

Culzean Castle Spine Wall Consolidation: Archaeological Mitigation

Data Structure Report



by Louise Turner

issued 31st March 2017

on behalf of National Trust for Scotland


RATHMELL 
ARCHAEOLOGY LTD

Quality Assurance

This report covers works which have been undertaken in keeping with the issued brief as modified by the agreed programme of works. The report has been prepared in keeping with the guidance of Rathmell Archaeology Limited on the preparation of reports. All works reported on within this document have been undertaken in keeping with the Chartered Institute for Archaeologists' Standards and Policy Statements and Code of Conduct.

Signed  Date31st March 2017...

In keeping with the procedure of Rathmell Archaeology Limited this document and its findings have been reviewed and agreed by an appropriate colleague:

Checked  Date31st March 2017...

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Inventory Garden & Designed Landscape (GDL00124)			
Canmore IDs	40959 (Castle; Country House; Steps; Tower House; Wall)		

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Introduction

1. This Data Structure Report has been prepared to present the findings of archaeological monitoring undertaken in support of conservation work upon the fabric of the Spine Wall of the Walled Garden at Culzean Castle. The work comprised the removal of modern cast concrete coping from the wallhead, and its replacement with an equivalent line of coping executed in hand-tooled sandstone.
2. These works were designed to mitigate adverse impact on the historic fabric of the walled garden and also to ensure that insights into the construction or development of the walled garden were captured as the works progressed.
3. The Spine Wall forms part of the Category A Listed Walled Garden (LB7612), which itself forms an element of the nationally significant Inventory Garden & Designed Landscape of Culzean Castle (GDL00124).
4. Rathmell Archaeology Limited was appointed by the National Trust for Scotland ('NTS') to undertake the development and implementation of archaeological mitigation works, the specific details of which were agreed with the NTS by way of a Method Statement (Rees & Turner 2016).

Archaeological and Historical Background

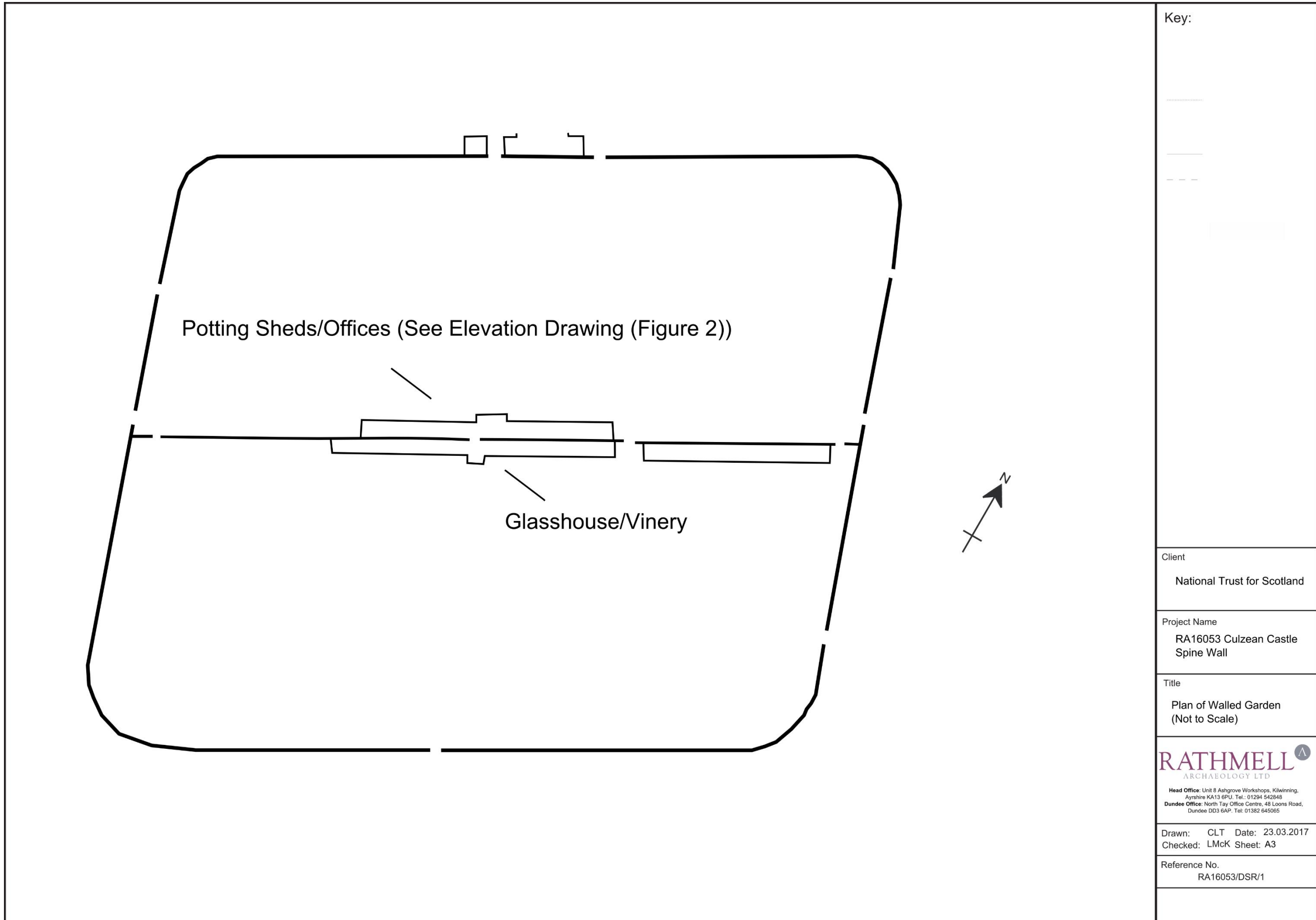
5. The designed landscape at Culzean is discussed at length in its Inventory of Garden & Designed Landscape entry and it is not proposed to reproduce all the details here (for further details, see the accompanying entry at <http://portal.historicenvironment.scot/designation/GDL00124>). In summary, Culzean represents one of the most important Picturesque landscapes to survive in Scotland (c. 1780-1830s), its significance further enhanced by the role it plays as the landscape setting for Robert Adam's Classically-inspired Culzean Castle.
6. Situated 19km SW of Ayr, Culzean Castle and its policies sit above rocky cliffs which overlook a broad coastal bay. Bounded to the SE by the modern public road from Maybole to Maidens, the character of the designed landscape comprises wooded parkland, gardens and farmland enclosed by moorland to the N and S.
7. The walled garden was an important element of the castle's policies from a very early stage, providing cut flowers and – sometimes exotic – fresh produce for consumption by the castle's residents. Documentary evidence suggests that the structure was laid out after 1775: an early estate plan compiled by Foulis in 1755 shows the site of the future walled garden as occupied by an enclosed plot labelled 'Scipio's Land.' This refers to Scipio Kennedy (Moss, 2002), a former slave who continued to work for the Kennedy family as a freed man (Addyman, 2001). Scipio was rewarded for his long service with a plot of land within the estate and he died in 1774, aged 80, thus providing a *terminus post quem* for the creation of the walled garden.
8. Although the walled garden's primary function would have been as a source of produce for the main house, it also provided an additional space which could be utilised by the family as a place for perambulation and leisure. Within its enclosing walls can be found a mixture of structures of practical and ornamental value: the functional buildings include potting sheds and glasshouses, while the ornamental include a sundial and a rustic summerhouse. Even the functional buildings were created with aesthetic principles in mind, with the group in its entirety forming a visually pleasing whole.
9. From the very beginning, a key role of the garden was in the production of exotic species native to tropical or Mediterranean climates, and therefore not well-suited to growth in the local climate. Culzean was renowned in particular for its cultivation of grapes, with one of its gardeners in particular – Mr Murray, working in the late 1800s – earning great renown in this field (Addyman, 2001).
10. Although some sources suggest that the walled garden was enlarged c. 1830, evidence derived from historic building recording would argue instead that it represents a single, uniform build. The subdivision of the garden into two roughly equal parts through the building of a SW-NE aligned internal cross wall – the spine wall – appears to have been

