SHERIFF HUTTON CASTLE,
SHERIFF HUTTON, NORTH YORKSHIRE

ARCHAEOLOGICAL AND ARCHITECTURAL SURVEY OF THE NORTH-EAST TOWER

VOLUME 2: APPENDICES

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SHERIFF HUTTON CASTLE, SHERIFF HUTTON, NORTH YORKSHIRE

ARCHITECTURAL AND ARCHAEOLOGICAL RECORDING OF THE NORTH-EAST TOWER

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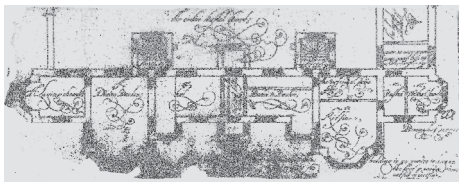
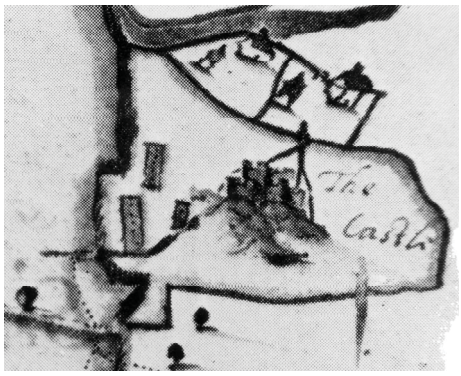
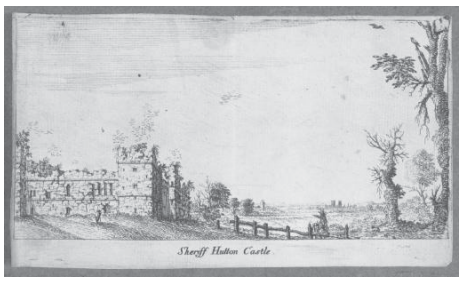
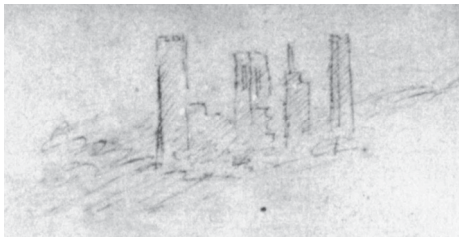
APPENDIX 1

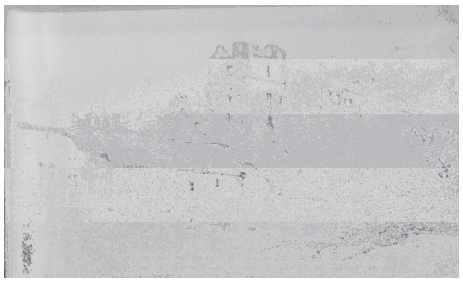
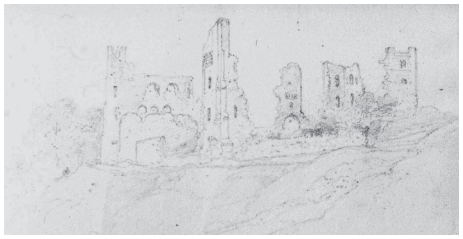
ILLUSTRATIONS OF SHERIFF HUTTON CASTLE

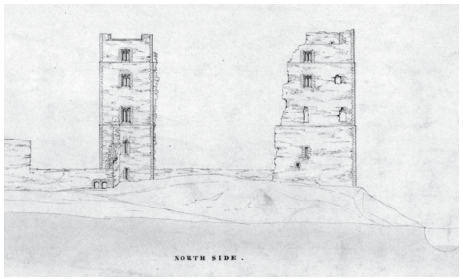
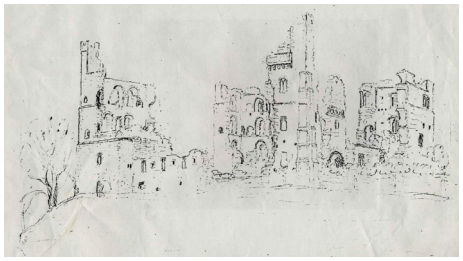
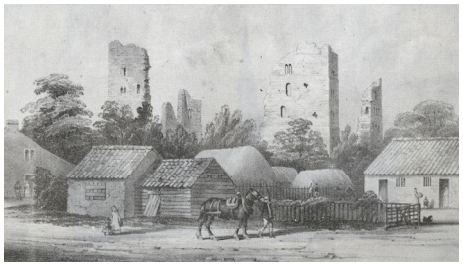
by Tony Wright

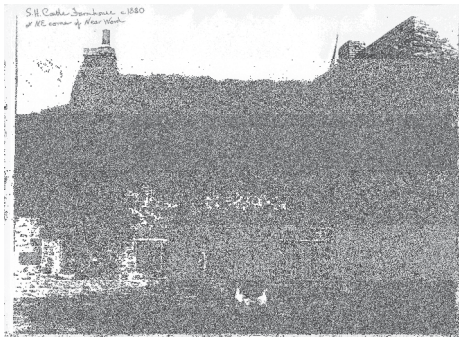
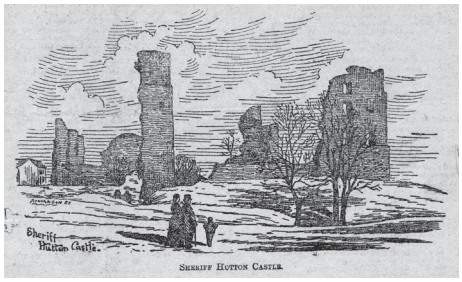
APPENDIX 1: ILLUSTRATIONS OF SHERIFF HUTTON CASTLE
by Tony Wright

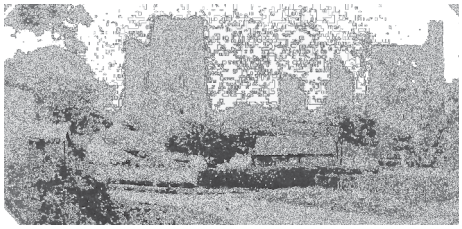
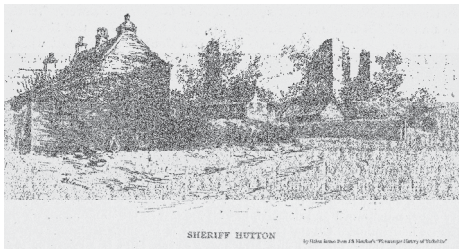
	1570s Did Sir Ambrose Cave do a survey and drawings of Sheriff Hutton Castle along with the other royal castles north of the Trent? If so, they have not yet been found. The National Archives have surveys by him of Lancaster Castle, Clitheroe Castle, Melbourne Castle (Derbyshire), Tickhill, Sandal Magna, Knaresborough, Tutbury (Staffordshire), Pontefract Castle and Swillington Tower. There is also a survey from 1569 of the Duchy of Lancaster.
	1618-19 Three plans by Bernhard Dininckhof (Dinninghof) of proposed modifications to the gatehouse of Sheriff Hutton Castle (WYAS Leeds WYL100/SH/A3/2/1-3). (WYL/100/SH/A3/2/1 shown).
	1624 John Nordens' survey of Sheriff Hutton park has an isometric view of the castle (British Library, Harleian MSS 6288 f27).
	1660-89 Print on paper from an etching by an unknown artist (possibly William Lodge) undated but possibly 1660-1689 (Tate Gallery, Tate Online, T11607, described as "British(?) School, Sheriff Hutton Castle, purchased as part of the Oppé Collection, 86 x 169 mm"). This may be an engraving by William Lodge – not found but listed in Walpole's Dictionary of Artists and Engravers (copy in York Minster Library). Lodge lived from 1640 to 1689 and was a member of the self styled "Club of Virtuosi". Print privately owned.
	1715-18 Drawing by Francis Place showing the inside of the south-east tower and gatehouse (York City Art Gallery, ref. D5, their photograph Y1085).

	1720-21 By Samuel Buck (1696-1779), possibly with his brother, Nathaniel. Buck published the engraving in at least two versions, one with the tree on the right in leaf and another with it looking bare. An early version of the BL catalogue attributed this engraving to John Warburton. This engraving does not match.....
	....the sketch in Buck's sketchbook (British Library, Lansdowne MSS, No 914 published by Wakefield Historical Publications in "Samuel Buck's Yorkshire Sketchbook" (Wakefield, 1979, p11) which is labelled "A Distant view of Sheriff Hutton Castle" and seems to be from the south and show the castle much as it is now (2008). Buck toured Yorkshire and made sketches for a planned book with text possibly by Warburton.
	1797 Engraving "by J Walker from an original drawing by Mr J Hornsey", published January 1797 by J Walkers Ltd, No 16 Rosoman Street, London. The picture is fanciful and shows less of some parts of the castle than exist now, but other details now match known but lost items, such as the double doors in the north side of the Middle Court.
	c.1809 Drawing by Henry Cave, showing the castle from the north-west (York City Art Gallery PD424a "Presented by the family of the late Mr Wm Henry Cobb of York").
	c.1809 Drawing by Henry Cave, showing the castle from the south-east (York City Art Gallery PD424b "Presented by the family of the late Mr Wm Henry Cobb of York").

	1824 Engraving published by J & George Todd in "Castellum Huttonicum", 1824 facing p7, "drawn by H Cave". Titled "South East View of Sheriff Hutton Castle" - Cave's drawing has been confused such that the south wall of the Middle Court seems to join the south-east tower and the north-east tower and the masonry of the gatehouse has been partly merged with the north-west tower. Also published by Thomas Allen in his 3 volume "New and Complete History of the County of York" in 1831.
	1824 Engraving published by J & George Todd in "Castellum Huttonicum", 1824, "drawn by H. Cave". Titled "North West View of Sheriff Hutton Castle".
	1824 One of two drawings by George Nicholson, August 1824, from the north-east (p10 of the sketchbook, dated 17th August 1824) (York City Art Gallery PD353).
	1824 One of two drawings by George Nicholson, August 1824, from the south-east (p11 of the sketchbook, dated 17th August 1824) (York City Art Gallery PD353).
	1827 Painting by L Bainbridge dated 10th June from the south-east. Stylised but shows some detail. Probably dated to 1827, but certainly before the collapse of the north-east tower in 1875. Privately held by J Armitage, Park Farm, Sheriff Hutton.

	1829 Engraving by "J Rogers SC" and "N. Whittock Del^{T}" undated but probably also from Henry Cave's drawing, even more distorted than the above as the gatehouse is firmly merged with the north-west tower and the south wall of the Inner Court is turned north-south. It is entitled "Ruins of Sheriff Hutton Castle and one version has an additional inscription: "?? Published by ? T Hinton 4 Warwick Square 1829". Privately held.
	1839 Four drawings (elevations from each compass point) by Samuel Sharp with written description, 1839 (Royal Institute of British Architects X(079)So 728.81 (42.74 SH)). (North elevation shown).
	1840 Drawing from the south-east by S J Allen, dated 18th May 1840 (York City Archives, 100/S01/156).
	1847 Drawing of "Sherriff Hutton Castle", dated 27th August 1847, from the south-west by George Samuel Allen (York City Archives, 100/S01/157).
	1852 Engraving by W Monkhouse & Co of York, published in "Vallis Eboracensis" by Thomas Gill, 1852 (facing p421). View from the north-west, showing village houses and people as well.
	Pre 1879 Two drawings of the castle by Edward Blore FSA (1787–1879), sometime before 1879 ([British Museum Additional MSS catalogue 1926-30 42034 ff 49 & 50).

	c.1880 Photograph of the Courthouse, c1880, in the north-east corner of the Middle Court, showing the remains of a tower, from the east. Privately held.
	c.1880 Photograph of the Courthouse, c1880, in the north-east corner of the Middle Court, showing the remains of a tower, from the north. Privately held.
	c.1887 Photograph from the east, possibly about 1887, showing the orchard courthouse. Unknown photographer. Privately held.
	Pre 1887 Three photographs by an unknown photographer, date estimated as before 1887 but after 1875 when the north-east tower collapsed. The photographs show the inside of the north-west tower, the south-east tower from the south, and the view from the south-west (shown). Privately held.
	1889 Drawing in the “Weekly Post”, Saturday, August 24, 1889 in an article “Sheriff Hutton Castle”.

	1893 "Sketch by Mr Blair, F.S.A. June 3rd 1893" published in "The Antiquarian", vol. 28 (July-December 1893), p10. Shows view from the north-east, depicting the Middle and Inner Courts.
	Undated, c.1890s Photograph, undated, from the north-west, showing village cottages with thatched roofs in disrepair. Shows intact turret on the south-west tower. Privately held.
	c.1900 Photograph in centre of a multi picture postcard "With best wishes from Sheriff Hutton", possibly by William Hayes about 1900. Privately held.
	c.1910 Drawing by Helen James showing the castle from the north-west, part of New Street and The Square, Sheriff Hutton. Published in J S Fletcher's "Picturesque History of Yorkshire" c1910.
	Pre 1927 Photograph on postcard, taken before 1927, as it shows the intact turret on the south-west tower which was blown off by a lightning strike that year. Possibly by William Hayes, so probably turn of century. Privately held.

	Pre 1927 Photograph from the south – predates 1927 as the turret on the south-west tower is still intact. Privately held.
	1930 Photograph on postcard, dated September 1930, showing view form the north-west. Damaged turret to south-west tower? Ed Dennison collection.
	1972 Detailed sketch from the south-east, published as the header for a calendar, by Dereck Arrowsmith in 1972. Privately held.

APPENDIX 2

THE GEOLOGY OF SHERIFF HUTTON CASTLE

by Richard Myerscough, University of Hull

THE GEOLOGY OF SHERIFF HUTTON CASTLE

by Richard Myerscough, Centre for Lifelong Learning, Institute for Learning, University of Hull

Introduction

Sheriff Hutton Castle and associated village stand within a natural and human landscape. The Castle is built of local rocks that still invoke local stories and legends and which stand in testimony to the work of the medieval architect and builder (Pevsner 2000).

The Castle within the Landscape

Sheriff Hutton Castle stands on prominent East –West Ridge from High Stittenham (SE 679676) in the East to Farlington (SE614675) in the west, with minor lanes still following more ancient routes along the ridge that has a maximum height of about 70 metres OD. To the west the ridge disappears beneath the Quaternary 'drift' deposits of the Late Devensian cold stage (approximately 18,000 to 10,000 years ago) that give rise to variations in land use within the Vale of York from rich fertile soils to barren sands supporting only birch and heather. Within the Castle walls several examples of glacial erratic have been found indicating an ice flow direction from the North, whilst in local fields a similar variety of rock groups have been ploughed up.

To the North of the castle the ridge falls away into a flat featureless valley once occupied by a post glacial lake and evidence for its existence can be found in the glaciolacustrine deposits of fine silts, peat beds and the occasional bog oaks brought up by ploughing. The lake filled with glacial melt water at the end of the Devensian Ice Advance and was effectively trapped between the decaying ice sheet that occupied the Vale of York and the prominent scarp slope to the North and East. Eventually the waters over flowed along the present course of Bulmer Beck to cut a spillway that can still be seen today and which occupied a valley higher in altitude than the former lakebed and required explosives to cut down to the present course of the Ings Beck. The melt waters flowed to the south of the ridge into a string of similar temporary lakes and eventually into the River Derwent. The lake bed appears to have been finally drained in C19 along the Ings Beck but the landscape remind us of its previous existence with drainage ditches, Pump House and word endings such as 'Ings' and 'Carr'. Even today after heavy rains the lake beck can flood. On the far side of the valley the land rises steeply up Terrington Bank (SE657708) to form a dominant west-facing scarp in the landscape along which ancient route ways were established and which modern roads follow today. Here too a steep spillway can be observed down which melt waters derived from decaying Devensian snowfields flowed. Today the landscape is heavily farmed with woodland occupying old quarries and steep scarp slopes.

The Castle was therefore built on the ridge occupying a dominating position along ancient route ways with marshy ground to the North and South

The Geological Landscape of the Castle

The British Geological Survey Sheet 63 York (Solid and Drift Edition) covers the Geology of the area that was mapped in the C19 by geologists from the survey with supporting memoirs (Fox-Strangways 1881and 1892). A local farmer Mr Stephen Gibson holds a copy of the original 6" map for the area around Mowthorpe. Since then the area had not been studied until the Ryedale Vernacular Building Materials Research Group (RVBMRG) started work in 2002 (Myerscough 2003a and 2004). At present the York sheet is being re-mapped by the Geological Survey geologists. (Jon Ford, British Geological Survey)

The Castle and village stand on a ridge of 'solid' mudrocks and sands of the Lower Jurassic age (204 to 182 million years ago) overlain by Devensian 'drift' deposits of till, outwash sands, and gravels. To the North the lacustrine deposits of the former glacial lake to form low-lying flat plain only 30 metres in height cover the Jurassic rocks. None of these deposits are resistant enough to outcrop at the surface but are sufficiently impermeable to produce boggy ground across the old lakebed as well as the artificial fishponds at Mowthorpe. Thin paper shales of Whitby Mudstone Formation have been observed in Mowthorpe Quarries (Myerscough 2003a), whilst lower sandy horizons below the shales outcrop along paths at Mowthorpe and Stittenham where they form local spring lines. These sandy beds (Cleveland Ironstone and Staithes Sandstone Formations) contain iron nodules and may have provided the raw materials for local Bloomery sites. The lowest beds of the Early Jurassic (Redcar Mudstone Formation) do not outcrop at present as they underlie the Devensian glacial drift and

lacustrine deposits, but are thought to underlie the fishing lake at Mowthorpe. A few examples argillaceous nodules of Early Jurassic age have been observed in the walls of the Castle but cannot be regarded as principle building stones.

The oldest rocks in the area of study belong to the Triassic Era and consist of soft red marls and sandstones of The Mercia Mudstone Group laid down in a desert basin some 250 million years ago. Within the sequence Salt Crystals and beds of Gypsum are indicative of their origins within temporary hyper saline lakes. These rocks are rarely exposed due to their soft nature and the almost complete coverage by Drift deposits. There is no evidence for these rocks or the minerals within them being used in the construction of the Castle.

Beyond the flat lake bed the land rises steeply at Terrington Bank where resistant iron rich limestones and sandstones of the Middle Jurassic age (182 to 160 million years ago) outcrop. This is 'The Dogger' a hard permeable rock that overlies the softer impermeable Lower Jurassic mudrocks to produce a pronounced spring line along which the mudrocks form slumps and rotational slips giving the false impression of human activity (Myerscough 2004). The Dogger displays a wide range of lithologies across its outcrop from iron rich sands at Terrington Bank to thick sandstones and shelly limestones at Mowthorpe, whilst compact iron rich sandstone with a broken shelly matrix outcrops at High Stittenham Quarry (SE683679). Such changes in the lithology of the Dogger have been observed across the North Yorkshire Moors (Rawson and Wright 2000) but as yet no research has been undertaken in the study area. During the winter ploughed fields along the scarp display a characteristic brown coloured soil with many blocks of Dogger to be seen.

The Building Stones of the Castle – main constructional materials

The Castle was built from individual flat pieces of red-brown rock that average 2 – 3 cms thick by 20 cms in length. The rock has been identified as iron rich oolitic limestone with a rich bivalve, bryozoa and echinoid fauna that can be seen on local walls and buildings. There appears too been very little dressing as the rock naturally splits into this form.

Traditionally the rock is associated with the Quarries at Mowthorpe having been transported across the lake in winter and was mapped by the survey as the Dogger (Fox-Strangways 1881) whilst other authors considered the rock to be older:

"The evidence about here is very obscure. Professor Blake considers the ridge upon which Sheriff Hutton stands as being capped by beds of the Middle Lias (Early Jurassic) age from the fact that of the large flaggy limestones of the Middle Lias being frequently used in the neighbourhood of that village. There is no evidence as to where these flags came from; neither could we obtain any additional evidence bearing on the subject…although it is possible that the Middle Lias may cap other portions of the ridge." (Fox Strangways 1892 quoting Tate and Blake 1876).

The survey were clear about the identification of the rock as Dogger:

"The Dogger rapidly thickens out, probably to as much as 10-15 feet (2-3 metres) it makes a considerable spread along the edge of the hill at Mowthorpe, where it is quarried as road material and forms quite a rocky scarp along the sides of the dale." (Fox-Strangways 1892).

In 2003 The Ryedale Vernacular Building Material Research Group surveyed the Castle and potential source quarries (Myerscough 2003a). The quarries expose over 5 metres of iron rich sandstones overlain by thinly bedded shelly limestones, some of which contained rolled phosphatic pebbles indicating a shallow water origin. Samples of the limestones matched those in the walls of Birkdale Farm, Mowthorpe (SE 687691) and the ashlar blocks at the Castle.

However the fauna was more representative of the younger Whitwell Formation (Middle Jurassic) but there was no similarities between hand specimens. So we can only conclude that the environment of deposition was very variable and at Mowthorpe conditions were more suitable for iron rich shelly limestones to form. Similar rock lithologies have been observed in the Thirsk area (Powell et. al 1992). The quarries at Mowthorpe are at least 1 km in length x 0.5 km in width and over 10 metres in depth, which means that sufficient rock was removed to build the Castle and may have continued to supply stone into the C19. In comparison the Dogger quarry at High Stittenham is about 100 metres in length and although there is evidence of industrial activity around the quarry it appears to be only supplying local needs, such as the houses at High Stittenham.

The total amount of rock to supply the building of the Castle was probably in the order of 30,000 tons over a period of 20 years during the winter season from October to March (Tony Wright personal communication).

The Geological Survey was still unsure about the nature of the rock but was able to quote local folklore as to the method of transport across the lake in winter:
"The Lower Calcareous Grit (a much younger rock of Late Jurassic age) is employed as a building stone along the whole range of its outcrop from the coast at Scarborough to the Hambleton Hills and throughout a greater part of the Howardian Hills … the rock although thinner in the Howardian Hills than along the Tabular range it is more compact and consequently all the noted quarries in it occur along the southern outcrop. The stone of Sheriff Hutton Castle was probably obtained from this rock. It is said to have been conveyed in boats across the low ground then a lake between the Oolite hills and Sheriff Hutton" (Fox Strangways 1892).

It would appear that the author made a mistake in the rock outcrop as all modern references now refer to the Castle's building stone as the Dogger:
"In the Howardian Hills around Terrington was used in the C12 in the construction of Sheriff Hutton Castle" (Wilson 1948 repeated by Kent 1980).
"The Dogger worked in the Terrington area and employed in the construction of Sheriff Hutton Castle" (Smith in Rayner and Hemingway 1974).

In conclusion we can be certain of the main ashlar as being a localised form of Dogger and that it was transported across the lake in winter. This would mean that the main quarrying activities would take place in summer with the stone being stock piled. The need for iron tools would require local Bloomery sites of which at least one is known from 'Smithy Hill' but as yet this has been dated. The lime for mortar was probably mixed on site either from the limestones in Mowthorpe Quarry or from other Middle Jurassic limestones nearby, such as the Whitwell Oolite (nearest locality being Welburn) and/or the Scarborough Formation (nearest location being Brandsby), although historical evidence suggests lime from York being used for repairs (Tony Wright – personal communication).

Recently a document has come to light suggesting an alternative method of transporting the stone (Tony Wright – personal communication):
"Slingsby Tuesday May 3rd 1949.
Mr Nash told me that when he first went to work the old men told him the following tradition as to how the stone of which Sheriff Hutton Castle was built was transported from Mowthorpe. They said that their fathers and grandfathers used to say that it was passed from one man to another right from the bottom of Bulmer Bank to Sheriff Hutton and they stood a yard or so apart from each other".

The second building stone of the Castle is used for corner quoins as well as windows and door jams. This rock is a grey to brown medium grained sandstone often iron rich frequently giving it a rusty appearance. The rock has been identified as channel sandstone of The Ravenscar Group (Middle Jurassic) laid down along an advancing sub tropical shoreline. This contrasts with the marine shelly limestones of the Dogger. Several blocks have yielded fossil plant remains indicative of a land based fluvial environment of deposition. These sandstones are poorly cemented and easily eroded as can be seen on many of the window jams (unlike the ashlar limestones). It is difficult to identify the source quarries with any certainty but the iron rich sandstones appear to very similar to those seen below the limestones in Mowthorpe, i.e. The Dogger, whilst those with little or none observed iron content seem to be more typical of channel sandstones observed across the North York Moors and along the coast (Rawson and Wright 2000). Recent fieldwork has identified several quarries in channel sandstones at Snargate Hill (SE 608722), (Kent 1980, Plate 14). P.78) and Brandsby (SE592724), (Myerscough 2005a). Although these quarries can be positively related to the building stone we can only assumes that there used to be many more quarries than we see today. As with the main ashlar limestones the quarries needed to be close to the Castle and were easily transportable.

The Missing Building Stones
Recent work by the RVBMRG has identified a number of High Status building stones used in North East Yorkshire:
Birdsall Calcareous Grit (Wright 1975)
Brandsby Roadstone and Slate (Fox-Strangways 1892)
Hildenley Limestone (Senior 1990)

These rocks were highly prized and many high status buildings have them in their fabric and they were frequently reused often over a wide area (Windsor 2003). Thus when the Castle fell into disrepair it would become a local quarry and the High Status stone would be robbed out first. Later the main ashlar walls would have been quarried out with examples of reused Dogger found within the village (Dennison 2004) including the Church (Pevsner 2000), in which examples of all the building stones of the Castle can be found within its fabric (Myerscough 2004)

Birdsall Calcareous Grit (Upper Jurassic)
This is buff coloured fine-grained marine sandstone with distinctive blue hearts and black worm feeding tubes. There are no known quarries in the vicinity of Sheriff Hutton with the only identifiable ones being in the area of Birdsall (SE 816654) (Myerscough 2003c) It can be easily dressed but can also be decalcified by weathering if it is not dressed and set in the correct manner. Recent research work on the Yorkshire Wolds has shown that BCG was the prominent building stone for Churches from Saxon times up to mid C19, with over 90% of recorded Churches having examples within their wall fabric. (Myerscough 2005b) Only one example has been found within the Castle and that was an internal partition in the top chamber of the North West Tower (Specimen supplied by Ed Dennison with identification by Dr John Wright)

Brandsby Roadstone and Slate (Middle Jurassic)
Both of these rock types were laid down by a marine incursion of the Middle Jurassic coastal swamps and are the equivalent to the Scarborough Formation of the coast (Rawson and Wright 2000). Little is known about the industry that was:
"In the Howardian Hills the Grey Limestone (Scarborough Formation) is much flaggier…. Having been quarried for a great number of years at Brandsby as a material for mending roads (and) is better known in this district as 'Brandsby Roadstone'. It is a hard siliceous limestone splitting up into large slabs, in fact some of the beds are so fissile as to afford roofing slates for which purpose it was largely used in former years" (Fox-Strangways 1892).

And:

"…two distinctive rocks are widely recognised – 'The Brandsby Roadstone (named by Phillips in 1829) and 'The Crinoid Grit' (first described by Richardson in 1912)…. some of the sandy (Brandsby Roadstone) limestones are fissile and relatively tough which in the past led to use as roofing tiles and Roadstone." (Hemingway 1974).

Research by RVBMRG has recorded a number of localities with old discarded Brandsby Slate as far away as Burton Agnes Church, Bridlington and Abbey House, Old Malton (Myerscough 2005a). At present only Shandy Hall, Coxwold (SE530772) and Brandsby Chapel (SE598719) have slate roofs. RVBMRG are of the opinion that this High Status roofing material could have been used for roofing the Castle and this is supported by an example found in the Castle moat (Robin Wardell – personal communication) and historical accounts referring to "slates from Brandsby" (Tony Wright – personal communication).

Recent fieldwork by RVBMRG at Brandsby has identified a number of small quarries and collected specimens of Roadstone and worked slate. The present conclusion is that the industry was very small and localised and probably became extinct prior to the Survey's visit in C19. (Fox-Strangways 1892)

Hildenley Limestone (Upper Jurassic)
This pure white Chalk-like Limestone has been highly prized since Roman times (Senior 1990) and was readily reused in a variety of buildings (Windsor 2003). At Slingsby Castle several examples of Hildenley have been recorded as fireplace mantle shelves (Senior 1990). It is possible that this High Status stone was also used within Sheriff Hutton Castle and that it would be the first of the stones to be robbed out. Examples of reused stone have been found in the fabric of Sheriff Hutton Church (St Helen and Holy Cross) and more recently a number of blocks have been recorded in the fabric of nearby cottages and other buildings (Myerscough 2003b and 2004).

Conclusions
Sheriff Hutton Castle stands within the natural and man made landscapes and it testimony to the constructional expertise of its builders who quarried and transported stone over varying distances. They used easily extractable local stone for the main castle walls, its doors and window jams.

Internally they would have used High Status limestones and sandstones to complete their image of the Castle as a symbol of power and possession. To protect the interior lead and slates roof completed the Castle and when it was finally abandoned in 1618 (Salter 2001) it became a source of stone not only for local houses but also maybe for grander schemes many miles away.

