Excavations of a Bronze Age landscape and a post-Roman industrial settlement 1953-1961, Gwithian, Cornwall

Assessments of individual key datasets 2003-2006

Volume II

Historic Environment Service (Projects)

Cornwall County Council

A Report for English Heritage

(The ALSF scheme)

Excavations of a Bronze Age landscape and post-Roman industrial settlement 1953-1961, Cornwall

Assessments of individual key datasets 2003-2006

Volume II

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Acknowledgements

This volume is one of 2 volumes produced during work on the Gwithian Archive, Cornwall, in 2005-2006. The study was commissioned by English Heritage and funded by the ALSF scheme. This volume is a compilation of individual assessment reports commissioned as part of the Gwithian archive project and which were carried out during the period 2003 - 2006. It is a companion document to Volume I which summarises the results of the work on a number of key datasets and which provides a background history of this major post-excavation project.

Work was carried out by the projects team of the Historic Environment Service (formerly Cornwall Archaeological Unit), Environment and Heritage, Cornwall County Council. The main work on the archive was carried out by Joanna Sturgess, Anna Lawson-Jones and Carl Thorpe with help from John Smith, Neil Craze, Matt Mossop, James Gossip, Konstanze Rahn, Sean Taylor and Imogen Wood (all at HES, Cornwall). In addition a large number of specialists have worked on material within the archive and all their individual contributions are presented here. The project has been greatly supported by the co-operation, support and advice of Professor Charles Thomas and Henrietta Quinnell who have played key roles in helping to design the programmes of post-exacavation assessment. Within the Historic Environment Service, the Project Manager was Jacky Nowakowski.

The project team at the Historic Environment Service (HES, Cornwall County Council) would like to thank the Aggregates team at English Heritage in particular Kath Buxton and Peter (Buzz) Busby, as well as Fachtna McAvoy, Ian Morrison and Vanessa Straker for their support and advice throughout all stages of the project. Mark Barrett gave practical advice on the OASIS database. Tim Evans at ADS has been extremely helpful with transfer of digital data to the ADS project at AHDS Archaeology at the University of York.

The views and recommendations expressed in this report are those of the Historic Environment Service projects team and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

As Cornwall County Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.

HES will ensure that all information arising from the project shall be held in strict confidence to the extent permitted under the Act. However, the Act permits information to be released under a public right of access (a "Request"). If such a Request is received HES may need to disclose any information it holds, unless it is excluded from disclosure under the Act.

Front cover Dr Erika Guttmann and Dr Helen Roberts taking nes samples at site GMXVII, Gwithian, Cornwall, June 2005. Copyright © Jacky Nowakowski, Historic Environment Service.

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Abbreviations

AHDS	Archaeology Data Service
ALSF	Aggregates Levy Sustainability Fund
AMS	Accelerator Mass Spectrometry measurement
BA	Bronze Age
EH	English Heritage
HER	Cornwall and the Isles of Scilly Historic Environment Record
HES	Historic Environment Service, Cornwall County Council
MBA	Middle Bronze Age
NGR	National Grid Reference
OASIS	Online AccesS to the Index of archaeological investigationS
OS	Ordnance Survey
OSL	Optically Stimulated Luminescence Dating

PR	Post-Roman
RB	Romano-British
RCM	Royal Cornwall Museum, Truro.
RIC	Royal Institution of Cornwall, Truro.

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Summary

For over 20 years, during the late 1940s through to the 1960s, the sand dunes at Gwithian in West Cornwall became the scene of a major landscape study. Summary results on certain aspects of the numerous archaeological investigations at Gwithian have been published although the major results remain unpublished. From 2003 to 2006, the Historic Environment Service, Cornwall County Council, carried out a major post-excavation programme on material within the Gwithian archive. This work comprised a comprehensive audit and appraisal alongside rapid and detailed assessments. This document is a compilation of individual assessment reports carried out on a number of datasets within the Gwithian archive. It is a companion volume to volume I.

Introduction

1.1 Project background

For over 20 years, during the late 1940s through to the 1960s, the sand dunes at Gwithian in West Cornwall became the scene of a major landscape study. During that time over 70 sites, dating from the Mesolithic through to the post-medieval periods, were discovered and investigated to varying degrees, through large and small-scale excavations, field survey and field-walking. The extent of the study area was approximately 15 sq km. This project was directed by Charles Thomas (Thomas 1958) and throughout its history, discoveries entirely new to Cornish and British archaeology were made. While some of the results of this work were published as interim statements, the opportunity to fully publish the results of this major study did not materialise.

From 2003 to 2006, work on a number of datasets within the Gwithian archive has taken place as part of a major programme of post-excavation work. This document is a compilation of individual assessments commissioned as part of the Gwithian archive project.

The project has been funded through the ALSF scheme administered by English Heritage. Since 2003, work on the material has gone through a number of stages. The first stage (2003 - 2004) was a comprehensive audit of the entire archive which resulted in detailed summaries of all the work on sites of different periods examined by the Gwithian archaeological project. During this initial project, the entire archive was audited, listed and rapidly appraised. The results were presented in a number of summary documents.

- *Archaeology Beneath the Towans Excavations at Gwithian, Cornwall 1949-1969 Updated Project Design* - Design for Assessment, analysis and publication March 2004, J A Nowakowski, An HES (projects), Truro, Cornwall.
- *The Gwithian Project - Summaries and Evaluations of Enumerated Sites* September by J Sturgess, 2004a. An HES (projects), Truro, Cornwall. Report no: 2004R069.
- *The Gwithian Project 1949 – 2004 Paper Archive Inventory* November 2004 by J Sturgess 2004b. HES (projects report), Truro, Cornwall. Report no: 2004R070.

From 2005 to 2006 work has concentrated on a number of key datasets principally focussing on two major excavations - the Bronze Age and the post-Roman sites with some limited re-examination of the work on the Roman period enclosure ditch found at Crane Godrevy.

In June 2005 a small field sampling exercise took place at the Bronze Age site GMXVII. Alongside the recovery of palaeo-environmental samples, samples for OSL dating were colleted. A scientific radiocarbon (AMS) dating programme on a selection of samples from the Bronze Age and post-Roman sites has also taken place. These linked pieces of work have produced a number of stand alone reports which are listed as follows:

- *Archaeology Beneath the Towans Excavations at Gwithian, Cornwall 1949-1969 Project Design for Assessment of Key Datasets* February 2005 by J A Nowakowski *et al*. HES (projects), Truro, Cornwall.
- *Gwithian, Cornwall Report on Palaeo-environmental sampling fieldwork June 2005* Scheduled Monument Cornwall 771 by J A Nowakowski, J Sturgess and A Lawson-Jones, 2005 An HES report (projects), Truro, Cornwall. Report no: 2006R042
- *Crane Godrevy, Revisited. Archaeological excavation of enclosure ditch between 1956 and 1969 in Cornwall* by J Sturgess and A Lawson-Jones, 2006a. An HES report (projects) no 2006R066, Truro. Cornwall.
- *Bronze Age Gwithian, Revisited. Archaeological Excavations between 1956 and 1961 in Cornwall* by J Sturgess and A Lawson-Jones, 2006b. An HES report (projects), Truro, Cornwall. Report no: 2006R067, Vols I & II.
- *Post- Roman Gwithian, Revisited. Archaeological Excavations between 1953 and 1958 in Cornwall* by J Sturgess and A Lawson-Jones, 2006c. An HES report (projects), Truro, Cornwall. Report no: 2006R072, Vols I & II.

This current document is also a product of this work and is a companion volume to the overall summary of the results of the assessment of the key datasets as identified in the February 2005 project design (see above).

1.2 Structure and content of this document

This document is divided into 4 sections and the contents of each section relates to specific programmes of work on this large archive (see above).

Section 1 comprises assessments of a number of individual classes of key (finds) datasets related to the sites at Sandy Lane (SL) , Old Lands Surface (OLS), Wheal, Emily (WE), and Gwithian Towans, the major Bronze Age excavations (sites GMIX, GMX and GMXV) and the post-Roman excavations (sites GMI, GMA, GMB, GME and GMIV). All these assessments were carried in 2006.

Section 2 comprises reports on individual classes of datasets (finds and palaeoenvironmental samples) excavated during fieldwork at the Bronze Age site GMXVII in June 2005 (Nowakowski, Sturgess and Lawson-Jones 2006). All these assessments were carried in 2005-6.

Section 3 reports on individual classes of data which were ***rapidly assessed*** and ***appraised*** during the *initial programme* of work on the Gwithian archive from 2003 to 2004 (see above). These were originally presented and summarised in *Archaeology Beneath the Towans Excavations at Gwithian, Cornwall 1949-1969 Project Design for Assessment of Key Datasets* (Nowakowski 2004). These reports comprise statements on a whole range of finds dating to different periods and as well as dealing with datasets from the major excavations (which were the subject of major post excavation work in 2005-2006, see above). There is also data within these reports which relate to sites investigated as part of the wider landscape study at Gwithian ***but which have not*** **been subject to a thorough recent review**. These reports were produced during 2003-2004 *before any detailed work on the structure and stratigraphy had taken place.* All these reports must therefore be treated as working documents produced as part of a rapid appraisal of the entire material archive conducted at that time.