part of the established design from the outset (Figure 1). Addyman's investigation of the features indicates that the ends of the cross wall are integral to the fabric of the outer, enclosing wall, and there was no indication of multi-phased construction within the wall itself.

11. In those walled gardens where the cultivation of tender species was a priority, the installation of an intra-mural heating system was an integral part of the construction, and the spine wall at Culzean was no exception. The glasshouses were built to utilise the south-facing aspect of the wall (the side most favourable to encourage plant growth), with the service structures – the potting sheds and furnace houses – placed against the north side. Heat was generated within the furnace houses then distributed through the wall via a system of flues built with an inner lining of handmade bricks, ceramic being a material conducive to radiating heat as well as being more robust when exposed to high temperatures compared with the sandstone used to construct the masonry.
12. The cultivation of vines continued at Culzean until World War II, when the function of the walled garden changed. The produce became more utilitarian in nature, with the facility functioning instead as a market garden which could supply a military convalescent home at nearby Turnberry Hotel (Addyman, 2001). The Vinery became derelict at this time, and was demolished in 1948. Photographs of the structure survived, however, and these proved critical for providing a model for the building's subsequent reconstruction after AD 2000.
13. Historic building recording works carried out by Addyman & Kay Ltd. c. 2000, prior to the reconstruction of the Vinery, yielded – in addition to a detailed understanding of the intra-mural heating system – information which indicated that the configuration of the spine wall had changed throughout its history. In particular, they highlighted the presence of a raised section of wallhead, measuring around 5.4m in length and projecting above the neighbouring sections by a height of 0.25m. Placed centrally within this raised section was an arched entrance, with a circular oculus-type window placed above the keystone. This had subsequently been blocked, and replaced with the modern opening still in use today. Following the investigative works carried out prior to the reconstruction of the glasshouses, both these earlier features and a short section of the brick lining with its intramural flues have been left exposed to help visitors understand the site's function and development more clearly.

Project Works

14. The programme of works comprised archaeological monitoring of consolidation works undertaken upon the wallhead of the spine wall (Figure 1) in the vicinity of the central buildings (the potting sheds and glasshouses/vinery). The works comprised the removal of the previous, cast concrete coping, followed by consolidation of the historic masonry below. The use of modern, cementitious mortars – as opposed to historic lime mortars – had proved detrimental to the earlier fabric, which required consolidation and rebuilding in some places, particularly along the wallhead. These repairs were carried out using materials more in keeping with the structure's historic origins, in particular handmade bricks and lime mortar, with hand-tooled sandstone coping stones replacing their earlier concrete counterparts.
15. Works were ongoing between the summer of 2016 and the early spring of 2017. During this period, two separate archaeological monitoring visits were undertaken, on 21st July 2016 and 20th January 2017 respectively. These timings were chosen carefully in order to allow as much of the exposed wallhead as possible to be examined, and – crucially – to allow any variation in the structure to be assessed, recorded and properly understood. Weather conditions contrasted considerably between the two visits: the summer monitoring visit was characterised by dry, warm and intermittently sunny weather; the winter visit by weather which was dull and cold but largely dry.
16. All works were conducted in accordance with the Chartered Institute for Archaeologists' Standards and Policy Statements and Code of Conduct and Historic Scotland Policy Statements.



Key:

Client
National Trust for Scotland

Project Name
RA16053 Culzean Castle
Spine Wall

Title
Plan of Walled Garden
(Not to Scale)

RATHMELL
ARCHAEOLOGY LTD
Head Office: Unit 8 Ashgrove Workshops, Kilwinning,
Ayrshire KA13 6PU. Tel: 01294 542848
Dundee Office: North Tay Office Centre, 43 Loons Road,
Dundee DD3 6AP. Tel: 01382 645065