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APPENDIX 3

CERAMIC BUILDING MATERIALS AT SHERIFF HUTTON CASTLE (NORTH-EAST TOWER)

by John Tibbles, JT Ceramic Buildings Materials

A Report on the Ceramic Building Materials at Sheriff Hutton Castle (Northeast Tower) North Yorkshire

(SE 653 633)

John Tibbles
BA (Hons); AIFA

Report No 2027

20th August 2003

JT Ceramic Building Materials
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Contents

Summary

The bulk of the ceramic building material examined appears to be typical of assemblages recorded within the region. The majority of the ceramic roof tile was not identifiable to enable a comparison to be made with local typologies. Fragments that were identifiable were HFA Type 1a dateable from the 13th century.

A significant proportion of the brick examined appeared to be either re-used material or of a 'second' quality. At least three broad types were identified all of a medieval date range of which types 1 and 2 can be tentatively compared with the HFA Typology type 6.

A brief summary of the remaining brickwork examined within the castle complex has also been added.

The Ceramic Building Material.

2. *Introduction & Methodology*

A visual survey of the ceramic building material was undertaken during the restoration of the north-eastern tower. Where possible the in situ material was examined in detail using a 10x-magnification lens and information regarding the dimensions, general characteristics, shape and fabric was recorded and catalogued accordingly. A Munsell colour code has been incorporated where appropriate to assist in identification. The resulting information was then compared with any known typologies and any correlation recorded.

Five fabrics (F1-F5) were provisionally identified throughout the material examined (Appendix I)
It should be noted that the diversity of size and colour within brick and tile caused during the manufacturing process must be taken into consideration when comparing examples within collected assemblages and local typologies. The varying sizes and colours can be attributed to the variation in the clays used, shrinkage during drying, firing within the kiln or clamp and the location of the brick/tile within the kiln. The dating of ceramic building material can be highly contentious due to its re-usable nature and therefore the date range given is that of the known dates where such materials have been previously recorded.

Bricks and tiles alone cannot provide a firm date because of their re-usable nature but it is possible to date particular types of brick and roof tile by their earliest occurrence within dated contexts. There is also potential for comparison with CBM assemblages from elsewhere in the area, particularly brick and tile manufacturing sites.

For the purposes of this report the survey of the ceramic building materials examined within the north eastern tower has been broken down into the three main areas of examination with further notes on the material examined within the castle complex.

1. Top storey
2. Main floor
3. North facing tower wall
4. Other castle structures

3. *The results*

The in-situ Material

The top storey

The uppermost floor examined termed *'the sentry box'* displayed large bricks within the stone construction of the western wall of the 'chamber'. The short brick buttress of fourteen courses has been constructed by laying the bricks stretcher face to stretcher face bonded by a grey-white sandy mortar. Other bricks incorporated within the western wall have been laid on the stretcher edge and have been sealed or partially sealed with plaster/render. All the bricks examined displayed dimensions of 11 ½"-12" x 6" x 1 ¾" and were manufactured in a weak red (10R/4/6) sandy fabric (F1), some of which still bore residual moulding sand and moulding impressions from their manufacture. It should be noted that although generally the bricks are of a similar nature some of the samples appeared to be manufactured from a much less sandy fabric (F2)

The main floor

The main floor of the tower had been constructed from stone slabs with randomly laid brick areas up to one metre in width between the slabs. The majority of the bricks ranged in size between 10"-11" x 5-5 ½" x 2" and were of a poor quality, probably purchased as 'seconds' with others displaying the recognisable characteristics of wasters. A significant number of the bricks showed a smooth worn surface that suggests heavy footwear over a period of time.

Four brick structures were recognised within the floor area and identified as a brick-lined smelting pit, an oven and two hearths.

The smelting pit (009)

Sunk within the western side of the floor were the residual elements of a brick faced pit constructed from bricks laid obliquely header to header with the rim formed by bricks laid along the stretcher edge. The base of the pit was constructed from part bricks laid horizontal with many of the bricks still bearing traces of lead smelting. Traces of mortar on some of the bricks suggest that the brick used in its construction are re-used material from elsewhere.

The oven (025)

Positioned in the north-eastern area of the floor was a circular structure approximately 1m in diameter constructed from complete and part bricks. The bricks were of two differing sizes: 11" x 5 ½" x 2" (280mm x 140mm x 50mm) and 10" x 5" x 2" (254mm x 140mm x 50mm), although at least one brick displayed a thickness of 1 ¾". They displayed the general characteristics of near-wasters or at least inferior '*seconds'* with the primary signs of 'blowing'. The choice of brick quality may have been deliberate as 'over-burnt' bricks are generally fired to a stone-like quality that increases their heat tolerance before shattering. The bricks on the exterior or rim of the structure show distinct signs of fragmentation due to burning from where it was possible to identify an F3 fabric.

The southern hearth (015/016)
At the southern end of the chamber a rectangular brick structure approximately 1.15m x 0.65m extended to the chamber edge. It was constructed from eleven complete bricks measuring 10-11" x 5" x 2" laid flat, stretcher to stretcher, in two rows divided by part bricks set on edge. Surrounding the brickwork were a number of flat stone pieces laid on edge to form a perimeter. Many of the bricks and stones were displaying evidence of heat fragmentation or weakening prior to breakage. Although identified as a hearth the structural material remaining did not appear to have been subject to direct heat but possibly indirect heat and therefore may have acted as a brazier stand.

The south-eastern hearth (019)

Within the south-eastern corner of the floor a further hearth, possibly incorporating a later rebuild extended into the eastern wall. At least three bricks, within a four brick alignment, survived laid flat and header to header before turning 908 enclosing an area approximately 1m by 1m. Within the enclosed area the hearth surface had been constructed from part bricks and flat stone set on edge, all bearing evidence of heavy burning. The stonework to the rear of the surviving elements of the hearth may represent consolidation or consolidated collapsed wall rubble within which the residual elements of a second hearth were visible albeit at approximately 0.30-0.40m higher level. At least two bricks survived laid flat and header to header, aligned east/west at the northern edge. A small area of hearth floor survived within the north-eastern corner constructed in a similar fashion to its predecessor (i.e. brick and stone on edge). There were, however, bricks incorporated into the stone rubble behind the hearth suggesting the possibility of association with the hearth. All the bricks were reasonably well made although slightly over-fired and measured 10 ½" x 5" x 2"

A small chamber approximately 1m x 1m appears to have been attached to the northern side of the latter hearth constructed from brick (10 ½" x 5" x 2") and heavily burnt stone. The residual elements appear disorganised, however, part of a brick wall two bricks wide, remained in situ on the eastern side butting up to the northern wall of the later hearth. Clearly visible within the surface of one of the bricks is a tiler's tallymark (*see finds of intrinsic interest*).

South facing extant wall

The south facing extant wall within the chamber had been substantially repaired by the infilling of gaps within the stonework with brick and tile for several courses. Several complete bricks measuring 8 ½ " x 5" x 2" were recorded, the majority displaying headers to the surface. A single nibbed flat roof tile had been incorporated into the wall at approximately 0.10m below the lowest course of brickwork, its stretcher surface facing outward to promote a relatively level surface. All the ceramic building material had been bonded within the stonework by a creamy-grey, sandy lime mortar.

The North facing tower wall

A substantial amount of brick and tile had been incorporated within the stonework construction of the north facing tower wall. The highest fragments recorded in situ were relatively small compared with the fragments at a lower level. Their small size prevented full dimensions from being recorded with the exception of thickness in the roof tile. However, the brick and tile fabric was identified as Type F2. . The roof tile identified displayed no suspension characteristics and therefore could not be allocated a classification, however, from the thickness and general characteristics the fragments were identified as flat roof tile 15mm - 20mm thick.

The lower courses of stonework contained substantial amounts of brick and tile infilling, with heavy concentrations around the western side of the north-facing window. Initial examination of the tile in situ showed it to have a slight curvature suggesting ridge or pantile, however, on closer examination all the tile was identified as misshapen flat roof tile, probably purchased as '*seconds*' for direct use as infilling or repairs. The fragments of brick incorporated with the tile displayed dimensions of 4 - 4 ½ " in width by 2" thick and were generally of a type F5 fabric. Occasional part bricks were identified as '*seconds'* and, as with the roof tile, purchased solely for the use of infilling and/or repairs. The majority of the brick and tile had been inserted horizontally/laying on their stretcher surfaces however, occasionally a brick had been inserted lying on its stretcher edge exposing its larger surface. This practice had also been identified within the internal walls of the tower chamber. All the material had been bonded with a light grey sandy mortar.

4. Discussion

The material examined is comparable with most ceramic roof tile assemblages recorded within the region and contained no new or unusual material. From the material examined, only a basic identification was possible, particularly regarding the roof tile, of which only one diagnostic fragment could be compared with regional typologies (Regional Type 1a, manufactured in Beverley, Yorkshire from the late 12th century). However, the basic characteristics of the tiles suggest a 13th-16th century date, the fabric suggesting 'local' manufacture. It is possible that the roof tiles may have been salvaged from elsewhere and incorporated within the structure as a cheaper alternative to stone.

The brick identified can be classified into three broad ranges with a possible fourth type based upon width, thickness and fabric (*See table 2*). The possible date range for the manufacture of the material examined has a broad span from the 13th to the early 16th centuries; the larger bricks may be of an earlier date. At least five provisional identifiable fabric types within the ceramic assemblage (*see table 1*) of which F1 and F2 were more predominant within the brick. This suggests a number of different local clay sources may have been exploited by a number of manufacturers or a single manufacturer, although the material may also have been imported from various other parts of the county. The bricks may have also been reused from elsewhere as a cheaper alternative to stone.

From the basic visual examination of the fabric alone it is not possible for the non-diagnostic fragments to be compared with the local typologies for classification to any degree of accuracy. Brick types 1 and 2, based upon a *best-fit* policy, are similar to HFA type 6 whilst type 3 is likely to be of local manufacture. Type 4, displaying incomplete dimensions would fit within a large range of brick types within typologies. However, the diagnostic bricks identified are common throughout the region during the medieval and later periods.

A summary of a superficial examination of the remaining brickwork within the castle complex can be found within Appendix 2.

5. Recommendations

The brick and tile examined is important, not only in terms of the information which it can provide regarding the construction methods used on the medieval castle, but also in terms of the valuable contribution which it makes to the ongoing study of what was a highly significant regional brick and tile industry.

It is recommended, therefore, that the ceramic building material from the site is fully quantified and compared with existing typologies. A published report on the material should be produced outlining its main characteristics, and discussing its significance in local and regional terms. The architectural function of the materials should also be discussed, with a view to enhancing our understanding of the structure and appearance of the regional buildings.

Following this analysis, representative samples of the brick and roof-tile (if possible) should be selected for inclusion in the local typologies and ultimately deposition in the appropriate museum.

6. Finds of intrinsic interest

Tallymark.

A single brick from the southern hearth surround displayed a linear finger striation approximately 2 ½" (63mm) in length across the upper stretcher surface. This was identified as a Type 1 tilers *'tallymark'* of which parallels from the East Riding of Yorkshire are known from the 14th century (Tibbles forthcoming), (Tibbles in prep)

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Humber Field Archaeology Regional Brick and Tile Typology.

Appendix 1

Table 1: Fabric Types

Fabri	Colour	Munsell	Inclusions	Comments
F1	Weak Red	10R/4/6	Sporadic black inclusions	Sandy fabric. Ranges of density
F2	Red	2.5YR/5/8	No visible inclusions	Ranges of density
F3	Red	10R/4/8	shale inclusions <3mm	
F4	Dark red	10R/3/6	Sporadic black inclusion	Significantly less sandy than F1
F5	Red	2.5YR/6/8	Frequent red pellets <1mm & black speckles	Patches of under-fired clay

Table 2: Brick Typology

Type	Dimensions	Colour	Munsell	Fabric	Date Range
1	11 ½"-12" x 6" x 1 ¾"	Weak Red	10R/4/6	F1-F2-F4	13th-16th c
2	10"-11" x 5 ½" x 2"	Red	10R/4/8	F3	13th-16th c
3	8 ½ " x 5" x 2"	Dark Red	10R/3/6	F2	14th-16th?
4	? x 4-4 ½" x 2	Red	2.5YR/6/8	F5	?

Appendix 2
Observations in relation to the remaining castle structures

Eastern gate wall
Substantial infilling of the stone coursing by rooftile, possibly pantile. The windows have been bricked up in the late 18th or 19th centuries using stock bricks and wasters. The southern side of the gateway contains bricks measuring 8 ¾" x 4 ¼" x 2 3/8" and 9" x 4" x 3", there general manufacturing characteristics suggest a date of 1825-1850. The rebuilt wall at a higher level incorporated stone, cobble and brick, the latter possibly of re-used late 18th century date.

Internal wall and ramp
The internal wall and ramp contained bricks measuring 8 ¾" x ? x 3", some examples displaying machine-made *'Bullnose'* characteristics suggesting a late 19th century date.

The South-western tower
Of the few brick examples available for examination at the tower base no complete brick was identified, however, dimensions of part bricks were recorded as 4 ¼" wide by 2 ½-2 ¾" thick.

The north-western tower.
No brickwork was identified at a recordable height; however, a substantial well-constructed fireplace was visible within the north wall on the fourth floor with a possible further brick fireplace on the third floor. These structures were not accessible for closer examination

APPENDIX 4

ANALYSIS OF A MORTAR SAMPLE FROM THE NORTH-EAST TOWER OF SHERIFF HUTTON CASTLE

by Sandberg Consulting Engineers

SANDBERG
CONSULTING ENGINEERS
TESTING INSPECTION
QUALITY MANAGEMENT

REPORT 24305/C

NE TOWER, SHERIFF HUTTON, YORK

ANALYSIS OF A MORTAR SAMPLE

Historic Property Restoration Ltd
Sandgate Hall
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This report comprises
3 pages of text
Table 1 of 1 sheet

For the attention of Mr S Taylor

6 September 2002

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REPORT 24305/C

NE TOWER, SHERIFF HUTTON, YORK

ANALYSIS OF A MORTAR SAMPLE

Reference: Verbal Instructions from Mr Steve Taylor

1. INTRODUCTION

Three samples of mortar taken by yourselves from the above site were received on 27 August 2002. We were asked to determine mix constituents and proportions on sample 2 only.

2. SAMPLE DETAILS

Sandberg Reference	Client Reference	Description	Weight of sample received, g
C48079	Sample 1	Pieces and powder, light brown colour, moderately soft . Lime pockets visible	540
C48080	Sample 2	Pieces and powder, light brown colour, moderately soft.	267
C48081	Sample 3	Pieces and some powder, light grey colour, moderately soft.	455

3. ANALYSIS METHODS AND RESULTS

The sample was prepared and analysed using documented in-house methods, Section 34.1, supported by qualitative chemical analysis where appropriate.

As examination of the analysis data in conjunction with the appearance, tactile properties and available background information for the sample suggested that the mix consisted of moderately hydraulic lime and sand, the mix proportions were calculated on this assumption, following documented in-house methods.

The binder content was calculated from the acid soluble calcium content. The approximate volume mix proportions were calculated using typical bulk densities for the constituents as indicated in the analysis tables.

Details of the analysis given in Table 1 of this report, including details of the assumptions made in the calculations. The mix proportions are summarised below:

Sample Reference	Mix constituents	Mix proportions	
		by weight	by volume
Sample 2	Moderately hydraulic lime : sand	1 : 2½	1 : 1

4. REMARKS

It is not always possible by chemical analysis alone to distinguish with certainty between Portland cement and lime binders or between hydraulic and non-hydraulic limes.

Microscopical examination can usually ascertain the presence or otherwise of Portland cement in the mortar and of calcareous material in the aggregate. In the absence of such confirmatory work, interpretation of the analytical results is made on the basis of consideration of the analysis in conjunction with the appearance and any available background information for the mortar.

Mix proportions are traditionally expressed on the basis of volume ratios and, in the absence of information about the particular binder or aggregate, assumed bulk density values are used to calculate such proportions. Volume proportions can as a result be somewhat inaccurate and it may be desirable to use weight proportions if an attempt is made to match to match for renovation work, etc.

A sample of washed sand is supplied herewith.

Historic Property Restoration Ltd
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for Sandberg

J L Pickering
Department Manager

For the attention of Mr S Taylor

JLP/Chemcur/nb

6 September 2002

SANDBERG

CONSULTING, INSPECTING
AND TESTING ENGINEERS

UKAS TESTING
0262

24305/C

Table/Sheet
1

MORTAR - CHEMICAL ANALYSIS
DETERMINATION OF MIX PROPORTIONS

Documented in-house Methods based on BS4551: Part 2: 1998

Date of Test
2-3/9/02

Sandberg Reference:	C48080			Assumed values used in mix calculations
Client Reference:	2			
Details:	mortar			
CHEMICAL ANALYSIS			Sand	
			- CaO %	0.0
	% by mass		- SO_3 %	0.0
			- bulk density kg/m³	1675
Insoluble Residue	60.30		Hydraulic Lime (eminently)	
Soluble Silica, SiO_2	1.58		-CaO %	62.0
Acid soluble Alumina, Al_2O_3	1.00		- bulk density kg/m³	1000
Acid soluble Total Iron, Fe_2O_3	0.77		Hydraulic Lime (moderately)	
Acid soluble Calcium, CaO	17.06		-CaO %	62.0
			- bulk density kg/m³	575
Acid soluble Magnesium, MgO	0.49		Non-Hydraulic Lime	
Acid soluble Sulphate, SO_3	0.45		- CaO %	75.6
			- MgO %	69.1
Loss on Ignition	16.79		- bulk density kg/m³	575
			Gypsum	
			- SO_3 %	55.2
			- bulk density kg/m³	860
TOTAL	98.44			

CALCULATIONS OF MIX PROPORTIONS

Assumed compositions to nearest 0.5%	% by mass of dry mass		Remarks
Hydraulic lime:sand (eminently)			
- Hydraulic lime, dry	-		
- Sand	-		
- Volume proportions	-		
Hydraulic lime:sand (moderately)			
- Hydraulic lime, dry	30.5		
- Sand	69.5		
- Volume proportions	1 : 1		
Non-hydraulic lime:sand:			
- Hydrated lime, dry	-		
- Sand	-		
- Volume proportions	-		
Gypsum:lime:sand:			
- Gypsum	-		
- Lime	-		
- Sand	-		
- Volume proportions			

- = Not determined or not applicable.

APPENDIX 5

LIST OF ARCHAEOLOGICAL CONTEXTS AND FINDS FROM THE NORTH-EAST TOWER

by Ed Dennison, EDAS

SHERIFF HUTTON CASTLE: NORTH-EAST TOWER
LIST OF CONTEXTS AND ARTEFACTS

Area A

Contexts

Context	*Description*
001	Turf and firm black silty loam (topsoil), 0.10m thick.
002	Dump of compacted concrete/limestone/brick rubble.
003	Firm dark brown sandy silt containing high proportion of angular gravel.
004	Spread of hard packed angular limestone pieces (floor surface?) with possible post-pad 0.30m diameter.
005	Concrete/hardcore, 0.20m thick.

Area B

Contexts

Context	*Description*
001	General fill of basement (C20 farm waste, wood, red ash, soil, animal bone etc).
002	Primary fill of basement - soil, silt loam, C19 pottery etc topped in from opening in N wall).
003	TP1 - firm mid brown sand, 0.14m thick, with occasional inclusions of limestone rubble.
004	TP1 - stiff dark brown clay with frequent inclusions of limestone rubble.
005	TP1 - compacted dark brown/purplish ashy silty sand, 0.24m thick, containing substantial amounts of pottery, bone, glass, limestone rubble, leather shoes & plastic material.
006	TP2 - firm mid brown gritty sand, 0.10m thick.
007	TP2 - firm mid brown gritty sand, 0.24m thick.
008	TP2 - stiff/hard dark brown clay, 0.12m thick, containing frequent limestone rubble.
009	TP1 - crude limestone rubble footing, 0.20m thick.

Area C

Contexts

Context	*Description*
001	C1/C2 – firm black sandy silt loam (topsoil), 0.30m thick.
002	C2 – firm dark brown gritty silty sand, 0.70m thick (fill of 003).
003	C2 - vertical cut (robber trench for curtain wall).
004	C2 - large limestone slab, 0.3m long x 0.5m wide (remains of curtain wall footings?).

Artefacts

Context	*Description*
002/003 (C2)	1 piece unidentified CBM. 34gm. 1 piece of glazed floor tile (undecorated). C14-C15. 1 piece of Brandsby? roof tile with peg hole. 1 piece of roof tile waster, possibly used for levelling material. 3 sherds hard grey fabric with green glaze. 2 sherds from a base, 1 body sherd. Compare Humberware or Hambletonware (HAMBT). C15 or C16. 144gm. 2 sherds green glazed ware base. Compare Hambletonware (HAMBT). c.C15. 34gm. 1 sherd Langerwehe stoneware jug from Germany (LANG). C14-C15. 16gm. 2 bags assorted animal bone.

Area D

Contexts

Context	*Description*
001	Black/dark grey silty loam, 0.10m thick (topsoil).
002	Loose grey/brown silty loam, up to 0.95m thick, with frequent limestone pieces.
003	Loose light orange sand, up to 1.20m thick, with very high proportion of limestone/sandstone rubble.
004	Densely packed layer of fallen limestone rubble, up to 0.75m thick.
005	Sandstone ashlar wall, 1.68m long x 0.62m wide x 0.92m high.
006	L-shaped section of limestone rubble wall, c.3.0m long x 0.7m wide x c.0.5m high.
007	Loose fine mid grey ashy sand, c.0.20m thick, containing frequent charcoal, bottle and window glass, pottery, lead fragments etc.
008	Loose dark grey ashy sand 0.05m thick, containing very high proportion of charcoal and animal bone.
009	Brick-built lead smelting hearth, 0.9m diameter and 0.46m deep.
010	Firm dark grey ashy sand, 0.10m thick, containing frequent charcoal – upper fill of hearth 009.
011	Area of limestone flags/bricks.
012	Area of limestone flags, same as 013.
013	Area of limestone flags, same as 012.
014	Low wall of crudely dressed sandstone ashlar, 0.44m long x 0.40m wide x 0.30m high.
015	Area of limestone slabs, reddened by heat, set on bed of reddened mid brown sandy silt - remains of hearth?
016	Brick steps (to hearth 015?).
017	Area of worn limestone slabs and stone cobbles, 0.12m thick – floor surface.
018	Possible post pad, 0.36m square within 017.
019	Brick fireplace, 1.4m long x 1.7m wide x 01.2m thick.
020	Area of reddened sandstone and brick, 0.40m long by 0.30m wide - former hearth?
021	Hard dark brown/orange silt, 0.10m thick, with a high proportion of charcoal - infill of 020.
022	Hard dark brown/orange silt/mortar spread, >0.10m thick.
023	Block of burnt/reddened indeterminate stone, 0.50 long x 0.45m wide x 0.21m deep.
024	Burnt mortar/limestone spread (surround of oven 025).
025	Brick-built oven base, 1.70m long x 1.30m wide.
026	Compacted gritty red sand, 0.05m thick (middle layer in hearth base 009).
027	Compacted dark red gritty sand, 0.05m thick, overlying thin sheet of lead (lower layer in hearth base 009).
028	Firm brick red sand, 0.02m thick, below 019.
029	Firm clean buff sand, 0.04m thick, below 028.
030	Firm pink sand, 0.04m thick, below 029.
031	Firm black ash/silt, 0.08m thick, below 030.
032	Accretion of slag within hearth 009, up to 0.3m thick.
033	Surface of limestone slabs, 0.7m long x 0.4m wide, on east side of hearth 009.
034	Firm orange/black mortar, 0.05m thick, either side of 033.
035	Firm orange sand/black charcoal-ash bands, at least 0.10m thick, below 034.
036	Alternating bands of firm black charcoal-ash/orange sand, 0.18m thick.
037	Compacted firm black charcoal-ash layer, 0.37m thick.

Artefacts

Context	*Description*
003	2 pieces Brandsby ? roof tile, bevelled edges with some mortar attached, both with peg holes. 2 pieces of roof pantile, one with square nib. Early-mid C18. 1 piece unidentified tile. 1 complete orange handmade brick, 220mm x 100mm x 60mm. 1 complete orange handmade brick, 220mm x 120mm x 45mm. Various items of late medieval iron door fittings (hinge pivot, staples, hasp, hold-fasts and strap hinges), and padlock of late 18th/mid 19th century date. Lead fragments, including tie strip and melt.
004	1 piece Brandsby? roof tile, with bevelled edges and peg hole. Various items of late medieval iron door fittings. Pieces of window glass.
007	1 sherd Hambletonware type (HAMBT). c.C15. 20gm. 2 sherds Ryedale type (RYEDT), from same large open bowl or platter. C17. 126gm. 2 pieces glazed undecorated floor tile, mortar on rear, well foot-worn. From one tile. C14 on.

	1 piece glazed brick, possible from base of kiln, reused as evidenced by mortar on both upper and lower surfaces.
	1 piece roof tile. Late C19.
	1 bag of assorted animal bone.
	Lead fragments, including tie strip and melt.
	Pieces of window glass.
008	1 bag of assorted animal bone.
010	Lead fragments, including tie strip ball and melt.
	3 pieces of lead alloy curved sheet or pipe.
017/018	1 bag of assorted animal bone.

Area E

Contexts

Context	*Description*
001	Fallen limestone rubble with dark brown sandy silt and mortar, up to 0.70m thick.
002	Loose dark brown silt sand soil, 0.30m thick.
003	Light brown mortar floor.

Artefacts

Context	*Description*
002	1 bag of assorted animal bone.
	Copper alloy rumbler bell.

APPENDIX 6

PALAEOENVIRONMENTAL ASSESSMENT

by Allan Hall, Harry Kenward, John Carrott and Katherine Johnson,
Palaeoecology Research Services

Palaeoecology Research Services

Assessment of biological remains from architectural and archaeological survey at Sheriff Hutton Castle, Sheriff Hutton, North Yorkshire (site code: SH02)

PRS **2004/15**

Assessment of biological remains from architectural and archaeological survey at Sheriff Hutton Castle, Sherfii Hutton, North Yorkshire (site code: SH02)

by

Allan Hall, Harry Kenward, John Carrott and Kathryn Johnson

Summary

Three bulk sediment samples and three spot samples (from a total of twenty collected), recovered from deposits encountered during a programme of architectural and archaeological survey at Sheriff Hutton Castle, North Yorkshire, were submitted for an assessment of their bioarchaeological potential. The archaeological work primarily comprised the supervision of the hand-excavation of the first floor of the tower to facilitate the repair of the ground floor vault below, with watching briefs also undertaken on several different parts of the tower and surrounding area as the consolidation works progressed. Although, the castle itself has its origins in the late 14th century, it is likely that much of the activity represented by the sampled deposits was of considerably later (late 16th/17th century) date.

Ancient plant remains consisted largely of wood charcoal, forming the greatest part of the three subsamples from the bulk sediment samples. Other ancient plant remains were confined to a very few charred bread/club wheat grains and a single charred hazelnut shell fragment. Trace quantities of invertebrate and vertebrate remains were recovered, but these were largely unidentified, too few to be of interpretative value and some, at least, were clearly of modern origin.

The charred cereal grains and hazelnut shell fragments would provide suitable material for radiocarbon dating to be attempted, if required.

No further study of the current material is warranted.

KEYWORDS: SHERIFF HUTTON CASTLE; SHERIFF HUTTON; NORTH YORKSHIRE; ASSESSMENT; MEDIEVAL; POST-MEDIEVAL (LATE 16TH/17TH CENTURY); PLANT REMAINS; CHARRED PLANT REMAINS; CHARRED CEREAL GRAINS; INVERTEBRATE REMAINS; VERTEBRATE REMAINS

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7 March 2008

Assessment of biological remains from architectural and archaeological survey at Sheriff Hutton Castle, Sheriff Hutton, North Yorkshire (site code: SH02)

Introduction

A programme of architectural and archaeological survey was carried out by Ed Dennison Archaeological Services Ltd (EDAS) at Sheriff Hutton Castle, North Yorkshire (NGR SE 653 663), mostly between April 2002 and February 2003, but with subsequent lesser phases in July and August 2004 and September 2005. The works were undertaken as part of major consolidation and repair to the north-east tower of the castle.

The archaeological work primarily comprised the supervision of the hand-excavation of the first floor of the tower to facilitate the repair of the ground floor vault below, with watching briefs also undertaken on several different parts of the tower and surrounding area as the consolidation works progressed. The castle itself has its origins in the late 14th century, but it is likely that much of the activity represented by the sampled deposits was of considerably later date. Documentary evidence demonstrated that the removal of fixtures and fittings from the castle was well underway by the late 16th century, whilst actual demolition commenced in the early 17th century. The hearth (009) uncovered in the north-east corner of the first floor of the north-east tower was being used to melt down lead window cames, and could be associated with either of these phases. A total of twenty samples were collected, most of which were related to this hearth and were composed largely of sand and lead/lead slag.

Three of the bulk sediment samples ('GBA'/'BS' *sensu* Dobney *et al*. 1992), and three other samples examined as organic 'spot' finds, were selected for assessment of their bioarchaeological potential and submitted to Palaeoecology Research Services Ltd, County Durham (PRS).