Section 4 presents the results of two major dating programmes on data in the Gwithian archive. The first discusses the results of the OSL (Optically Stimulated Luminescence) dating programme which took place at the Bronze Age site GMXVII in June 2005. It is followed by a report (which also combines the OSL results) on the pilot radiocarbon (AMS) dating programme on a number of selected ceramic residues selected from the Bronze Age and post-Roman sites. These studies took place during 2005 - 2006.

Publications

A summary paper discussing the results of all recent work on the Gwithian archive will be published in a forthcoming volume of *Cornish Archaeology* (Nowakowski, Quinnell, Sturgess, Thorpe and Thomas forthcoming). This will include a statement which publishes the results of the scientific dating programme by D Hamilton, P Marshall, H Roberts, C Bronk Ramsey and G Cook.

An illustrated summary of the results of the Bronze Age excavations was published in *British Archaeology* in August 2006 called “Life and Death in a Cornish Valley” by J A Nowakowski.

A summary of the results of the Bronze Age excavations will be published in a forthcoming Prehistoric Society monograph *Land and People* – Papers in tribute to John Evans. This is called “Living in the Sands - Bronze Age Gwithian, Cornwall, Revisited” by J A Nowakowski.

An illustrated summary of the results of the post-Roman excavations will be published in a forthcoming issue of *Current Archaeology*.

1.3 The Archive

The entire material archive was audited and finds re-bagged and re-boxed during initial work on the archive in 2003-2004 (see Volume I, Section 2.3.1 and Nowakowski 2004). All finds have been placed within the Royal Cornwall Museum, Truro. In 2005-6 an Access database was developed for the finds relating to the Bronze Age and post-Roman excavations. The entire site documentation (field notes, books, finds registers, correspondence, field drawings and photographs) have been listed and catalogued and stored in archive boxes (Sturgess 2004a and 2004b). This part of the archive will be deposited in the Royal Cornwall Museum, Truro on the completion of this project. A security copy of the entire site documentation was placed into the Royal Cornwall Museum in 2004.

A copy of the digital archive created during this project has been deposited with the Archaeological Data Service (AHDS Archaeology at the University of York).

1.4 References

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SECTION 1

2 Gwithian Assessments of finds 2006

2.1 Assessment of pre-grass-marked pottery from the Sandy Lane sites

Henrietta Quinnell with Carl Thorpe

Dated: May 2006

2.1.1 Introduction

The material has been grouped as accurately as possible following data in the archive, which makes clear that some locations are tentative. Figures 5, 7 – 11 in Nowakowski 2004 show site locations. All comes from surface collections. The quantity of grass marked/bar lug/Sandy Lane pottery in each location is noted but this has not been assessed. A range of stone artefacts and of ecological material is recorded in the archive but is not considered here as it is impossible to tie this to periods of activity represented by the ceramics. It may be noted that the HER includes records of other prehistoric finds from this area which do not form part of the archive, including PRN 37111 a side-looped bronze spearhead and 37021 part of a slate wristguard. The sites are presented from the south west to the north east.

Some sherds collected from the surface have been heavily abraded by blown sand. Comments on abrasion relate to breaks unaffected by such erosion.

No sherds have residue.

2.1.2 Gwithian Towans SW 576 408 Cliff exposure

c 1980 HJ Berryman (Marked 'Cliff Exp.Berry')

Trevisker Middle Bronze Age

Sixteen sherds, gabbroic admixture fabric. One sherd has a slightly everted rim with internal bevel; neat sloping incisions on exterior. A second b/s has similar decoration. The form and decoration of both sherds are entirely typical of Middle Bronze Age Trevisker assemblages and the appearance of the remaining sherds is consistent. Sherds generally fresh with only one sand-eroded.

2.1.3 Gwithian Towans Wheal Emily and Southward

HJ Berryman (Marked 'G Tow Berry')

Trevisker Middle Bronze Age

One hundred and forty six sherds, 2380g, gabbroic admixture fabric. Sherds are generally small with no conjoins and vessels do not merit illustration. Five rims (Bag 10) have cord impressed decoration surviving only as horizontal bands*:* both parallel and opposed twist are represented, one with six adjacent lines of parallel twist: two of these rims are out-turned, flat-topped and heavy and come from Style 1 storage vessels. 18 body sherds (Bag 10) have cord impressed decoration, some of them indicating complex bordered chevron designs. Incised decoration is represented by 19 sherds (Bag 13) represented neat, unbordered, designs with chevrons: One of these has an out-turned rim with internal bevel. There are two further plain out-turned rims (Bags 2, 9). Some 17 sherds (Bag 12) represent parts of base or base angles, mostly from large storage-type vessels. The assemblage is generally fresh, with perhaps 5% sand-eroded.

Roman period

Five sherds, 80g, (Bag 2) gabbroic fabric include two lugs from Type 12 vessels and a handle with a central groove.

Grass-marked/bar- lug/Sandy Lane

Represented by c 14 sherds.

2.1.4 Wheal Emily SW 5787 4157

1993 (Marked 'WE 13')

Roman period

1 sherd, 100g, gabbroic fabric with burnish (Bag 13), unusual piece with an apparent lug projecting from rim and interior strengthening. Perhaps an unusual version of a Type 12 lug which would not be later than mid 2nd century AD on the quality of fabric.

2.1.5 Gwithian OLS

(Marked 'OLS')

Trevisker Middle Bronze Age

Thirteen sherds, 208g, gabbroic admixture fabric, including substantial lug scar from biconical vessel (Bag 10), two small sherds with impressed cord decoration (Bag 13), and two basal angle sherds (Bag 10). Most of these are sand eroded.

Early Iron Age

Nine sherds, 70g, well made gabbroic fabric (Bag 7). Four of these sherds have sharp carinations and are likely to come from open bowls; these sherds all have areas of burnish either on the interior or exterior.

Middle Iron Age

Two sherds, 14g, gabbroic fabric (Bag 10), may be Middle Iron Age. One has a tooled curvilinear line similar to those on South Western Decorated vessels, the other is a simple bead rim.

Roman

Nine sherds, 62 g, including the rim from a small Type 11 jar (Bag 10) , chunk with groove from Type 16 storage jar (Bag 9) and probable sherd from Type 20 bowl (Bag 13). The range of forms could be accommodated in the second to third centuries AD.

Grass-marked/ bar-lug/ Sandy Lane

Represented by c 197 sherds.

2.1.6 Gwithian OLS collected as Berryman Gwithian Towans Area 5

(Marked 'G.Tow OLS Berry Area 5')

Trevisker Middle Bronze Age

2 sherds, 21g, gabbroic admixture, bodysherds (Bag 8) one with single impressed cord line. Generally abraded.

Roman

4 sherds, 30g, four body sherds (Bag 8), likely to be Roman period on fabric.

2.1.7 Sandy Lane

from C Thomas intervention (marked SL); this material was included in the 2004 assessment

Trevisker Middle Bronze Age

C 20 sherds, gabbroic admixture, one with an impressed opposed twist cord line (Bag Number 33)

Roman

Rim of a Type 4 Roman jar, reduced gabbroic fabric (Bag Number 41).

Grass-marked/bar-lug/Sandy Lane

Represented by c. 2600 sherds.

2.1.8 Hockins Pit SW 5848 4148 in 1990

(Marked 'HP 1990 P.Steele')

Trevisker Middle Bronze Age

Fifty three sherds, 794g, including 6 rims (Bag 5) one with sharp out-turn, internal bevel and finger nail decoration around girth, eight sherds with cord impressed decoration (Bag 6) all parallel twist: several of these belong to complex bordered designs with chevrons and one has an unusual curved loop at the base of the design. Also two basal angle sherds (Bag 4).

Roman

Ten sherds, 100g, gabbroic and probably Roman period on fabric (Bag 11). One sherd has probable girth groove from Type 16 storage jar.

Gwithian Style

Bag 10 contains 46 sherds, 413g, gabbroic fabric of which the principal distinctive pieces are a Gwithian Style platter with thumbed sides and sanded base and a range of jar rims all of which may have comparanda among the Gwithian Style.

Grass-marked/ bar-lug/Sandy Lane

Represented by 578 sherds

2.1.9 Hockins Pit collected as Gwithian Towans Area 1

HJ Berryman (Marked 'Hockins Pit Berryman Area 1')

Trevisker Middle Bronze Age

Three sherds, 46g, gabbroic admixture fabric (Bag 5), including one with part of lug scar and incised design.

Iron Age

Six sherds, 71g, well made gabbroic fabric(Bag 3) which suggests these are Middle to Late Iron Age or possible Roman period up to the mid 2nd century AD.

