailed context descriptions are presented in the context inventory (Appendix A), and within the descriptive text in Section 3.3 where they are integral to the interpretation of the context in question.
- 3.1.2 Finds reports are presented in Section 3.4. A discussion and interpretation of this evidence can be found in Section 4.

#### 3.2 Description of archaeological deposits

##### *Test Pit 1*

- 3.2.1 Test Pit 1 (Fig. 3) was excavated to the east of the porch of the South Range. The trench was initially excavated to 1.4m x 1.2m. The northern half of the trench was subsequently extended eastwards by 0.5m.
- 3.2.2 The test pit revealed an east-west aligned wall footing (106) and a hemispherical structure (103). The relationship between the two was obscured by later disturbance (108) and it is possible that the two structures are contemporary. Early 20<sup>th</sup> century photographs show vegetation growing up the south facade of the South Range and it is likely that this is the origin of the disturbance.
- 3.2.3 Both structures were butted by the rubble rich deposit (104/105) which forms the make-up for the mid 18<sup>th</sup> century terrace. The pillar bases of the porch structure rested on a single course of stone (102), although where the base of the southernmost pillar extended beyond the southern face of structure 103, the stone course overlay deposit 104.
- 3.2.4 An additional trench (Test Pit 1A) was opened to the west of the porch and revealed the western continuation (107) of the southern face of the structure 103. It was not clear whether east-west aligned structure 106 also continued to the west.

##### *Test Pit 2*

- 3.2.5 Test Pit 2 (Fig. 4) was excavated within the former toilet block in the South-East Wing. As the inspection chamber proved to have been set into a concrete slab over a weak mix base layer (into which cast iron pipe work had been set), the concrete was broken out within the chamber to reveal a layer of stone beneath (200), the top of which was at approximately 8.70m OD. No further excavation was possible within the confines of the inspection chamber.

##### *Test Pit 3*

- 3.2.6 Test Pit 3 (Fig. 5) was excavated to the south of the South-East Wing and measured 2m x 1m (aligned east-west). The majority of the excavated material comprised the backfill (301, 302) of a redundant service trench (304), aligned east to west, which contained a broken ceramic pipe. The service trench had truncated a sequence of deposits visible in the south-facing section.
- 3.2.7 The earliest deposit was a very well-compacted metallised surface (309) c1.10m below present ground level (7.22m OD), which was overlain by a 0.05m thick dark brownish grey clay silt layer (313). Above this was a series of later surfaces or compacted layers (312, 307, 311). These were very similar to each other in composition, consisting

largely of crushed and compacted slate. The top of the earliest of these (312) was at 7.28m OD and was overlain by a dark grey brown clay silt (308). The remaining two slate surfaces (307 and 311) were encountered at 7.33m OD and 7.53m OD respectively, and were separated by a layer of reddish brown silty clay containing stone rubble (306).

- 3.2.8 A cobbled surface set in a reddish brown silty clay (310) was encountered at 7.57m OD, and directly overlay layer 311. This was in turn overlain by a further layer (305) of reddish brown clay silt with stone rubble throughout. A layer of lime mortar (303) overlay layer 305 and may have represented a bedding layer for a subsequently truncated surface. The top of the mortar deposit was at c7.83m OD. The remaining deposits within the trench were either fills of the service trench or modern levelling deposits for the tarmac surface (300).

#### ***Test Pit 4***

- 3.2.9 Test Pit 4 (Fig. 6) was excavated to the east of the South-East Wing and originally measured 2m x 1m (aligned north-south), although the northern 1m was subsequently extended c.0.2m. A north-south aligned wall footing (404) was encountered at 7.75m OD with a stone-lined and capped drain (410) running along its eastern face and apparently contemporary with it. To the west of the wall, at 7.62m OD, was a very compacted horizon (415) which may represent a surface, although this was only seen in the north-west corner of the trench, so any interpretation is necessarily tentative.
- 3.2.10 Truncating the wall, drain and possible surface was an east-west aligned wall footing (414). A stone-lined, slate-based drain (402) ran along its southern edge and appeared to post-date it. Indeed, this drain may be contemporary with the construction of the extant South-East Wing (see Fig. 6 section 400). The footings (412) of the standing eastern wall (408) of the South-East Wing were constructed primarily over a foundation of loose stone rubble (407), except where they directly overlay wall 414. A sherd of pottery, a fragment of bottle glass and a fragment of plaster were recovered from layer 407. Although none of these finds are particularly closely dated, all are consistent with the mid-18th century construction date of the South-East wing.
- 3.2.11 At the point where wall 408 overlay the earlier footing (414), a brick repair had also been inserted (413).
- 3.2.12 The earlier wall and drain (404 and 410) were also truncated at the northern end of the trench by a cut which forms part of a service trench running from the drainage gully which lies immediately to the north of the trench. The remaining deposits in the trench consisted of a levelling deposit for the tarmac surface.

#### ***Test Pit 5***

- 3.2.13 Test Pit 5 (Fig. 7) was excavated within the courtyard to the north of the South-East Wing, and measured 2m x 1m (aligned east-west). The earliest deposits encountered were a mid red-brown silty clay with stone throughout (508) overlain by a 0.10m thick, very mixed deposit (509). Overlying 509 was a mortar-rich layer (510) which was overlain in turn by a layer of crushed and compacted slate (504), similar to those seen in Test Pit 3. The top of layer 504 was at 8.04m OD, and was overlain by a further deposit of reddish brown clay silt (511), which may represent the remnant of a later levelling layer.
- 3.2.14 All these deposits were truncated by a north-east/south-west aligned cut (507) for a lead pipe, which was overlain by an east-west aligned stone wall footing (503) at 0.36m

below ground level (8.60m OD). The wall footing was 0.30m deep and was butted by a mixed deposit (502) of uncertain origin. The wall and the mixed deposit were overlain by a layer (501), perhaps associated with the demolition of wall 503. Layer 501 was in turn overlain by compacted stone rich material which forms the existing courtyard surface (500).

### 3.3 Description of historic building investigations

#### ***External render removal (Areas 1 and 2)***

- 3.3.1 In the *east external wall* of the South-East Wing (Area 1) the removal of render at a high level has revealed the primary phase stone construction of this extension. There are two large patches of infill using a red/brown coloured brick in what appears to be a varying Flemish bond. These areas of infill show us the location of former windows. Patch removal of render below the first-floor level reveals further brick infill associated with early ground-floor windows. The brick infill is not bonded into the stonework resulting in the extensive cracking through structural failure seen on this elevation.
- 3.3.2 On the *north external wall* of the South-East Wing (Area 2) the removal of the hard concrete modern render revealed a mix of primary phase stonework and later brickwork. Adjacent to the eastern window a stone jamb one side and a brick jamb the other side. The western window has brick jambs continuing downwards either side of the window. The bricks measure 225 x 110 x 68mm and are red/orange coloured with sharp arrises, they are laid in alternating pairs of headers and stretchers. The mortar associated with the bricks was unseen as large patches of the removed render covered the joints. The easternmost window is clearly sited at the location of a former opening which was later widened and the western window is located at the site of a former doorway, later blocked and a window inserted. The windows themselves have wooden frames and cross transom and are divided into 4 or 6 lights. The sills are of 20th-century stonework, and plain in style. Removal of mortar beside the doorway revealed the eastern jamb to be brick and the western jamb to be of stone. The style and type of brickwork is the same as seen adjacent to the windows. The stone jamb is earlier in date, and probably of the primary phase (18th century).