Methods

The lithologies of the bulk samples were recorded, using a standard *pro forma*. Subsamples from each were processed for the recovery of plant and invertebrate macrofossils, broadly following the techniques of Kenward *et al*. (1980). Prior to processing, the subsamples were disaggregated in water for 24 hours or more and their volumes recorded in a waterlogged state.

Plant and invertebrate remains in the processed subsample fractions (washovers and residues) were recorded briefly by 'scanning' (using a low-power microscope where necessary), identifiable taxa and other components being listed on paper. The residues and washovers were primarily mineral in nature, with any ancient remains present being preserved by charring, and were dried prior to recording.

During recording, consideration was given to the suitability of the remains for submission for radiocarbon dating by standard radiometric technique or accelerator mass spectrometry (AMS).

Nomenclature for plant taxa follows Stace (1997).

Results

All of the samples assessed were taken from Area D (the first floor of the tower) and the results are presented in context number order. Archaeological information, provided by the excavator, is given in square brackets. A brief summary of the processing method and an estimate of the remaining volume of unprocessed sediment follows (in round brackets) after the sample numbers.

AREA D – FIRST FLOOR OF THE NORTH-EAST TOWER OF THE CASTLE

Context 10 [upper fill of hearth 009]
Sample 3/T (3 kg sieved to 300 microns with washover; approximately 5 litres of unprocessed sediment remain)

Dry, light to mid grey-brown, unconsolidated, fine sand and silt (?ashy). Stones (2 to 60 mm), ?mortar/plaster, charcoal and ?modern rootlets were present.

The moderately large washover of about 300 cm^3 consisted of angular charcoal (to 15 mm in maximum dimension). It was well preserved and, on a relatively brief inspection, found to include oak (*Quercus*), willow/poplar/aspen (*Salix/Populus*), ash (*Fraxinus*, evidently from roundwood) and ?maple/sycamore (cf. *Acer*). There were also traces of charred bread/club wheat (*Triticum 'aestivo-compactum'*) grains, a little small vertebrate bone and a few uncharred (probably modern) seeds and other plant debris. Modern beetle sclerites were also present and there were two molluscs: an unidentified snail and a freshwater bivalve (?*Pisidium*) shell. The only other material present comprised rare fragments (to 10 mm) of mortar.

The large residue (dry weight 1.45 kg) was mostly sand and stones (to 40 mm).

Context 10 [upper fill of hearth 009]
Sample 3/SPT

This spot sample consisted of a few fragments of crumbly charcoal, including *Quercus* and cf. *Acer*, to 30 mm.

Context 10 [upper fill of hearth 009 – lower 0.05 m of deposit]
Sample 8/T (3 kg sieved to 300 microns with washover; no unprocessed sediment remains)

Dry, light to mid grey to brown, unconsolidated, fine sand and silt (?ashy). Mortar/plaster, ?cinder, charcoal and modern rootlets were also present.

There was a moderately large washover of about 350 cm^3 of angular charcoal: as before, oak (to 15 mm) and ash (to 30 mm, including roundwood to about 9 years in age) were noted. Two rather distorted charred bread/club wheat grains were also present and a single fragment of charred hazel (*Corylus avellana* L.) nutshell. There was some small vertebrate bone and a few specimens of (probably) modern uncharred seeds and other plant fragments. Small (to 5 mm) fragments of mortar, bird eggshell and what may have been baked clay/daub were also observed.

The large residue (dry weight 1.68 kg) was mostly sand, with some stones (to 55 mm) and occasional flecks of black ash/cinder (to 2 mm).

Context 26 [upper level of red sand in base of hearth 009]
Sample 15/T (3 kg sieved to 300 microns with paraffin flotation, no unprocessed sediment remains).

Dry, light to mid pinkish-brown, unconsolidated, fine sand and silt (?ashy). Stones (2 to 6 mm), brick/tile, lead-flash and charcoal were present.

The very small washover, of about 20 cm^3, consisted of angular charcoal (to 10 mm) which was very brittle and crumbly and included oak. A single amphibian bone and a few scraps of insect cuticle (probably modern) were also noted.

The large residue (dry weight 1.55 kg) was mostly sand, with some stones (to 20 mm).

Context 31 [black ash sand charcoal below 030]
Sample 20/SPT

This spot sample comprised a small bag of about 80 g of charred material which was washed to 300 microns and dried: the clasts seemed essentially to be brown to grey concreted silty sand (?slightly baked, but not reddened), at first sight resembling cinder (but not that material).

Context 32 [slag from hearth 009]
Sample 6/SPT

This sample comprised massive lumps of pale, crumbly, extremely dense material, presumably largely lead slag or decayed lead, with some small patches (to 20 mm) of black, presumably carbonaceous, material with no apparent internal structure (this might be highly burnt

charcoal or other organics caught within hot slag/melted lead).

Discussion and statement of potential

The ancient plant remains consisted largely of wood charcoal, forming the greatest part of the three 'GBA subsamples. Other ancient plant remains were confined to a very few charred bread/club wheat grains and a single charred hazelnut shell fragment (all from Context 10), on the basis of which very little may be said about the nature of the deposits (or the site).

Trace quantities of invertebrate and vertebrate remains were also recovered, but these were largely unidentified, too few to be of interpretative value and some, at least, were clearly of modern origin (e.g. beetle sclerites from Sample 3, Context 10).

The charred cereal grains and hazelnut shell fragments would provide suitable material for radiocarbon dating to be attempted (via AMS), if required.

Recommendations

No further work can be justified for the samples investigated and any other samples from the excavation probably do not warrant inspection.

Retention and disposal

The small quantities of biological remains recovered from the assessment subsamples should be retained as part of the physical archive of the site.

Unless required for purposes other than the study of biological remains, the remaining sediment samples may be discarded.

Archive

All material is currently stored by Palaeoecology Research Services (Unit 8, Dabble Duck Industrial Estate, Shildon, County Durham), along with paper and electronic records pertaining to the work described here.

Acknowledgements

The authors are grateful to Ed Dennison, of EDAS, for providing the material and the archaeological information.

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APPENDIX 7

THE COPPER ALLOY, IRON, LEAD AND GLASS

by Lisa Wastling

Sheriff Hutton Castle (SH02)

The Copper Alloy, Iron, Lead and Glass

Lisa M. Wastling

Aims and Objectives

The following report aims to assess the potential of the following artefacts for further analysis, to meet the requirements of MAP2, Phase 3, 'Assessment of Potential for Analysis', (English Heritage, 1991). The structure of this report is based on guidelines recommended by the Roman Finds Group and Finds Research Group 700-1700 AD (1993), and the Institute of Field Archaeologists Finds Group (1991).

Quantification by Material and Function

77 objects were submitted for assessment. Three bags of lead melt fragments were each counted as a single object as these contained hundreds of tiny fragments.

Copper Alloy - Total 1 object (Area E, context 002)

Function	**Description**	**Quantity**
Dress fitting/ pastime	rumbler bell	1
Total		**1**

Ironwork – Total 14 objects (Area D, contexts 003/004)

Function	**Description**	**Quantity**
Door fitting	hinge pivot	1
	hasp	1
	strap hinge	2
	strap hinge and hinge pivot	1
	strengthening strip	2
	U-shaped staple	1
Structural	holdfast	2
	nail	1
	?nail shank	1
	?wallhook	1
Miscellaneous	strip/sheet fragment	1
Total		**14**

Iron and Lead alloy – Total 1 object (Area D, context 003)

Function	**Description**	**Quantity**
Security/ door fitting	padlock	1
Total		**1**

Lead - Total 23 objects (Area D, contexts 003, 007 & 010)

Function	Description	Quantity
Structural	tie strip	1
Re-cycling/lead working	melt (tiny fragments) >100	3
	Melt (large fragments)	17
Miscellaneous	sheet	2
Total		**23**

Lead alloy – Total 3 objects (Area D, context 010)

Function	Description	Quantity
Miscellaneous	curved sheet/ pipe	3
Total		**3**

Glass - Total 35 objects (Area D, contexts 004 & 007)

Function	Description	Quantity
Structural	window fragment	35
Total		**35**

Objects of intrinsic interest

1. **Rumbler bell.** Copper alloy. Complete. Made of sheet metal, in 2 halves, soldered together. Bells such as this were used as dress accessories and were attached to animals from the medieval period onwards (Lawson and Margeson 1993, 213).
Diam. 17mm Suspension loop L. 4mm
Area E, context 002

2. **Padlock.** Iron and lead alloy. Heart-shaped box form, with rotary lock mechanism. Has a lead alloy tapered pivoting keyhole cover. Left in unlocked position and open. Late 18th to mid 19th century.
Height 98mm W. 60mm Th. 21mm
Area D, context 003

3. **Hinge pivot.** Iron. Round-sectioned pivot, rectangular-sectioned shank.
Pivot L. 46mm Diam. 14mm Shank L. 110mm W. 18mm Th. 14mm
Area D, context 003

4. **U-shaped staple.** Iron. Both tips of arms missing.
L. 74+mm W. 37mm Th. 13mm
Area D, context 003

5. **Hasp.** Iron. Complete. Figure of 8-shaped. Small circular loop at the fixed end, slightly pointed oval loop at the other end.
L. 135mm W. 35mm Th. 8mm
Area D, context 003

6. **Hold-fast.** Iron. Near complete. With tapered shank and flat laterally-set round head, with central perforation containing the head of an iron nail. Head shows minerally-preserved wood.
L. 210mm Max. shank W. 22mm Th. 11mm Head diam. 28mm
Area D, context 003

7. **Hold-fast.** Iron. Incomplete. With tapered shank and flat laterally-set oval head, with central perforation containing an iron nail. Head shows minerally-preserved wood.
L. 130+mm Max. shank W. 20mm Th. 13mm Head 26x30mm
Area D, context 003

8. **Strap hinge.** Iron. Complete. With looped eye and spearhead terminal. 5 L-shaped iron nails in situ. Spacing of nails decreases towards the eye. Nails show minerally-preserved wood. Clenched tip of one nail indicates that the door thickness was 47mm
L. 422mm W. 30mm Th. 7mm Nail L. 70mm
Area D, context 003

9. **Strap hinge and hinge pivot.** Iron. Incomplete. Partial strap hinge with looped eye. 2 perforations and 1 flat round-headed iron nail in situ. Head diam. 17mm.
Hinge L. 126+mm W. 28mm Th. 8mm Nail L. 50mm
Hinge pivot L. 127mm Max. shank dimensions 14x14mm
Area D, context 003

10. **Strap hinge fragment.** Iron. With 2 perforations and 2 iron nails in situ, one L-shaped the other with flat round head. Clenched tip of one nail indicates that the door thickness was 46mm. This is probably the end of the partial hinge strap above.
L. 204mm Max. W. 28mm Th. 7mm Nail L. 60 & 51mm
Area D, context 003

11. **Strengthening strip.** Iron. Complete. Bent to oblique angle off centre, with 6 perforations containing nails. Probably used flat flat.?? Nails show minerally-preserved wood.
Arm L. 185 & 157mm W. 51mm Th. 9mm Nail L. 42mm
Area D, context 004

12. **Strengthening strip.** Iron. Complete. Bent to acute angle c45 degrees, with 6 perforations containing nails. Probably used flat. Nails show minerally-preserved wood. Nails have flat round heads 12mm in diameter.
Arm L. 175 & 170mm W. 45mm Th. 9mm Nail L. 41mm
Area D, context 004

11. **Tie-strip ball.** Lead. Coarsely rolled ball of diamond-sectioned cast lead strip. Probably tie-strips associated with leaded windows, possibly to attach to glazing bars.
Strip W. 5mm 'ball' dimensions 27 x 15mm
Area D, context 010

Key Groups

Door fittings and structural items

Area D contexts 003 and 004 contained the entire fittings from a wooden door, including the padlock used to lock it. These consist of: two strap hinges and accompanying hinge pivots; a pair of strengthening strips, which have become bent, post-use; a figure of 8-shaped hasp; a U-shaped staple used to attach the hasp or as the padlock attachment; and the accompanying iron padlock. The majority of these finds are from context 003, and it is likely that the two strengthening straps also originated from this context.

The form of these fittings suggest that the wooden door was of planked construction with a thickness of 46 to 47mm. It was likely to have been constructed during the 16th century at the earliest and may have been a

replacement for an earlier door. Spear-headed strap hinges existing within houses of known date cover the period from 1583 to 1743 (Alcock and Hall 1994, 22).

The padlock is a late 18th to 19th century example, which clearly post-dates the door fittings and must relate to the last period in which the door was in use and secured on a regular basis. Following this last use the no-longer needed padlock was left unlocked and open, after which the corrosion products of the iron permanently fixed it in this position. What the door fittings demonstrate is that both the door and the room to which it belonged were still in a sufficient state of preservation to be of use, potentially as late as the 19th century.

The fact that the nails and fittings display minerally-preserved wood suggests that the door decayed in situ, rather than undergoing destruction by burning.

Further structural material consists of material which relates to the fabric of the tower itself, namely iron fittings used with wooden components of the structure, such as the hold-fasts and window components.

35 fragments of window glass were recovered, the majority coming from Area D, context 007. It varies in thickness and one of the fragments possesses a pontil scar. These features indicate that it was manufactured by the crown method. Some of the edges of the glass were grozed (snipped) to shape, though there is not enough of any of the pieces to suggest whether the glass was set in a diamond lattice or not. It is, however unusual to see pontil scar 'bullseyes' with this form of glazing, suggesting that perhaps the glass was set as small square panes, thus dating it to the post-medieval period.

Lead working/ re-cycling

The lead consisted mainly of fragments of lead melt, most of which were recovered from the upper fill of the hearth (Area D, context 010). In addition to this were cut up fragments of lead sheet and lead alloy curved sheet (possibly originally a pipe), plus a rolled up ball of potential lead glazing ties.

The lead assemblage suggests the systematic recycling of lead which derived from the structure of the castle itself, potentially being undertaken in the more substantially surviving areas of the building. The lead sheet probably originated as a roofing material and the ties as part of leaded windows.

Lead can be recycled using a domestic hearth, due to its low melting point. The excavation narrative suggests that the hearth (Area D, context 009) on which the lead was re-cycled was constructed of brick. It is of interest that the lead melt included fragments of heavily burnt red ceramic material, some fragments of which are nearly vitrified. These suggest that the heath attained temperatures much higher than needed, potentially damaging the structure of the hearth itself.

Rolled balls of lead strips and lead came derived from windows were recovered from excavations near the junction of the Foredyke and the River

Hull, between Hull and Beverley, where earlier structures were being dismantled and stripped in order to cast lead shot, potentially during the English Civil War (Wastling 1999, 28). The lead from Sheriff Hutton Castle may possibly be part of a similar activity.

Statement of Potential and Recommendations

This finds assemblage, though small, has the potential to shed light upon the structure of the north-east tower, its fittings and the activities which were undertaken during the latter phases of its use.

The structural ironwork and door fittings are of potential interest to building historians with a particular interest in Sheriff Hutton Castle. The suite of door fittings may provide enough information to re-construct the door itself. This would need input from a specialist in historic buildings.

In view of the above, the ironwork would benefit from illustration. It may also benefit from conservation, though this would be dependant on both the landowners and on the scope of the project.

It is recommended that the ironwork be deposited within the local museum, in the event that it is not required for return to the landowners as part of the restoration project.

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Junction of Foredyke and River Hull, Humber Field Archaeology Report **,** January 1999 (unpublished)

APPENDIX 8

SEM EXAMINATION OF LEAD AND RESIDUES

by Richard Smith

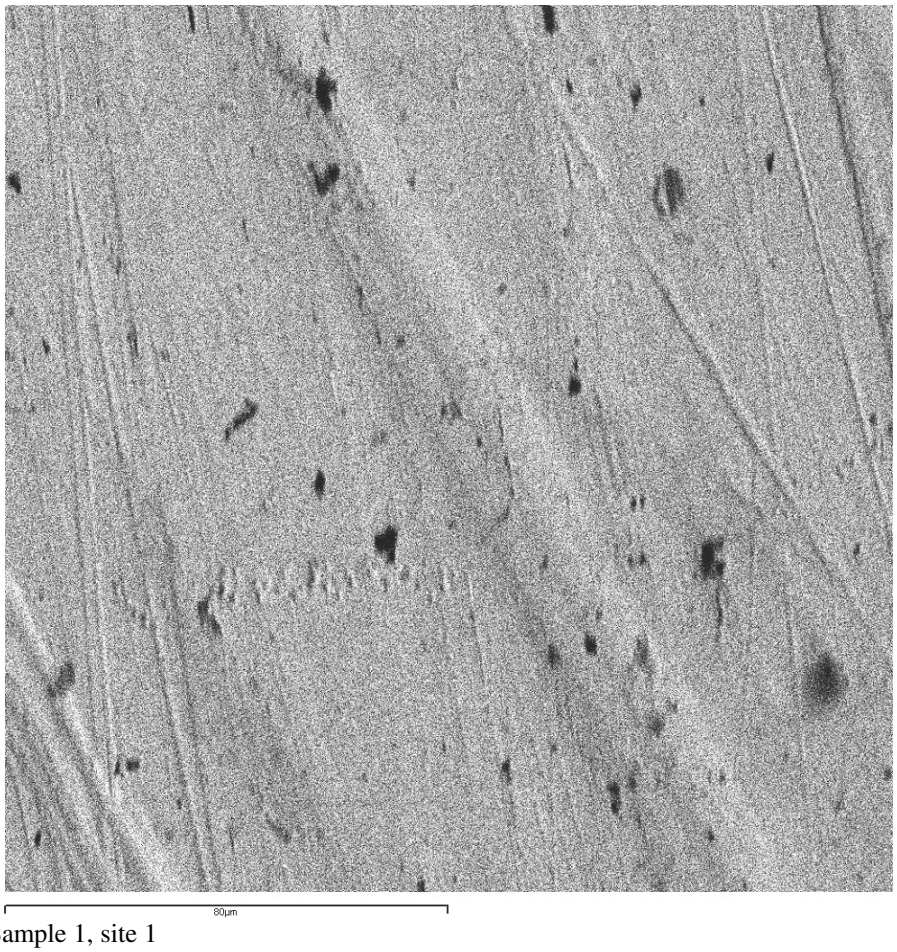
SEM Examination of Lead and Residues from Sheriff Hutton Castle

By Richard Smith

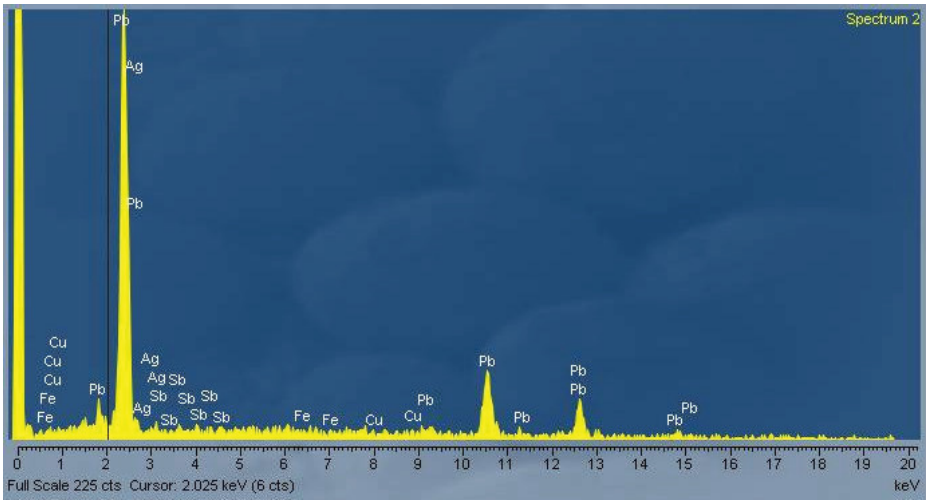
Sample 1

Metal splatters received

Sample 1 was a small piece of lead taken from one of the two splatters above. It was roughly polished and examined by SEM using the backscatter detector which is used to show contrasts in atomic number.



Sample 1, site 1



Sample 1, site 1, full area

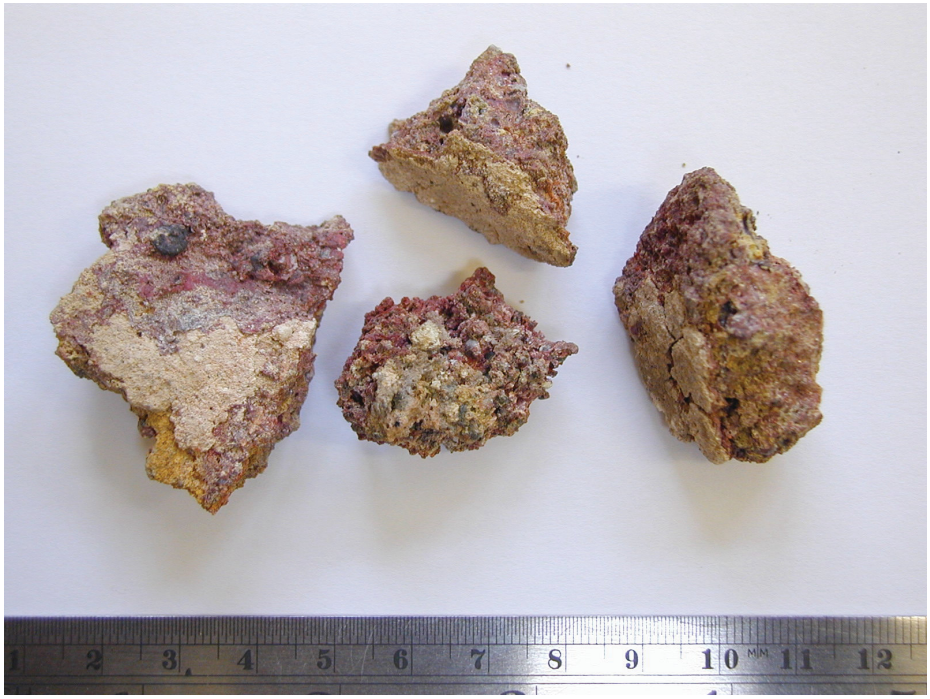
Element	App	Intensity	Weight%	Weight%	Atomic%
	Conc.	Corrn.		Sigma	
Fe K	-0.02	0.9517	-0.02	0.85	-0.09
Cu K	-0.03	1.1225	-0.03	1.16	-0.08
Ag L	-0.44	0.4715	-0.82	2.02	-1.60
Sb L	-0.11	0.4888	-0.19	1.94	-0.33
Pb L	124.61	1.0877	101.06	3.17	102.10
Totals			100.00		

Sample 1, site 1, full area

The whole area was scanned and showed lead to be present with no detectable impurities. The small black pieces in the photograph are silicon carbide abrasive particles used in preparation. Other areas of the sample were examined and quantitatively analysed at different magnifications but no additional information was obtained.

Sample 2

Sample 2 was taken from the many pieces of yellow/grey dross which were received.



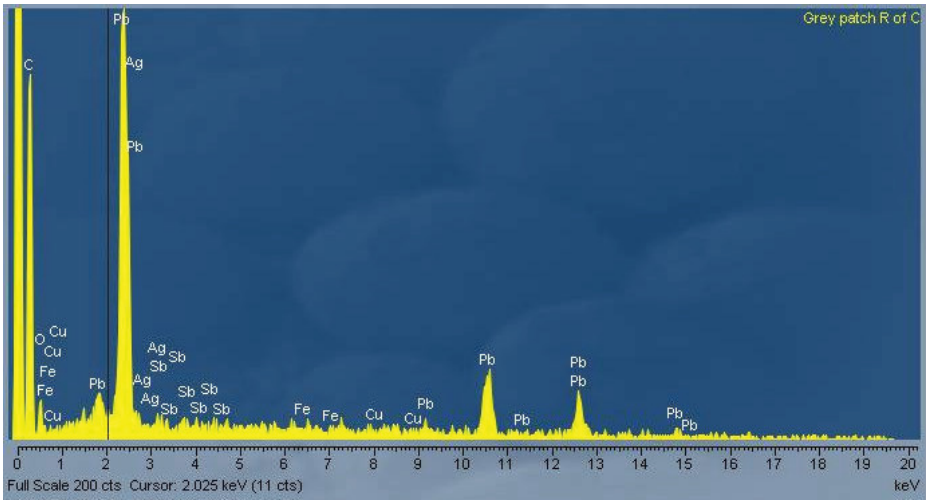
Sample 2, site 1

Sample 2 site1 was an example of the dark granular pieces received. It was broken to an approximately flat surface, impregnated with resin to prevent breakage. The photograph shows a fracture running diagonally from bottom to top.

Three areas were analysed:

1. The flat area to the right of the fissure in the lower left hand quadrant.
2. The white area in the centre.
3. The rough grey area right of centre

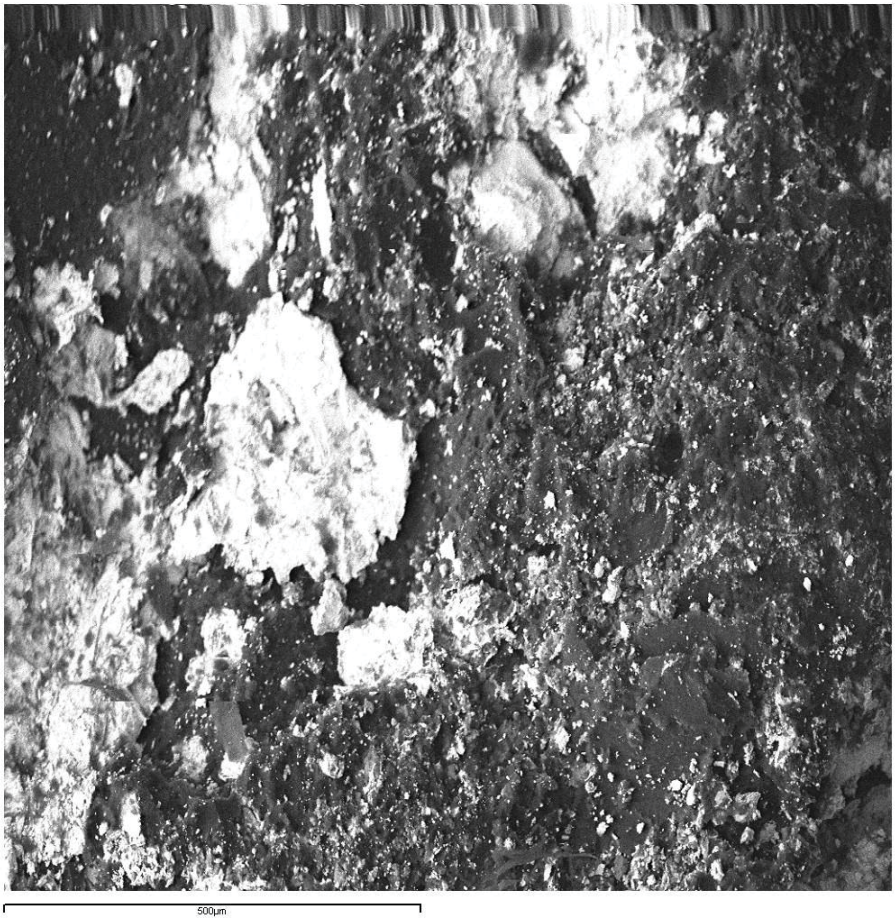
All showed the same analytical results; those for 3 above are shown below



Sample 2, site 1, grey patch right of centre

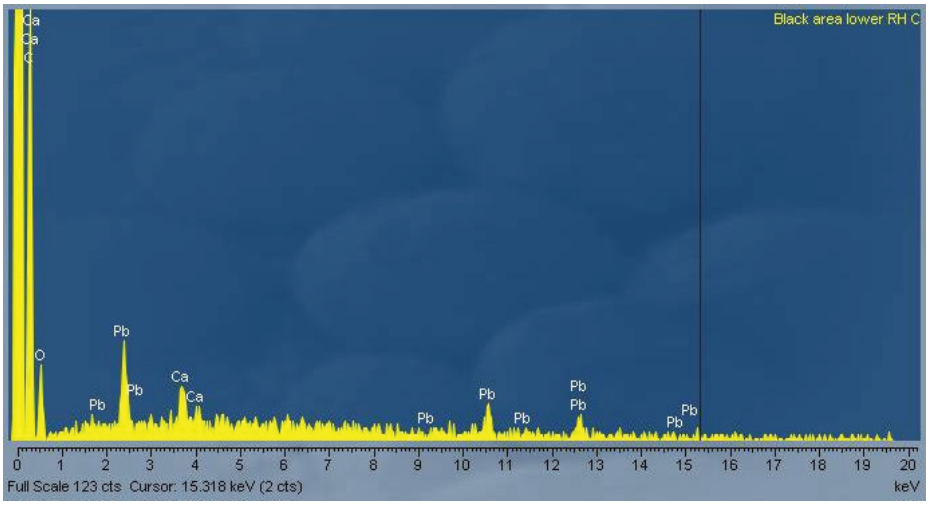
Element	App	Intensity	Weight%	Weight%	Atomic%
	Conc.	Corrn.		Sigma	
O K	7.05	0.4572	15.86	3.83	72.35
Fe K	-0.42	0.9286	-0.47	0.84	-0.61
Cu K	-0.51	1.0639	-0.49	1.18	-0.56
Ag L	-0.74	0.5083	-1.50	1.81	-1.02
Sb L	-1.37	0.5229	-2.70	1.80	-1.62
Pb L	87.32	1.0060	89.30	4.68	31.46
Totals			100.00		

The results show only lead and oxygen to be present. Oxygen is at the limit of the equipment used and quantitative results can not be obtained with the rough method of preparation used.