Iron Age ?

One sherd, 4g, gabbroic fabric (S Hartgroves 1993 Bag 4), has fine diagonal scratches on exterior and appears to be Middle Iron Age.

Gwithian Style

Five sherds, 73g, similar gabbroic fabric (Bag 2), includes bowl rim which probably belongs to the Gwithian Style

Also

Lump of baked clay, 174g, one surface possibly smoothed. Microscopically examined by Roger Taylor and shown to be local clay mixed with beach sand.

Grass-marked/ bar lug/Sandy Lane

Represented by 265 sherds

2.2 Comment

Trevisker Middle Bronze Age

Some 253 sherds have been identified, present on all four sites immediately south of the Red River and a further site c 1 km south west down the coast at SW 576 408. These are all of a similar gabbro admixture fabric, generally rather harder than that present on the excavated GM sites. The style of vessels and their decoration is generally similar to those from “Layer 5” (Phase 3) as opposed to “Layer 3” (Phase 5) with its untidy incised decoration. The presence of rims from Style 1 (Parker Pearson 1990) storage vessels in the Wheal Emily area should indicate, for this location at least, some form of reasonably permanent settlement. The sherds have all been collected from the surface and indicate the presence of extensive Middle Bronze Age settlement on the south side of the Red River. Unfortunately the area has now been very much disturbed and any investigation of these sites is not feasible. Against the total sherds of this date from the GM excavations, around 3000, these 250 surface sherds form a sizeable total. They should be included in any full analysis of the GM material to provide contextual background for Middle Bronze activity in the Gwithian area. While the sherds are probably too fragmentary to merit illustration, they need detailed cataloguing to provide comparanda with the GM material. Further information should be provided by their petrology. The non-gabbroic inclusions in the gabbroic admixture fabric should be identified and compared with those on GM sites. In addition there is the strong indication, provided by the presence of unbaked gabbroic clay in GMX and GMXI in “Layer 3”, that gabbroic clays were being imported and potted at Gwithian. While there are as yet no clear indicators of local manufacture at Gwithian predating the Layer 3 assemblage, these may be provided on analysis. (A lump of baked clay from Hockins Pit, thought possibly to be of gabbroic clay, was microscopically examined by Dr R Taylor and shown to be of local clay mixed with sand).

Early Iron Age

The small group of nine sherds from OLS fill in a lacuna in the settlement sequence from the Gwithian area. The sherds come from open carinated bowls, only otherwise known in Cornwall from Bodrifty (Dudley 1956, Fig 9) and Nornour (Butcher 1978, Fig 24). These bowls do not occur in the Plain Jar Group of the seventh/sixth to fourth

centuries BC (Quinnell forthcoming a) and it is probable that they belong to an earlier ceramic phase than the Plain Jar Group, perhaps centring on the eighth century BC. At least two similar vessels are represented. It is noteworthy that these vessels are in well made gabbroic fabric with burnish, the earliest date at which this good quality version of gabbroic fabric has been found.

Middle Iron Age

The two suggested sherds from OLS also help fill the settlement lacuna of the first millennium BC. The body sherd is probably an irregularly decorated example of Middle Iron Age South Western Decorated Ware, and the rim sherd could also be of this date. The only other site at Gwithian which has produced similar ceramics is Godrevy Hillside (site GH), where a rim and some body sherds appear to be of this type.

Roman

The 31 Roman period gabbroic sherds form a sparse scatter across the four principal sites, Wheal Emily, OLS, Sandy Lane and Hockins Pit. The Type numbers used to describe sherds above relate to the nomenclature devised for the large Roman period assemblage from Trethurgy (Quinnell 2004, Chapter 5). The dates of the Types could all be accommodated within the second to third centuries AD. Pottery of the Roman period has previously been found at Gwithian at Porth Godrevy, Crane Godrevy and, probably, Godrevy Hillside. This sparse scatter of sherds perhaps points to general activity in the south of River area, such as the spreading of waste on agricultural land, rather than to the presence of settlement structures.

Gwithian Style

The Hockins Pit area has produced about fifty sherds which may belong to the post-Roman Gwithian Style. The Style is distinguished by low-walled platters without grass marking and a range of, generally high fired, jars and bowls in a range of forms which need further study. The Style was first identified in the lower levels of GM 1 (Thomas 2005) which provides the largest assemblage known to date. This assemblage was however only rapidly appraised in 2003 and needs further study. An assemblage from Boden Vean (Quinnell forthcoming b) demonstrates the potential range of forms. Compared to later grass marked wares, sites with Gwithian Style material are few in Cornwall and it is therefore significant that this material occurs in a second location at Gwithian itself. It is recommended that work on the Hockins Pit material be included in any future assessment of the GMI assemblage.

2.3 Preliminary note on further work

Two days work for detailed cataloguing and comparanda of the South of River Trevisker material with that from the main GM sites should be allowed. In addition six thin-sections should be allowed, with two days work for petrological examination. Work on the Iron Age and Roman material, which needs neither illustration or petrology, should take a further half day's work, in view of the lack of comparanda for the Early Iron Age material among the excavation assemblages. The Gwithian Style material needs full assessment and is likely to require about a day's cataloguing and a day's work for an illustrator to provide drawings supplementary to those from GMI.

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3 Gwithian: Bronze Age Objects and waste of bone and antler

Ian Riddler

Assessment Text, *amended version*

Dated: November 2006

3.1 Introduction

A total of 57 objects and 10 fragments of waste were submitted for assessment. The majority of these items come from contexts of prehistoric date, largely dating to the mid-late Bronze Age to early Iron Age. All of the objects have been examined, in some cases under low magnification, to determine their species and skeletal element. In the first part of the report, the objects are briefly described in terms of their bone type, wear and function, within the two broad period bands. In the second part of the report the potential of the objects is addressed, in terms of their local, regional and national significance, in relation to the nature of the site itself.

3.2 The Later Prehistoric Assemblage

Quantity, Species and Element

The later prehistoric assemblage consists of 53 objects, two unfinished objects and ten fragments of antler and bone waste (Table 3.1). Two further fragments of bone are not thought to have been worked. Pointed bone implements dominate the identifiable objects, although there are also bladed tools and gouges, as well as needles and pin-beaters. Beads, combs and other objects, which include two toothed tools (or "pot stamps"), occur either singly or in small numbers. They can be separated into broad descriptive types, following the arrangement used for the larger late Bronze Age assemblage from Potterne (Seager Smith 2000, 223). This scheme distinguished seven groups:

1 Pointed Tools

2 Bladed Tools

3 Toothed Tools

4 Spatula Tools

5 Dress, Decorative or Gaming Artefacts

6 Miscellaneous Bone Objects

7 Antler Objects

The Potterne scheme was based on an earlier treatment of Iron Age material from Wessex and is of value for the way in which it separates objects into basic, descriptive categories. The categories do not represent functional interpretations but reflect instead the properties of the objects themselves. The scheme also has its drawbacks, an analysis of which lies beyond the scope of this assessment, but it forms a useful means of ordering the assemblage, albeit with a few necessary amendments. The seventh category is a distinction of material rather than form and it has not been used here. An eighth category, of waste material and unfinished objects, has been added to the list. The categories are described in turn and the question of functional interpretation is then considered. Type designations in italics within brackets in the text are those used for Potterne.