#### ***Internal opening up (Area 3)***

- 3.3.3 Two areas of plaster were removed, on either side of the existing door opening where the intended lift platform would be located.
- 3.3.4 On the south side a section of boarding c.300mm square was removed beneath the existing handrail. This revealed a substantial stone wall c.30mm from the current wall face with a deep offset return on the outer (east) side approximately 300mm from the current edge and 620mm deep. There are traces of horsehair plaster on the stonework within this void. The current walling at the south eastern corner of the reveal is constructed with timber uprights and within the adjacent room (G3) lath and plaster. The base of the void is covered with debris and there is some rubble stonework. The interior stone of the wall within the door reveal is fairly smooth suggesting this opening was part of the early construction of the South Range. The stonework has traces of limewash indicating it was previously exposed.
- 3.3.5 On the north side a section of boarding c.500mm square was removed adjacent to the north west corner of the opening. This revealed a further stone surface as seen on the south wall, this again the surface had traces of limewash suggesting it was previously exposed. Unlike the south wall, the stone wall continues to the corner of the reveal and reflects the modern boarding at this point.

- 3.3.6 Both areas of stonework are probably datable to the 13th century, though the former opening here is not necessarily a primary one. A small amount of the wall in the adjacent gallery room (G2A) can be seen between the boarding and the stone surface. This wall has a large area of brick blocking in on the lower section. The bricks are orangey red coloured and laid in an English bond with thick grey coloured mortar. Access to this infilled section was limited and therefore no detailed description of the brickwork and mortar at this point could be taken.

## 4 FINDS SUMMARY

### 4.1 Pottery

*By John Cotter*

#### **Introduction**

- 4.1.1 A total of 9 sherds of pottery weighing 383g were recovered from three contexts. All the pottery was examined and spot-dated. The pottery sherd count and weight by context and the context spot-date (the date-bracket during which the latest pottery types in the context are estimated to have been produced or were in general circulation) are presented in the table below, along with comments on the presence of datable types, vessel form (jugs, bowls etc) and any other attributes worthy of note (eg. decoration etc).

Context	Spot-date	No.	Weight	Comments
100	c1800-1900+	4	77	Red terracotta flowerpot (PMR FLP) incl base sherd. All fresh
400	c1600-1800?	4	257	Prob local/regional post-med glazed redwares (PMR). 4 separate vessels as fresh sherds. Incl large ?bowl base in pinkish fabric similar to Donyatt wares (plain). Jug sherd in hard smooth red fabric with sparse igneous/metamorphic inclusions & similar internal glaze to N Devon gravel-tempered ware. Coarser flat sandy flat base (sl worn) with abundant igneous inclusions - poss 16/17C? Fine red cup/drug jar flat base with internal glaze
407	c1650-1800	1	49	Probable jug handle of rod section in sandy cream/pale brown fabric with patchy ext light greenish-brown glaze. Possibly Verwood-type ware (VERW)
<b>Total</b>		<b>9</b>	<b>383</b>	

#### ***Date and nature of the assemblage***

- 4.1.2 The condition of the sherds is generally fresh. This is a small collection of post-medieval glazed coarsewares - mostly glazed redwares of fairly local or regional manufacture and mainly of 17th/18th-century date except for the few sherds of red flowerpot from context 100 which are probably of 19th-century date.

### 4.2 Bottle glass

*by John Cotter*

- 4.2.1 A single piece of glass weighing 613g. was recovered from (407). This represents the complete base and part of the wall and shoulder of an early wine bottle in dark green glass. The bottle is 'mallet-shaped' with a wide base (diam. 123mm.) and relatively short straight or slightly concave walls rounding gently inwards to a shoulder. It survives to a height of 100mm. The base walls are thick and the underside has a characteristic large domed prunt. The surface of the glass is decayed in places. A general 18th-century date is likely for this type of bottle.



### 4.3 Wall plaster

*by John Cotter*

- 4.3.1 A single piece of wall plaster weighing 153g. was recovered from (407). This has a maximum length of 130mm and tapers in thickness from 16-25mm. The outer face is dead flat and has at least one thin coat of whitewash. This sits on a base of coarse sandy white render. The inner surface is also quite flat, except at the thinner end where it is rougher. There are internal traces of a brown sandy material which may be from the brick or stone wall it was originally applied to. The piece is fairly fresh in appearance. A post-medieval date seems likely.

### 4.4 Architectural Stone

*By Alison de Turberville*

- 4.4.1 Two worked stone fragments were recovered from Test Pit 4. Both items were recovered from context (407).
- 4.4.2 The first stone is a section of moulded Breccia stone with one worked face. This face has two clear sections of bead moulding. The face is extremely rough and weathered suggesting it was an external face. The two sections of bead moulding converge together. It is unclear what this section of stone was originally for but it probably derives from the abbey buildings. Breccia stone is used extensively in the abbey buildings and moulded work can be seen particularly within the ornate chapter house doorway of the east claustral range. It is likely that this fragment is medieval in date, possibly part of the c.1200 structure.
- 4.4.3 The second fragment is a block of limestone window mullion or transom. There are three visible worked faces, the remainder having fractured off. Two faces are extremely worn and have a wide rebate running the length of the stone, presumably for glazing. One face also has a plain chamfer detail. The opposing face has fractured off but it is assumed that this would have been symmetrical. The remaining face is fairly smooth with clear tooling marks and a partial masons mark. It is likely that this face was not part of the visible stonework when the piece was *in situ*. The fragment has traces of a stoney lime mortar suggesting the reuse of the stone, probably as part of the rubble foundation for the stone wall uncovered within this trench. This piece evidently pre-dates the post medieval wall it forms the foundation of and so is also likely to be medieval in date.

### 4.5 Animal Bone

*By Geraldine Crann*

- 4.5.1 Eight fragments from two crab claws were recovered from context 105.

## 5 DISCUSSION

### 5.1 Reliability of field investigation

5.1.1 Whilst the coverage of the site area was limited, a reasonable interpretation of the range and preservation of surviving archaeological deposits can be presented, given the correlation with the well documented development of the Abbey. However, as a consequence of the distinct lack of artefactual evidence recovered, attempting to establish any correlation between the results from each test pit was problematic. As such, the following interpretation is presented by test pit rather than by speculative phasing.

### 5.2 Evaluation objectives and results

5.2.1 The principal aims of the evaluation were to inform the Scheduled Monument consent application by establishing the depth, nature and extent of surviving archaeological deposits and, as such, the evaluation has been successful. Whilst the full stratigraphic sequence was not excavated, the features and structures revealed within the trenches are reasonably well understood within the context of the known history of the Abbey, although interpretation of a number of the features is necessarily tenuous, given the restricted nature of the excavations.

### 5.3 Interpretation by Test Pit

#### 5.4 Test Pit 1

5.4.1 The origin of structures 106 and 103/107 is unclear, given their limited exposure within the test pit. A number of possible interpretations present themselves:

- Structure 106 may form part of the southern face of the medieval undercroft. However, as it is known that the southern elevation of the South Range is composed of medieval fabric, this would imply that the south wall of the undercroft was stepped out from the first floor structure.
- The structures may form part of an entrance to the first floor of the South Wing, pre-dating the current arrangement.
- Structures 106/107 and 103 may be part of the infilling of doorways to the undercroft which were blocked during the reconfiguration of the South Range and the construction of the terrace between 1741 and 1743.