Sample 2, site 2

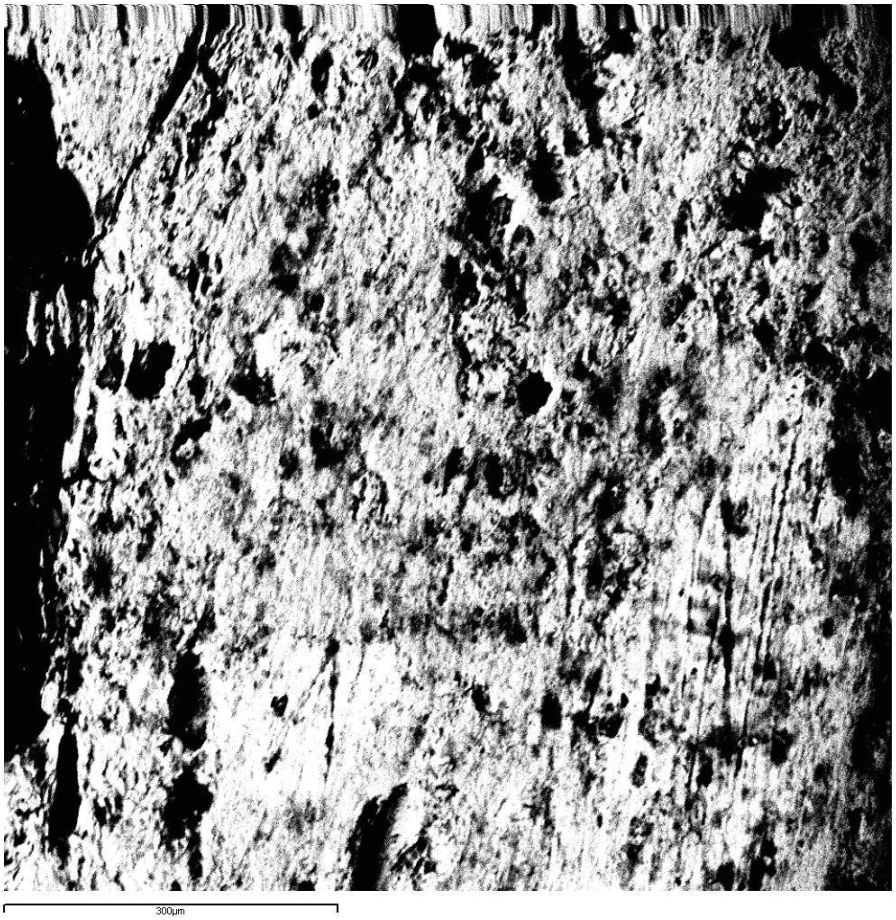
Site 2 shows white pieces of leady material encapsulated in a resin base (black) which was necessary to allow the sample to be polished. The sample was extremely friable (as were all of the residues) and some pieces of intermediate grey material can be seen. The tiny white bits are leady material , probably broken off during polishing.



Sample 2, site 2, black area bottom RH corner

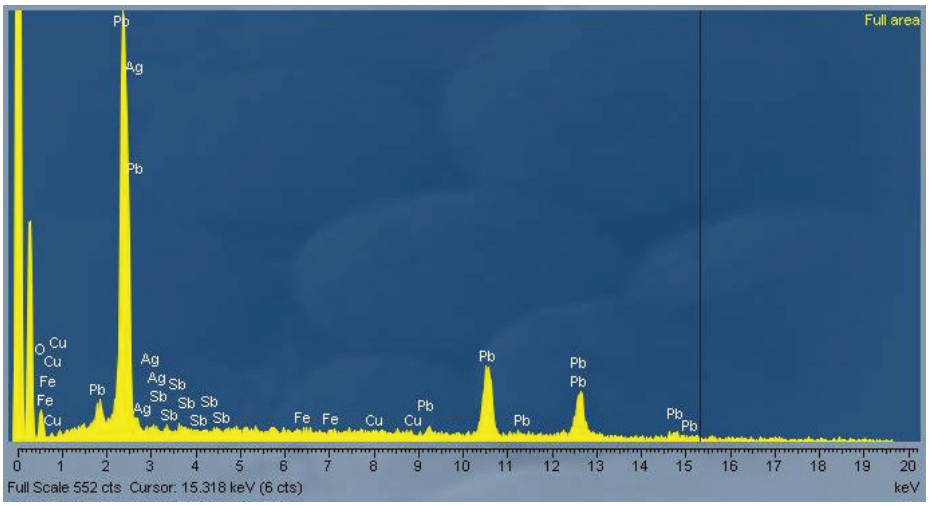
The black area shows the presence of both lead and calcium, the latter probably arising from building mortar below the resin coating.

Sample 3



Sample 3, site 1

The sample was cast in resin and roughly polished. The photograph shows black spots which arise from the carbon coating used to impart conductivity to the sample; the larger ones are pits and the black area at the left is the edge of the sample. Some scratches show as straight black lines and arise from polishing.

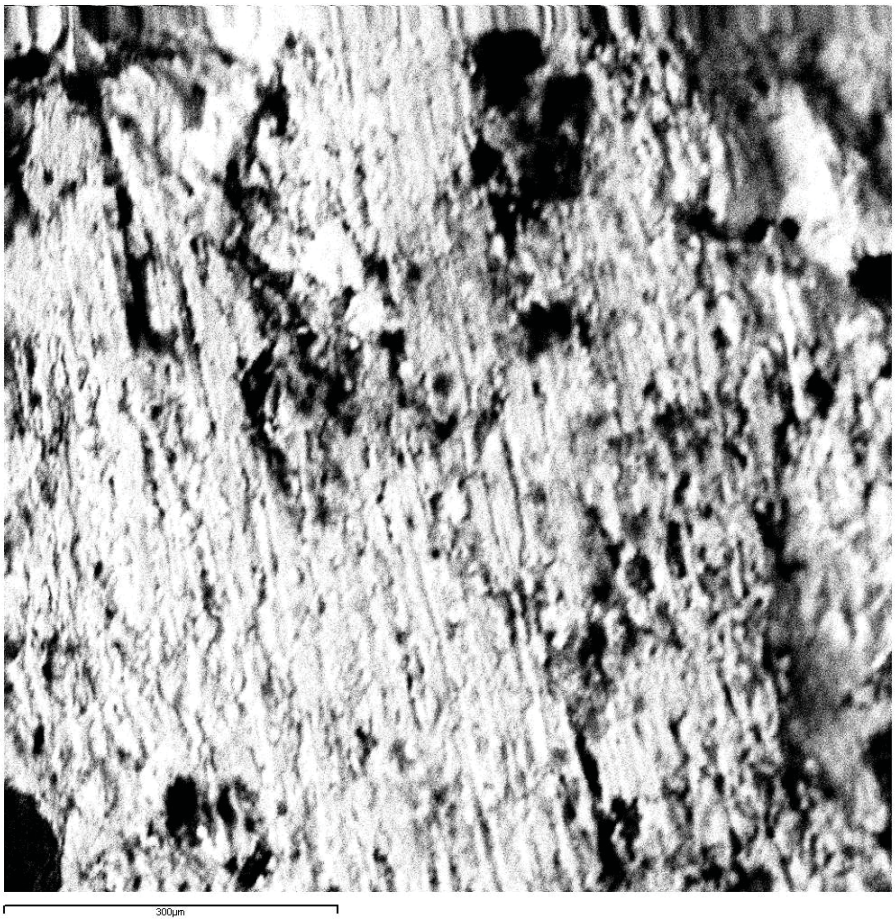


Sample 3, site 1, full area

Element	App	Intensity	Weight%	Weight%	Atomic%
	Conc.	Corrn.		Sigma	
O K	9.39	0.4574	15.66	1.67	70.69
Fe K	-0.18	0.9270	-0.15	0.32	-0.19
Cu K	-0.09	1.0608	-0.07	0.37	-0.07
Ag L	0.34	0.5112	0.51	0.81	0.34
Sb L	-0.16	0.5239	-0.24	0.74	-0.14
Pb L	110.72	1.0024	84.28	1.94	29.38
Totals			100.00		

Sample 3, site 1, full area

Sample 4



Sample 4, site 1

Sample 4 was cast in resin and showed only lead and oxygen to be present.

Discussion of Results

Lead samples – the lead was relatively soft and no impurities were detected. However, the SEM has difficulty detecting elements below 1%. The positions of the most probable impurities have been displayed on the spectra and clearly show no positive identifications. Lead metal tends to smear on polishing and so no great efforts were made to remove the scratches introduced in the initial stages.

Residue samples – these were all very friable and resin casting had to be used to stabilise the samples. Despite this, damage occurred during polishing and only poor surface finishes could be obtained. The samples subjected to examination showed pits and scratches. Attempts to obtain a better finish often result in parts of the sample being torn out of the resin and so this was not persisted with.

The main constituent of the residue samples was lead oxide, probably litharge introduced by oxidation of molten lead. Had this been produced at a high temperature (typically above 800 ^{o}C), it would have melted and appeared as a dense brown compact slag, typical of that formed during silver refining or high temperature lead softening. The yellow, granular form of litharge is typical of that formed below the melting point of litharge and is typical of a low temperature softening or casting dross.

Discussions with Richard Lamb who sent the samples, suggest that the materials may have arisen from melting lead from the castle structure during the robbing/demolition phase. The castle was occupied by Richard Duke of Gloucester who held mineral rights over the whole of England north of the Trent. In view of this it is possible that silver-bearing lead could have been transported to Sheriff Hutton for processing. This initial examination suggests this to have been less likely and has been made without consideration of the context of the finds and the nature of the bowl-shaped furnace which was uncovered.

Further SEM examination of the drosses sent is unlikely to offer more information without a proper consideration of the context of the residues.

APPENDIX 9

ARCHAEOMAGNETIC ANALYSIS

by GeoQuest Associates

ARCHAEOMAGNETIC ANALYSIS OF FOUR MEDIEVAL BURNT FEATURES AT SHERIFF HUTTON CASTLE: CONTEXTS 009, 025, 019 & 015

Client:

Ed Dennison Archaeological Services Limited

19th April 2003

SUMMARY

A total of 37 samples of brick and burnt sandstone were removed from four Contexts for the purpose of archaeomagnetic analysis and dating. Specimens were oriented in situ using the button method, combined with spirit levels and a magnetic compass. Demagnetisation tests suggest that the magnetisation in the brick materials is of relatively low stability. 3 samples in Context 019 and 2 samples in Context 025 yielded archaeomagnetic vectors that were anomalous, almost certainly due to movement during abandonment and burial beneath collapse debris. Context 009 (a lead smelting furnace) proved undateable owing to a poor grouping of archaeomagnetic vectors in the sample set. Date ranges for last firing in the remaining 3 Contexts are suggested as follows:

Context 025	*1230-1270 A.D. or 1350-1420 A.D.*
Context 019	*1170-1280 A.D. or 1390-1450 A.D.*
Context 015	*1290-1340 A.D.*

GeoQuest ASSOCIATES

MAGNETIC DATING REPORT

SITE NAME: Sheriff Hutton Castle (1st Floor)
SITE CODE: SH02
SAMPLING DATE: 5/2/03
CONTEXT: 009. Brick

LOCATION: Sheriff Hutton, N. Yorks.
COORDINATES: 54.1°N 1.0°W
SITE CONTACT: Ed Dennison
FEATURE TYPE: Med. Pb smelt. furnace

SITE/CONTEXT DESCRIPTION

During consolidation works on the castle, fabric recording and excavation has been carried out on the 1st floor level by E.D.A.S. Ltd. Clearance of collapse debris revealed a number of *in situ* fired structures, including the base of a 1.0m diameter, bowl-shaped lead smelting furnace, constructed of brick. The age of Context 009 is presumed to be medieval and dating from a period when the castle was partly demolished and lead was re-processed on site.

ANALYTICAL METHODS

Sampling via button method with orientation by fluxgate magnetic compass. Archaeomagnetic remanence measured using a Molspin fluxgate spinner magnetometer and stability assessed using stepwise, alternating field demagnetisation. Secondary components of magnetisation removed by partial demagnetisation. Mean of selected vectors computed (with unit weights) and corrected to Meriden. Comparison then made to the UK Master Curve to obtain a last-firing date. Further details of technical methods are contained in the Appendix.

RESULTS

SAMPLE	J	D	I	A.F.	D	I	Comment
SHH1	31.9	84.8	69.5	2.5	88.2	70.1	
SHH2	25.0	79.8	64.8	2.5	77.7	67.1	
SHH3	190.1	345.2	57.7	2.5	342.0	58.7	
SHH4	58.0	342.6	53.7	2.5	343.2	54.9	
SHH5				2.5			Too small
SHH6	1134.5	78.5	82.8	2.5	86.1	82.3	
SHH7				2.5			Too small
SHH8	106.4	344.4	55.4	2.5	344.1	56.2	
SHH9	10.8	263.6	34.9	2.5	261.4	35.2	
SHH10	23.4	81.9	62.7	2.5	81.6	65.3	
MEAN		K=7.2 Alpha95=22.1 c.s.e.=10.7			359.3	76.7	
MERIDEN							

D=declination, I=inclination, J=intensity in units of $mAm^{-1}x10^{-3}$. A.F.=peak alternating demagnetising field in milliTesla. K=precision parameter, c.s.e.=circular standard error, alpha95=semi-angle of the 95% cone of confidence.

Estimated date range for last firing:

Not Dateable

GeoQuest ASSOCIATES

MAGNETIC DATING REPORT

SITE NAME: Sheriff Hutton Castle (1st Floor)
SITE CODE: SH02
SAMPLING DATE: 5/2/03
CONTEXT: 025. Brick

LOCATION: Sheriff Hutton, N. Yorks.
COORDINATES: 54.1°N 1.0°W
SITE CONTACT: Ed Dennison
FEATURE TYPE: Base of bread oven or drying kiln

SITE/CONTEXT DESCRIPTION

During consolidation works on the castle, fabric recording and excavation has been carried out on the 1st floor level by E.D.A.S. Ltd. Clearance of collapse debris revealed a number of *in situ* fired structures, including the base of a 2.0m diameter, bread oven or drying kiln, presumed to be contemporary with this floor level of the castle.

ANALYTICAL METHODS

Sampling via button method with orientation by fluxgate magnetic compass. Archaeomagnetic remanence measured using a Molspin fluxgate spinner magnetometer and stability assessed using stepwise, alternating field demagnetisation. Secondary components of magnetisation removed by partial demagnetisation. Mean of selected vectors computed (with unit weights) and corrected to Meriden. Comparison then made to the UK Master Curve to obtain a last-firing date. Further details of technical methods are contained in the Appendix.

RESULTS

SAMPLE	J	D	I	A.F.	D	I	Comment
SHH11	3603.3	6.3	58.9	2.5	8.8	58.9	
SHH12	1798.2	22.3	66.2	2.5	24.9	67.1	
SHH13				2.5			Too small
SHH14	3482.8	24.3	60.7	2.5	24.8	60.6	
SHH15	1552.0	14.7	60.9	2.5	11.0	61.3	
SHH16	2255.6	25.6	53.2	2.5	24.6	53.9	
SHH17	1060.1	17.8	56.4	2.5	16.6	55.8	
SHH18	2214.4	22.8	57.2	2.5	21.2	56.7	
SHH19	314.0	43.0	50.2	2.5	43.2	51.5	Reject
SHH20	2187.6	10.9	41.9	2.5	11.7	42.3	Reject
MEAN		K=212.4 Alpha95=4.2 c.s.e.=2.1			18.8	59.3	
MERIDEN					18.2	57.8	

D=declination, I=inclination, J=intensity in units of $mAm^{-1}x10^{-3}$. A.F.=peak alternating demagnetising field in milliTesla. K=precision parameter, c.s.e.=circular standard error, alpha95=semi-angle of the 95% cone of confidence.

Estimated date range for last firing:

1230 A.D. – 1270 A.D. or **1350 A.D. – 1420 A.D.**

The earlier date is favoured, since it corresponds to the closest approach of the archaeomagnetic vector to the curve. It has been assumed that the declination is in error owing to effects of scaffolding on the compass orientation (red dashed lines in Figure 10).

GeoQuest ASSOCIATES

MAGNETIC DATING REPORT

SITE NAME: Sheriff Hutton Castle (1st Floor)
SITE CODE: SH02
SAMPLING DATE: 5/2/03
CONTEXT: 019. Brick

LOCATION: Sheriff Hutton, N. Yorks.
COORDINATES: 54.1°N 1.0°W
SITE CONTACT: Ed Dennison
FEATURE TYPE: Medieval freplace

SITE/CONTEXT DESCRIPTION

During consolidation works on the castle, fabric recording and excavation has been carried out on the 1st floor level by E.D.A.S. Ltd. Clearance of collapse debris revealed a number of *in situ* fired structures, including parts of the floor and back of a brick-built fireplace. The age of Context 019 is presumed to be medieval and contemporary with this floor level of the castle.

ANALYTICAL METHODS

Sampling via button method with orientation by fluxgate magnetic compass. Archaeomagnetic remanence measured using a Molspin fluxgate spinner magnetometer and stability assessed using stepwise, alternating field demagnetisation. Secondary components of magnetisation removed by partial demagnetisation. Mean of selected vectors computed (with unit weights) and corrected to Meriden. Comparison then made to the UK Master Curve to obtain a last-firing date. Further details of technical methods are contained in the Appendix.

RESULTS

SAMPLE	J	D	I	A.F.	D	I	Comment
SHH21	1076.5	4.0	58.9	2.5	5.1	58.8	
SHH22	881.0	0.8	16.1	2.5	2.8	17.3	Reject
SHH23	1042.5	60.2	18.4	2.5	61.5	19.1	Reject
SHH24	103.9	0.1	52.7	2.5	0.3	53.1	
SHH25	374.3	10.8	61.0	2.5	7.1	61.5	
SHH26	2843.3	5.0	34.6	2.5	3.6	33.8	Reject
SHH27	634.9	9.8	68.7	2.5	9.8	67.8	
SHH28	537.8	28.2	65.1	2.5	25.6	65.2	
SHH29	1390.6	23.7	63.0	2.5	24.2	63.0	
SHH30							Too small
MEAN		K=127.6 Alpha95=6.0 c.s.e.=2.9			11.1	61.9	
MERIDEN					10.6	60.4	

D=declination, I=inclination, J=intensity in units of $mAm^{-1}x10^{-3}$. A.F.=peak alternating demagnetising field in milliTesla. K=precision parameter, c.s.e.=circular standard error, alpha95=semi-angle of the 95% cone of confidence.

Estimated date range for last firing:

1170 A.D. – 1280 A.D. or **1390 A.D. – 1450 A.D.**

The earlier date is favoured, since it corresponds to the closest approach of the archaeomagnetic vector to the curve.

GeoQuest ASSOCIATES

MAGNETIC DATING REPORT

SITE NAME: Sheriff Hutton Castle (1st Floor)
SITE CODE: SH02
SAMPLING DATE: 5/2/03
CONTEXT: 015. Burnt sandstone

LOCATION: Sheriff Hutton, N. Yorks.
COORDINATES: 54.1°N 1.0°W
SITE CONTACT: Ed Dennison
FEATURE TYPE: Wall above Med. hearth

SITE/CONTEXT DESCRIPTION

During consolidation works on the castle, fabric recording and excavation has been carried out on the 1st floor level by E.D.A.S. Ltd. Clearance of collapse debris revealed a number of *in situ* fired structures. In this instance, samples were taken of a burnt sandstone wall above a brick built hearth. The hearth itself was in too poor condition for archaeomagnetic analysis. The age of Context 015 is presumed to be medieval and contemporary with this floor level of the castle.

ANALYTICAL METHODS

Sampling via button method with orientation by fluxgate magnetic compass. Archaeomagnetic remanence measured using a Molspin fluxgate spinner magnetometer and stability assessed using stepwise, alternating field demagnetisation. Secondary components of magnetisation removed by partial demagnetisation. Mean of selected vectors computed (with unit weights) and corrected to Meriden. Comparison then made to the UK Master Curve to obtain a last-firing date. Further details of technical methods are contained in the Appendix.

RESULTS

SAMPLE	J	D	I	A.F.	D	I	Comment
SHH31	345.2	344.2	66.7	2.5	343.7	67.3	
SHH32	21.7	2.5	66.8	2.5	3.3	67.0	
SHH33	16.2	0.9	66.4	2.5	358.7	67.5	
SHH34	13.3	4.9	63.8	2.5	4.3	64.5	
SHH35	4.3	9.8	63.1	2.5	6.9	63.0	
SHH36	11554.9	3.7	58.7	2.5	3.8	57.8	
SHH37	90.5	344.8	51.0	2.5	347.0	51.1	
MEAN		K=118.6 Alpha95=5.6 c.s.e.=2.8			357.9	62.9	
MERIDEN					357.8	61.5	

D=declination, I=inclination, J=intensity in units of $mAm^{-1}x10^{-3}$. A.F.=peak alternating demagnetising field in milliTesla. K=precision parameter, c.s.e.=circular standard error, alpha95=semi-angle of the 95% cone of confidence.

Estimated date range for last firing:

1290 A.D. – 1340 A.D.

FIGURE 1

Directions of natural remanent magnetisation in samples from Context 009 at Sheriff Hutton Castle, shown on an equal area stereogram. In this representation, declination increases clockwise while inclination increases from zero at the equator to 90° at the centre of the projection.

CONTEXT 009. NRM

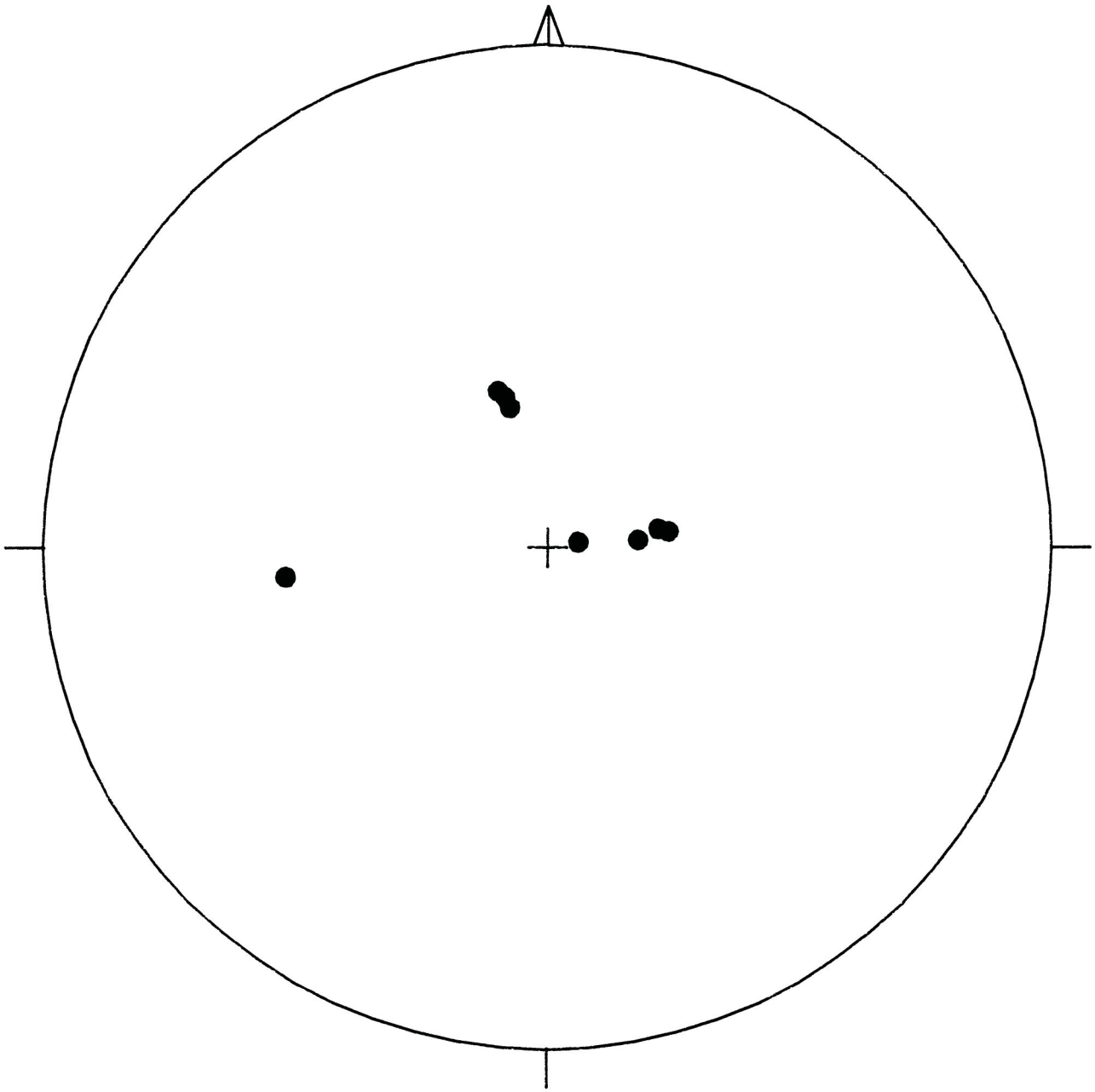


FIGURE 2

Directions of natural remanent magnetisation in samples from Context 009 after partial demagnetisation in an alternating field of 2.5mT.

CONTEXT 009. 2.5mT

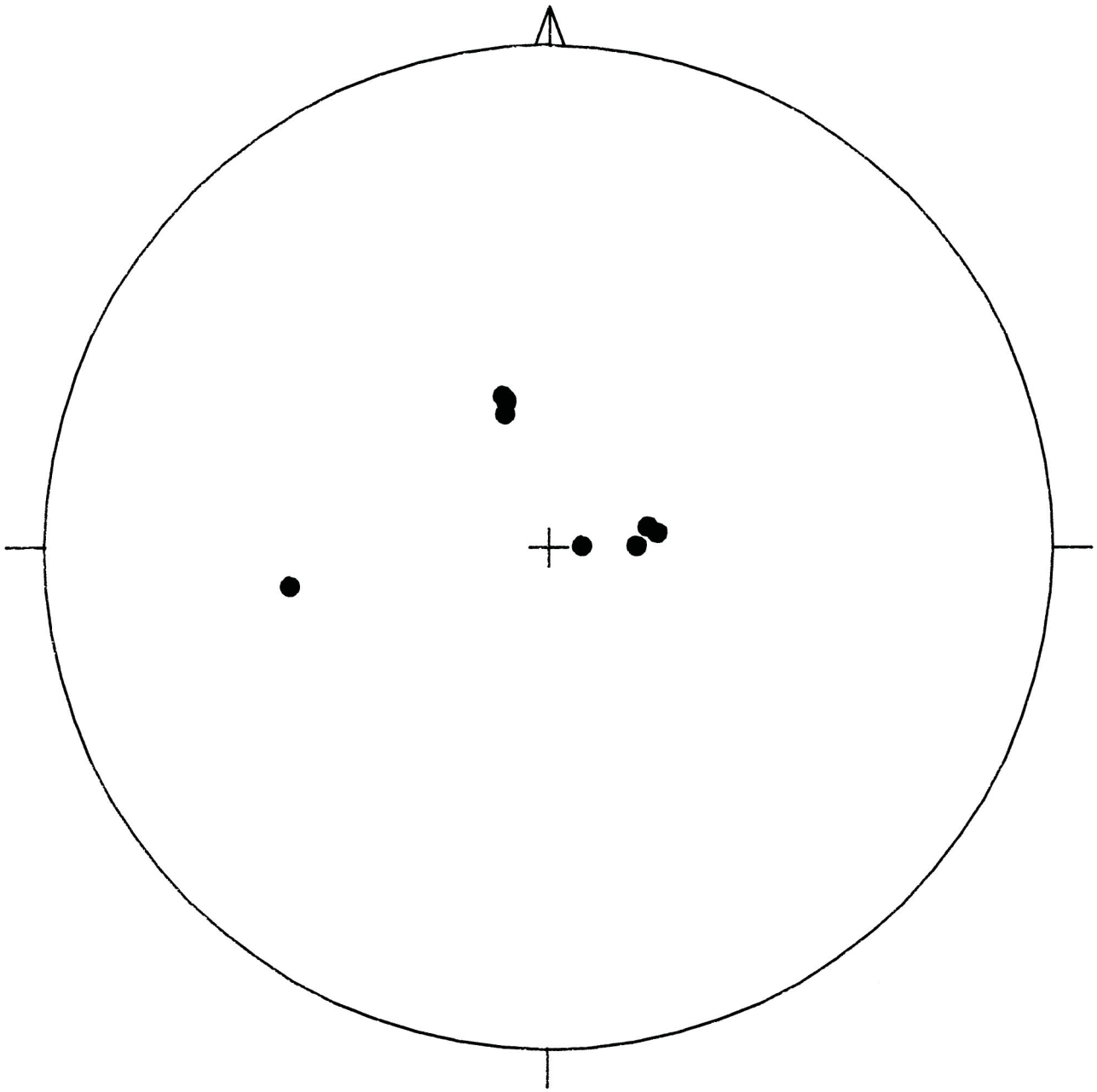


FIGURE 3

Directions of natural remanent magnetisation in samples from Context 025 at Sheriff Hutton Castle, shown on an equal area stereogram. In this representation, declination increases clockwise while inclination increases from zero at the equator to 90° at the centre of the projection.