Site	*Bag*	*Species*	*Element*	*Object*	*Extent*
GMX	323	Cattle	Metatarsus	Pointed Bone Implement	Complete
GMX	372	Cattle	Metatarsus	Pointed Bone Implement	Complete
GMX	0	Cattle	Metatarsus Proximal End	Pointed Bone Implement	Incomplete
GMX	395	Roe Deer Antler		Pointed Bone Implement	Near Complete
GMX	770	Cattle Sized	Midshaft	Pointed Bone Implement	Complete
GMX	447	Cattle-Sized	Midshaft	Pointed Bone Implement	Complete
GMX	598	Ovicaprid ?	Midshaft	Pointed Bone Implement	Complete
GMIX	89	Cattle Sized	Midshaft	Pointed Bone Implement	Complete
GMX	737	Cattle Sized	Midshaft	Pointed Bone Implement	Near Complete
GMX	372	Cattle Sized	Tibia ?	Pointed Bone Implement	Complete
GMX	440	Ovicaprid	Metatarsus, towards Distal End	Pointed Bone Implement	Complete
GMX	633	Ovicaprid	Radius, Proximal End	Pointed Bone Implement	Complete
GMX	627	Ovicaprid	Tibia, towards Distal End	Pointed Bone Implement	Complete
GMXV	88	Ovicaprid	Distal Radius	Pointed Bone Implement	Near Complete
GMX	737	Ovicaprid	Midshaft	Pointed Bone Implement	Complete
GMX	77	Ovicaprid	Tibia, towards Distal End	Pointed Bone Implement	Complete
GMX	707	Ovicaprid	?Metatarsus, Unfused Distal End	Pointed Bone Implement	Fragment
GMIX	112	Ovicaprid	Midshaft	Pointed Bone Implement	Complete
GMX	640	Ovicaprid	Midshaft	Pointed Bone Implement	Complete
GMXV	153	Cattle Sized	Midshaft	Pointed Bone Implement	Complete
GMX	75	Pig Fibula	Distal end	Pointed Bone Implement	Complete
GMIX	0	Cattle Sized	Midshaft	Pointed Bone Implement	Fragment
GMX	548	Ovicaprid	Midshaft	Needle	Near Complete
GMX	737	Ovicaprid	Midshaft	Needle	Fragment
GMIX	103	Cattle	Metapodial Midshaft	Pin-beater	Near Complete
GMX	242	Cattle	Metatarsus	Pin-beater	Complete
GMX	603	Animal Rib	Animal Rib	"Pot Stamp"	Near Complete
GMX	791	Animal Rib	Animal Rib	"Pot Stamp"	Complete
GMX	120	Animal Rib	Animal Rib	Rib Blade	Fragment
GMX	69	Animal Rib	Animal Rib	Rib Blade	Fragment
GMX	405	Animal Rib	Animal Rib	Rib Blade	Complete
GMX	546	Animal Rib	Animal Rib	Rib Blade	Fragment
GMIX	65	Cattle Sized	Animal Rib	Rib Blade	Complete
GMX	709	Animal Rib	Animal Rib	Worked Rib	Fragment
GMX	598	Animal Rib	Animal Rib	Worked Rib	Fragment
GMX	489	Animal Rib	Animal Rib	Worked Rib	Fragment
GMIX	92	Animal Rib	Animal Rib	Worked Rib	Complete
GMX	622	Cattle Sized	Animal Rib	Worked Rib	Complete
GMIX	158	Cattle Sized	Animal Rib	Worked Rib	Fragment
GMIX	32	Antler ?		Comb	Fragment

GMX	363	Antler	Crown	Gouge	Fragment
GMIX	138	Cattle	?Radius, towards Proximal End	Gouge	Complete
GMX	651	Cattle	Metacarpus Midshaft	Gouge	Fragment
GMX	161	Horse ?	Metatarsus ?	Gouge	Fragment
GMXV	177	Cattle	Metatarsus Proximal End	Gouge	Complete
GMXV	209	Cattle Sized	?Metacarpus Midshaft	Gouge	Fragment
GMIX	92	Cattle Sized	Midshaft	Gouge	Complete
GMX	754	Cattle Sized	Midshaft	Gouge	Fragment
GMXV	32	Cattle Sized	Midshaft	Gouge	Fragment
GMIX	15	Bone or Antler		Bead	Complete
GMX	87	Cattle	Phalange	Perforated Phalange	Complete
GMX	731	Roe Deer Antler	Burr and beam	Object	Fragment
GMX	0	Whalebone		Vertebra	Fragment
GMX	802	Roe Deer Antler	Tine	Waste	Fragment
GMIX	58	Roe Deer Antler	Upper Part	Waste	Complete
GMX	709	Red Deer Antler	Tine	Waste	Fragment
GMX	807	Red Deer Antler	Tine	Waste	Fragment
GMIX	68	Red Deer Antler		Waste	Fragment
GMIX	68	Red Deer Antler		Waste	Fragment
GMIX	80	Red Deer Antler		Waste	Fragment
GMIX	108	Red Deer Antler		Waste	Fragment
GHX	386	Red Deer Antler		Waste	Complete
GMIX	111	Cattle	?Metacarpus Midshaft	Waste	Fragment
GHX	386	Red Deer Antler		Unfinished Object	Incomplete
GMX	813	Ovicaprid	Metatarsus Midshaft	Unfinished Object	Complete

Table 3.1

Prehistoric Objects and Waste Material

3.2.1 Pointed Bone Implements

This category dominates the later prehistoric assemblage, as is usually the case with material of this date. Twenty examples of pointed bone implements can be identified, most of which came from GMX. They have been separated here into four types, with several sub-types.

1 LARGE BONE AND ANTLER IMPLEMENTS (*1.1*)

Four examples, all from GMX, can be assigned to this category. Three of these have been produced from cattle metatarsals and two are near complete, allowing the object type to be defined with some precision. With these two examples the proximal end of the bone has been trimmed and perforated axially, and the midshaft has been elegantly sliced, ending in a rounded point. A lateral perforation occurs a little below the proximal end. The third, fragmentary example has been perforated axially and lacks most of the midshaft. It differs from the other two implements, however, for the lack of a lateral perforation near the proximal end and the proximal end is little modified, so that it resembles socketed points of the late Saxon period (MacGregor,

Mainman and Rogers 1999, 1989-90), although it is almost certainly of prehistoric date.

The fourth implement is a roe deer antler, for which two of the tines have been removed, leaving the skull-attached burr and coronet, the beam and the central tine. The end of the tine has been trimmed to a rounded, knopped point.

2 AWLS (*1.4*)

Nine objects can be placed in this category. Awls can be defined as implements with sharp, tapering points of circular section. They can be subdivided into two types. With the first, which consists of three objects, the points widen evenly to distinct junctions with the main part of the object. As a result, the points could only be inserted to a certain length into organic or other material. Two of these awls are made from cattle-sized bone and the third is probably ovicaprid (possibly from a metatarsus) and includes a perforation at the blunt end. One of the awls appears to have been manufactured from a re-used section of a gouge.

The second type retains the tapering point of circular section but lacks the distinct junction with the shaft. The six examples of this sub-type include five from GMX and one from GMIX. Some of the points are shorter and more rounded than with the awls of the first type. This is essentially a small type of implement and most are a little shorter in length than the first sub-type, and are mainly produced from sheep or goat bones (most of which are probably sheep), including the metapodia, radius and tibia. Three slightly larger examples have been cut from cattle-sized midshaft sections. Objects of this type are common in Bronze Age contexts elsewhere in southern England.

3 BROAD BLADE IMPLEMENTS (*1.3*)

The three implements within this category have sliced midshafts leading to broad, rounded points. In effect, they are smaller versions of the type 1.1 implements noted above, produced from ovicaprid bones. Two examples come from GMX and one from GMXV. One example retains the distal end of the tibia, with a lateral perforation above it, a typical form of the mid to late Bronze Age. A further example from GMXV, elegantly produced from a distal radius, is similar to a series of objects of Anglo-Saxon date, identified as bone spearheads used in fishing (Riddler forthcoming A), but the basic object type goes back to the later prehistoric period.

4 SMALL POINTED IMPLEMENTS (*1.2*)

This category includes two types of object. Three implements, two from GMX and one from GMIX, have short points trimmed from tapering sections of ovicaprid midshaft. In one case part of the distal end of the bone remains and the point has fractured, making this the only pointed terminal that is no longer present within the entire assemblage. These are short, small implements, similar to the second type of awl but with short, rounded points.

A second group consists of two disparate objects, one of which is a pig fibula with a carefully modelled, straight shaft, whilst the other is a cattle-sized midshaft of square section with a rounded terminal at one end. Both conform with the definition of this category as tools less than 75 mm in length, with a worked point at one end, although this is clearly a broad grouping that can encompass a variety of object types. The pig fibula comes from GMX and the other object from GMXV.

3.2.2 Weaving Implements

Weaving implements form a separate interpretive sub-group within the Potterne classification and include needles (type 1.6). Two single pointed pin-beaters can be identified at Gwithian and they are also described here.

NEEDLES (*1.6*)

Two needles came from GMX. One of them is an elegant example produced from a pig fibula with a modelled head cut from the distal end and an oval perforation. The second object has the vestige of a possible perforation at the broad end but is otherwise a thin, rectangular section of midshaft with a pointed terminal. In strict terms, it may not be a needle and it requires further investigation.

PIN-BEATERS

Two bone implements of a similar length widen evenly from short points to midshafts of rectangular section with rounded ends. They are substantially similar to single pointed pin-beaters of post-Roman date (Walton Rogers 1997, 1755-7; Becker 2001; Riddler, Trzaska-Nartowski and Hatton forthcoming). However, they have not been produced to the near-uniform high standard of smoothness and polish of the post-Roman series, and they could be of an earlier date, although they are unparalleled in later prehistoric assemblages. Both came from Phase 5 (Layer 3) contexts, at GMX and GMIX, and they should, therefore, be of Bronze Age date.

3.2.3 Bladed Tools

Two forms of bladed tool are present within the assemblage, namely rib blades and worked animal ribs.

1 RIB BLADES (*2.2*)

Four of the five rib blades come from site GMX, and the other is from GMIX. With one exception, they are narrow implements formed from split sections of rib, rounded at one end. With one example only part of the rib has been split away, but the object conforms readily with the type. One section of rib has a rounded end, but is much broader than the remainder of the group.