5.4.2 Whilst these interpretations are far from conclusive, the apparent instability of the existing porch is almost certainly a result of the fact that the southernmost set of pillar bases are only partially resting on the solid block of masonry that is Structure 103/107, whilst the remainder overhangs the looser terrace deposits to the south.

#### 5.5 Test Pit 2

5.5.1 The origin of the stone deposit in the base of Test Pit 2 is uncertain. A north-south aligned wall is recorded in this approximate location by Watkin on his amended plan, presumably extrapolated from observations made during the alterations of the 1930s, and it is possible that this represents the Abbey dorter. However, the location of Test Pit 2 would appear to be too far to the east for the stone deposit to correlate to this wall.

5.5.2 Additionally, the level at the top of the stone deposit was approximately 8.70m OD. If this deposit does represent in situ medieval masonry, it would suggest that within the

South-East Wing it survives almost 1m above the top of the possible medieval wall in Test Pit 4 (7.75m OD - see below); 1.5m above the possible medieval surface in Test Pit 3 to the south (7.22m OD – see below); and 1.4m above the medieval surface recorded in Trench 10 of the MoLA evaluation within the courtyard to the north (7.32m OD – MoLAS, 2004).

- 5.5.3 Given the confines of the trench, it is not possible to further characterise this deposit, other than to say that it has the potential to represent the top of an archaeological horizon of indeterminate date.

## 5.6 Test Pit 3

- 5.6.1 The lack of dating evidence from Test Pit 3 made characterisation of the stratigraphic sequence problematic. The metallised surface at the base of the sequence is potentially medieval in date, given the similarity in elevation and (to a lesser extent) composition between this surface and that recorded as a medieval surface in MoLA Trench 10 to the north (7.22m OD and 7.32m OD respectively).
- 5.6.2 The series of slate layers may represent rudimentary surfaces marking construction horizons, perhaps associated with various phases of roofing of the South Range. Given the predominantly slate composition, it seems unlikely that they would have been laid specifically as external surfaces.
- 5.6.3 It is known that Sir Hugh Pollard stripped four tonnes of lead off the roof of Torre Abbey to be turned into shot to help to put down the Prayer Book Rebellion of 1549 (Rhodes, draft and pers. comm.). It seems likely therefore that Ridgeway's alterations 50 years later would have also included a significant amount of re-roofing, and it is possible that this is the origin of the slate layers recorded within Test Pit 3. If the slate layers and deposits between them represent demolition/construction horizons and levelling layers associated with these alterations, then it may be that the overlying cobbles formed the 17<sup>th</sup> century ground surface following Ridgeway's works. If this is the case, the overlying levelling deposit and mortar layer may relate to the 18<sup>th</sup> century re-configuration of the South Range and the construction of the South-East Wing between 1741-3.
- 5.6.4 As the purpose of this test pit was to assess the potential for new service runs to compromise archaeological features or deposits, the presence of the redundant service trench is potentially of some significance. It is worth noting that this trench appeared to be aligned with two existing manhole covers to the west, and may have originally formed part of an earlier foul water main, which was re-configured during the alterations in the 1930s. If this is the case, it may be possible to mitigate the potential impact to *in situ* archaeological deposits by re-using this trench.

## 5.7 Test Pit 4

- 5.7.1 The north-south aligned wall in Test Pit 4 is most likely to be the western wall of the structure identified by Watkin as the infirmary (I on Fig. 8). The fact that the adjacent stone capped drain appears to respect the eastern face of this wall would imply that it represents an internal drain, which probably ran beneath the floor of the building. As the top of the drain was at c.7.80m OD, this would suggest a floor level at a greater elevation. The drain appears to be similar in nature to those revealed within Trenches 2b and 7 of the earlier evaluations (2002 and 2004 respectively), and may therefore be part of the same drainage system.
- 5.7.2 If the interpretation as a medieval surface applied to the compacted deposit (415) to the west of the possible infirmary wall is accurate, it would suggest that the ground level of

the space between the infirmary and the dorter was at 7.62m OD. This implies a variation of medieval floor level between this area and those referred to above, as tabulated below:

Trench/Test Pit	Date	Location	OD Level
TP3	2011	Inner courtyard south of dorter	7.22m
TP4	2011	Area between infirmary and dorter	7.62m
TP4	2011	Infirmary interior	7.80m+ (top of drain)
Tr2a	2002	Refectory undercroft	7.90m
Tr7	2004	South-east of cloister	9.12m+ (top of drain)
Tr10	2004	Dorter interior	7.32m

Table: *Elevations of possible medieval ground level*

- 5.7.3 The possible medieval wall (404) was quite clearly truncated by east-west wall 414, which in turn appeared to be overlain by drain 402 and the foundation (412) of the standing wall of the South-East Wing (408). Drain 402 may be contemporary with the construction of the South-East Wing.
- 5.7.4 The relationship between these structures implies that wall 414 was constructed following the post-dissolution demolition of the east range, and prior to the construction of the South-East Wing in 1741-3. It is possible that this represents alterations to the buildings of the east range (i.e. the “infirmary”) during their use as farm buildings following the dissolution, but before the Ridgeway’s tenure and restoration of the south and east range (Rhodes, 2010, p25-26).
- 5.7.5 The removal of a 400mm strip of render from the east facing elevation of wall 408 revealed the eastern and western limits of the first floor Gothick windows blocked in 1801 during works to the ballroom. As the foundation of footing 412 was predominantly rubble to the north of wall 414, the fact that the northern limit of the window corresponds with both the northern face of 414 and the northern edge of the brick “repair” to footing 412 (413), is almost certainly the cause of the crack visible on the east elevation of the standing wall. It may also suggest that the east-west aligned structures in Test Pit 4 are related to the 18<sup>th</sup>-19<sup>th</sup> century alterations, and are inserted into wall 408 rather than overlain by it. The removal of the remaining render during the Phase II works should go some way to resolving these anomalies.

## 5.8 Test Pit 5

- 5.8.1 As with the majority of the other trenches, no artefactual material was recovered from the deposits in Test Pit 5. Consequently, the date of the slate layer 511 and underlying deposits is unclear. It is possible that layer 511 is equivalent to the layers in Test Pit 3, which were very similar in composition, although there is a considerable difference in height between the two (8.34m OD in Test Pit 5 compared to 7.53m OD for the uppermost slate deposit in Test Pit 3).
- 5.8.2 The NE-SW aligned trench (507) for the lead pipe which truncated these layers was in turn overlain by an east-west aligned wall footing (503). The latter is almost certainly the southern wall of an early 19<sup>th</sup> century brewhouse (J on Fig. 8). The lead pipe is likely to be the equivalent to a “modern” pipe recorded in the south-east corner of MoLA

Trench 10, although the fact that it was overlain by the brewhouse wall suggests that it has an earlier, albeit post-medieval, origin.