Drawn: CLT Date: 23.03.2017
Checked: LMCK Sheet: A3

Reference No.
RA16053/DSR/1

Figure 1: Plan of Walled Garden

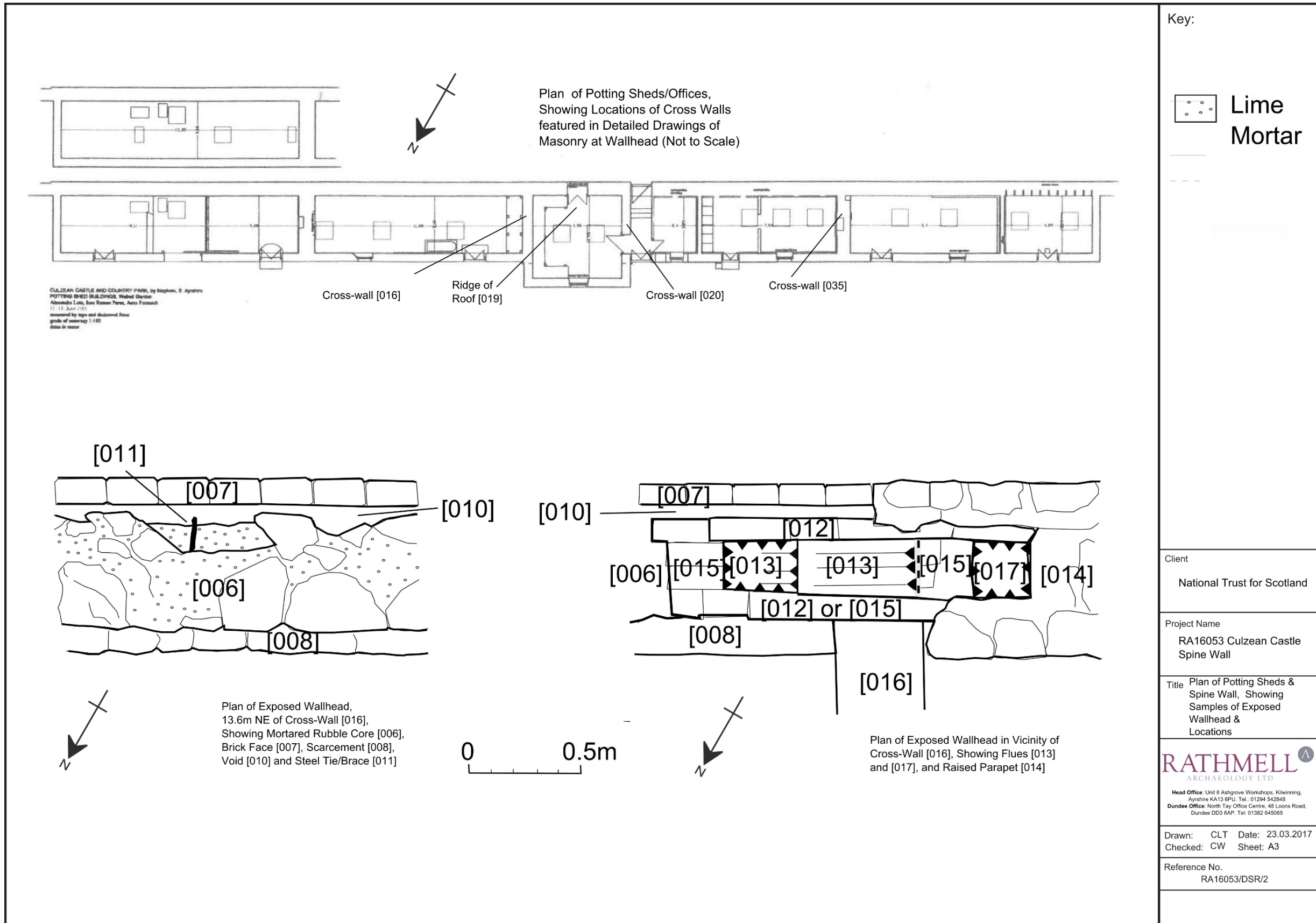


Figure 2: Plan of potting sheds and spine wall, showing samples of exposed wallhead and locations

Findings

17. The observations made during the two site visits are summarised in this section, with the accompanying drawings provided in Figure 2. These show the locations of structural elements such as cross walls as well as sample lengths of wallhead drawn in plan in order to demonstrate the character of the masonry in these locations. The wallhead is shown in section (outwith the extent of the raised centrepiece [014] in (Figure 3).
18. The first archaeological monitoring visit (July 2016) took place following the removal of the concrete coping blocks over a distance of approximately 30m along the length of the spine wall as it ran between the potting shed range and the glasshouses starting at their NE end. The wallhead was already in the process of being consolidated at the NE end, over a distance of 10.5m, making inspection impossible. The roof of the potting shed had also been replaced in this area, and one of the original flue outlets rebuilt using handmade bricks [003]. The wallhead was then consolidated with an external face of bricks set out in stretcher bond and bonded with lime mortar, with the area between this and the original wall structure infilled with crushed sandstone rubble set in a matrix of lime mortar [002] (Figure 4a).
19. Beyond this point, the original masonry remained exposed, allowing unimpeded inspection of its character (Figure 4b). The locations of flues were noted, and sample lengths of the wallhead drawn on plan to provide more detailed records of the structure (see Figure 2).
20. From this, it was possible to establish that the bulk of the wall was composed of unworked or roughly worked sandstone rubble set within a lime mortar matrix [006]. The width of wall [006] at its upper level was 0.6m, but its maximum (visible) width was 0.7m: the structure included an integral scarcement ledge [008] 0.1m wide, running the length of its rear, NW face, for a distance of 28.5m from the NE end of the consolidated area. This functioned as a support for the timber wallplate upon which the slated roof of the potting shed rested.
21. Along the front, SE, edge, the presence of a similar scarcement ledge could be inferred by the roofing requirements of the adjacent glasshouse which houses the Vinery. This feature could not, however, be seen from the wallhead, as it had been obscured by later consolidation works. In particular, a wall-facing [007] comprising a single skin of modern, Annbank bricks, laid in stretcher bond, formed the outer edge of the wall (Figure 5a). Between this and the inner face of the original masonry spine wall [006], there was a void (010) which had been infilled with crushed stone and debris (Figure 5a). The concrete coping would then have been laid flush with the rear, NW, face of [006] and the front SE edge of brick facing [007], concealing void (010) beneath.
22. The presence of void (010) suggests that – rather than representing a later attempt at consolidation of a pre-existing wall face (i.e. the handmade brick lining noted at a lower level on the SE-facing side of the wall) - the modern brick face [007] represents instead a raising of this brick lining to create a change in the roofline of the glasshouses. As [007] is only one skin in width, the void can be envisaged as the space above the inner skins of the earlier brick lining: this latter feature would have been more than one skin in width as it needed to accommodate the full width of the flue, which, where exposed, measured 0.2m. We can therefore envisage that the NE side of the spine wall included a similar scarcement ledge to that still extant on the NW side, though at a much lower level. This would have allowed the siting of a wallplate, upon which rested the cast-iron frame forming the rear edge of the roof of the glasshouse/vinery.
23. The case for a change in roofline was further supported by the regular presence of iron straps or ties [011], bedded deep within the rubble core of [006], from which they projected by a short length (Figure 5b). Four of these items were identified in total, occurring at semi-regular intervals running between 15 and 28m SW of the NE end of the consolidation works. The spacing of these ties varied between 1.25 and 1.7m: either this distance varied at the time of construction or – more likely - the original intended distance between the individual ties can no longer be determined due to later remodelling or consolidation works.