2 WORKED RIBS (*2.5*)

This type encompasses the remaining pieces of animal rib, most of which have only been slightly worked. Four come from GMX, with one from GMIX and the sixth example from GMIX. Unlike the rib blades, these objects retain both sides of the rib, and all six examples are fragmentary. Two have lateral incised lines on them, whilst two others have rounded ends. The fifth example merely has a longitudinal line incised into it and it may represent an early stage in the division of the material to form a rib blade. The same can be said of the sixth example, which has been lightly modified from one end of a cattle-sized rib.

3.2.4 Toothed Tools (3.1 and 3.2)

Two forms of toothed tool occur within the assemblage. There is a single example of a fragmentary comb (*3.1*), as well two toothed tools or "pot stamps" (*3.2*).

1 COMB (3.1)

The only other object to be assigned to this sub-category is a fragment from a comb from GMIX, for which several of the teeth remain. The fragment survives in poor condition, unfortunately.

2 TOOTHED TOOLS "POT STAMPS" (3.2)

The two "pot stamps", both made from animal rib, are amongst the best-known objects from Gwithian, and are of great significance. One example (Bag 603) widens

evenly from the apex to a set of short teeth, spaced at 6 per centimetre, with most of the teeth now worn and fragmentary. The second example (Bag 791) is much smaller, with parallel sides and short teeth of a similar style, also set out at 6 per centimetre.

3.2.5 Spatulate Tools

A broad definition of this group is provided here, enabling the series of gouges to be included. All of the examples of this group are made from cattle-sized bones. Four come from GMX, two from GMIX and three from GMXV. Two types of gouge can be identified from the three examples that are complete or near complete. The first has a broad blade cut from the midshaft and a hollow section of bone or antler behind it, whilst the second consists entirely of a modified slice of midshaft, with no complete profile of the bone. Three of the complete or near complete examples belong to the first category, including one object made of red deer antler, alongside one fragment that probably belongs to this type. The antler object has a rounded blade but has not been hollowed and may be unfinished. There is one example of the second type. Four fragmentary pieces include parts of their rounded blades, but they are too small to be assigned to either of the types. The object type was not identified at Potterne, although one miscellaneous object could be placed within the group (Seager Smith 2000, fig 93.71). In general terms, the bone spatulate tools are similar to Legge's type 1 tools from Grimes Graves (Legge 1992, 43 and fig 20).

3.2.6 Dress, Decorative or Gaming Artefacts

A bone or antler biconical bead from GMIX forms the only object that can be placed in this category. The bead is barrel-shaped with a large axial perforation.

3.2.7 Miscellaneous Bone and Antler Objects

A section of roe deer beam from GMX has been trimmed around the burr and the coronet has been removed. It resembles several objects from Potterne (Seager Smith 2000, fig 96.92 and 94). The trimming of the burr would allow that surface to be used for grinding or polishing. The upper part of the beam is missing and that may have been trimmed to a point, allowing the object to fulfil several functions.

A section of whale vertebra represents one of the few unstratified items from the site. Little of the original surface remains and it is not possible to tell whether it had been used as a chopping block (Riddler 1998). It is a chance find, recovered from GMX some years after excavations had ceased, and it is not necessarily of prehistoric date. A cattle phalange has two perforations, one lateral and the other axial through the distal end. It can be compared with a series of similar objects of the same bone type, which were used as jiggers in line fishing. All of the other examples are of late medieval date (Riddler 2006, 174). The phalange came from a midden at GMX.

Two fragments of cattle-sized bone midshaft from GMIX form part of an implement, but only the upper end survives and the precise object type is unclear.

3.2.8 Waste and Unfinished Objects

This category consists almost entirely of fragments of antler, alongside one piece of bone and several unfinished objects. The antler waste includes fragments of both red and roe deer. Six pieces came from GMIX and four from GMX. The roe deer waste consists of the upper part of an antler and a small fragment from a tine, cut from a separate antler. It has been worked, albeit only slightly, and represents waste discarded during object manufacture. The red deer waste consists mainly of fragments of tines, together with one piece from a beam, and could all derive from a

single antler. It survives in reasonable condition, with some details of tooling. A fragment of a cattle metacarpus has been sawn neatly at one end, separating the midshaft from the distal end of the bone.

One possible unfinished worked rib has been noted above. A small ovicaprid metatarsus from GMX includes a groove along the anterior surface, where the bone has a natural channel. The intention here was clearly to cut the bone in half, using the groove and splinter technique (as Clark and Thompson 1953). In addition, a curved section of antler tine from GMX has a lateral incision at one end and vestiges possibly of teeth at the other; it could be an unfinished comb.

3.3 Condition

The condition of the objects and waste varies from fresh and clean with clear details of tooling, to heavily abraded fragments surviving in poor condition. Table 3.2 summarises the condition of the objects, which have been placed in four categories. Good condition indicates that the object shows details of manufacturing marks and also use wear, in some cases. However, most of the objects have been treated with lacquer or some form of PVA in the past and this means that it is not possible to analyse the polish applied to them during their use. Objects in reasonable condition retain their outer surface but show slight abrasion or damage. Those in abraded condition have pitted outer surfaces and it is not possible to see any tool marks or traces of wear, and the heavily abraded objects are in poor condition, with only a part of the original surface present.

Implement	*Type*	*Good*	*Reasonable*	*Abraded*	*Heavily Abraded*	*Total*
Pointed Bone Implements	1.1	2	2			4
Pointed Bone Implements	1.4	2		3		5
Pointed Bone Implements	1.3	1		2		3
Pointed Bone Implements	1.2	3	4	1	1	9
Needles	1.6	1		1		2
Pin-beaters		1	1			2
"Pot Stamps"	3.2	1	1			2
Rib Blades	2.2	2	1	1	1	5
Worked Ribs	2.5	1	4	1		6
Comb	3.1			1		1
Spatulate Tools		3	4	2		9
Bead	5.1		1			1
Miscellaneous Objects			2	2		4
Unfinished Objects		1	1			2
Waste		2	8			10
Total:		20	29	14	2	65

Table 3.2

Condition of the Prehistoric Objects and Waste

3.4 Potential for Analysis

3.4.1 Survival and Identification

As tables 3.1 and 3.2 indicate, the majority of objects are complete or near-complete (34 of 55, including the two unfinished objects), and almost all of them can be placed in a broad descriptive category. Several pointed bone implements are fragmentary and cannot be identified to a specific type or category. Unlike many assemblages, there are few examples of tapering points that have fractured from the remainder of the object. A few more of these would have been expected.

The identification of objects to species and to skeletal element is straightforward in some cases but is difficult with objects like the bead, where the bone or antler has been considerably modified. Similarly, the comb fragment appears to be antler, but has yet to be conclusively identified to material type. Distinctions can, however, be made in most cases between broad species: ie. between bone and antler. The antler items can be identified as roe or red deer and the skeletal element used for the bone items can also be identified in the majority of cases. Reasonable potential exists therefore for correlations between species, skeletal element and object type. The mechanical properties of antler differ from those of bone (MacGregor and Currey 1983; Deschler-Erb 1998, 55-67) and it will be possible to examine the choice of material for specific object types.

3.5 Wear and Function

The question of the function of the various forms of later prehistoric implement is a very difficult one to answer. Antler spatulate implements of early Bronze Age date illustrate this situation very well. Having been described as leatherworking tools, their association with archery equipment was noted, but then discounted in favour of an interpretation as pressure flakers for flint implements. A recent assessment of them notes that 'these tools could have been used for leather working, potting, flint-working, netting or archery. Spatulae and awls have been found together and with other bone tools such as rods, suggesting they formed part of a wider tool kit' (Barclay, Serjeantson and Wallis 1999, 236).

Functional interpretations can be provided in some cases, however, and the analysis of wear patterns can help in these determinations. The study of wear patterns has occasionally been undertaken on southern English prehistoric worked bone and antler objects, although it is more widely practised elsewhere (Semenov 1964; LeMoine 1997; Olsen 2003; Becker 2001). LeMoine has distinguished three forms of analysis, based on low power, high power and scanning electron microscopy, each of which has its advantages and disadvantages (LeMoine 1997, 15-16). Low power microscopy is the most appropriate technique for this assemblage. It is useful in determining manufacturing wear, but not use wear, which would be difficult to identify securely within the assemblage, because of the post-excavation treatment of the objects. The lacquer or PVA applied to a number of objects has preserved them well but has also obscured all traces of polish and most indications of use wear.

Table 3.2 indicates that 20 of the objects and waste survive in good condition and 29 in reasonable condition. Thus 75% of the objects and waste could be examined under low microscopy for indications of manufacturing wear, if not for use wear. Although this represents a reduced sample and deals only with manufacturing wear, a summary of that wear can assist in determining possible functions.