## 5.9 Historic building investigations

### ***Areas 1 and 2 (external render removal)***

- 5.9.1 The render removal on the east wall of the South-East Wing revealed two areas of blocking in connected to former Gothick style sash windows seen depicted in late 18th century historic sketches and paintings. It is possible that the blocked windows were bricked up during construction of the ballroom for a visit by Earl St Vincent in 1801 (Cary 1929,1). The brickwork certainly appears to correspond with this phasing. Removal of other small sections of render on this elevation revealed the brick blocking of the corresponding southern ground floor window. Sketches and engravings of the late 18th century suggest the positioning of the windows was much more symmetrical in layout and it is likely that the current two ground floor windows were repositioned at the time of the insertion of the ladies WC in the 1930s.
- 5.9.2 Early 20<sup>th</sup> century plans of the abbey, including the Watkin's 1930s plan (Fig. 8), show the room layout for this area and in particular the basement rooms of south wing north wall which can be accessed through the brewery yard. From this and the archaeological evidence we can conclude that the eastern window on the was formerly a doorway leading to a WC, with no further access from within the wing. The remaining window does not appear on any of the early 20<sup>th</sup> century plans and its date is unknown but due to the bricks used on the jambs it possibly dates to the 18<sup>th</sup> or 19<sup>th</sup> century. The doorway is located opposite the central window on the south elevation of the wing and is shown on the 1930s plan. The stone jamb suggests the door was part of the primary phase construction of the wing and the brick jamb suggests the doorway was later widened. The interior walls of the wing at this level appear to be mostly of brick (with some of stone) suggesting this section of the wing was substantially reworked.
- 5.9.3 Further render removal should be monitored and any further exposed features recorded as it is clear that the external appearance of the south wing has been greatly altered.

### ***Area 3 (internal opening up)***

- 5.9.4 The return seen in the stonework on the southern door reveal is probably part of the 18th-century construction of the wing joining onto the medieval fabric of the South Range. On the northern reveal the stonework is clearly part of the medieval monastic build. The brick infill on the east wall of the adjoining room observed during the works is of interest and appears to be a blocked in fireplace, although not centrally located within the internal elevation as expected. The report produced by Keystone for Torre Abbey in 2003 suggests that this wall had a 'hiding hole' as reported in *Hiding Places* (Squires 1933, 249) until the 1930s and the appearance of the brickwork would suggest the early 20th century date for the work. The presence of limewash on the stone faces of both reveals suggest that the stonework was previously exposed, but does not necessarily show that they represent a medieval opening.
- 5.9.5 Further opening up works in this area should be investigated and may provide further insight into the construction of the South Range and the later addition of the South-East Wing extension.

## APPENDIX A. TEST PIT DESCRIPTIONS AND CONTEXT INVENTORY

Test Pit 1						
General description					Orientation	n/a
					Avg. depth (m)	
					Width (m)	
Contexts						
context no	type	Width (m)	Depth (m)	comment	description	date
100	Deposit		0.06	Modern garden soil	Friable mid grey brown silty clay	
101	Structure			Possible border edging	Single course of brick on an east-west alignment	
102	Structure		0.17	Footing for eastern side of porch structure	Stone rubble	
103	Structure		0.52(+)	Possible pre-18th century steps	Hemispherical stone built structure	
104	Deposit		0.60(+)	1741-3 Terrace deposit	Architectural stone and building rubble in matrix 105	
105	Deposit		0.85	1741-3 Terrace deposit	Loose mid grey brown silty clay	
106	Structure			Western continuation of structures 107 and 103	Stone structure with east-west face	
107	Structure			East-west aligned structure	Roughly dressed stone in lime mortar	
108	Cut			Bioturbation. Possibly from Virginia creeper formerly growing up southern facade	Void at interface between structures 103 and 107	
Test Pit 2						
General description					Orientation	
					Avg. depth (m)	
					Width (m)	
Contexts						
context no	type	Width (m)	Depth (m)	comment	description	date

200	Deposit			Stone	Possible wall???	
<b>Test Pit 3</b>						
<b>General description</b>					<b>Orientation</b>	
					<b>Avg. depth (m)</b>	
					<b>Width (m)</b>	
<b>Contexts</b>						
<b>context no</b>	<b>type</b>	<b>Width (m)</b>	<b>Depth (m)</b>	<b>comment</b>	<b>description</b>	<b>date</b>
300	Deposit			Tarmac	Tarmac	
301	Deposit		0.1	Levelling deposit for tarmac	Red brown silty clay, gravel throughout	
302	Fill		0.36	Fill of redundant service trench	Red brown silty clay gravel and modern material throughout (concrete, brick etc.)	
303	Layer		0.12	Mortar ?surface/bedding deposit	Compact, light creamy yellow lime mortar with some grey mottling	
304	Cut	0.80m +	1.1m	Redundant service trench	East-west aligned service trench	
305	Deposit	0.52		Levelling deposit for mortar layer 303	Mid red brown silty clay	
306	Deposit	0.09		Levelling deposit for "surface" 311	Red brown silty clay 25% stone throughout	
307	Layer	0.08		Slate "surface"	Crushed and compacted slate	
308	Deposit	0.08		Trample/levelling deposit over "surface" 312 and overlain by "surface" 307	Dark grey brown clayey silt	
309	Layer			Metalled surface	Very compacted cobbles of various sizes in mid red brown silty clay matrix	
310	Layer	0.14		Cobbled surface	Cobbles set in compacted red brown silty clay matrix	
311	Layer	0.06		Slate "surface"	Crushed and compacted slate	

312	Layer	0.05		Slate "surface"	Crushed and compacted slate	
313	Deposit	0.05		Layer of trample over 309	Brown silty clay	
<b>Test Pit 4</b>						
<b>General description</b>					<b>Orientation</b>	
					<b>Avg. depth (m)</b>	
					<b>Width (m)</b>	
<b>Contexts</b>						
<b>context no</b>	<b>type</b>	<b>Width (m)</b>	<b>Depth (m)</b>	<b>comment</b>	<b>description</b>	<b>Suggested Assessment phase</b>
400	Deposit		0.32	Tarmac surface and made ground	Tarmac surface and made ground	
401	Fill		0.16	Fill of slate based drain	Loose mid red with grey patches and sandy rubble	
402	Structure	0.62	0.16	Stone lined drain with slate base	East-west aligned drain	
403	Cut	0.9	0.16	Cut for stone lined drain		
404	Structure	0.76	0.35	Possible medieval wall		
405	Fill		0.48	Fill of cut for modern drain	Loose mid brownish red and light greyish white clayey sand and mortary rubble	
406	Cut			Cut for foundation (407) of footing (412) of standing wall (408)		
407	Fill		0.67	Fill of construction cut 406	Loose mid-light brownish beige silty sand frequent mortar, stone and brick fragments	
408	Structure			Standing eastern wall of South-East Wing		
409	Cut			Cut for modern drain		
410	Structure			Stone lined and capped drain	North-south aligned drain	
411	Cut			Construction cut for drain 410		
412	Structure			Foundation for standing wall 408		
413	Structure			Brick "repair" to footing 412		
414	Structure		0.8	East-west wall of	East-west aligned	