CONTEXT 025. NRM

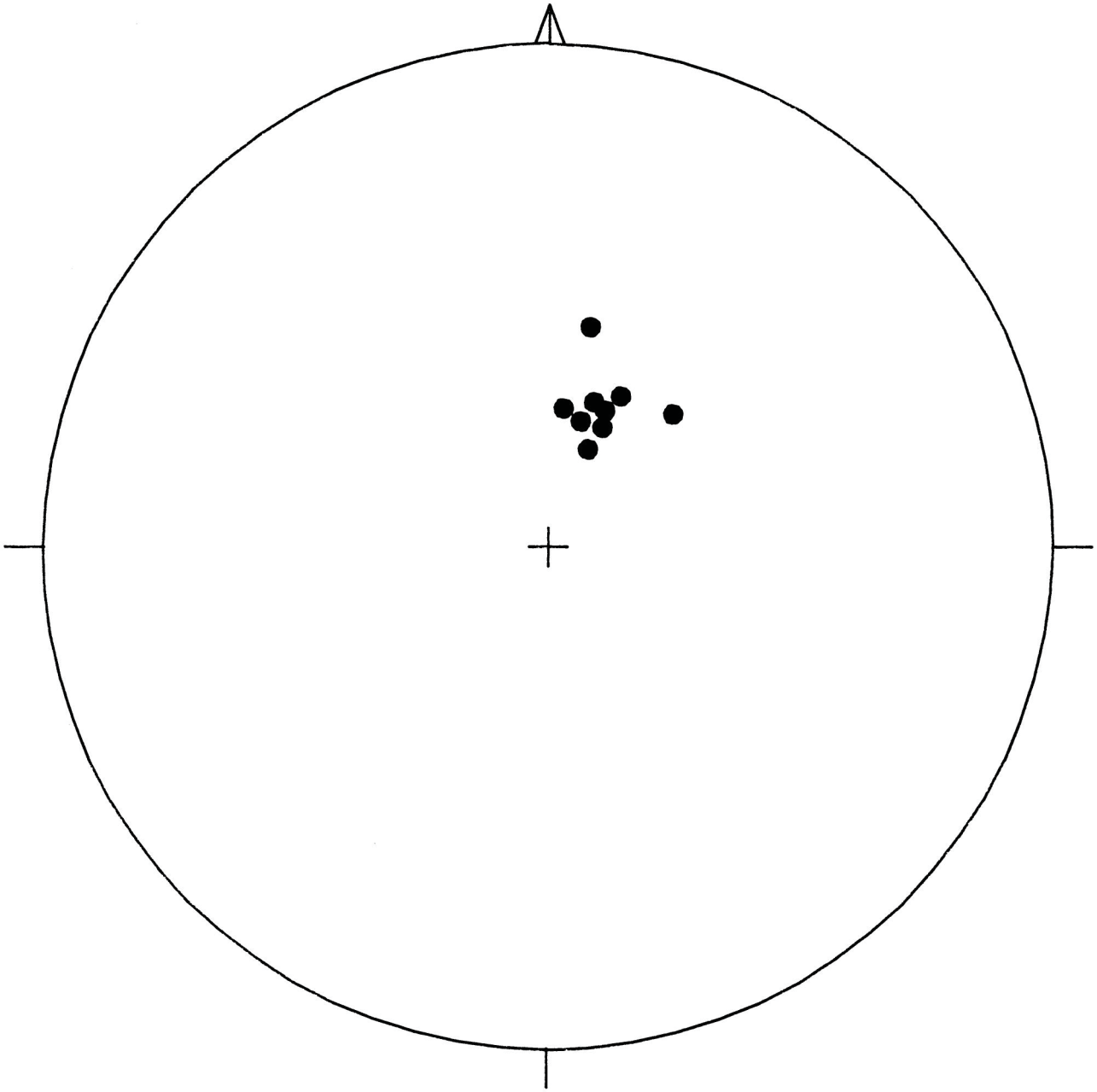


FIGURE 4

Directions of natural remanent magnetisation in samples from Context 025 after partial demagnetisation in an alternating field of 2.5mT.

CONTEXT 025. 2.5mT

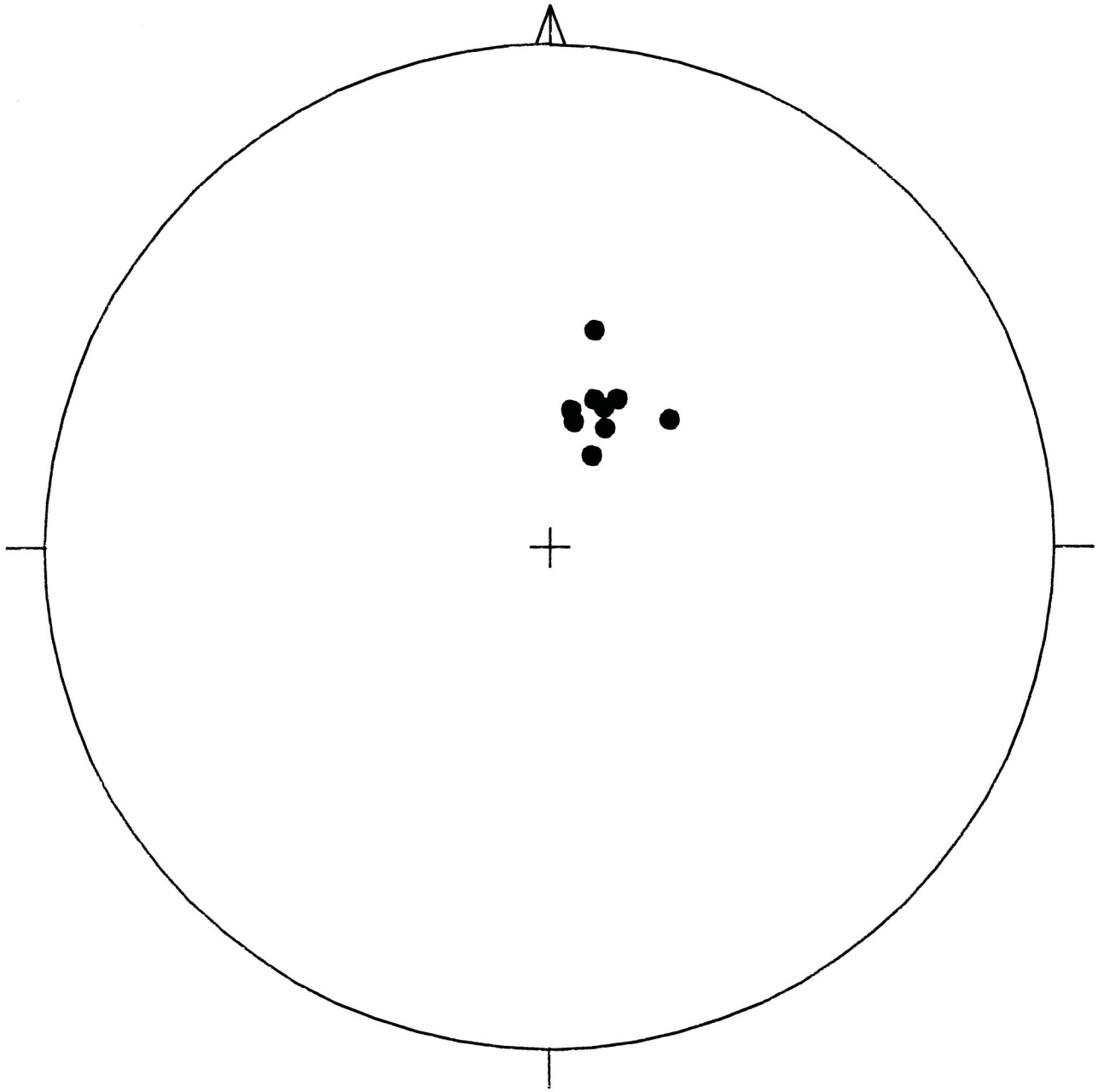


FIGURE 5

Directions of natural remanent magnetisation in samples from Context 019 at Sheriff Hutton Castle, shown on an equal area stereogram. In this representation, declination increases clockwise while inclination increases from zero at the equator to 90° at the centre of the projection.

CONTEXT 019. NRM

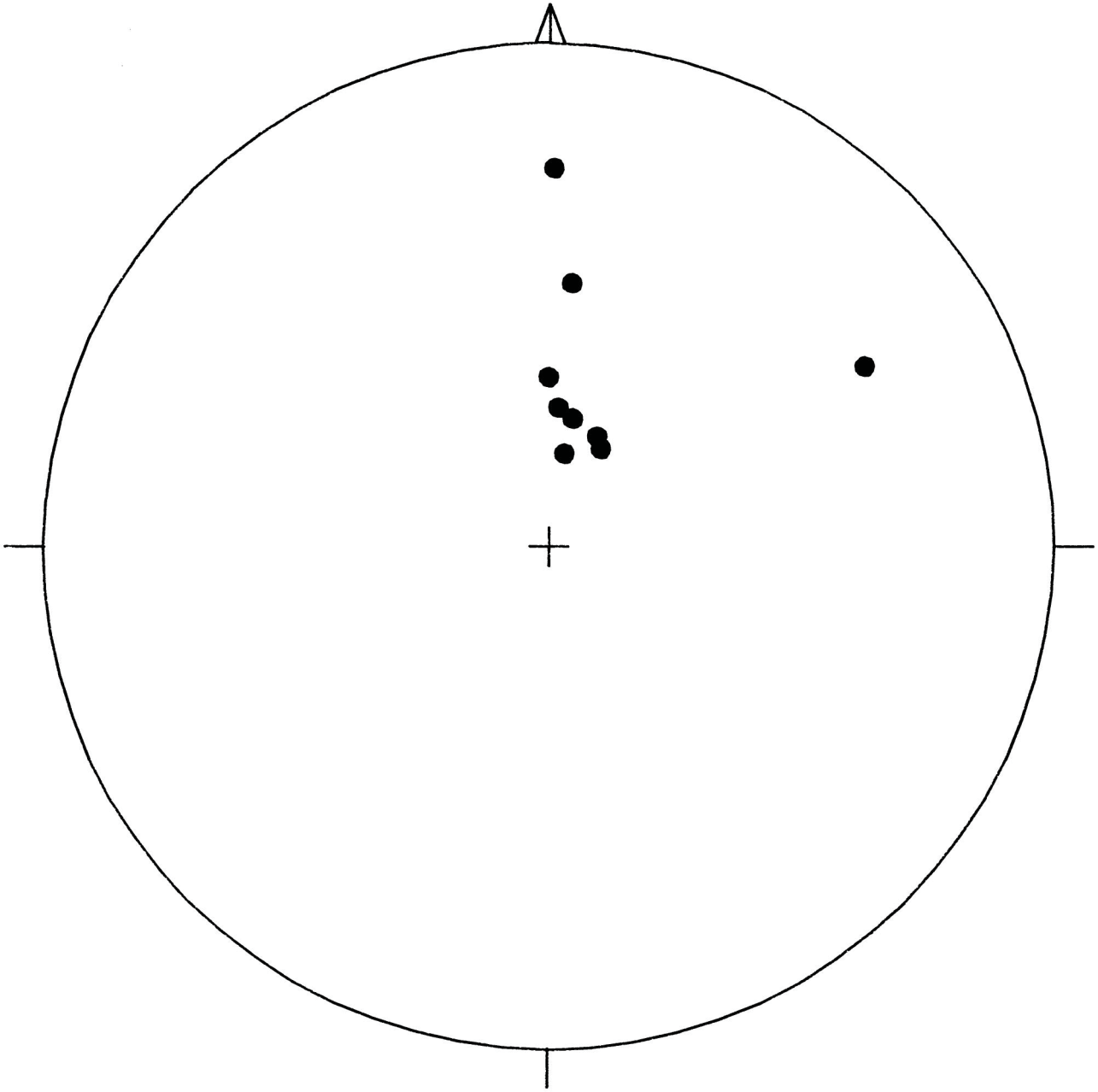


FIGURE 6

Directions of natural remanent magnetisation in samples from Context 019 after partial demagnetisation in an alternating field of 2.5mT.

CONTEXT 019. 2.5mT

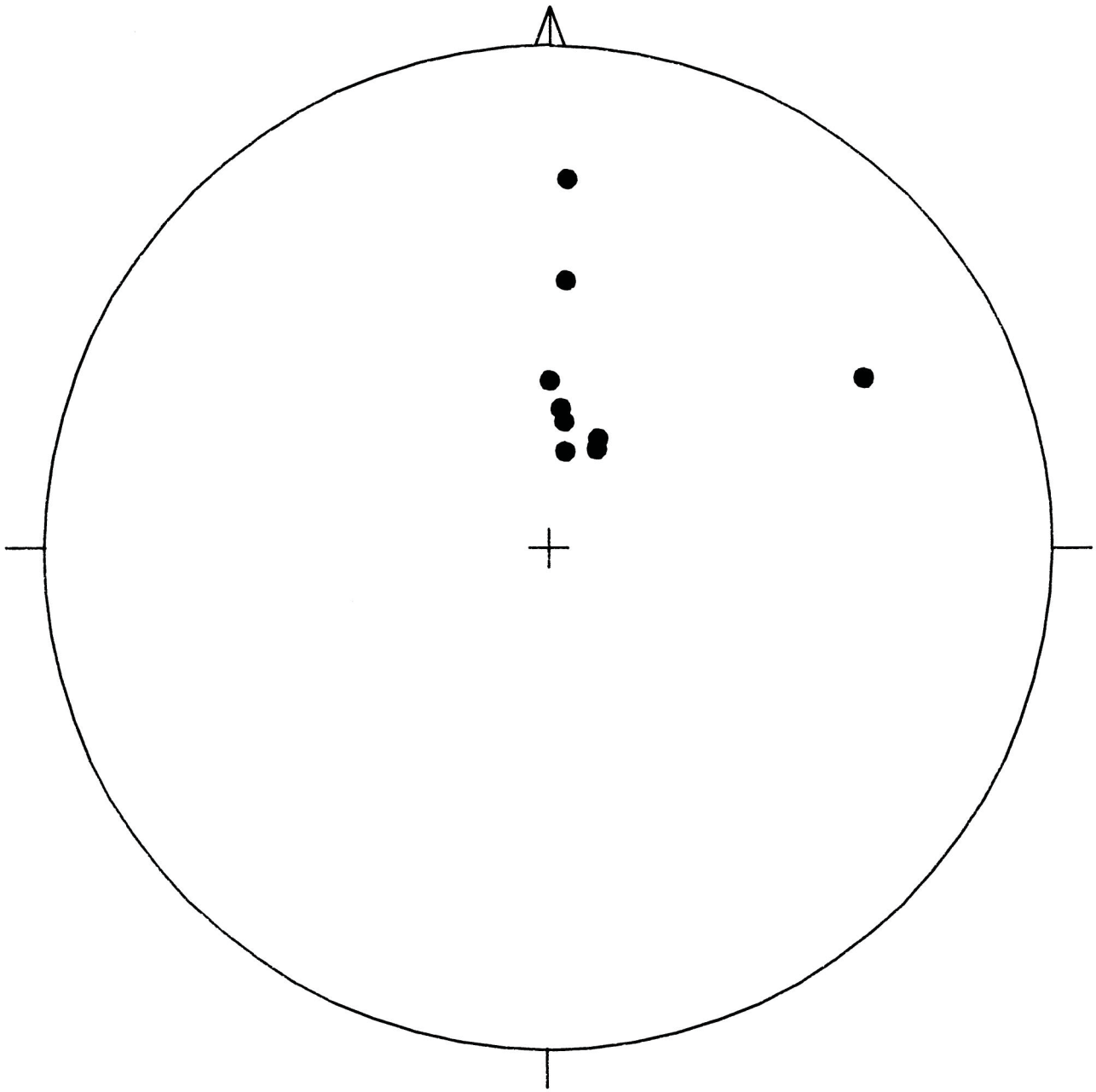


FIGURE 7

Directions of natural remanent magnetisation in samples from Context 015 at Sheriff Hutton Castle, shown on an equal area stereogram. In this representation, declination increases clockwise while inclination increases from zero at the equator to 90° at the centre of the projection.

CONTEXT 015, NRM

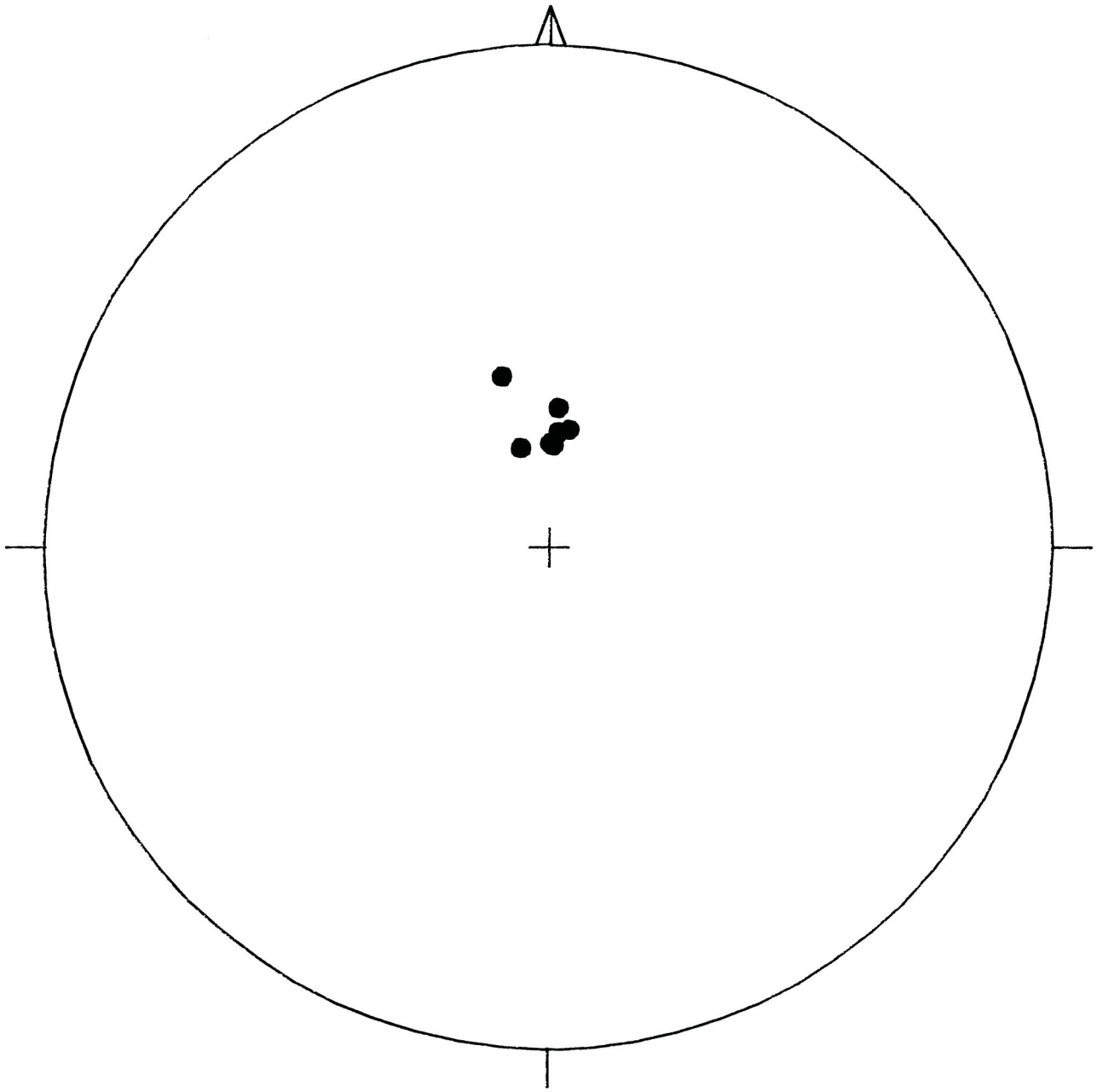


FIGURE 8

Directions of natural remanent magnetisation in samples from Context 015 after partial demagnetisation in an alternating field of 2.5mT.

CONTEXT 015, 2.5mT

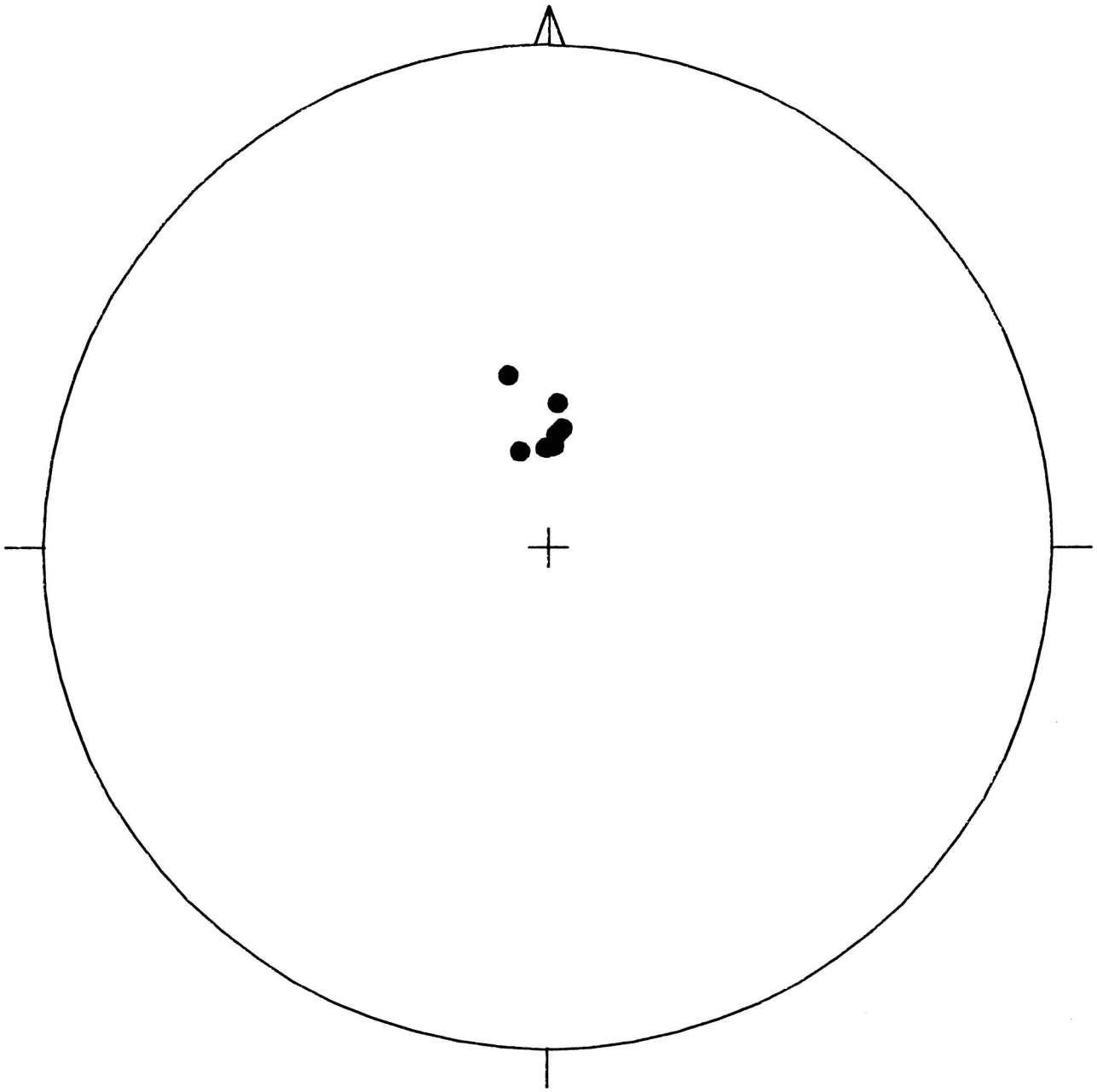


FIGURE 9

Changes in direction and relative intensity of remanent magnetisation in sample SHH1 during stepwise demagnetisation by alternating magnetic fields.

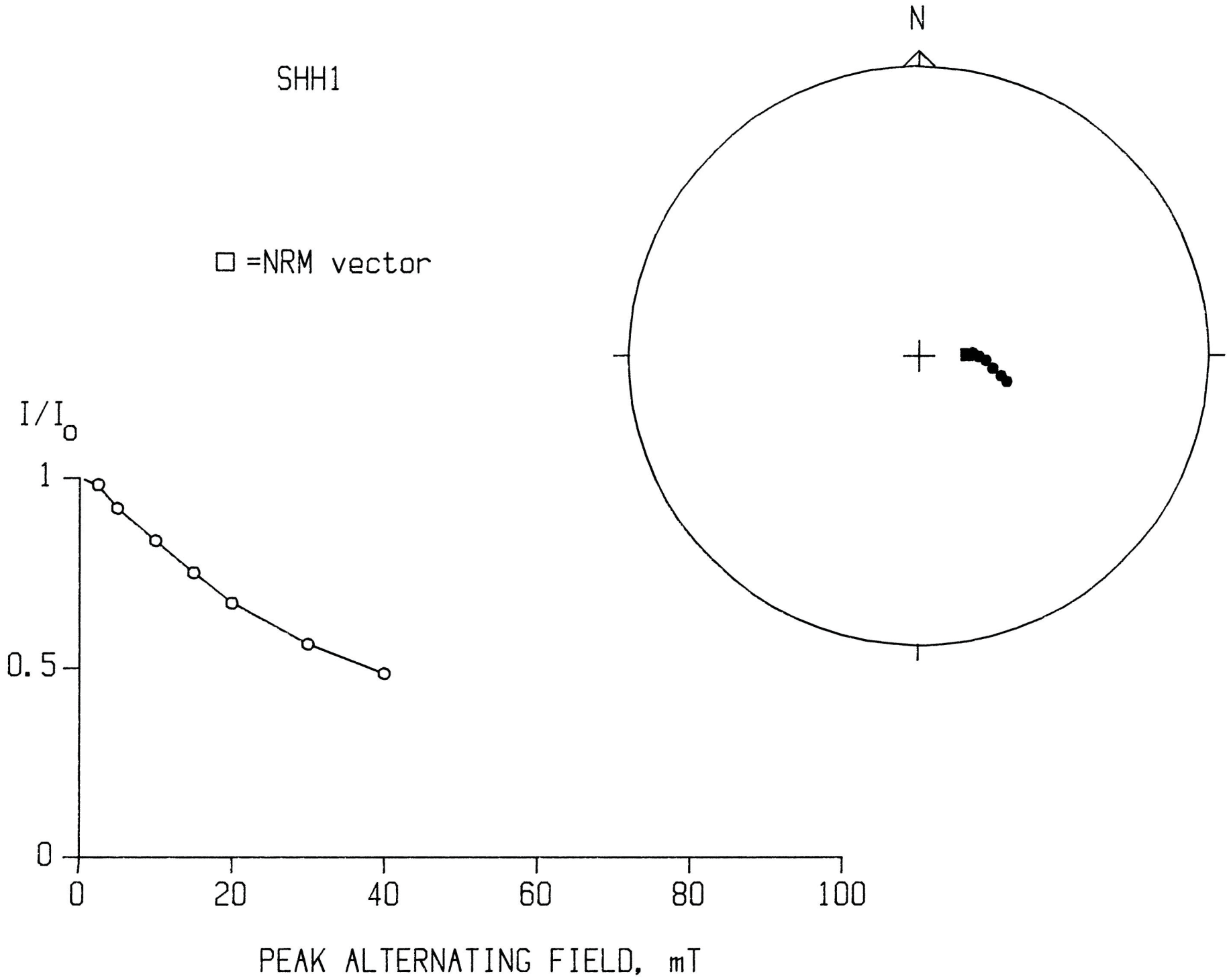
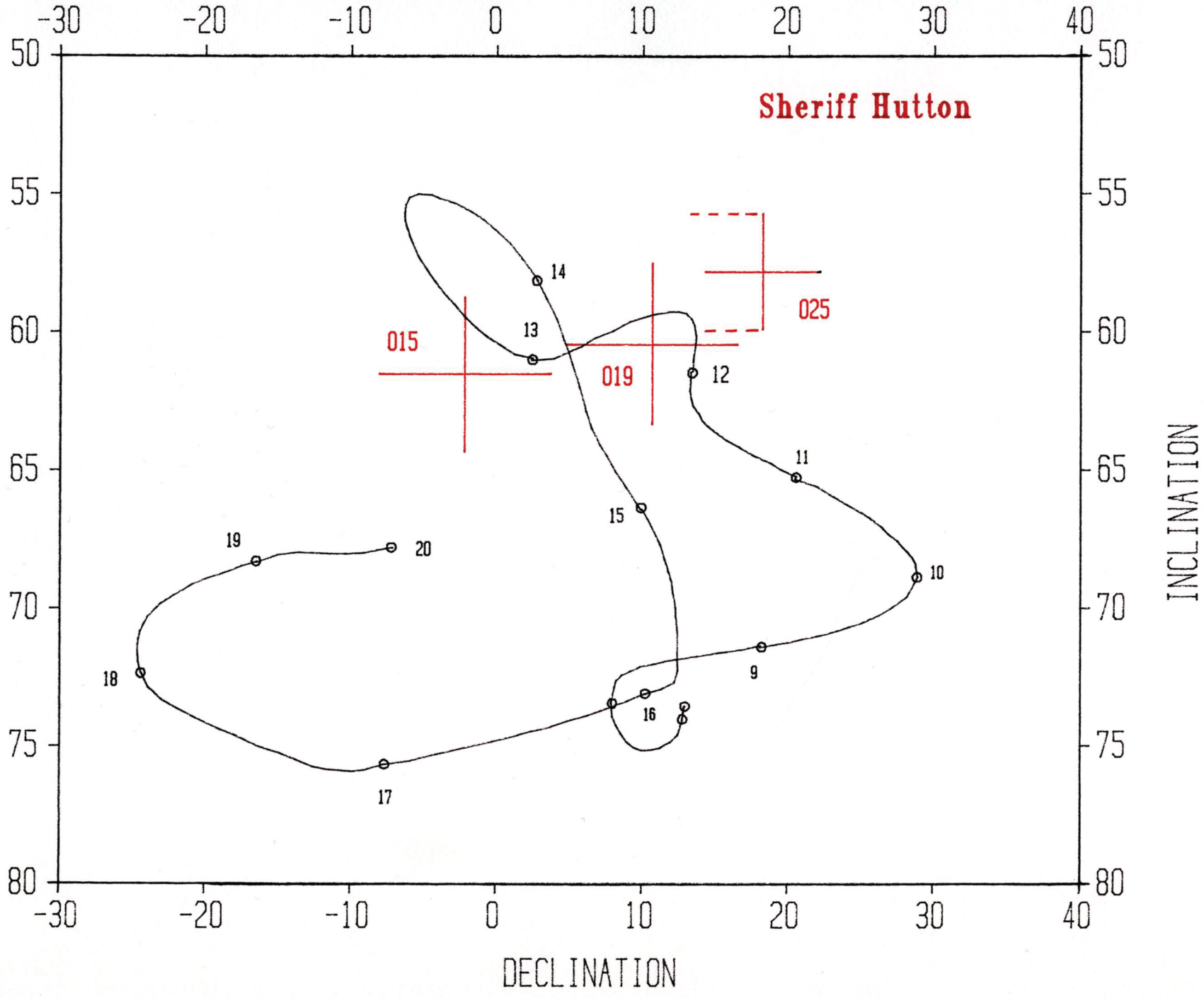

SHH1
□ =NRM vector
N
I/I0
1
0.5
0
0
20
40
60
80
100
PEAK ALTERNATING FIELD, mT

FIGURE 10

Comparison between the mean archaeomagnetic vector in Contexts 015, 019 and 025 with the UK Master Curve 600 A.D. to present. Numbers refer to the date in centuries. The error bars are based on the circular standard deviations given in the Tables above. Context 009 contained a poorly resolved archaeomagnetic vector which was therefore undateable. The red dashed lines describe the adjustment in declination required to bring the vector for Context 025 onto the Master Curve: the error is presumed to be due to effects of steel scaffolding on the samples' magnetic orientation.