Functional interpretations can also be determined in part by relating the objects to their contexts. For example, Gwithian is a coastal site and some of the objects may reflect an interest in fishing practices, whilst others indicate craft activity within a domestic setting, as well as other occupations, possibly including hunting. From the brief functional interpretations provided above, crafts like leatherworking and textile

manufacture are readily apparent. A number of the objects could also have been used in pottery manufacture, including the two animal rib "pot stamps". The two "pot stamps" are extremely significant, as has been realised in previous discussions of Gwithian. Alongside other objects, they can be usefully compared with the near-contemporary sequence from Tinney's Lane, Sherbourne, where ceramics were manufactured (Riddler forthcoming B). Most of the functional interpretations offered are suggestions rather than certainties, but the potential exists to correlate the information available from the objects, their associations and their contexts, in order to examine their functions.

3.6 Intrinsic Dating

None of the objects can be dated with any precision and most can only be placed within a broad period band. The bone tools consist largely of types that can span a long period of time. It is worth noting that a more precise dating framework for late prehistoric bone objects is slowly developing, particularly for those of southern England. Whilst comparisons can be made with other sites within this region, the precision of dating is nonetheless still quite broad and ceramic dating remains much more accurate. Late Roman and post-Roman objects of bone and antler have been subject to overall surveys (MacGregor 1985), but this has yet to happen for objects of prehistoric date, with a few notable exceptions (eg Tuohy 1999). In most cases it can be said that the typological dating of particular object types generally agrees with the ceramic dating, without being as precise.

3.7 Spatial Distribution and Placement

Almost all of the objects include some form of context description, and are assigned to specific sites, cuttings and layers (Table 3.3). Most of the objects and waste come from GMX and GMIX, with small quantities from GMX, GMIXI and GMXV. Four objects are unstratified but can be attributed to particular sites.

Site	*Cutting*	*Phase*	*Quantity*	*Comment*
GMX	3	5	2	
GMIX	5	5	1	
GMIX	6	5	2	One disturbed in layer three
GMIX	7	5	3	
GMIX	5-7	5	9	
GMIX		5	1	Possibly belonging with bag 103
GMX	2	Midden	1	
GMX	3	5	2	
GMX	3	3	1	
GMX	3	Gully	1	
GMX	3	Midden	5	
GMX	3.5	5	4	
GMX	4	Dark Soil with Shell	1	
GMX	12	3/5	1	
GMX	18	3	1	

GMX	21	5	5
GMX	21	3	3
GMX	21		1
GMX	23	5	6
GMX	26	5	2
GMX	27	3/5	1
GMX	23 or 24	5	1
GMX	23-5	Floor	3
GMX		5	2
GMX			2
GMIXI			1
GMXV	9	2	1
	16	2	1
	19	3	2
	22	3	1

Table 3.3

Site, Cutting and Layer information

At this stage, no attempt has been made to correlate the objects with the site records and to examine their spatial distribution. The potential exists to examine both their distribution and their associations with other types of objects. Specific zones of activity may be identified within the site and production episodes may be localised from a consideration of the unfinished objects and the waste material. It is interesting to note that most of the waste consists of antler, whilst most of the objects are bone; but this is a common situation with prehistoric assemblages, where evidence for bone working is generally scarce.

The spatial distribution of the bone and antler objects provides good possibilities for examining questions related to the deliberate placement of objects, and the possible meaning of such depositions (Brück 1999a and b). In particular, a broader analysis of objects by descriptive category and functional type, linked to considerations of wear (where possible) and the completeness of artefacts, may reveal more detailed levels of spatial patterning. The bone and antler assemblage certainly provides this possibility, given its condition and relative completeness.

3.8 Local, Regional and National Significance

The local significance of the assemblage can scarcely be underestimated, given that it is practically the only worked bone and antler assemblage of the prehistoric period to have been discovered in Cornwall. Equally, there is little of any later period from the county, outside of the small assemblages from Mawgan Porth and Launceston Castle (Bruce-Mitford 1997, 85-6; Riddler forthcoming C).

Further to the east there are a number of contemporary or near-contemporary assemblages from south-west England, including those from Brean Down, Cadbury

Castle, Encombe, Maiden Castle, Potterne and Sherbourne. A number of these sites allow a perspective to be created for the Wessex region as a whole, against which the Gwithian material can be examined. Such comparisons can only be taken so far, particularly when a coastal site in Cornwall is being viewed against inland settlements some distance away, and some of these sites may have had specific functions of their own, creating a notable bias in their assemblages. Comparisons can be made with these assemblages for specific object types, in terms of their dating and functional interpretation. Regional distinctions may also be apparent, although these tend to be more obvious within categories like dress accessories, which are poorly represented at Gwithian. In contrast, pointed bone implements of the same form can be widespread across large areas of the country.

In the absence of any broad overview of bone and antler implements of the Bronze Age, the Gwithian material undoubtedly has a national significance. Most assemblages of this date are fairly small and many are smaller than Gwithian, or are of a comparable size, like Grimes Graves, for example (Legge 1992). Good assemblages are known from Runnymede and there is interesting material from East Anglia (both published and unpublished, particularly from Cambridgeshire) and from Lincolnshire, with small groups also from Kent. The significance of the Gwithian material lies in part in its mid Bronze Age dating. A lot of the comparable assemblages are later in date and extend from the late Bronze Age to the early Iron Age, or later. Equally, early Bronze Age material is familiar from sites like Stonehenge, but middle Bronze Age worked bone and antler is not particularly common.

Comparisons should also be made with prehistoric material from Ireland, although soil conditions there generally reflect those in Cornwall, and bone survival is poor. Where they have survived, as at Freestone Hill for example (Raftery 1994, 120-1 and fig 69), they provide a broader perspective and a useful counterbalance to the Wessex culture, which otherwise tends to dominate the discussion. Unlike England, most of the comparable Irish material is stored at one location, within the National Museum of Ireland in Dublin, and it is readily accessible for comparative study.

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4 Assessment report on Bronze Age clay refractories and stone mould from Gwithian, Cornwall

Stuart Needham

Dated: October 2006

4.1 Description and background

- 1 x fragt = GMX bag 28 cutting 4 context (56) which is a general occupation layer (Phase 5).
- 2 x frags = GM/X no context details
- 1 x frags = GM IX bag 46 cutting 2/3 context (1009) also general occupation layer (Phase 5).

Four fragments of clay mould have been identified amongst the Gwithian Bronze Age assemblage: two are from contexts, the other two being unstratified. All are from Phase 5 contexts. All four are small and more or less abraded. In two cases (both unstratified) this results in the object types cast being unidentifiable, although the moulds can still be recognised on fabric and form as probably of Bronze Age technology. The two contexted fragments offer some information on the cast objects and technology, and deserve full study.

4.2 Recommended work

- Describe all four for morphology and fabric (macroscopically)
- Draw the two diagnostic examples (sketches would be provided and final artwork checked)
- Suggested identifications for diagnostic fragments
- Discuss any implications for dating and production tradition (likely to be extremely limited in this case)

4.3 Work not thought worthwhile

- Testing for metal traces on surface, given post-excavation history
- Petrological analysis of clays [this would only be worthwhile as part of a programme of analysis on ceramic equipment from the site and/or region]

4.4 Comment on the stone mould and Bronze Age copper pieces

Parts of two separate matrices from the same stone block were found respectively in House 1 (175) GMX and House 4 (471) GMX. These have been published by Burgess (1976) and Needham (1981) but would benefit from re-examination in the light of current knowledge. Burgess suggests that the mould belongs to the Pennard phase of the Middle Bronze Age while Needham suggests a rather later date, at the start of the Stogursey tradition of the Late Bronze Age. The question of date and affinities needs resolution and analysis of metallurgical traces could be helpful: the presence of lead would support a later dating. There are three pins (two now missing) of 'Mels-Rixheim' type (Rowlands 1976) all from Phase 5 contexts from sites GMX and GMIX which are now missing but the drawings published by Rowlands would allow reconsideration. The awl (phase 1) and spatula (phase 3) from GMXV and the rapier blade fragment found from either a layer 3 or 5 horizon in 1988 could

also be usefully reconsidered and analysed metallurgically. The remaining 2 copper alloy fragments are currently of uncertain type but merit further study.

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5 Gwithian: Post-Roman Objects and Waste of Bone and Antler

Ian Riddler

Assessment Text, *Revised Version*

November 2006

5.1 Introduction

A total of nineteen objects of bone and antler and two fragments of antler waste have been assessed from the post-Roman Gwithian sites. The objects include several comb fragments, spindle whorls, pins and needles, as well as a small range of miscellaneous artefacts. All of the objects are of post-Roman date, with the possible exception of a serrated rib bone from GMI, which could be prehistoric. The majority come from GMI. They are summarised by object type in Table 5.1. The objects and waste fragments have been examined to determine their species and skeletal element, where possible. They are described by object type, within broad functional categories. Their condition and completeness has been considered, and traces of wear and polish have been noted.

5.2 Quantity, Species and Element

The nineteen post-Roman objects and the two fragments of antler waste are summarised in Table 5.1.