context no	type	Width (m)	Depth (m)	comment	description	Suggested Assessment phase
				uncertain provenance	wall	
415	Layer			Possible medieval surface to west of wall 404 and overlain by foundation 407??	Compacted mortar	
416	Cut			Construction cut for wall 414	East-west aligned cut	
<b>Test Pit 5</b>						
<b>General description</b>					<b>Orientation</b>	
					<b>Avg. depth (m)</b>	
					<b>Width (m)</b>	
<b>Contexts</b>						
context no	type	Width (m)	Depth (m)	comment	description	Suggested Assessment phase
500	Deposit			Modern courtyard surface	Compacted mid red sandy clay with limestone fragments throughout	
501	Deposit		0.55	Levelling layer from demolition of brewhouse?	Light grey silty clay with c2% red brown mortar and 75% stone rubble throughout	
502	Deposit		0.29	Possible demolition deposit within brewhouse	Loose mid purple brown silty sand with frequent slate, stone, mortar, cbm flecks	
503	Structure		0.5	Southern wall of 19thC brewhouse	East-west aligned wall	
504	Layer		0.04	Slate "surface"	Crushed and compacted slate	
505	Pipe			Lead pipe	Lead pipe	
506	Fill		0.5	Fill of pipe trench	Loose brown red silty clay 10-15% slate and stone	
507	Cut		0.5	Cut for lead pipe	NE-SW aligned pipe trench	
508	Deposit			Possible levelling layer	Loose mid red	

<b>context no</b>	<b>type</b>	<b>Width (m)</b>	<b>Depth (m)</b>	<b>comment</b>	<b>description</b>	<b>Suggested Assessment phase</b>
					brown silty clay 5% stone	
509	Deposit		0.1	Possible levelling layer for "surface" 504	Mid-dark brown purple silty sand	
510	Deposit		0.11	Mortar bedding for "surface" 504	Firm light greyish white sandy lime mortar	
511	Deposit		0.08	Base of ?demolition deposits??	Loose pinky reddish brown silty clay	
512	Deposit			Same as 502 to south of wall 503	?demolition deposit	

## APPENDIX B. BIBLIOGRAPHY AND REFERENCES

- |                       |       |  |
|-----------------------|-------|--|
| Architecton           | 2010  | Torre Abbey, The Kings Drive, Torquay: Justification and Access Statement  |
| Cary, L               | 1929  | 'Nelson and St Vincent at Torre Abbey', <i>Devon &amp; Cornwall Notes &amp; Queries</i> , XV (1929), p.1-                              |
| English Heritage      | 1991  | <i>Management of Archaeological Projects</i> .   |
| Hey, G. and Lacey, M. | 2001  | <i>Evaluation of Archaeological Decision-making Processes and Sampling Strategies</i> .  |
| MOLA                  | 2010  | <i>The Premonstratensian abbey of Torre, Devon</i> . Draft publication text – V.02   |
| MoLAS                 | 2004  | <i>Torre Abbey</i> (Area of archaeological investigation/opening up. Revision C) A Post Excavation Interim Report on the investigation |
| Oxford Archaeology    | 1992  | <i>Fieldwork Manual</i> , (Ed. D Wilkinson, first edition, August 1992)  |
| Oxford Archaeology    | 2000  | <i>OA Environmental Sampling Guidelines and Instruction Manual</i>   |
| Oxford Archaeology    | 2011  | Archaeological Evaluation at Torre Abbey, Torquay: Written Scheme of Evaluation  |
| Rhodes, M             | 2010  | <i>Torre Abbey, Torquay. Conservation Management Plan</i>  |
| Rhodes, M             | draft | <i>Torre Abbey 800-years of Devon's religious history</i>  |
| Watkin, HR            | 1909  | <i>A Short Description of Torre Abbey, Torquay, Devonshire</i>   |

## Websites:

<http://www.torbytes.co.uk/op/tm4/lv2/item236.htm>

## APPENDIX A. SUMMARY OF SITE DETAILS

**Site name:** Torre Abbey Evaluation  
**Site code:** TORRE 11  
**Grid reference:** SX 290740 063830 (centred)  
**Type:** Evaluation  
**Date and duration:** 18<sup>th</sup>-22<sup>nd</sup> July 2011

### Summary of results:

In July 2011, Oxford Archaeology undertook a field evaluation at Torre Abbey, Torquay, Devon (centred on SX 907 638).

The evaluation revealed a possibly medieval metalled surface to the south of the South-East Wing, which was overlain by a sequence of later rudimentary surfaces, possibly representing construction horizons associated with the post-dissolution re-configurations of the South Range of the Abbey.

A potentially medieval wall was also revealed to the east of the South-East Wing. The wall was aligned north-south, and is likely to correlate to the west wall of the building identified as the infirmary by Hugh Watkin in the early 20th century. This wall was truncated by a later wall on a perpendicular alignment which appeared to be overlain by the footings of the standing wall of the South-East Wing.

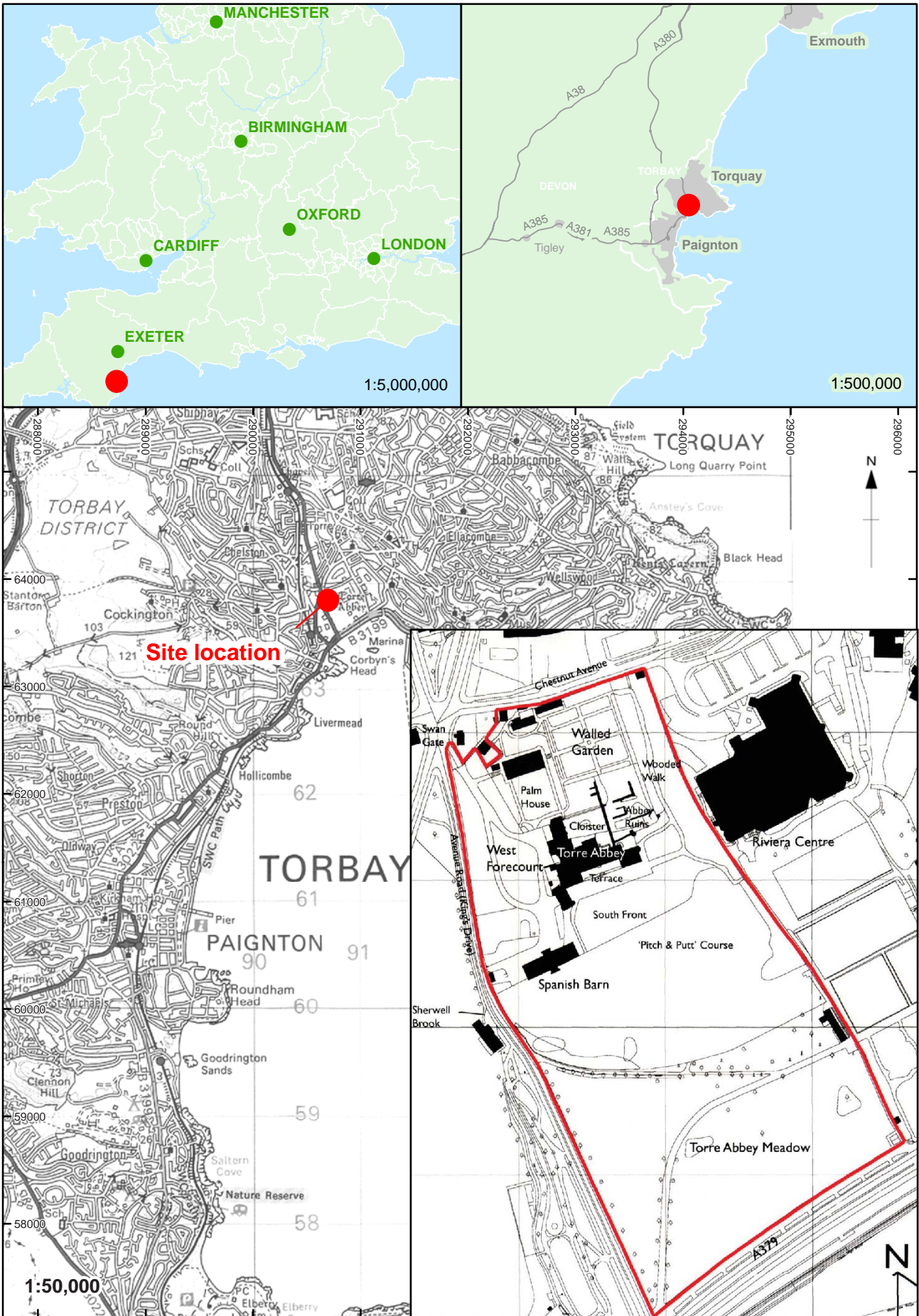
A test pit excavated to the north of the South-East Wing revealed a wall footing which almost certainly formed part of an early 19th century brewhouse. This overlies a lead pipe of uncertain, but probably post-medieval, date.