Sheriff Hutton
-30
-20
-10
0
10
20
30
40
50
55
60
65
70
75
80
015
019
025
12
13
14
15
16
17
18
19
20
9
10
11
DECLINATION
INCLINATION

APPENDIX
Principles of Magnetic Dating

Magnetic dating is based on comparing the remanent magnetisation in an archaeological structure with a calibrated reference curve for the geomagnetic secular variation. Two distinct methods have evolved. The *intensity* technique relies on obtaining estimates of the past strength of the Earth's magnetic field while *directional* magnetic dating uses archaeomagnetic measurements to derive the orientation of the geomagnetic vector in antiquity. Intensity dating can only be applied to fired materials which have acquired a thermoremanent magnetisation upon cooling from high temperatures (>600°C) while the directional method enables the age of a broader range of archaeological materials to be determined. For example, sediments and soils may have acquired a dateable 'detrital remanence' if magnetic grains had been aligned by the ambient field during deposition. The growth of magnetic minerals during diagenesis or as a result of manufacturing processes can also give rise to a magnetisation which may enable materials such as iron-rich mortars, for example, to be dated. However hearths, kilns and other fired structures are the most common features selected for magnetic dating primarily because their thermoremanence is generally strong, stable and sufficiently homogeneous that the ancient field can be determined with sufficient precision from a small set of specimens. An analysis of dated archaeomagnetic directions, largely from fired structures, together with lake sediment and observatory records has enabled a master curve for the UK region to be synthesised for the period 2000 B.C. to the present (Clark, Tarling & Noel, 1988).

For directional magnetic dating it is essential to obtain specimens of undisturbed archaeological material whose orientation with respect to a geographic coordinate frame is known. A number of sampling strategies have evolved, enabling specimens to be recovered from a range of archaeological materials with orientations being recorded relative to topographic features, the direction of the sun, magnetic or geographic north. For this feature the miniaturised 'button method', illustrated overleaf, was employed Clark *et al*, 1988). Modern archaeomagnetic magnetometers are sufficiently sensitive that only small volumes of material (~1ml) are required for an accurate remanence measurement (Molyneux, 1971). This has the advantage of reducing the impact of sampling on archaeological features - of particular significance if they are scheduled for conservation and display. For dating, all archaeomagnetic vectors are transposed to Meriden, the reference location for the UK Master Curve (Noel & Batt, 1990).

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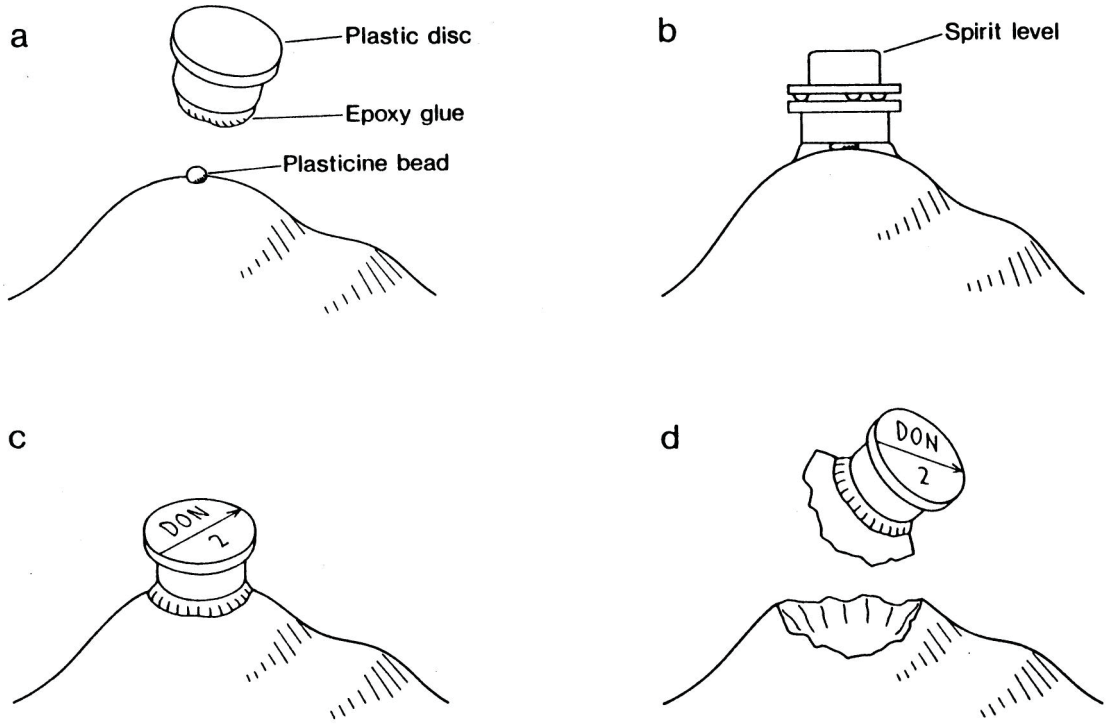
Molyneux, L., 1971. A complete result magnetometer for measuring the remanent magnetisation of rocks, *Geophys. J. R. astr. Soc.*, **24**, 429-433.

Noel, M. & Batt, C.M., 1990. A method for correcting geographically separated remanence directions for the purpose of archaeomagnetic dating, *Geophys. J. R. astr. Soc.*, **102**, 753-756.


a
Plastic disc
Epoxy glue
Plasticine bead
b
Spirit level
c
DON
2
d
DON
2

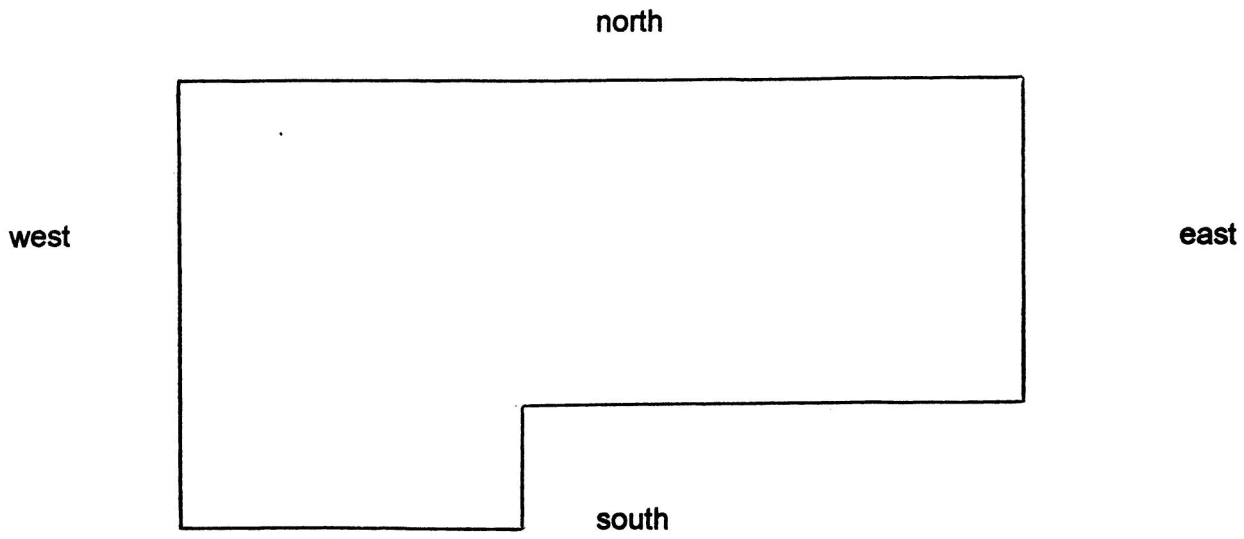
APPENDIX 10

PLAN DIAGRAMS OF PLANT COMMUNITIES ON THE NORTH-EAST TOWER

by Dr Madeline Holloway,
Ecological Information Network Consultants

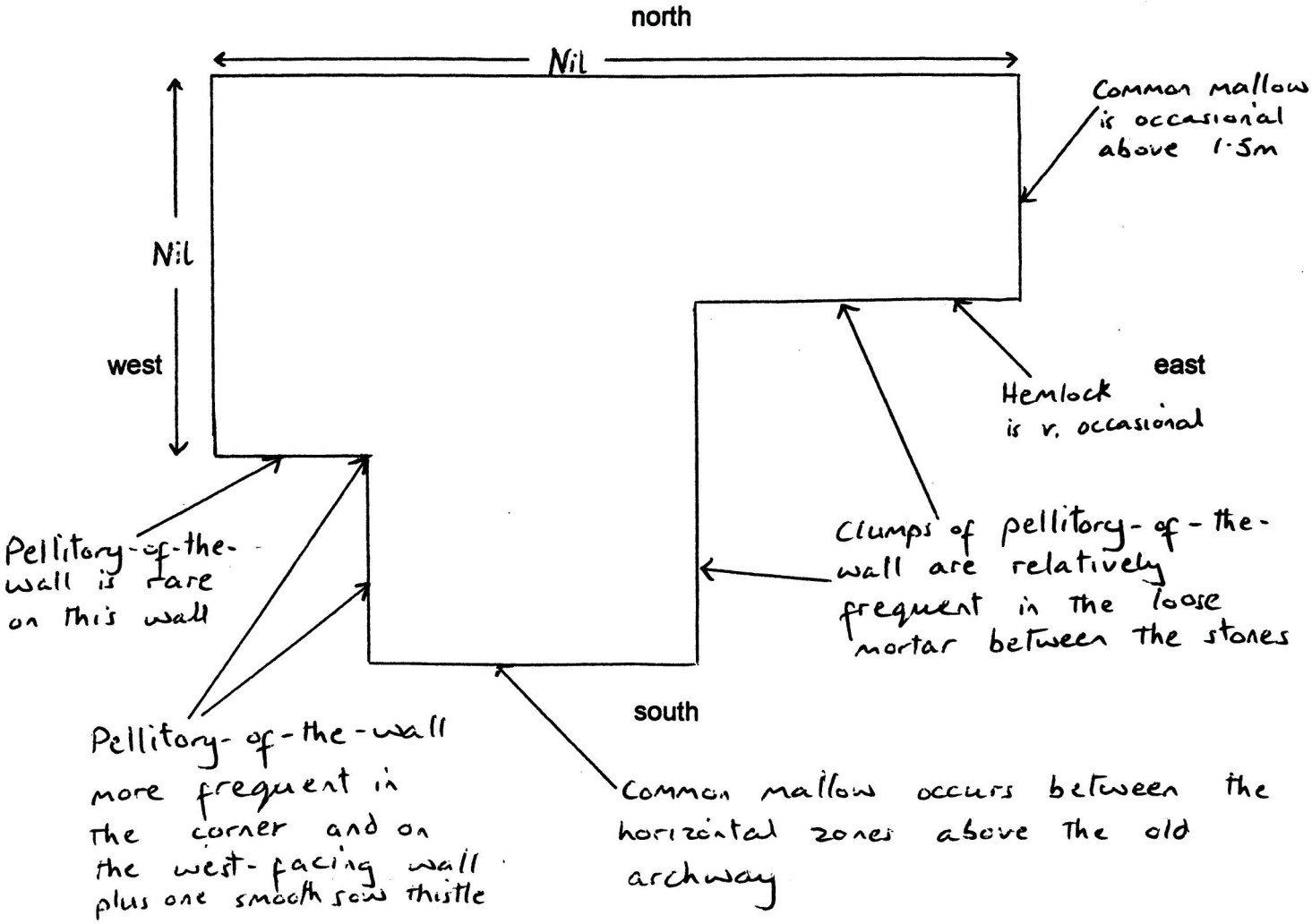
Plan diagrams of the plant communities growing on the exposed walls of the North East Tower at Platforms 1 - 12

Platform 12 (Top elevation)

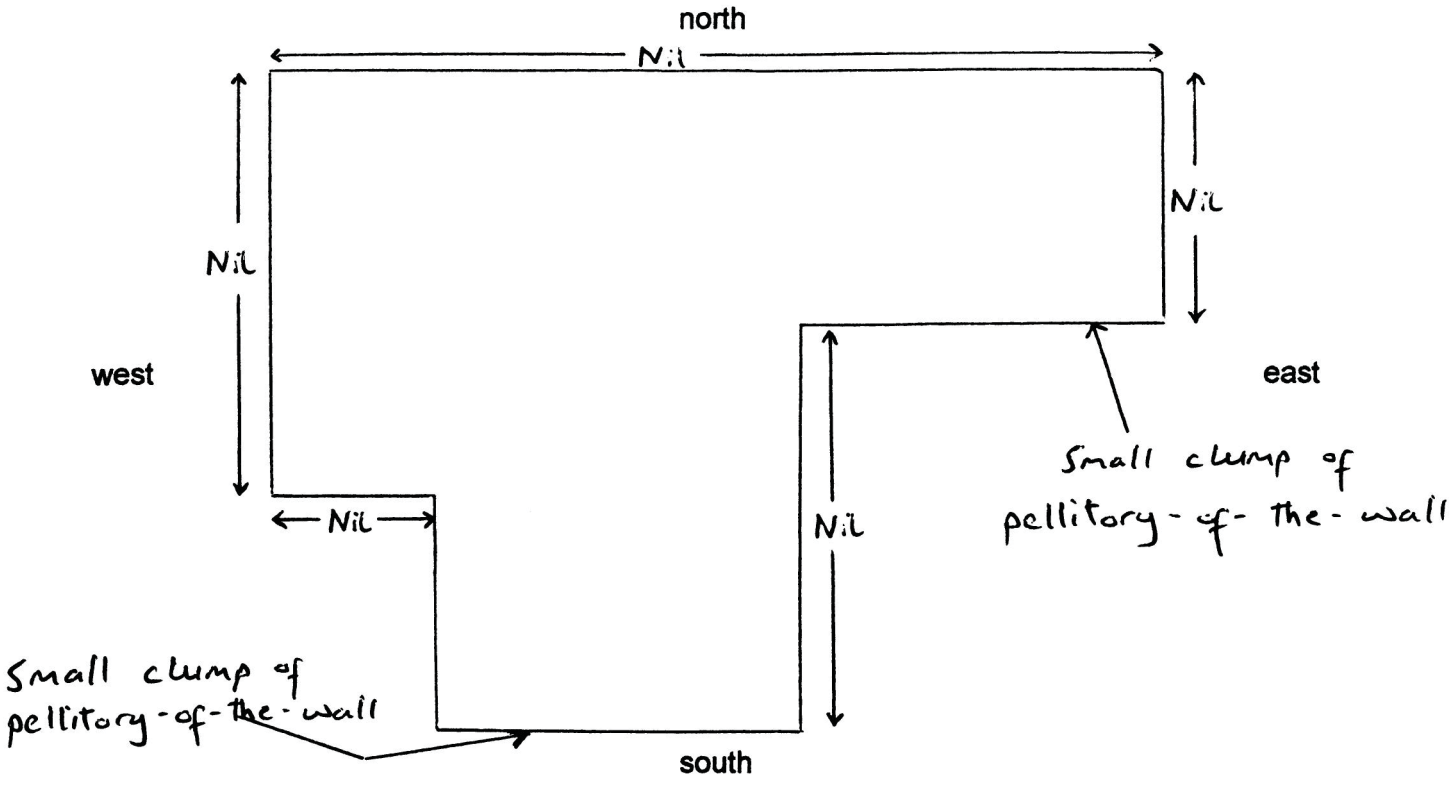


Common mallow *Malva sylvestris* and barren brome *Anisantha sterilis* are frequent inhabitants of the cracks between the crumbling stonework at the top of the tower. Occasional plants also include hemlock *Conium maculatum* and great lettuce *Lactuca virosa*. On the exposed vertical walls are occasional common mallow *Malva sylvestris,* hemlock *Conium maculatum* and pellitory-of-the-wall *Parietaria judaica*.