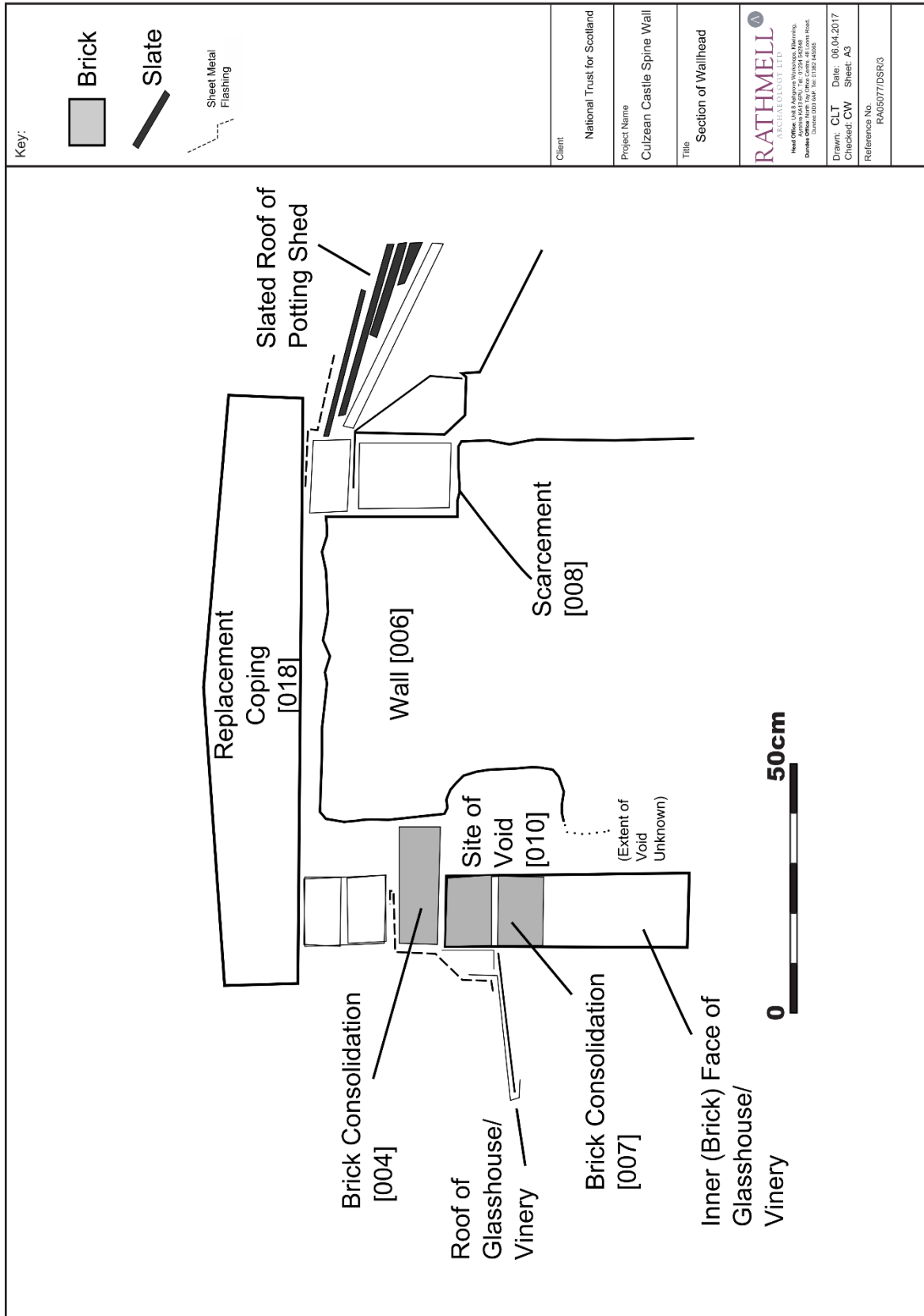




Figure 4a: Consolidated area at NE end of Spine Wall (0-10m SW of NE end)



Figure 4b: Transition between Consolidated Fabric [001] & [002] and Original Wall Fabric [006] and Scarcement Ledge [008], with Relaid Bricks [004] and Modern Lead Flashing [005] at SE edge (Looking NE)



Figure 5a: Rubble Wall [006], with Scarcement Ledge [008] to left and Modern Brick Lining [007] to Right, with Void (010) to rear



Figure 5b: Wall [006], with Iron Strap [011] to left of Void [010] and modern brick lining [007]