A layer of stone rubble was recorded within a test pit excavated within the South-East Wing itself. The small size of the test pit means that the interpretation and date of this deposit is uncertain.

A trench was excavated on the mid 18th century terrace, adjacent to the porch of the South Range. This revealed a large block of masonry which may be associated with the blocking of one or more of a series of archways leading from the refectory undercroft of the abbey to the inner courtyard to the south.

As part of the evaluation phase there were three areas of opening up to the building fabric. The external removal of render to the South-East Wing revealed the location of former and inserted openings in the north and east walls. The internal opening up revealed the primary phase walling for the abbey building onto which the 18th century extension was added.

**Location of archive:** The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES, and will be deposited with Torre Abbey Historic House and Museum in due course.



Reproduced by permission of the Ordnance Survey on behalf of The Controller of Her Majesty's Stationary Office (c) Crown Copyright. 1996 All rights reserved. License No. AL 10000569

Figure 1: Site location



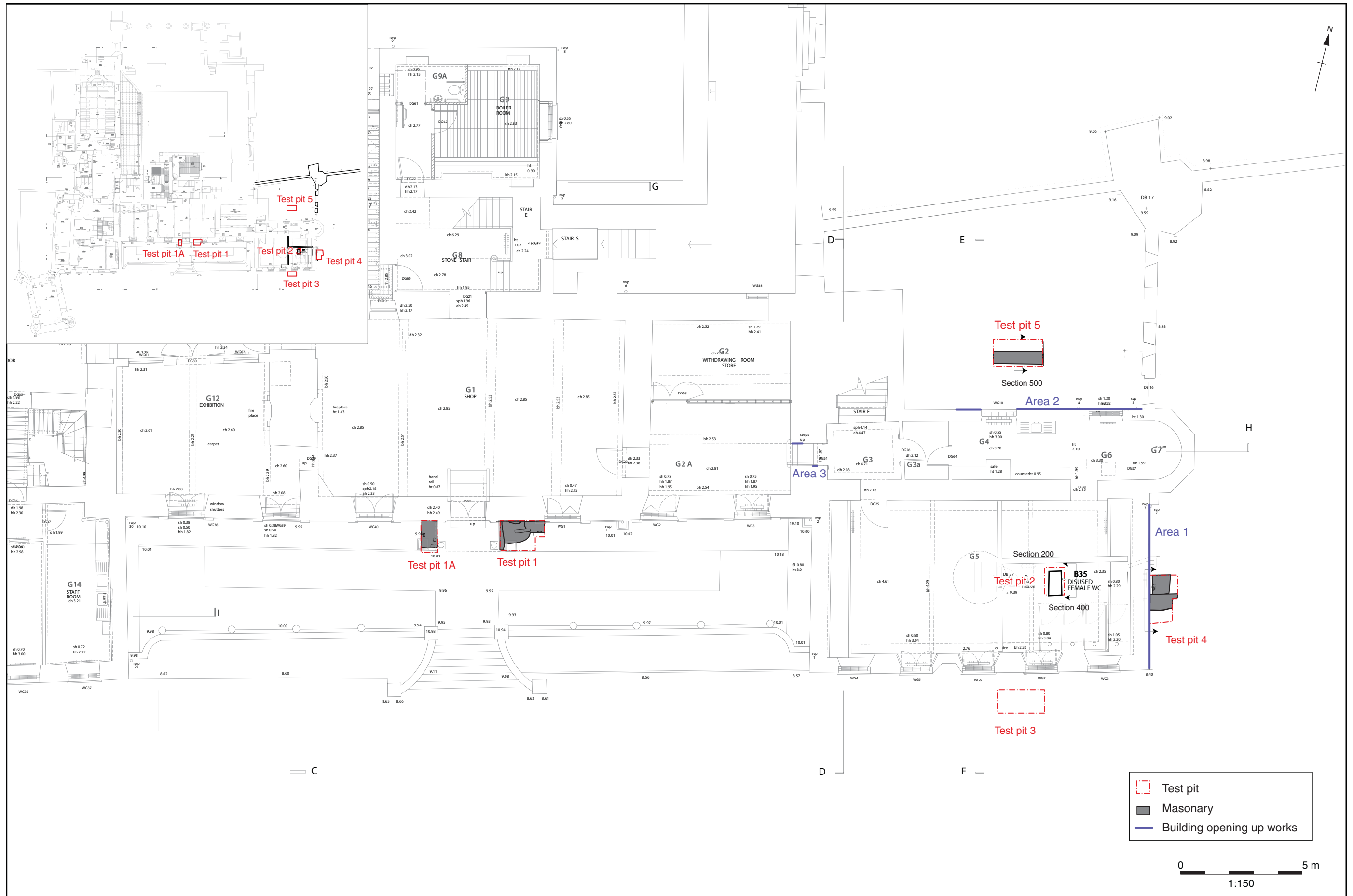


Figure 2: Composite basement and ground floor plan showing Test pit locations and opening up of works