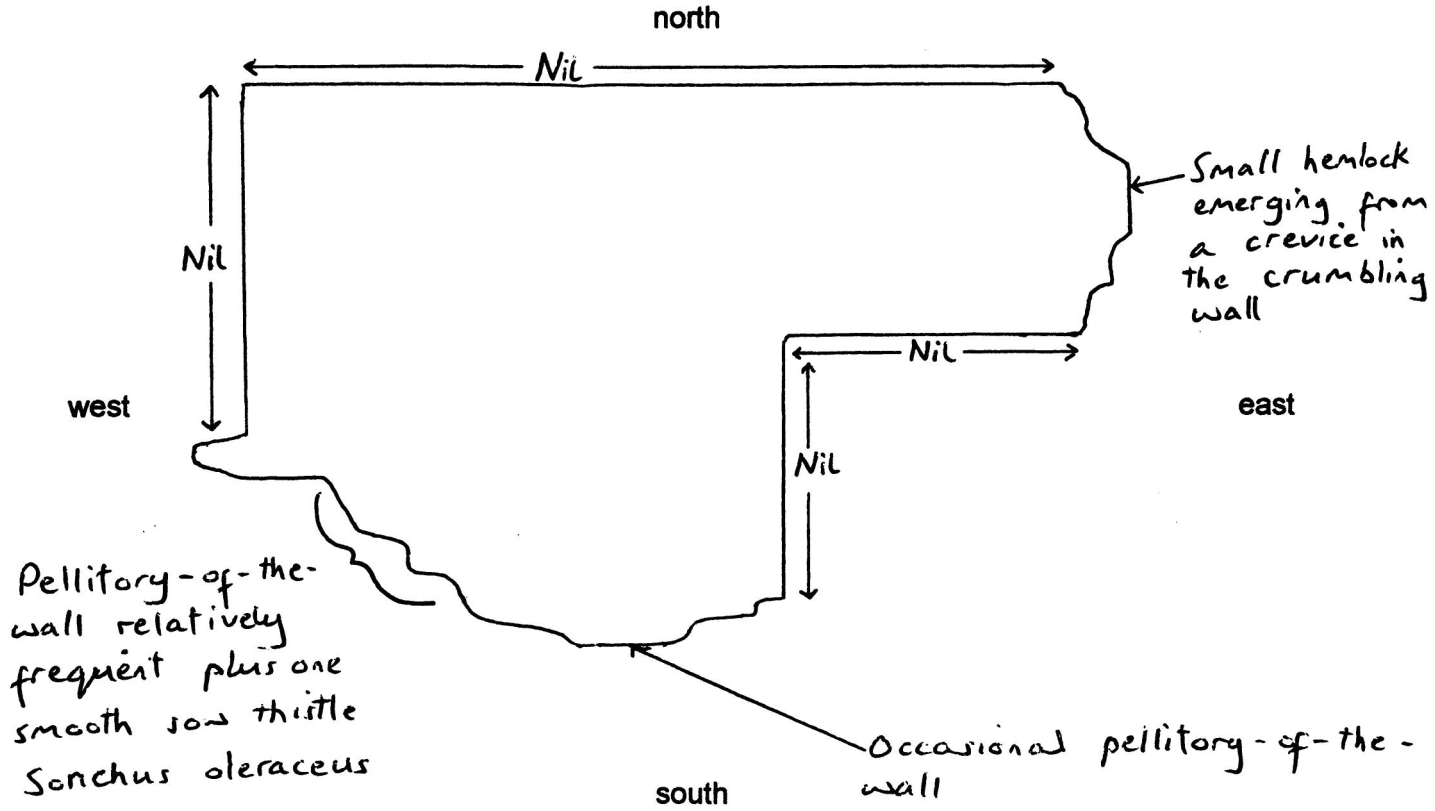
Platform 11



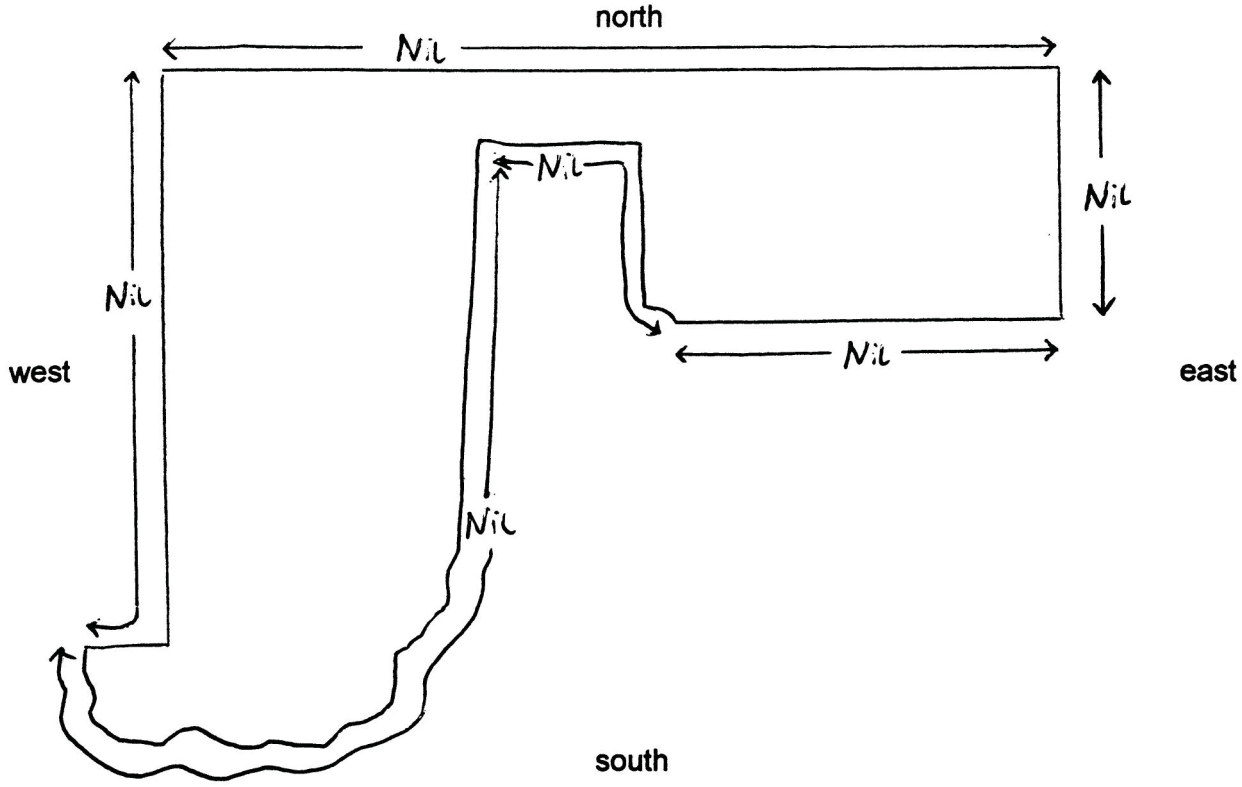
Platform 10



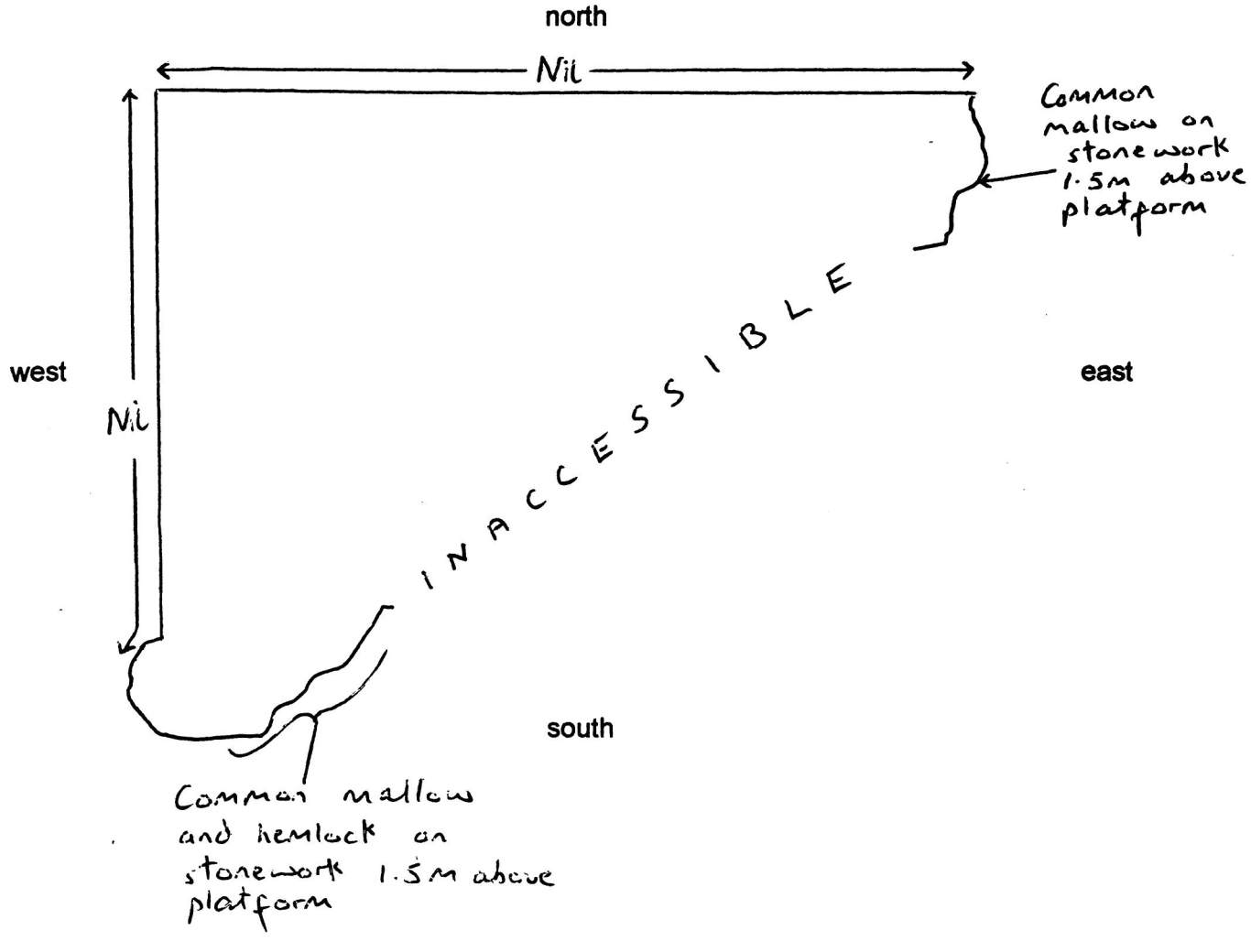
Platform 9



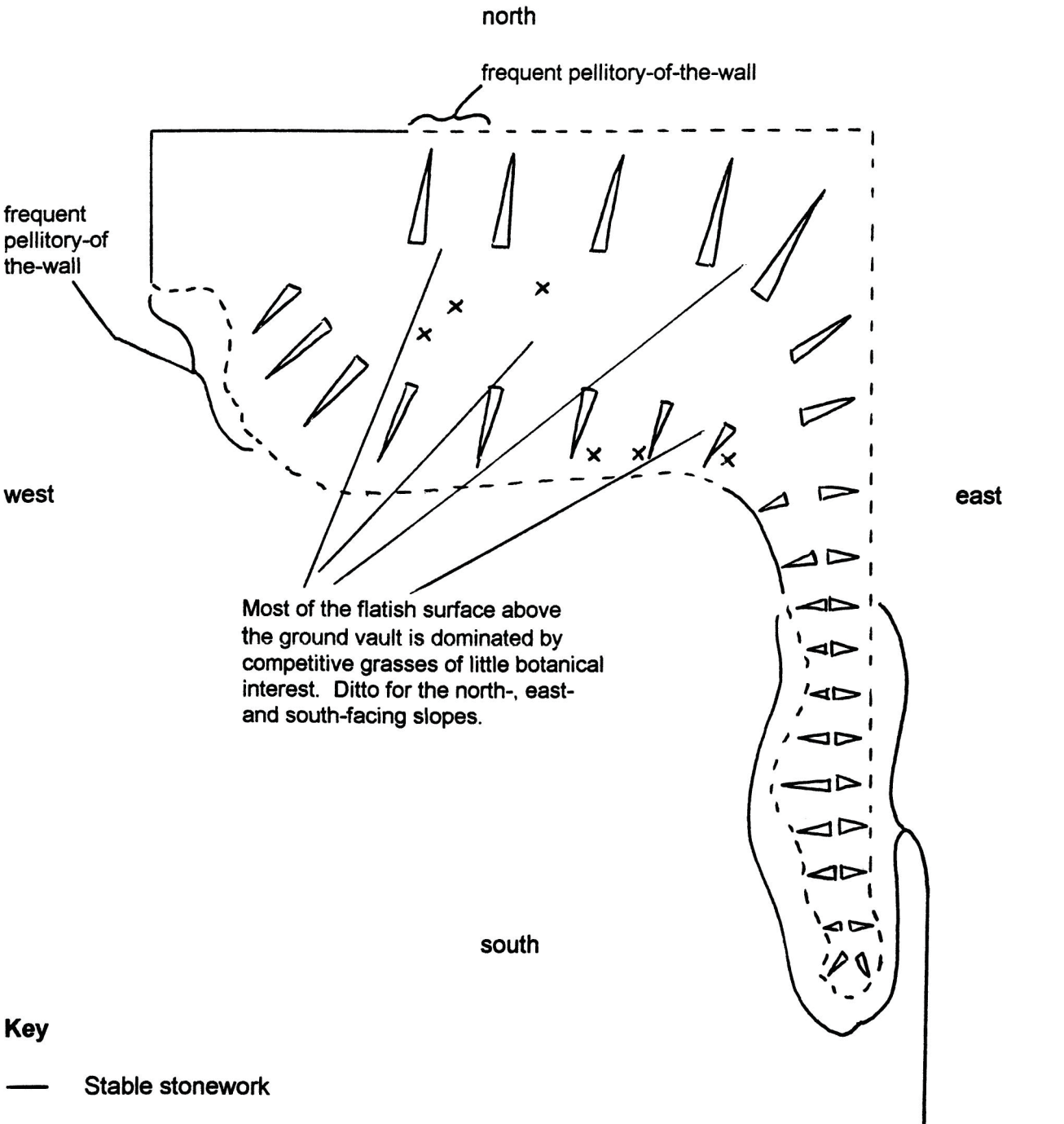
Platform 8



Platform 7



Platforms 5 and 6 – Plan of the plant community above the ground floor vault



Key

—— Stable stonework

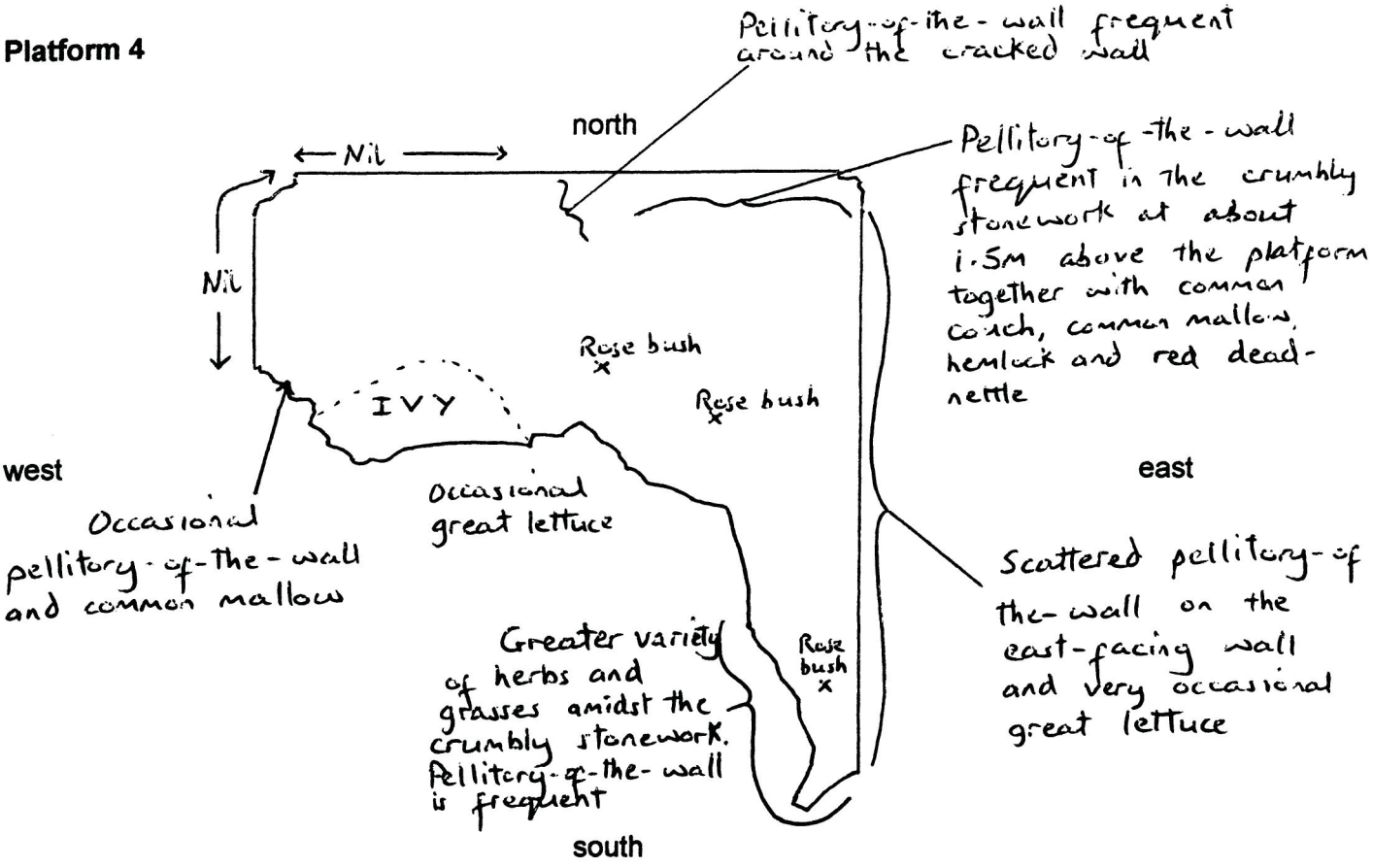
- – - Open-jointed masonry

Nil No plants recorded

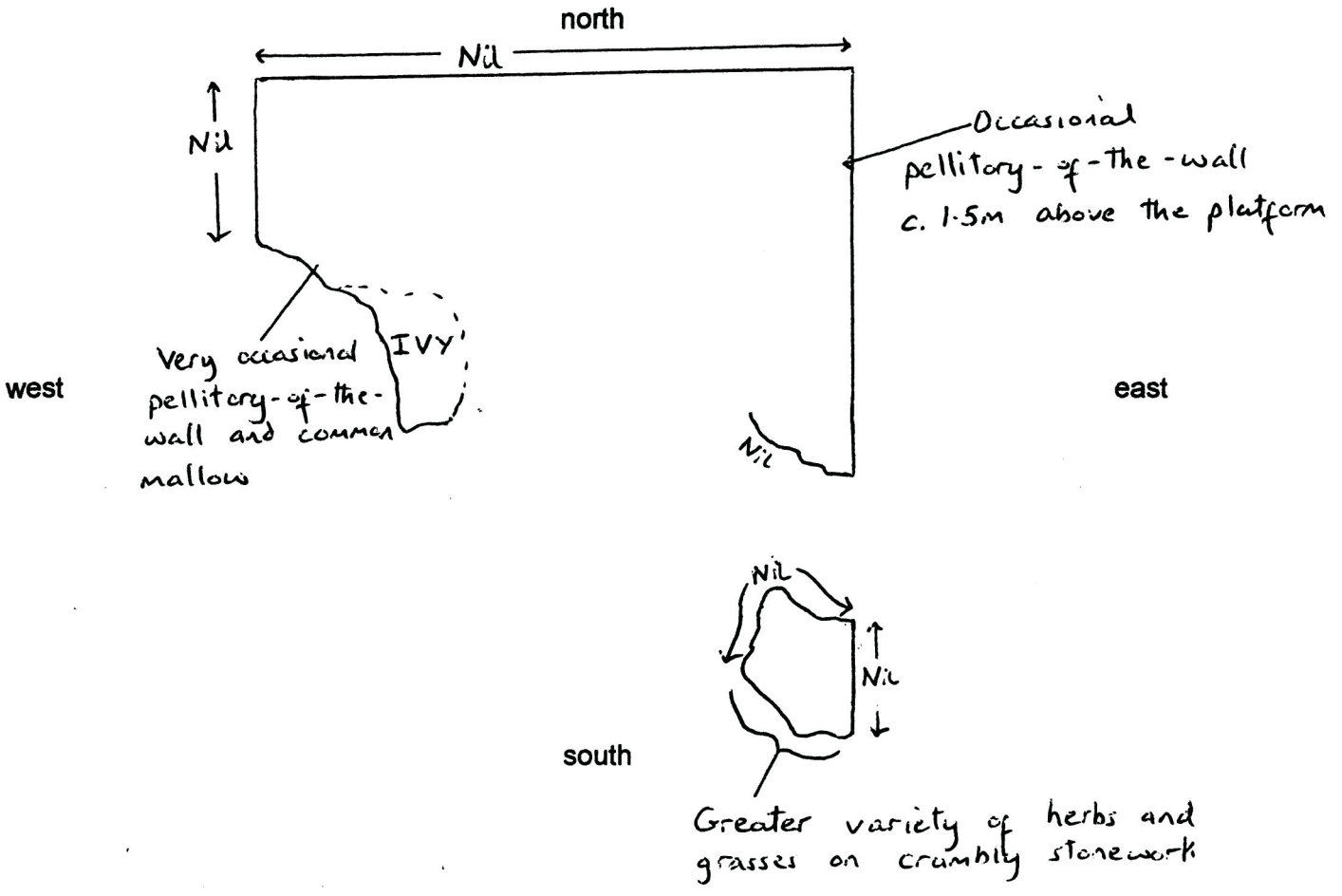
Slope

× Elder *Sambucus nigra* or rose *Rosa spp.* bush

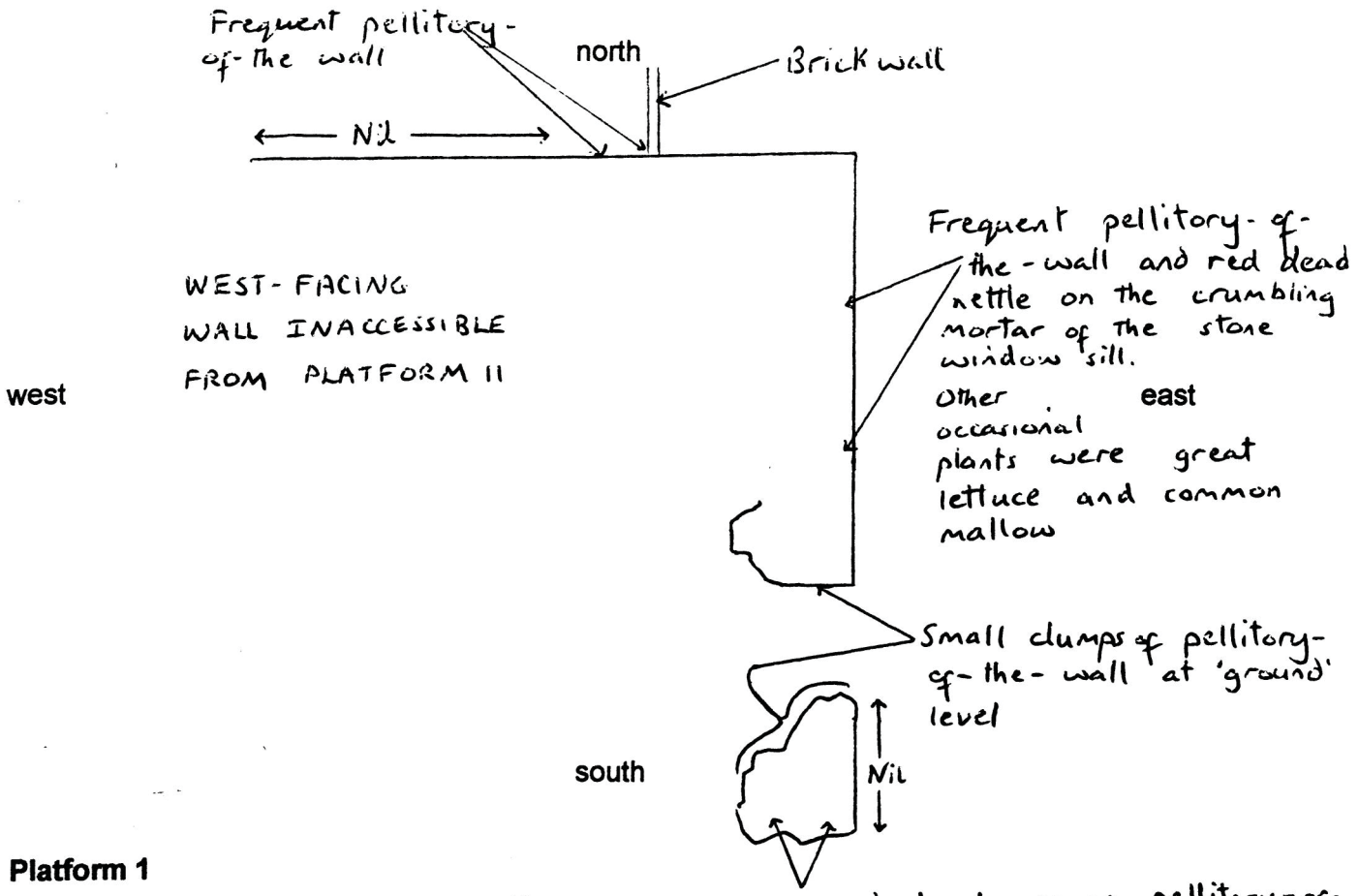
Platform 4



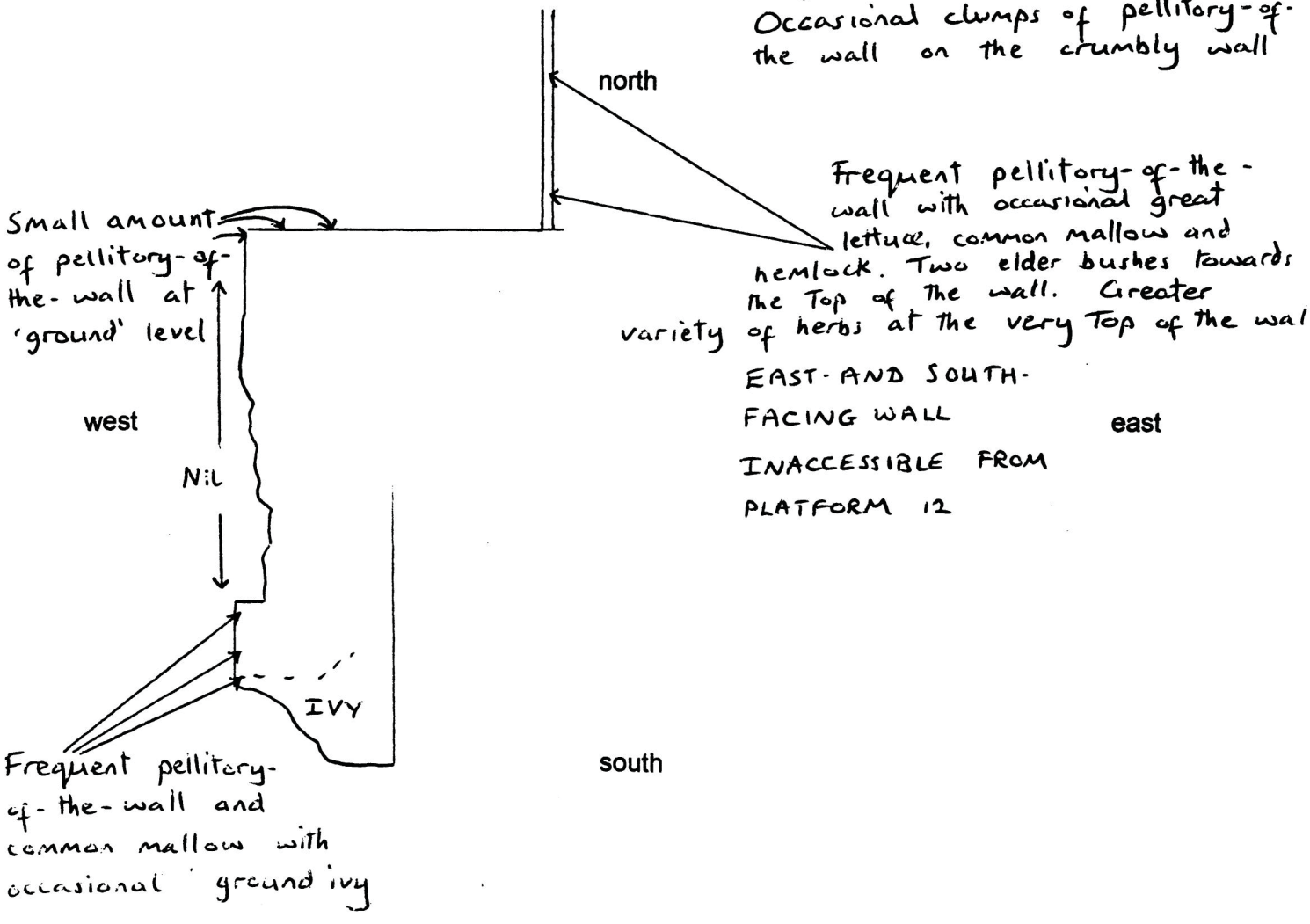
Platform 3



Platform 2



Platform 1



APPENDIX 11

LICHEN SURVEY OF THE NORTH-EAST TOWER

by Dr Peter Gouldsborough

SHERIFF HUTTON CASTLE
NORTH YORKSHIRE

Survey and report of the lichen species on the north-east tower

for

Ed Dennison Archaeological Services Ltd

by

Dr Peter F Gouldsborough

24 November 2002

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SHERIFF HUTTON CASTLE NORTH YORKSHIRE

SHERIFF HUTTON CASTLE NORTH YORKSHIRE

LICHEN SURVEY OF THE NORTH-EAST TOWER

Introduction

This survey is a stand-alone lichen survey undertaken while the north-east tower was fully scaffolded. The intention is that the remaining three towers of the castle will be surveyed in the same level of detail when they are scaffolded, and the data from all four towers will be incorporated into a comprehensive report and analysis of the lichen species for the whole site.

Aims and objectives

- To record the lichen species on the north-east tower;
- to identify areas of lichen colonisation which are significant and which should be preserved during works to consolidate and re-point the masonry.

Commission

The survey and report was commissioned by Ed Dennision Archaeological Services, Beverly, East Yorkshire.

Date of survey

The survey was carried out on 19 August 2002 by Peter F Gouldsborough.

The stone

The castle is known to be built from a stone known as the Dogger. This comes from the Middle Jurassic sequence in North Yorkshire (Rayner and Hemmingway 1974, 364), and it is known to have been quarried in the Terrington area, just 4.5 km north-north-east of Sheriff Hutton. The stone is calcareous, slightly oolitic, but with a high percentage of clastic debris. The consequences are that the stone has a rather characteristic, ragged, appearance when weathered. It also supports a characteristic lichen flora.

Survey method

The survey was carried out from fixed scaffolding, which permitted access and detailed inspection of all the masonry surfaces of this tower. Where identification confirmation was required, chemical spot tests involving potassium hydroxide, calcium hypochlorite and paraphenylendiamine were used. For a discussion of this method see Hawksworth and Rose (1976 p.48) and Dobson (2000).

For the sake of simplicity, rather than the full taxonomic authority for the botanical names of the lichens recorded, only the genus and species names are given in this report. For example:
Acarospora Massal. *fuscata*(Shrader)Th.Fr. is shortened to *Acarospora fuscata*.

Species list

Species	Dist.	Hab.	Zone	Characteristic appearance
Caloplaca citrina	191(1)	Ca	2	Yellow; powdery; orange fruits
Caloplaca decipiens	85(2)	Ca	5	lemon yellow; lobed margin; 'bitty' centre
Caloplaca flavescens	140(4)	Ca	3	orange with white inner zone; often, as here, only an outer arc remains
Diploicia canescens	100(5)	Ca+N	3	matt-grey; lobed margin; granular centre
Haematomma ochroleucum var. ***porphyrium***	68(0)	Si	4	grey; cracked crust; paler outer margin
Lecanora dispersa	192(0)	Ca	1	isolated grey fruits; white rim
Lecanora sulphurea	101(3)	Si+N	?	dark green; cracked; grey fruits
Leproloma vouauxii	35(0)	Ca	5	blue-green; powdery
Opegrapha saxatilis	58(8)	Si	?	immersed; elongated black fruits
Phaeophyscai orbicularis	174(0)	B	2	orbicular; grey; long narrow lobes divided at the tip
Physcia adcendens	159(2)	Ca	2	pale-grey; lobes raised and hood-shaped at the tips
Verrucaria muralis	163(3)	Ca	3	immersed; tiny black fruits
Xanthoria calcicola	110(2)	R+N	4	as *X. parietina* but darker; contorted lobes; granular centre
Xanthoria parietina	182(3)	R+N	4	orange; conspicuous; lobed margin; large orange fruits

Table 1 Sheriff Hutton Castle: lichen species recorded on the north-east tower

In Table 1, the data under the heading **Dist.** are taken from Seaward (1994). The first number indicates the number of 10km x 10km grid-squares in Yorkshire in which the species has been found. The number in brackets indicates the number of 10km x 10km

grid-squares from which the species has disappeared (there are 195 such grid-squares covering Yorkshire). This data has been compiled by Seaward (1994) from published and unpublished records from the mid-nineteenth century onwards.

The letters under the heading **Hab.** indicate the preferred substratum of the species:
'B' indicates basic substrates (pH>7);
'Ca' indicates a preference for calcareous substrata;
'N' indicates a preference for nutrient-enriched substrata;
'R' indicates rocks of undefined type;
'Si' indicates a preference for siliceous substrata.

The numbers in the column headed **Zone** indicate the tolerance of the species to atmospheric sulphur dioxide pollution on the Hawksworth and Rose scale (Hawksworth and Rose 1976). '1' indicates the highest level of pollution with mean winter levels grater than 170 $\mu g/m^3$. '10' indicates clean air.

Species appearance

The following illustrations show the appearance of the most conspicuous and most frequently occurring species, as well as some of the less frequent species.

Figure 1 *Xanthoria* species on the south side of the uppermost level of the tower

Figure 2 detailed appearance of *Xanthoria parietina* (left) and *Xanthoria calcicola* (right)

Figure 3 *Diploicia canescens* on the lower level of the east elevation

Figure 4 detailed appearance of *Diploicia canescens*

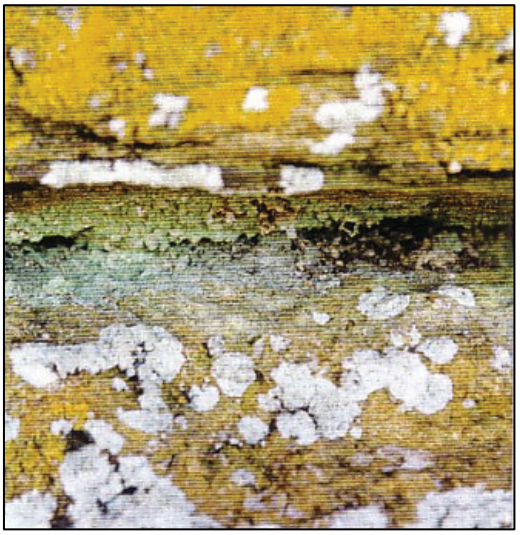

Figure 5 *Leproloma vouauxii* in a mortar joint on the lower level of the east elevation

Figure 6 detailed appearance of *Caloplaca flavescens* with *Lecanora dispersa* on the north elevation

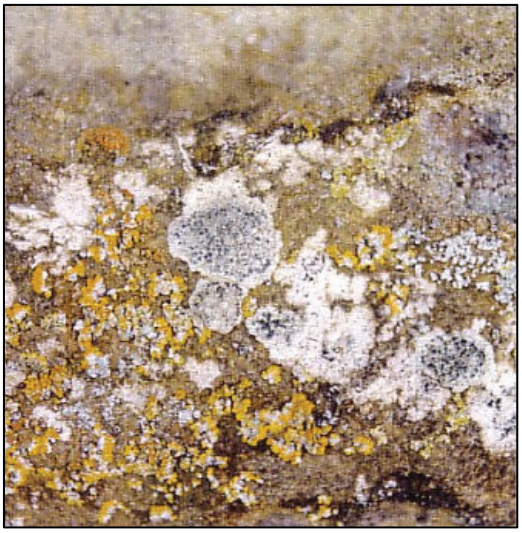

Figure 7 Detailed appearance of *Lecanora sulphurea* (centre) with remnants of *Caloplaca flavescens* on the north elevation

Figure 8 detailed appearance of *Haematomma ochroleucum* (left) and *Verrucaria muralis* (right) on a quoin stone on the north elevation

Species location

In Figures 9 to 12 inclusive, which follow, the locations of significant areas of colonisation are indicated.