24. Perhaps the most outstanding original features to be observed within the fabric of the spine wall were the flues. The first visit revealed three of these structures emerging at various locations along the length of the wall. A further four were revealed during the second visit, making a total of seven. At the time of the first visit, the flues at 1m and 14m SW of the NE end had already been capped with brick chimneys, built using reproduction handmade bricks. In their final form, these sat flush with the consolidated wallhead [002]. Ceramic pots or cans were subsequently added.
25. The NE completed chimney [003] was encompassed within the width of the wall, and aligned NE-SW; this contrasted with a second reconstructed chimney (again numbered [003]), which was aligned SE-NW and which projected beyond the NW edge of scarcement ledge [008] for a distance of 0.25m. This chimney was relocated slightly further to the west during the reconstruction works, and the ensuing void left in wall [006] where the flue had conjoined infilled with sandstone rubble [009].
26. The last of the three flues examined during the first visit was located between 28.2 and 29.8m SW of the NE end of the consolidation works. It had not yet been reconstructed and so it was possible to obtain a greater understanding of its structural form (Figure 6a). Two voids were noted, running vertically down into the depths of the wall. The northeasternmost void [013] was set lower within the wall, at a depth of roughly 0.3m, with the NE, NW and SE edges comprising vertical drops, but the SW edge adjoined by a sloping duct or channel, which would, presumably, have linked the flue with a bipartite brick chimney of a similar style to that reconstructed as [003]. Lying SW of this sloping duct was a vertical square flue [017], which would have discharged at the SW chamber in the bipartite chimney. The voids measured 0.25 x 0.25m in extent, with occasional signs of sooting. They were constructed from handmade brick using lime mortar [015], though there was evidence that the upper courses had been repaired or rebuilt using cement-based mortar, indication of recent repair work.
27. A further four double flues were identified during the second visit, located at 37.6m, 43m, 50m and 63.6m SW of the NE end respectively. All were aligned NE-SW, which meant they were contained within the main central core of the spine wall. They survived in different levels of preservation: flues [022] and [024] (37.6m SW of NE end) appeared to retain their original handmade brick lining in the upper levels (Figure 6b) (although it is possible that this feature had previously been consolidated), while flues [027]/[028] had been partly dismantled (Figure 7a). Flue [029] was in an even poorer condition (Figure 7b), apparently after having suffered what must have been quite a dramatic chimney fire: all four sides of the flue were heavily sooted, and the sandstone defining the NW wall degraded through the effect of heat.
28. One last feature of note was the raised section of walling [014] forming the 'centrepiece' noted by Addyman (2001). The beginning of this raised section corresponded with the rear cross-wall [016] in the NE, and it ended with cross-wall [020] in the SW. These cross-walls corresponded with the projecting central bay of the potting sheds and office complex which abutted the rear, NW face of the spine wall.
29. Along the length of this raised section [014], the wall face was flush with the external edge of the wall on both sides (giving it a total width of 0.8m), with no scarcement noted (Figure 8a & b). Since rooflines are evident on both sides, the presence of a raggle can be inferred, but this could not be confirmed by observation as both roofs remained *in situ* in this location. The masonry employed in the construction of [014] comprised large blocks of roughly squared or unworked sandstone rubble measuring up to 0.4 x 0.2m in extent. This elevated section of the wall had been bonded using a cement-based mortar, indication that it had been consolidated in recent times.



Figure 6a: Flues [013] (front) and [017] (rear), with change in wall configuration evident



Figure 6b: Flues [022] and [024], handmade brick lining in upper courses



Figure 7a: Flues [027] and [028], partly dismantled at upper levels



Figure 7b: Flue [029] showing heavy sooting of interior



Figure 8a: Raised Centrepiece [014], General View with flues revealed



Figure 8b: Raised Centrepiece [014], seen in section, flue [017] in foreground

Discussion

30. There were several interesting features revealed along the length of the spine wall following the removal of the concrete coping, the investigation of which helped contribute to improving our understanding of the structure and how its appearance and character had changed in the 200+ years since construction.
31. One of the most noteworthy aspects was the number of flues revealed, and their configuration. The presence of such features was inferred by the presence of the intramural heating system identified within the glasshouses/vinery; however, the concrete coping had concealed the locations of their discharge points. Two upstanding chimneys remain, both linked with fireplaces located within the range of potting sheds and offices abutting the NW face of the spine wall. From the evidence which survives, it is impossible to say whether the rest of these flues discharged through projecting stacks, or through an opening which was flush with the wallhead.
32. A total of seven flues was recorded: 6 were aligned NE-SW, their structures comfortably accommodated within the fabric of the spine wall. The alignment of the seventh (located approximately 14m from SW from the NE end) was NW-SE, with the brick structure sitting perpendicular to the line of the wall. This had been fully consolidated prior to the first site visit and its alignment may have changed during rebuilding works.
33. All of the flues took the form of double flues, the angles of which varied. Some rose vertically from within the depths of the wall, others ran at an angle, particularly in the upper levels. The short lengths of flue revealed during these works were insufficient to allow the exact configuration of these flues to be established, but it seems likely that they were arranged to allow uniform coverage throughout the rear wall of the Vinery, thus allowing a constant temperature to be maintained within the glasshouses.
34. Also of interest was the reconfiguration of the wallhead on the SE-facing wall, which indicated that the wallplate supporting the rear of the glasshouse/vinery roof had once been set lower, and the roof itself presumably, angled less steeply. This original, lower, scarcement had been remodelled through the addition of a line of Annbank bricks [007], leaving a void to the rear. Iron ties [011] remained *in situ* in the wall at semi-regular intervals, indicating where the earlier structure had been fixed to the spine wall.
35. The close association between the raised 'centrepiece' [014] (as described in Addyman 2001) and the cross-walls which define the projecting central bay of the potting sheds and offices which abutted the spine wall on the NW side was also clearly evident during the works. There was a marked contrast between the centrepiece, where the wall fabric was flush with the external face of the spine wall on both sides, and the flanking sections, which had a narrow scarcement ledge [008] measuring 0.1m in width on the NW side, and presumably an equivalent on the SE side, either concealed by the Annbank brick face [007] or formed by the handmade brick lining of the wall.

Recommendations

36. Following the works described in this report, Rathmell Archaeology Ltd recommends that no further archaeological monitoring work be undertaken in support of these consolidation tasks. The appropriateness and acceptability of our recommendations rest with the National Trust for Scotland.

Conclusion

37. Archaeological monitoring works were requested during consolidation works undertaken on the late 18th century spine wall which forms part of the Category A Listed walled garden, which itself is a component part of the Culzean Castle policies. The consolidation works comprised the removal of a line of concrete coping slabs, followed by consolidation of the wallhead. The coping was subsequently replaced with hand-tooled sandstone slabs.
38. Seven flues were revealed at various points along the length of the wall. They took the form of double flues, aligned NE-SW and located in the main core of the spine wall: some

rose vertically from the depths of the wall, while others were angled in the upper levels. They appear to have been brick-lined, although in some cases the brick lining had been removed near the opening. One at least had been subject to a substantial chimney fire.

39. Over much of its length, the spine wall comprised a central structure of mortared sandstone rubble blocks with a narrow scarcement on either side to allow the seating of a wall plate. On the NW side this formed the SE edge of the slated roof of the potting sheds/offices, and on the SE, it supported the glazed roof of the vinery/glasshouses. It was evident from the works that the configuration of the wallhead had changed on the SE side: originally, the scarcement had been lower, and the angle of the glazed roof slightly shallower. Iron ties – which would originally have helped secure the wallplate – still survived within the main body of the wall.
40. The raised 'centrepiece' (as described in Addyman 2001) provided a contrast with the remainder of the wall, with the wall face extended out on either side to incorporate those areas covered by the front and rear scarcement ledges. This 'centrepiece' coincided with a length of wall corresponding to the projecting central bay in the rear, NW-facing potting sheds and offices. It had been consolidated with Portland cement and as a result there was no way of determining whether it was an original feature or a later alteration to the wallhead.