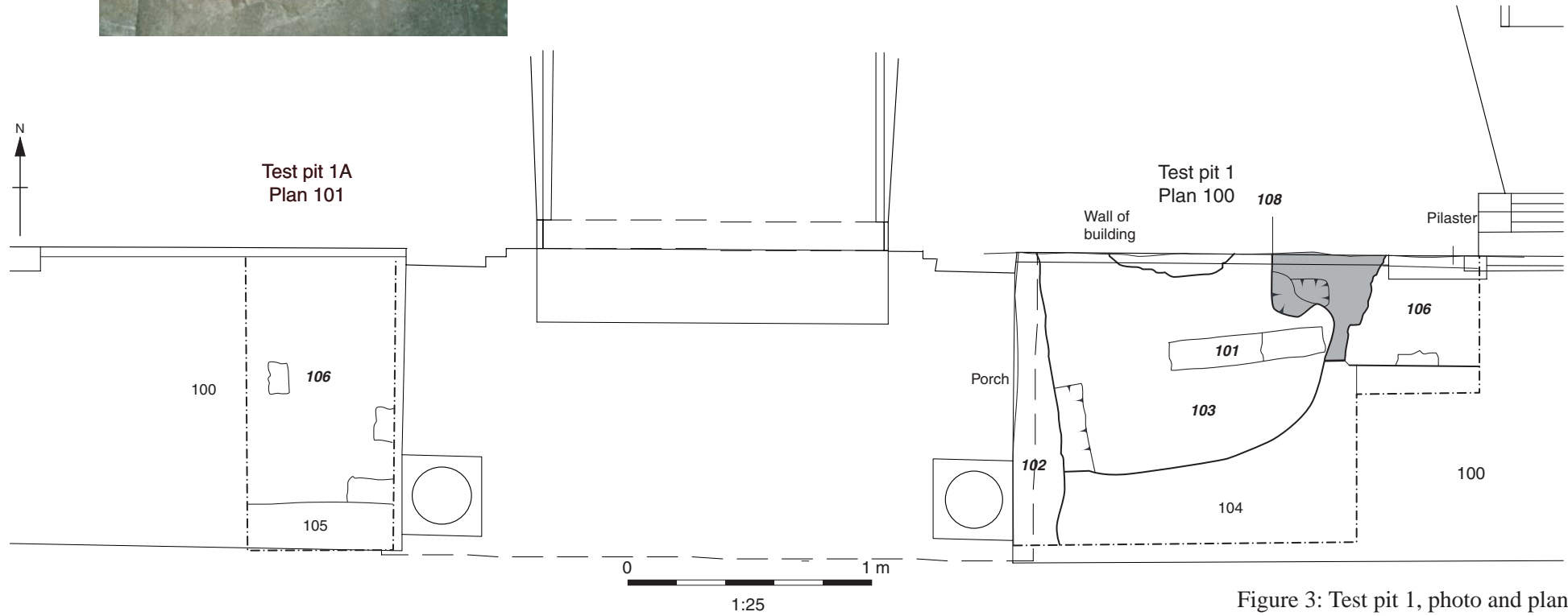


Figure 3: Test pit 1, photo and plan



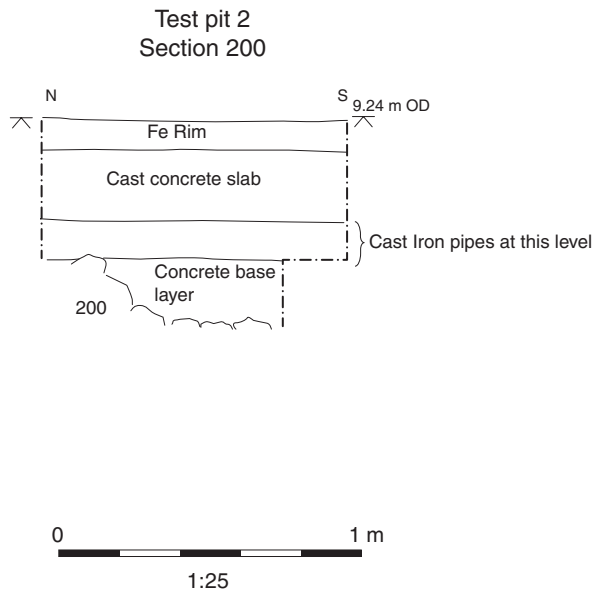


Figure 4: Test pit 2, section



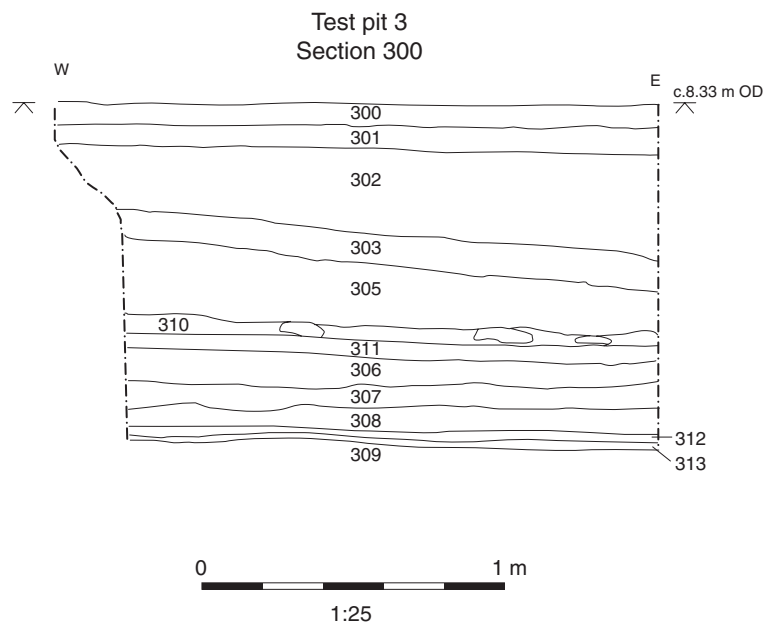


Figure 5: Test pit 3, photo and section





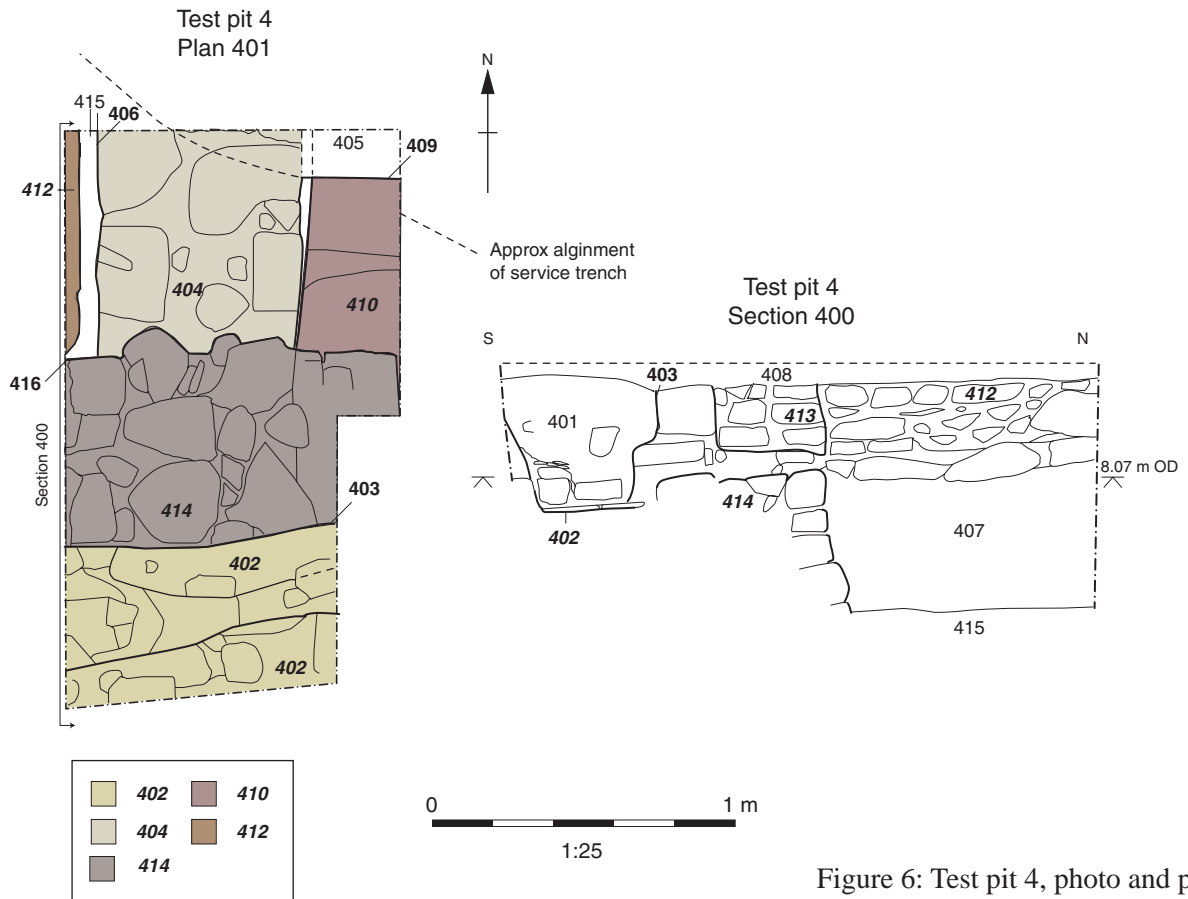


Figure 6: Test pit 4, photo and plan





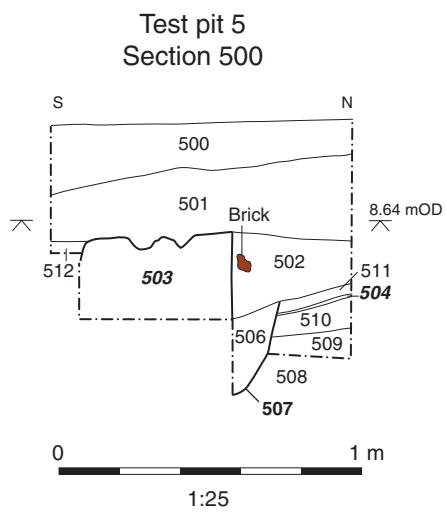


Figure 7: Test pit 5, photo and section



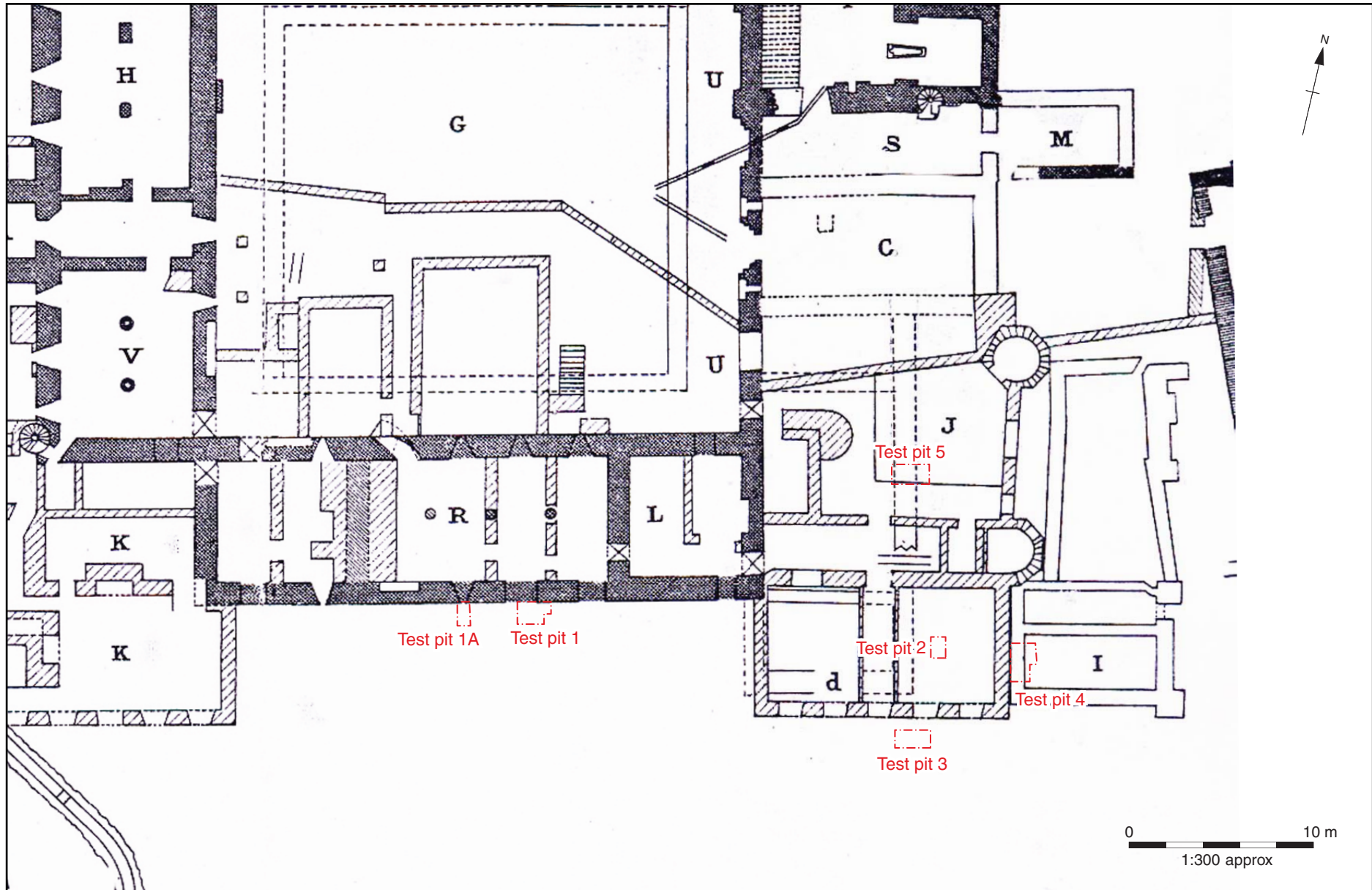


Figure 8: Watkins 1930s plan of Abbey with approx test pit locations a







Plate 1: Area 1 opening up on east elevation of south east wing



Plate 2: Area 2 opening up on north elevation of south east wing



Plate 4: Area 3 opening up - southern reveal of doorway



Plate 4: Area 3 opening up - northern reveal of doorway







**Head Office/Registered Office/  
OA South**

Janus House  
Osney Mead  
Oxford OX2 0ES

t: +44 (0) 1865 263 800  
f: +44 (0) 1865 793 496  
e: info@oxfordarch.co.uk  
w: <http://thehumanjourney.net>

**OA North**

Mill 3  
Moor Lane  
Lancaster LA1 1GF

t: +44 (0) 1524 541 000  
f: +44 (0) 1524 848 606  
e: oanorth@thehumanjourney.net  
w: <http://thehumanjourney.net>

**OA East**

15 Trafalgar Way  
Bar Hill  
Cambridgeshire  
CB23 8SQ

t: +44 (0) 1223 850500  
f: +44 (0) 1223 850599  
e: oaeast@thehumanjourney.net  
w: <http://thehumanjourney.net>



**Director:** David Jennings, BA MIFA FSA

*Oxford Archaeology Ltd is a  
Private Limited Company, N<sup>o</sup>: 1618597  
and a Registered Charity, N<sup>o</sup>: 285627*