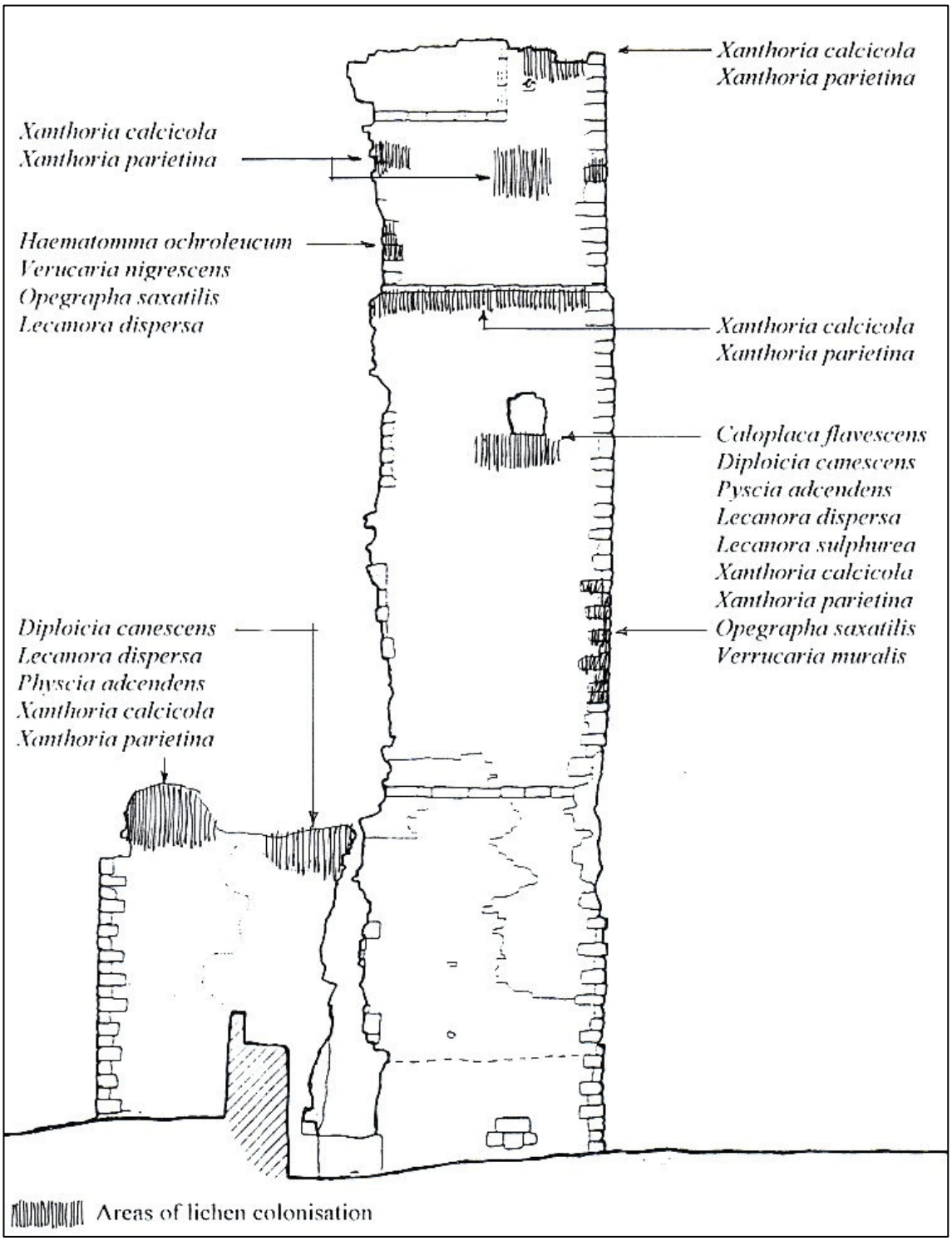

Figure 9 Sheriff Hutton Castle north-east tower: species location on the north elevation
Based on a drawing by Ed Dennison Archaeological Services not to scale

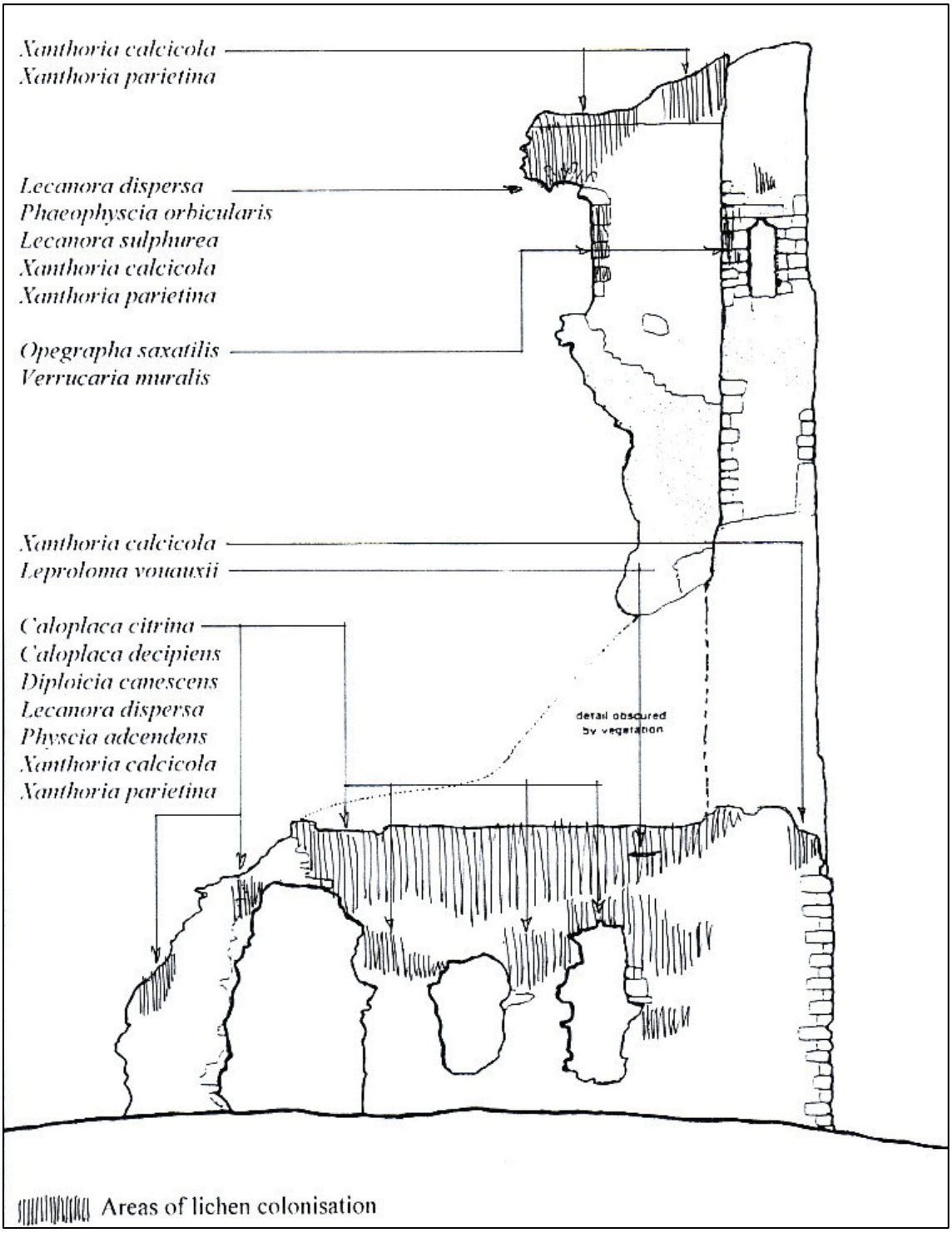

Figure 10 Sheriff Hutton Castle north-east tower: species location on the east elevation and the internal face of the west wall

Based on a drawing by Ed Dennison Archaeological Services not to scale

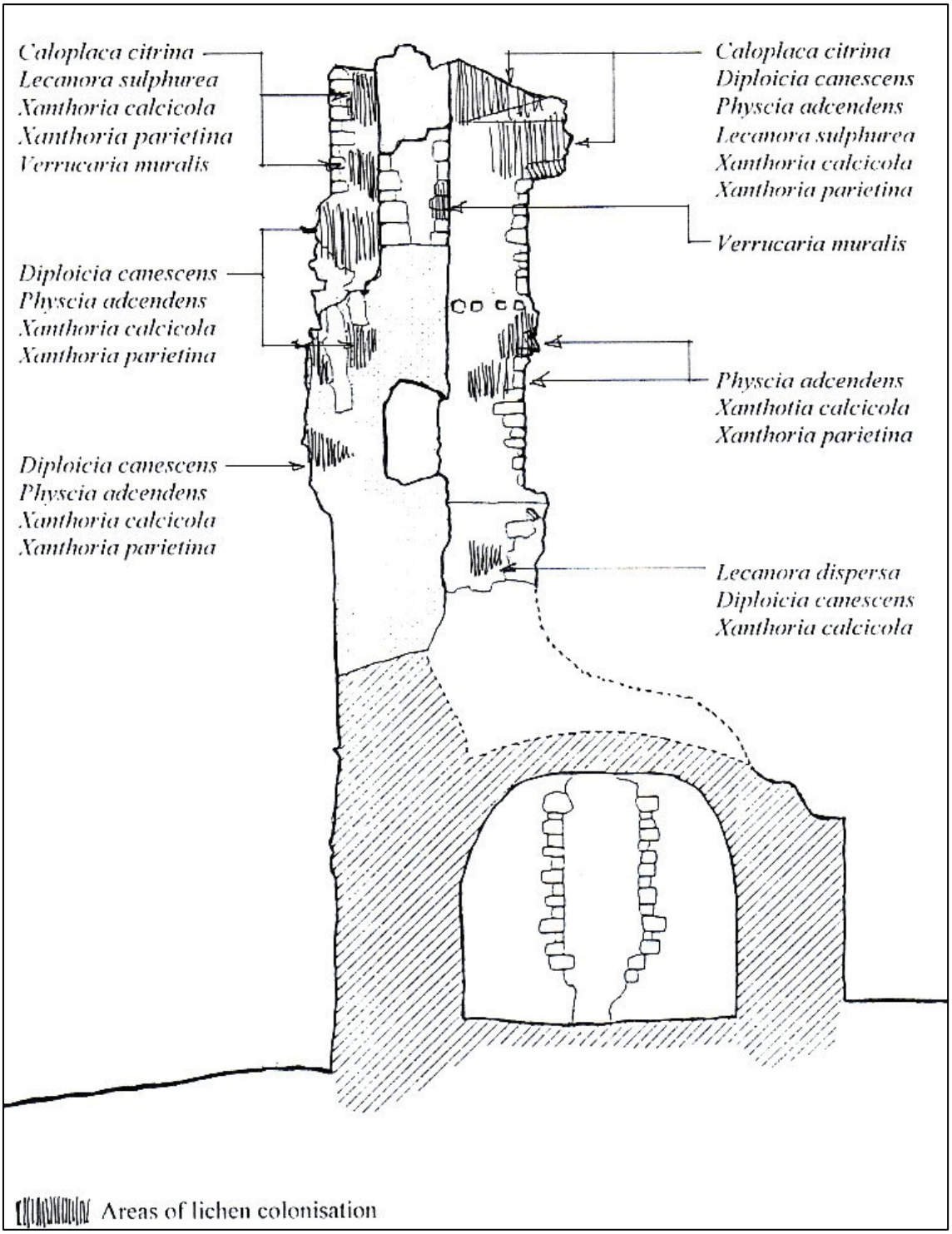

Figure 11 Sheriff Hutton Castle north-east tower: species location on the internal (south) face of the north wall

Based on a drawing by Ed Dennison Archaeological Services not to scale

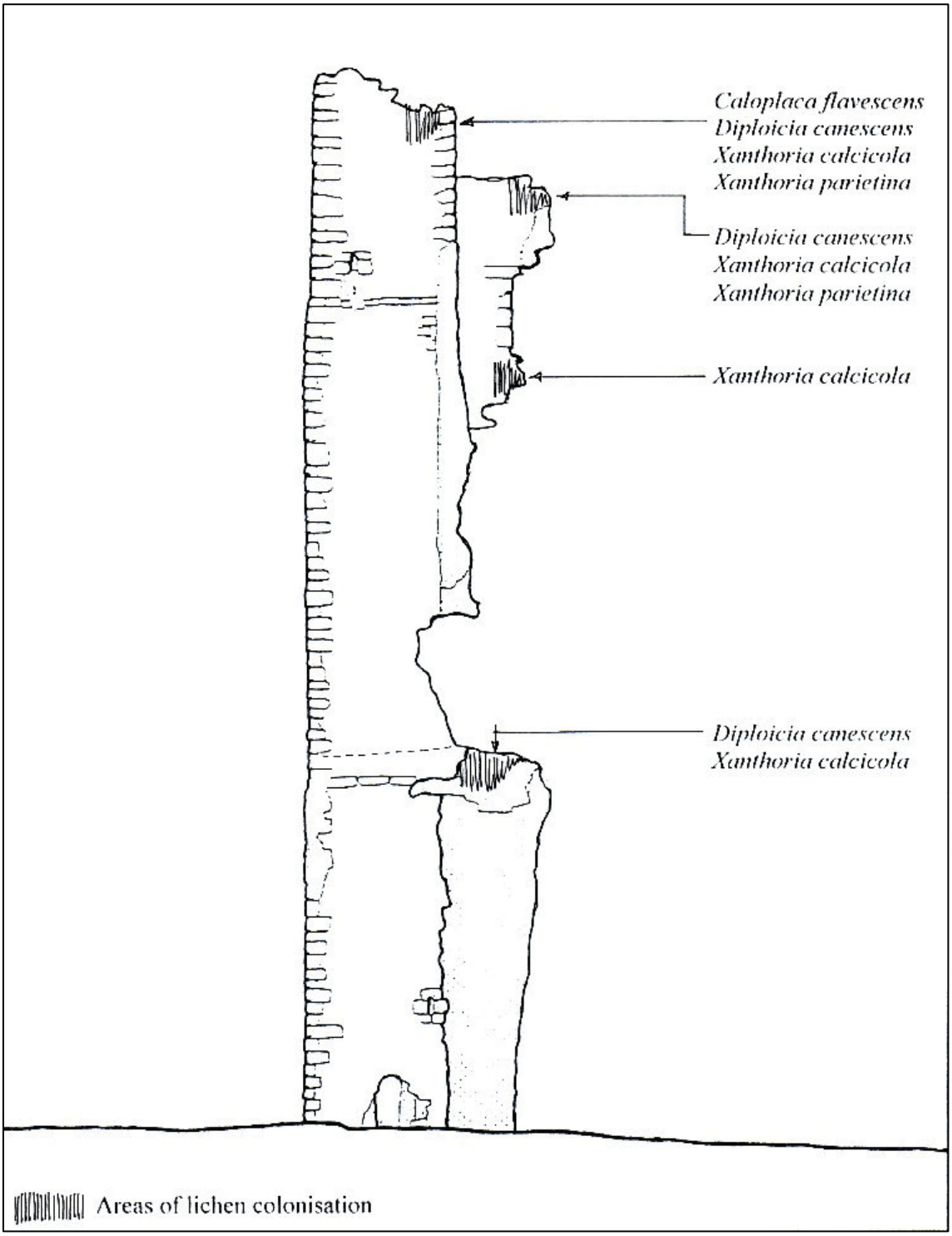

Figure 12 Sheriff Hutton Castle north-east tower: species location on the west elevation
Based on a drawing by Ed Dennison Archaeological Services not to scale

Discussion

The significance of the lichen flora of this tower can be considered from two distinct points of view. The first is from the point of view of the lichen flora in the regional context: their regional distribution and their pollution tolerance. The second is from the point of view of this site: their distribution on the tower, the local reasons for that distribution and the significance of that for the monument.

In the regional context three of the species found are relatively scarce: *Caloplaca decipiens* and *Leproloma vouauxii*, both found on the lower levels of the east elevation and *Opegrapha saxatilis* found as isolated specimens on the quoin stones of the north and east elevations. The remaining eleven species are relatively common, and this can be deduced from the figure in the column headed **Dist**. in Table 1. The average tolerance of the species to atmospheric sulphur dioxide pollution was calculated to be Zone 3 on the Hawksworth and Rose scale, which represents a mean winter sulphur dioxide level of 125 $\mu g/m^3$. This level of sulphur dioxide pollution may represent a significant factor in the weathering of the limestone of which much of this monument is built. It should be noted that without a record of the species for the whole site, it is not possible at this stage to provide a detailed analysis of the likely stability of the species recorded, or to confirm the level of air pollution at this site; however, it is also worth noting that in the absence of local atmospheric pollution monitoring, analysis of the pollution tolerance of lichen species is the only way in which an indication of pollution levels can be obtained in rural areas remote from the DEFRA automatic monitoring stations. High levels of sulphur dioxide result in high levels of weathering of calcareous stones (Cooke and Gibbs 1993).

At the local level there have been three principal influences on the distribution of the species recorded: the type of stone, low-level nitrification of surfaces and the influences of wildlife. Mention has already been made in this report of the Dogger, the Jurassic limestone from which much of the castle was built. This attracts its own peculiar lichen flora. The quoin stones of the castle are, however, of a different stone. Undoubtedly also from the Jurassic, but possibly from the Lower Deltaic Sandstone beds above, or from the beds beneath the Dogger bed. In any event the stone is a fine-grained sandstone and a spot-test with 10% hydrochloric acid showed that calcium carbonate

was absent. It is therefore a siliceous sandstone, although in the string coursed and drip mouldings its properties have invariably been modified by centuries of rainwater run-off from the limestone above, but on the quoins the lichen flora reflect its siliceous nature by the presence of *Haemotomma ochroleucum* and *Opegrapha saxatilis*, both species peculiar to acidic substrata.

One species *Diploicia Canescens*, is the dominant species at the lower levels of the east elevation of the tower, and for a large part is present as a conspicuous mono-culture. Dobson (2000) notes this species as one generally associated with basic and very nutrient-enriched rocks and walls, such as farmyard buildings, and there is no doubt that the presence of this species represents a record of past farming activity at this site.

Also, the two species of *Xanthoria* which are dominant at the upper levels of all the surfaces of the walls are noted by Dobson as being common on nutrient-enriched rocks and walls especially under bird-perching sites, as well as being associated with farm buildings. These two species are therefore an indication of the importance of this tower for bird-life, but there is one further factor. Many of the lichen species showed evidence of being grazed by gastropods and these animals are, in turn, a significant link in the food chain, being prey to birds, most notably members of the Turdidae family.

The final factor in this discussion is that the lichens of this tower, some by their distinctive appearance, have a significant effect on the appearance of the ruin. That is something which many writers have commented on as a desirable quality in a ruin (Stanford 2000; Macaulay 1977; Felmingham and Graham 1972; Piper 1946). This does though raise the question of whether the lichens on this tower have, or will have, a significant effect on the weathering of the masonry. Recent research has shown that on hard calcareous stones, like the Dogger, even with the extensive lichen cover on some parts of the masonry, the lichens are unlikely to have any significant influence on weathering due to frost, salts or acid rain, and any direct weathering due to the lichens themselves is likely to be negligible (Gouldsborough 2002). It is beyond the scope of this report to carry out an analysis of the physical properties and weathering characteristics of the stones of Sheriff Hutton Castle, but only after analysis of such data will it be possible to confirm that the lichen species recorded pose no weathering risk.

Summary

- Three of the lichen species recorded on this tower are relatively scarce in Yorkshire;
- the pollution tolerance of the species suggest high levels of atmospheric sulphur dioxide, which has implications for weathering of the stone;
- the two stone types of which the tower is built support their own characteristic lichen flora, and the species composition has also been influenced by low-level nitrification of the stone due to adjacent farming activity and by the bird-life for which the tower provided habitat;
- the dominant lichen species have a distinctive appearance which significantly affects the appearance of the monument;
- the lichen flora is unlikely to have a significant effect on the weathering of the stone, despite the high levels of cover in some areas.

Recommendations

- During consolidation and re-pointing of the masonry, care should be taken to conserve and protect the principal areas of lichen colonisation indicated in Figures 9 to 12 inclusive of this report;
- further detailed lichen surveys should be conducted on the three remaining towers, as access becomes available, to supplement the more general lichen survey carried out from ground level. This will enable a species list for the whole site to be compiled and a full analysis of all the lichen species carried out. The data can then be entered onto the national lichen distribution database.

Dr Peter F Gouldsborough

24 November 2002

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APPENDIX 12

IVY SURVEY OF THE NORTH-EAST TOWER

by Dr Peter Gouldsborough

SHERIFF HUTTON CASTLE
NORTH YORKSHIRE

SURVEY AND REPORT ON THE IVY OF THE NORTH-EAST TOWER

for

Ed Dennison Archaeological Services Ltd

by

Dr Peter F Gouldsborough

21 August 2002

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SHERIFF HUTTON CASTLE NORTH YORKSHIRE

SURVEY OF THE IVY ON THE NORTH-EAST TOWER

SHERIFF HUTTON CASTLE NORTH YORKSHIRE:

SURVEY OF THE IVY ON THE NORTH-EAST TOWER

Introduction

Ivy is usually recognised as being a climbing evergreen shrub, with five-pointed, glossy, dark green leaves, although there are many varieties with variegated leaves. It is epiphytic in habit, that is, it relies on other plants or structures for support. It is a member of the Family Araliaceae and of the Genus *Hedera* (Allaby 1996), which is characterised as climbing plants with woody roots. A further characteristic of species of the *Hedera* Genus is that they have the ability to produce adventitious roots, that is, roots which grow from the stem of the plant, in addition to the underground root system. The method of attachment of the plant to its support structure is by root-like rhizines.

Ivy excretes organic metabolites from its stems leaves and rhizines, mainly in the form of oxalic acid (Lewin and Charola 1981), which can be a source of weathering of masonry, and researchers have also suggested that ivy helps to maintain masonry in a permanently damp condition as a result of water diffused from the leaves by transpiration (Schaffer 1950). Its effects on masonry are commonly recognised to be chemical weathering and physical disruption.

Aims and objectives

- To record the position of the primary growth stems of the ivy;
- to identify the principle mechanisms by which any past weathering or damage to the masonry has occurred;
- to identify areas where the ivy may safely be removed to facilitate masonry consolidation;
- to identify any areas in which, for reasons of stability, the ivy should remain;
- to identify areas where the historic integrity of the masonry could be compromised by the removal of ivy;
- to assess the historical and ecological importance of the ivy.

Commission

This survey and report was commissioned by Ed Dennison Archaeological Services, Beverly, East Yorkshire.

Date of survey

The survey was carried out on 12 August 2002 by Peter F Gouldsborough.

Survey method

The survey was carried out from fixed scaffolding, which permitted access and detailed inspection of all areas of the ivy. The ivy extended to the fourth level of the eleven levels of scaffolding; level 0 was about 600mm above the adjacent ground level, and level 4 was about 8.5 meters above the adjacent ground level.

Observation

Figure 1 Sheriff Hutton Castle: north-east tower viewed from the south

The ivy on this tower is identified as *Hedera helix*, or common ivy. Its extent is limited to the south-west corner of this tower of the castle. The growth extends from ground level to approximately 9.3m high. Above this height, the upper level of vaulted masonry, the lack of any supporting masonry has prevented further vertical growth. Generally, the walls of the castle are massive, being some 3m thick at ground level, but throughout its height, the ivy relies for support on wall-core rubble which is a maximum of 900mm back from the face of adjacent facework to the north. There is no evidence of any facework or quoins in the area of the ivy. Figure 1, illustrates the extent of the ivy, photographed on 8 April 2002, before the erection of scaffolding.

The stone from which the castle is built is known as the Dogger which forms part of the Middle Jurassic sequence in North Yorkshire (Hemmingway 1974). It was quarried in the Terrington area to the north-east of Sheriff Hutton and is dense, calcareous, slightly oolitic and has a high percentage of clastic debris which results in a characteristic 'ragged' appearance when weathered.

Figure 2 Sheriff Hutton Castle: main growth stems at ground level

At level 0 (600mm above ground level), the main growth stems are visible. There are two adjacent stems on the west elevation and one on the east. The stems on the west elevation are 90mm and 70mm diameter, and the stem on the east elevation is 70mm diameter and soon branches, but has been severed below the branch at some time in the past. The resulting four stems immediately disappear into the brickwork buttressing which underpins this corner of the ruin, illustrated in Figure 2.

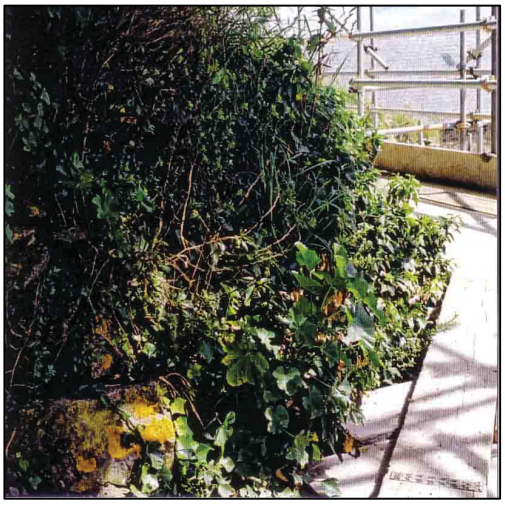
Figure 3 Sheriff Hutton Castle: lattice of intertwined ivy stems 3m above ground

At scaffold level 1 (2.1m above ground level), several of the aerial stems have been cut back to facilitate the erection of the scaffolding. The main stems at this level are 30 to 40mm in diameter on the west elevation and 40 to 50mm diameter on the east elevation. The secondary stems from a contiguous, intertwined lattice over the surface of the masonry and within the deeply eroded mortar joins, as illustrated in Figure 3.

At scaffold level 2 (4.2m above ground level), the ivy is at its most luxuriant, with an average depth of cover of 400mm, and a maximum of 900mm. The main growth stems on the west elevation are 30mm diameter, and those on the east are 30 to 40mm diameter. The same contiguous mass of intertwined secondary stems are evident here as at the lower level.

Figure 4 Sheriff Hutton Castle: ivy stems and lose masonry 7.5m above ground

At scaffold level 3 (6.3m above ground level and springing level of the vaulting) the cover is reduced to 200mm maximum. The main stems on the west elevation are 19 to 25mm diameter and those on the east 20mm diameter. The secondary stems remain intertwined on, and within, the masonry and mortar joints. At this level new growth can be seen to grow into the interstices between masonry units, as well as emerging from within the interstices. The masonry at this level is loose, most of the mortar having weathered away, illustrated in Figure 4.



At scaffold level 4 (8.5m above ground level) the ivy growth diminishes and ends some 900mm above this level and there is no further vertical masonry in this area. At this point the herb layer which grows from the debris above the top of the stone vaulting begins, illustrated in Figure 5.

Figure 5 Sheriff Hutton Castle: vertical limit of the ivy; herb layer over the vaulting

Discussion

To date, it has not been possible to determine whether there are documentary source from which the age or historical significance of this stand of ivy can be assessed; however, much appears to be relatively recent and, from the direction of growth of the main stems immediately above ground level, it can be deduced that the brick buttressing which underpins this corner of the tower predates this particular stand of ivy. The fact that one of the main stems has been severed at some time in the past suggests that there has been a perceived threat to the masonry; nevertheless, ivy growth on ruins, once admired so much during the eighteenth and nineteenth centuries for its contribution to the Picturesque value of ruins, is now a rare occurrence and should perhaps be valued for that rarity.

Why so much of the facework has disappeared in this area is not immediately apparent but the presence of passageways, fireplaces and flues within the wall thickness may be a contributory factor. It seems unlikely that this modest stand of ivy has been responsible for the massive loss of masonry in this are of the tower. Ivy has a predilection for corners, and can often be seen climbing external corners of masonry structures, as on the north west tower of this castle. In such situations quoin-stones can be prised out of position, provided that growing stems or adventitious roots can penetrate the mortar joints, and can leave large areas of wall-core vulnerable to further damage; however, in the area of the ivy on this tower there is little evidence of active masonry displacement by the ivy, as far as could be determined. There are therefore no areas where the structural integrity of the masonry would be compromised if the ivy were to be removed, with the exception of the top two meters, where the masonry is poorly bonded and the mortar joints are deeply weathered, or absent.

It is evident that the weathering of the masonry and the mortar joints in the area of the ivy predated the ivy. Differential weathering rates are evident between the sandstone quoins and the rubble walling, and between the rubble walling and the mortar joints. This is evident particularly on the north and east elevations of this tower, and the same differential weathering between mortar joints and rubble walling is evident within the

stand of ivy. This suggests that the area of wall now covered by the ivy has undergone the same weathering processes as the remainder of the masonry and that any chemical weathering that could be attributed to the ivy has been short-lived or relatively insignificant.

There is no doubt that much of the ivy will have to be removed as part of the conservation of the tower. To attempt to carry out such conservation work with it in place would be impracticable due to the density of the intertwined stems both on the surface of the masonry, within the mortar joints and within interstices. There will inevitably be some disruption to the masonry during any operation to remove the ivy, but since the masonry in question is exclusively the exposed rubble core of the wall the historical integrity of the wall should not be too severely compromised as a result.

The ecological value of this stand of ivy is, perhaps, modest compared to the ecological value of the site as a whole; nevertheless, the implications of its removal, and the opportunity, or desirability, of allowing it to regenerate following consolidation work should be considered carefully.

Summary

- There is no evidence to date that the ivy is of historical significance in the context of the castle;
- there is no evidence that this stand of ivy has had any major contribution to the loss of so much historic fabric in this area of the north-east tower;
- there is no evidence to suggest that this stand of ivy is currently causing significant disruption to the masonry;
- there is no evidence that the ivy has caused any major chemical weathering to the masonry;
- the presence of the ivy will hinder consolidation and re-pointing of the masonry, but its removal will inevitably cause disruption to the upper levels of masonry;
- the ecological value of the ivy is probably modest in the context of the whole site.

Recommendations

- The ivy should be carefully removed to permit consolidation and re-pointing;
- consideration should be given to allowing the ivy to subsequently regenerate, to maintain the ecological integrity of the site as a whole;
- an assessment should also be made of the ivy on the south-west tower, and more particularly of the ivy on the north-west tower, where the growth attains a greater height and is more abundant.

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Dr Peter F Gouldsborough

21 August, 2002