Acknowledgements

41. The author would like to thank Kinlay Laidlaw for his support throughout, and the stonemasons of Culzean Castle who were always willing to assist during the on-site visits. Thanks must also go to Claire Williamson for providing useful advice and editing input.

References

Addyman, T 2001 *The Vinery, Culzean Castle, Ayrshire: Archaeological Investigations*. Addyman Archaeology Draft Report

Moss, M 2002 *The 'Magnificent Castle' of Culzean and the Kennedy Family*. Edinburgh University Press

Rees, T and Turner, L 2016 *Spine Wall, Walled Garden, Culzean Castle: Archaeological Mitigation* Rathmell Archaeology, unpublished Method Statement

Appendix 1: Discovery and Excavation in Scotland

LOCAL AUTHORITY:	South Ayrshire
PROJECT TITLE/SITE NAME:	Culzean Castle Spine Wall
PROJECT CODE:	RA16052
PARISH:	Kirkoswald
NAME OF CONTRIBUTOR:	Louise Turner
NAME OF ORGANISATION:	Rathmell Archaeology Limited
TYPE(S) OF PROJECT:	Historic Building Recording
NMRS NO(S):	40959 (Castle; Country House; Steps; Tower House; Wall)
SITE/MONUMENT TYPE(S):	Walled Garden; Wall
SIGNIFICANT FINDS:	None
NGR (2 letters, 6 figures)	NS 231 098
START DATE (this season)	15 th July 2016
END DATE (this season)	17 th January 2017
PREVIOUS WORK (incl. DES ref.)	None
MAIN (NARRATIVE) DESCRIPTION: (may include information from other fields)	<p>Archaeological monitoring works were requested during consolidation work on the central portion of the late 18th century spine wall which forms part of the Category A Listed walled garden in the Culzean Castle policies.</p> <p>The removal of a line of concrete coping slabs revealed the discharge points of seven flues at various points along the length of the wall. These took the form of double flues, aligned NE-SW and located in the main core of the spine wall: some rose vertically from the depths of the wall, while others were angled in the upper levels. They had originally been brick-lined, and one at least had been subject to a substantial chimney fire.</p> <p>Over much of its length, the spine wall comprised a central structure of mortared sandstone rubble blocks with a narrow scarcement on either side to allow the seating of a wall plate. On the NW side this formed the SE edge of the slated roof of the potting sheds/offices; on the SE, it supported the glazed roof of the Vinery/glasshouses. The configuration of the wallhead had changed on the SE side: originally, the scarcement had been lower, and the angle of the glazed roof slightly shallower. Iron ties – which would have helped to secure the wallplate - still survived within the main body of the wall.</p> <p>The raised 'centrepiece' (as described in earlier works by Addyman in 2001) provided a contrast with the flanking sections of the wall. Here the wall face extended out on either side, incorporating those areas covered by the front and rear scarcement ledges. This 'centrepiece' corresponded with the</p>

	projecting central bay in the rear, NW-facing potting sheds and offices. Later consolidation work on this 'centrepiece' meant it was impossible to determine whether it was an original feature or a later alteration.
PROPOSED FUTURE WORK:	None
CAPTION(S) FOR ILLUSTRS:	None
SPONSOR OR FUNDING BODY:	National Trust for Scotland
ADDRESS OF MAIN CONTRIBUTOR:	Unit 8 Ashgrove Workshops, Kilwinning, Ayrshire KA13 6PU
E MAIL:	contact@rathmell-arch.co.uk
ARCHIVE LOCATION (intended/deposited)	Report to National Trust for Scotland and the West of Scotland Archaeology Service, and archive to National Record of the Historic Environment.

Appendix 2: Registers

Within this appendix are all registers pertaining to works on-site during the watching brief.

Context Register

Context No.	Area/ Trench	Type	Description	Interpretation
001	Spine Wall	Structure	Single course of handmade brick, laid in stretcher bond around perimeter of spine wall.	Part of 2016 consolidation works.
002	Spine Wall	Structure	Sandstone rubble set within lime mortar matrix, stones are quite modest in size (up to 0.2 x 0.2m in extent). Aligned NE-SW and measures approximately 0.6m wide.	Part of 2016 consolidation works.
003	Spine Wall	Structure	Rectilinear on plan, measuring 0.84 x 0.36m in extent. Two examples noted, the easternmost is aligned NE-SW, the westernmost NW-SE. Some use of worked sandstone, but most of the fabric comprises handmade bricks bonded with lime mortar.	Rebuilt on the site of earlier originals during 2016 consolidation works.
004	Spine Wall	Structure	Row of handmade bricks underlying [001] laid in header bond.	Part of 2016 consolidation works.
005	Spine Wall	Structure	Lead sheet flashing overlying [004] and underlying [001]	Part of 2016 consolidation works, equivalent to [021]
006	Spine Wall	Structure	Coursed sandstone rubble wall, comprising inner and outer faces of roughly squared or unworked blocks (pale greyish blonde sandstone) with a rubble core set within a lime mortar matrix. Measures 0.6m wide (not including scarcement, 0.7m wide (including scarcement, with narrow central section projecting 0.2m above height of scarcement).	Original fabric of 19 th century spine wall.
007	Spine Wall	Structure	Single skin composed of mass-produced 'Annbank' brick, number of courses and bond used are unclear. Forms upper courses of the SE-facing wall face.	Part of late-20 th century remodelling/consolidation works, in which the SE wall face was raised and the original roofline of the glasshouse/vinery altered.
008	Spine Wall	Structure	Straight ledge aligned NE-SW, running to rear of wall [006] and composed of the same fabric. Houses wallplate supporting the slated roof of the potting sheds located on the NW side of the skin wall.	Original fabric of 19 th century spine wall.