Site	*Species*	*Element*	*Object*	*Extent*	*Condition*
GMI	Pig ?	Femur Caput	Bead or Spacer	Complete	Reasonable
GMI	Ovicaprid	Rib	Decorative Comb	Complete	Good
GMA	Antler		Comb	Fragment	Reasonable
	Antler		Comb	Fragment	Reasonable
	Antler		Comb	Fragment	Reasonable
GMI	Ovicaprid	Metacarpus	Lucet	Complete	Reasonable
GMI	Antler		Mount	Fragment	Reasonable
GMI	Pig	Fibula	Needle	Fragment	Reasonable
GMI	Pig	Fibula	Needle	Incomplete	Reasonable
	Bird Bone		Needle ?	Incomplete	Good
GMI	Bone or Antler		Pin-beater	Fragment	Reasonable
GME	Ovicaprid	Scapula	Object	Near Complete	Reasonable
GMI	Bone	Midshaft	Object	Complete	Good
GMI	Ovicaprid	Metacarpus	Perforated Bone	Near Complete	Reasonable
GMI	Bone or Antler		Pin	Fragment	Reasonable
GMI	Ovicaprid	Scapula	Shovel	Complete	Reasonable
GMB	Cattle	Femur Caput	Spindle Whorl	Complete	Reasonable
GMI	Cattle	Femur Caput	Spindle Whorl	Complete	Reasonable

GMXX	Cattle	Femur Caput	Spindle Whorl	Complete	Good
GMI	Antler	Tine	Waste	Fragment	Good
GMIV	Roe Deer	Skull and Pedicle	Waste	Fragment	Reasonable

Table 5.1

Gwithian Post-Roman Bone and Antler Objects and Waste

They can be separated into a small number of functional categories, including dress accessories, personal items, weaving implements and household equipment, and they are briefly summarised by category below. The possible prehistoric implement (GMI, Decorative Comb) has been briefly considered in the assessment of the Bronze Age objects from Gwithian, but is described in more detail here.

5.3 Objects and Waste, by Category

5.3.1 Dress Accessories

A bead or spacer and a fragment of a pin can be placed in this category. The bead has been cut from a small unfused, possibly ovicaprid femur caput and it resembles a miniature spindle whorl, although it is too small and light for that purpose. It is not an elegant object but comparable examples have come from several post-Roman sites, where they appear to have been used as beads. A bone or antler midshaft has a circular section and is likely to derive from a pin, rather than a needle.

5.3.2 Personal Items

Three fragments stem from a minimum of two composite combs. Two end segments probably belong to either end of the same comb, a double-sided composite with connecting plates of trapezoidal section. One segment has a straight graduation of the teeth whilst the graduation is curved on the other piece, but otherwise they are very similar. The third fragment is a section of a connecting plate with pronounced saw marks from the cutting of the teeth on both sides, and a simple continuous lattice pattern at the centre.

5.3.3 Household Equipment

A fragment of an antler mount has a single ring-and-dot pattern close to its fractured edge, as well as a small rivet hole. The remainder of the mount is blank and it may stem from a casket, although this is by no means certain. The restrained decoration and treatment of both sides are not usually characteristic of casket mounts. As an alternative, it may have served as a furniture mount, or as a form of tag attached to a purse, an object type usually found in Roman contexts (Mikler 1997, 27-8).

5.3.4 Weaving Implements

Three spindle whorls, three needles, a pin-beater and a lucet can all be placed in this category. Two of the three cattle femur caput spindle whorls are complete and have been perforated, in one case with a square perforation, which is unusual but is not entirely unknown. The third example has been cut from the bone but has not been perforated. None of the needles are complete. Two examples are made from pig fibulae and one of these has fractured across a perforation and has subsequently been recut at the head. The second example retains the perforated head but lacks the lower part of the shaft. A third object is almost complete and has been lightly modified from a bird bone, with one end tapering to a point. There is no perforation

and in strict terms the object is therefore not a needle. However, thread could have been attached to the upper end without recourse to a perforation or, as an alternative, the object may have been used in the manner of an awl, accompanied by a needle. It has been provisionally placed in this category. The fourth object consists merely of the point of an object of bone or antler, which includes lattice decoration on one of its broader faces. Post-Roman bone or antler pins are seldom decorated along the shaft, and the width of the surviving segment suggests instead that this fragment formed part of a pin-beater, which was decorated towards its centre. Pin-beaters were ubiquitous weaving implements used to even out the warp spacing, to pick out threads and to push weft threads into position on the loom (Walton Rogers 1997, 175). The earliest examples in bone or antler are of late prehistoric date and they are commonly found in post-Roman deposits prior to the medieval period.

One object can be identified as a lucet, which in essence is a hollow section of bone with two sharp projections at one end, used in the production of braids. The lucet belongs to the longer, thinner type, usually made from sheep metapodia and cut from close to one end of the bone (Riddler and Walton Rogers 2006, 286).

5.3.5 Miscellaneous

Two ovicaprid scapulae and a perforated metacarpus can be placed in this category, as well as a slightly worked tibia fragment and an object formed from an animal rib, which may be of prehistoric date. One of the scapulae has been neatly trimmed to form a wide, spatulate object that may have been used in mixing or stirring materials, or as a smoothing blade. No residues survive on the bone, however. The other scapula is little modified, although two triangular cuts have been made into the lower end, which has been trimmed. An ovicaprid metacarpus has been perforated axially through the proximal articulation and the unfused distal end is no longer present. Perforated bones of this type occur in prehistoric contexts but have also been recorded in post-Roman deposits (Riddler 2005). A small fragment cut from the proximal end of an ovicaprid tibia has been rounded at one end, but is otherwise unworked.

A section of ovicaprid rib bone has a series of knife cuts at one end, forming a short, serrated edge. It is broadly similar to the decorative combs of prehistoric date from elsewhere at Gwithian (Riddler 2006) and could be a prehistoric implement, although a post-Roman date is also possible. There are examples of cut animal ribs from post-Roman contexts but most of these are generally larger and cattle-sized, and the longer edges of the ribs have been modified, rather than the ends (Riddler 2004, 60 and fig 39.5). However, there are some broadly similar and near-contemporary implements, which were used to decorate ceramics or leather with combed patterns (Riddler 1986b, 19 and fig 2).

5.4 Antler Waste

The waste material of antler consists of a small fragment of a red deer antler tine, as well as the pedicle and burr of a roe deer antler, from which the rest of the antler has been removed.

5.5 Condition

The condition of each of the objects is provided in Table 5.1. Most survive in reasonable condition, occasionally with some pitting of the outer surface and a loss

of detail of polish or surface treatment. Four objects and one waste fragment are in good condition, with evidence of manufacturing and wear patterns present.

5.6 Potential for Analysis

5.6.1 Survival, Identification and Context

Eight objects are complete, two are near-complete, two are incomplete and seven are fragmentary (Table 5.1). The fragmentary objects include the combs, a needle, a pin and a pin-beater. Little can be said of the pin, for which only a fragment of the shaft survives, but all of the remaining objects can be identified to type and in some cases, as with the combs and the pin-beater, their original form can be reconstructed, even if their full dimensions are not known. The majority of objects belong to familiar forms of the post-Roman period in northern Europe, where combs and weaving implements tend to be the most common encountered implements of antler and bone.

The raw material of each object can be distinguished to the basic level of bone or antler with just two exceptions, and the species of bone can be determined in most cases. No attempt has been made at this stage to identify the bird bone to species or skeletal element. This can be done at the analysis stage, in consultation with Andy Hammon, or with the faunal collection at Tring. The analysis of the animal bone assemblage may bring to light further examples of worked waste material, which need to be considered alongside the bone and antler objects. There is good potential to determine the correlation between the objects and the selection of materials for their manufacture. The relative lack of waste material or unfinished objects (at present) means that it cannot be said for certain that the objects were made at Gwithian, but broader comparative and technological analyses can help in this respect. It is inherently likely that most of the objects were made locally and a consideration of wear and spatial distribution will help in determining this, as far as possible. In particular, the wear on comb teeth can be used to determine whether they had been used before being discarded.

One object is unstratified and six others, as well as one fragment of waste, can only be identified to a particular site at present. In three cases even the identification of the site is uncertain (Table 5.1). The remaining objects have been assigned to specific contexts. Further investigation of the archive and consultation with Charles Thomas may possibly allow several of these objects to be provenanced a little more securely.

5.7 Wear and Function

Most of the objects survive in reasonable or good condition and it will be possible to examine traces of wear and polish on them, as well as manufacturing marks. This can provide indirect evidence of the tools used by the antler and bone worker. It might also be possible to identify some of the methods used in manufacture, which can vary across regions. The function of most objects is fairly clear, although the scapula implements are unusual in a post-Roman context and there are some uncertainties in relation to the decorative comb. It is worth noting that it is possible that the scapulae reflect a survival of prehistoric or Roman influence into the post-Roman period, given that worked examples are more commonly found in earlier

contexts. Similarly, the antler mount is redolent of Roman objects (bone *tesserae* and forms of comb used in textile manufacture) and the decorative comb from GMI, which could be of prehistoric date, can also be compared with Roman examples, as with those from Lyon or Richborough, for example (Béal 1983, 371-2 and pl LXI.1323-4). Béal considered that they were weaving combs, continuing the traditions of later prehistory, although they could also have been used as decorative combs on ceramics or leather. The trapezoidal section of one comb is certainly a post-Roman feature, but it too may echo late Roman practice (Riddler 1986A). At least some of the antler and bone objects may, therefore, reflect a continuation of Romano-British (or more properly, Romano-Cornish) practices, whilst others may have even earlier antecedents.