Context No.	Area/ Trench	Type	Description	Interpretation
009	Spine Wall	Structure	Mass of sandstone rubble set within lime mortar, irregular shape as infilling earlier void in masonry adjacent to site of [003] (central).	Part of 2016 consolidation works.
010	Spine Wall	Deposit	Deposit of stone chippings and debris infilling an earlier void located between sandstone wall [006] and mass-produced brick face [007].	Raggle and void derived from earlier roofline, now obscured behind altered SE-facing wall face [007].
011	Spine Wall	Structure	Cast iron strap or tie projecting from the SE face of [006] at irregular intervals (varying between 1.25 and 1.7 m apart) 0.1m below the upper surface of [006]. Set back slightly, in what appears to be a slight raggle in [006]. One end (set within wall fabric [006]) is rounded, the other slightly spatulate.	Supports for wall-plate or roof structure of glasshouse/vinery, at higher level (therefore reflecting steeper pitch?) than modern roofline.
012	Spine Wall	Structure	Wall face and upper courses of flue structure composed of handmade brick (original) but bonded with cement-based mortar.	Modern consolidation work on original fabric, late 20 th century in date.
013	Spine Wall	Structure	Line of original flue. Comprises a channel measuring 0.25 x 0.25m in extent, which drops vertically down into the depths of the wall, but which terminates in a gently sloping section which runs SW towards [017]	Part of original wall fabric.
014	Spine Wall	Structure	NE-SW aligned wall, 0.8m wide, with wall face reaching edge of spine wall and no scarcement present on either side. Comprises large flat slabs of roughly worked greyish blond sandstone, with a mortared rubble core. The mortar is cement-based. Extends from 28.8m SW of NE end to	Raised centre piece within wall located over original entrance in wall. Part of original fabric.
015	Spine Wall	Structure	Handmade bricks, bonded by lime mortar, lining interior of flue. Sooted in places.	Original brick lining of flue.
016	Spine Wall	Structure	Rubble-built wall running perpendicular to spine wall and sloping downwards from junction with spine wall. 0.4m wide and topped with droved flattened coping stones.	Cross-wall forming boundary between sloping roof of potting sheds and pitched roof of projecting central bay.
017	Spine Wall	Structure	Line of flue, 0.25 x 0.25m in extent, drops vertically into depths of spine wall, lined with handmade bricks [015], square on plan.	Flue
018	Spine Wall	Structure	Line of hand-tooled (droved) blond sandstone blocks, 0.45 x 0.8m in extent, gently sloping from either edge to a central apex running the length of the spine wall. The terminal blocks at either end of the projecting central parapet or 'centre-piece' have an additional chamfer,	Modern coping, part of 2016-17 restoration works.

Context No.	Area/ Trench	Type	Description	Interpretation
			forming a triangular sloping face towards the adjacent lengths of spine wall.	
019	Spine Wall	Structure	Pitched, slated roof, running perpendicular to spine wall. The apex is covered by sheet lead flashing.	Roof of projecting bay in centre of potting shed range.
020	Spine Wall	Structure	Wallhead, composed of mortared rubble capped with flat sandstone coping. Runs perpendicular to spine wall, with a sloping gradient that matches the pitch of the adjacent slated roof.	Crosswall, defining SW edge of central projecting bay of potting shed range.
021	Spine Wall	Structure	Line of sheet metal, presumably lead, which runs along NE edge of wallhead and folds over to protect the edge.	Modern lead flashing, part of modern consolidation works.
022	Spine Wall	Structure	Opening running vertically into depths of spine wall, measuring 0.35m NE-SW x 0.3m transversely. Defined by brick lining [023].	Vertical flue forming element of intra-mural heating system
023	Spine Wall	Structure	Brick structure, forming a squared 'A' shape on plan – NE end appears to be open, but the bricks may be concealed by mortar and masonry. Measures 0.75m NE-SW by 0.55m transversely. Bricks are hand-made.	Hand-made brick lining of flues [022] and [024]. Structure appears to be original, but may have been consolidated in recent times.
024	Spine Wall	Structure	Opening running vertically into depths of spine wall, measuring 0.3m NE-SW x 0.35m transversely. Defined by brick lining [023].	Vertical flue forming element of intra-mural heating system
025	Spine Wall	Structure	Area of crushed sandstone set within a lime mortar matrix. Measures 0.5m SE-NW x 0.1m transversely. Infills a former void between the SW outer edge of flue lining [023] and spine wall [012].	Modern consolidation work.
026	Spine Wall	Structure	Area of crushed sandstone set within a lime mortar matrix, Measures a maximum of 0.1m wide and runs length of SE edge of spine wall, infilling void between wall core [012] and Annbank brick consolidated wall face [007].	Modern consolidation work.
027	Spine Wall	Structure	Opening running vertically into depths of spine wall, measuring 0.35m NE-SW x 0.3m transversely. Defined by brick face on SE and SW edges (SW edge is [029], but NW & NE walls are sandstone, i.e. brick lining may have been removed and flue partly dismantled.	Vertical flue forming element of intra-mural heating system
028	Spine Wall	Structure	Opening running vertically into depths of spine wall, measuring 0.3m NE-SW x 0.3m transversely. Defined by brick face on NE and SE edges (NE edge is [029], but NE walls are sandstone, i.e. brick lining	Vertical flue forming element of intra-mural heating system

Context No.	Area/ Trench	Type	Description	Interpretation
			may have been removed and flue partly dismantled.	
029	Spine Wall	Structure	Single large flue opening, measuring 0.75m NE-SW x 0.35m transversely. The original handmade brick lining survives along the SE and SW sides; on the NE and NW sides, the opening is defined by degraded sandstone rubble, set in lime mortar. The opening is heavily sooted throughout, and the sandstone heat affected.	Possibly originated as a double flue, as the dimensions are similar. It has now been partly dismantled through the removal of the internal subdivision, perhaps in a response to a substantial chimney fire which appears to have resulted in partial dountaking of the feature.
030	Spine Wall	Structure	Modern steel roof tie, fixed onto modern timber wallplate [031].	Part of modern consolidation works.
031	Spine Wall	Structure	Modern timber wallplate, running to rear (NW) of wall [012].	Part of modern consolidation works, replacing the earlier wallplate which supported the roof of the potting shed range,
032	Spine Wall	Structure	Flue, measuring 0.4m NE-SW x 0.35m transversely, and sloping NE-wards down into the depths of the spine wall. Lined with hand made bricks ([034]) on SW and NW sides. It is probably brick-lined on NE and SE sides, too, but the surfaces are now obscured.	Part of double flue, forming part of the intra-mural heating system.
033	Spine Wall	Structure	Flue, measuring 0.4m NE-SW x 0.35m transversely, dropping vertically into the spine wall. Lined with hand made bricks ([034]) on NE, NW & SW sides. It is probably brick-lined on the SE side, too, but the surfaces are now obscured.	Part of double flue, forming part of the intra-mural heating system
034	Spine Wall	Structure	Brick lining of flues [032] and [033], comprising single skin of handmade bricks, bonded with lime mortar. Lines NW & SW sides, with central subdivision running perpendicular to line of spine wall. May continue around NE & SE sides, but now obscured.	Lining for double flues [032] and [033]
035	Spine Wall	Structure	Sandstone rubble masonry wall, sloping back from the spine wall at an angle matching the pitch of the adjacent slated roof.	Cross-wall of potting shed range
036	Spine Wall	Structure	Single skin of hand-made bricks subdividing vertical flues [027] and [0280. Bonded with lime mortar.	Part of double flue structure forming part of intra-mural heating system.

Photographic Register

Image No.	Digital	Description	From	Date
001	4096	Consolidated area at NE end ([001] & [002])	W	21/07/16
002	4097	Detail of consolidated flue [003], NE end	W	21/07/16
003	4098	Consolidated area at NE end ([001] & [002])	W	21/07/16
004	4100	Transition from consolidated area [002] to original spine wall structure [006]	SW	21/07/16
005	4101	Modern infill [009] & rebuilt central flue [003]	NE	21/07/16
006	4102	As above	NE	21/07/16
007	4103	Spine wall [006] with scarcement [008] to left & iron strap [011] to right	SW	21/07/16
008	4104	As above, seen in wider context	SW	21/07/16
009	4105	As above, close-up, with Annbank brick face [007] to right	SW	21/07/16
010	4106	General view of works (NW side, Potting Sheds)	W	21/07/16
011	4107	General view of works (N, Potting Sheds Side)	WSW	21/07/16
012	4108	General view of works (S, Glasshouse/vinery side)	WSW	21/07/16
013	4109	General view of works (S, Glasshouses/vinery side)	SW	21/07/16
014	4110	Flues [013] & [017] and parapet/'centrepiece' [014]	NE	21/07/16
015	4111	As above, transition from Annbank Bank [007] to Parapet [014] (& flues)	NE	21/07/16
016	4112	Detailed view of flues [013] & [017]	NE	21/07/16
017	4113	Parapet Wall [014] ('Centrepiece')	N	21/07/16
018	4114	Cross Wall [016] & Apex of Potting Shed roof with parapet wall [014] ('Centrepiece')	NE	21/07/16
019	4115	Parapet Wall [014] ('Centrepiece')	W	21/07/16
020	4116	Parapet Wall [014] ('Centrepiece') with Cross-Wall [016] to left	W	21/07/16
021	4117	Transition from Parapet [014] ('Centrepiece') to Annbank Brick [007]	SW	21/07/16
022	4118	Ex situ iron tie/strap	S/vert	21/07/16

Image No.	Digital	Description	From	Date
023	4119	As above	S/vert	21/07/16
024	4120	Section of Parapet [014] (Centrepiece) with Flues [013] & [017]	NE	21/07/16
025	4121	Exposed Wallhead & flues in vinery (original hand-made brick)	NE	21/07/16
026	4122	As above	SE	21/07/16
027	4123	Original doorway exposed in vinery	S	21/07/16
028	4124	As above	ENE	21/07/16
029	4125	As above	ENE	21/07/16
030	4126	As above	NE	21/07/16
031	5805	Central section of spine wall – view of works	NNE	20/1/17
032	5806	As above, new parapet & coping [018] in place	NNE	20/1/17
033	5807	Flues [022] & [024]	NW	20/1/17
034	5808	Flues [022] & [024]-general	S	20/1/17
035	5809	Flues [022] & [024] – general	SW/vert	20/1/17
036	5810	Flue [024] with crushed brick infill [025] adjacent	SW/vert	20/1/17
037	5811	General view of Flues [027] & [028]	N	20/1/17
038	5812	As above	S	20/1/17
039	5813	Flue [027] & [028]	W	20/1/17
040	5814	As above	NE	20/1/17
041	5814	Flues [027] & [028]	SW	20/1/17
042	5815	As above	SW	20/1/17
043	5816	Flue [029] – General View	W	20/1/17
044	5817	Flue [029] – General View	S	20/1/17
045	5818	Flue [029] – General View	SW	20/1/17

Image No.	Digital	Description	From	Date
046	5819	As above-detail	SW/vert	20/1/17
047	5820	Flue [029] & sooted timber [030]	SW	20/1/17
048	5821	Flue [029] – Interior (sooted)	NW	20/1/17
049	5822	Flue [029] – Front face (sooted)	NW	20/1/17
050	5823	General view of spine wall from SW end	SSW	20/1/17
051	5824	Flues [032] & [033] – General View	NE	20/1/17
052	5825	As above-general view (vert)	NE/vert	20/1/17
053	5826	As above-oblique	W	20/1/17
054	5827	Flues [032] & [033] – oblique view showing rebuilt wallhead	W	20/1/17
055	5828	View along wallhead showing modern consolidation & recent steel roof tie	SW	20/1/17
056	5829	Fragment of re-used masonry (coping or pier) in flue [027]	SW/vert	20/1/17

Drawing Register

Drawing No.	Sheet No.	Area/ Trench	Drawing Type	Scale	Description	Drawer	Date
001	1	-	Plan	1:10	Spine Wall on Plan, 0-13.5m SW of NE end	CLT	21/7/16
002	1	-	Plan	1:10	Spine Wall on Plan, 13.5-18.5m SW of NE end	CLT	21/7/16
003	1	-	Plan	1:10	Spine Wall on plan, 18-30m SW of NE end	CLT	21/7/16
004	1	-	Section	1:10	Section of Wall at 34.25m SW of NE end	CLT	21/7/16
005	2	-	Plan	1:10	Spine Wall on Plan, SW of Cross-wall [016]	CLT	21/7/16
006	2	-	Plan	1:10	Spine Wall on Plan, 6-13m SW of Cross-wall [016]	CLT	21/7/16
007	2	-	Plan	1:10	Spine Wall on Plan, 18.5m SW of Cross-Wall [016] to Apex of Potting Shed roof	CLT	21/7/16
008	2	-	Section	Not to scale	Section of Flue [029]	CLT	21/7/16

Contact Details

46. Rathmell Archaeology can be contacted at our Registered Office or through the web:

Rathmell Archaeology Ltd
Unit 8 Ashgrove Workshops
Kilwinning
Ayrshire
KA13 6PU

www.rathmell-arch.co.uk

t.: 01294 542848

f.: 01294 542849

e.: contact@rathmell-arch.co.uk

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