The general impression provided by the material is of craft and industry, with a preponderance of weaving implements. It is notable that the two dress accessories consist merely of a bead and a small fragment of a pin. This is a low representation of that functional category, even if the overall assemblage is only a small one. The combs may have been discarded by craft workers but a study of the wear patterns of their teeth can determine whether they have been used to any extent, allowing for the possibility that they were discarded during the manufacturing process, as working failures. They are hair combs and are not weaving combs, but they may also reflect on-site manufacture. Bone and antler working is often located close to other crafts in the post-Roman period, including ferrous metalworking and leatherworking, and this situation may prevail at Gwithian.

5.8 Intrinsic Dating

Few of the objects can be dated with any precision. They all fit well into a post-Roman milieu, accepting the slight reservations noted above about the decorative comb and scapulae. The two fragments probably from the same comb are of seventh century date, and a sixth to seventh century date can be given for the other comb. Bone femur caput spindle whorls are scarce before the seventh century, but common thereafter. Decorated double-pointed pin-beaters tend to be of seventh to eighth century date, or a little later. The majority of lucets are of ninth century or later date (Riddler and Walton Rogers 2006, 286), which is interesting in the context of the radiocarbon dates obtained for the post-Roman sites, because it is a slightly later date. Weaving implements change gradually in form over time and further work may help to clarify this small discrepancy in dating. In general, the bone and antler objects appear to be of sixth to seventh century date, most belonging to the seventh century, with the possibility that a few are slightly later.

5.9 Spatial Distribution

As noted above, eleven objects and one fragment of waste come from established contexts and it should be possible to examine their spatial distribution across the sites. This may allow for locations of bone and antler working or textile manufacture to be identified. The weaving implements can also be correlated for their distribution against objects of other materials used in the same processes. The decorative comb can be compared with the post-Roman ceramics, to see whether any correlation exists with them, and this may assist in determining its date.

5.10 Local, Regional and National Significance

As with the prehistoric implements of bone and antler, the scarcity of comparable post-Roman assemblages from Cornwall greatly enhances the local and regional significance of the material. Post-Roman objects generally of a later date have been recovered from Exeter, Launceston Castle and Mawgan Porth (Bruce-Mitford 1997, 85 and fig 89; Riddler 2006b; Allan 1984), but bone and antler material of fifth to seventh century date is very scarce in the south-west. Within region as a whole, the assemblage has obvious parallels with the small group of objects from Bantham Ham that include combs, pins and bone waste (Riddler 1986a and forthcoming a). There is also a small quantity of objects from contemporary sites a little further to the east, including Cadbury Castle (Alcock 1995; Barrett *et al* 2000) and to the north, notably at Dinas Powys (Alcock 1963, 150-9). Further afield, comparisons can be drawn also with a number of contemporary sites from Ireland, including Cahercommaun and the early phases of activity at Lagore Crannog (Hencken 1938; 1950; Cotter 1999). Other sites like Carraig Aille (O'Riordain 1949) should also be mentioned, although their dating evidence has not been reconsidered and improved in recent years, unlike Cahercommaun and Lagore. The possibility of Irish influence on post-Roman Cornwall has been raised previously by Charles Thomas and can be examined in terms of the bone and antler objects, even if the assemblage is only a small one. The Irish sequence has improved in terms of its dating evidence in recent years and the possibility of some influence from Ireland should be borne in mind, and can be examined within this assemblage. In the same broad terms, the range of implements present at Gwithian can be viewed against those from more conventional domestic settlement sites of the same date found further to the east. Such comparisons, against contemporary sites like Pennyland and West Stow – as well as those sites noted above – may serve to highlight the 'industrial' nature of the Gwithian assemblage, simply by looking at the relative proportions of objects belonging to different functional categories and comparing domestic situations with those of a more industrial nature. Small domestic settlement assemblages of bone and antler objects are fairly common in Anglo-Saxon England but are very scarce further to the west. Gwithian's position in Cornwall allows the post-Roman material to be viewed against Ireland and Wales on the one hand and Anglo-Saxon England on the other, and there are sufficient assemblages from these regions to allow something at least to be said of its position in relation to them.

The background of possible prehistoric or Roman influence on certain object types can also be explored. Certain object types endure over a long period of time, including antler picks and bone spearheads, neither of which are present at Gwithian, however. We may be seeing further evidence of this situation with the decorative combs, and possibly with the worked scapulae. As noted above, there is also the possibility that some objects reflect a continuation of Romano-Cornish practices into the post-Roman era, which is analogous to the continuation of Roman period forms into the early Christian period in Ireland. The potential exists to examine these issues, albeit with a small dataset.

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6 Metalwork finds from the post-Roman site excavated at Gwithian, Cornwall, 1953–58

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6.1 Introduction

The material was examined on 20–22 September, 2006. With the exception of one item known to have been stolen it was accessible in good order, with individual items identified by find number and most of them associable with stratified contexts. 75 items were recorded from GMI, 11 from site GMA and 6 from GME. Each item has now been digitally photographed by Carl Thorpe and nearly all of them also photographed on black & white film by myself.

There is a need for further curatorial and conservation work as a high priority. Comparison of items with drawings previously made by Charles Thomas revealed the considerable decay of the ironwork. This is inevitable, but it is therefore vital to x-ray all of the finds as soon as possible. Further cleaning would be valuable in a number of cases, at the same time as investigative conservation should be able to confirm the presence of mineral-preserved organic materials which visual inspection suggests are present, and even make accurate identifications (see table 6.1)

The collection of metalwork finds is dominated by iron artefacts. There is a small collection of copper-alloy objects and one item identified by Carl Thorpe as being of tin or pewter rather than lead.

6.2 Iron

I counted 91 individual items of this material, together with a number of very tiny fragments of iron, some of which are simply flakes off larger extant items. For the purposes of an overview relevant to the ultimate interpretation of the site, the ironwork can usefully be sorted into a set of broad categories: finished artefacts, tool and personal equipment, and fragments that are unidentifiable by function though they can be sorted by shape.

Amongst the finished artefacts, the most impressive is part of the cheek-piece of a horse's bridle (GM/M/52), with evidence of decorative copper-alloy foil. There is also what is referred to as a dagger (GM/M/89), apparently a tapering iron blade in a substantially preserved wooden sheath. The blade seems remarkably thin for a functioning weapon or tool, but this needs detailed expert examination in the lab to produce a precise description before we judge further.

Identifiable artefacts also include up to 8 iron dress pins and a pair of tweezers.

There is a high proportion of tools amongst the identifiable objects of iron. There are at least 7, maybe 11 knives, and 2 saws. In other cases we shall need to look carefully at parallels from other sites, and particularly in the Roman tool tradition, for the most plausible identifications, but there are 2 possible small adzes/gouges, 2

items that in contemporary Anglo-Saxon contexts would be identified as sharpening steels, and one possible auger bit.

Agricultural equipment is represented by 2 fragments of reaping hooks.

Functional ironwork of a less specific character includes 4 spikes, one socket and one rivet head. There are also at least 5 examples of iron plates or mounts with rivets from now unidentifiable objects, and 2 very neatly shaped, apparently decorative, small iron mounts.

Of the remaining unidentifiable fragments, relatively few are merely amorphous lumps. 17 are pieces of rod and a further 5 flattened bars. There are 8 pieces of rod angled into a L-shape or very close to that, some or all which may perhaps have been keys. There are 9 substantial fragments of iron plate, some of them with a definite shape, often in the form of a strip.

Altogether this constitutes a large, varied and interesting collection of ironwork, with an encouragingly high proportion of identifiable pieces. For analysis, it requires careful comparison with other site-assemblages, as noted above, for what in most cases will have to remain the most reasonable *suggestions* as to the original function of the remains. The primary tasks for future work are, therefore to identify and classify all of the iron finds, and to produce a catalogue of the ironwork with particular reference to the function proposed for each item.

A further possibility for valuable analytical work would be to compare the local iron, slag from the site and artefacts with sufficient surviving iron by laser spectroscopy for trace elements to see if a particular proportion of the objects eventually lost here were also made locally. This would require assessment of the collection for feasibility by Professor Ian Freestone (Cardiff), and costing.

6.3 Copper alloy

The assemblage consists of 12 pieces of copper alloy, plus a copper-alloy harpoon found on the site which has been drawn but lost through theft (see Fig. 74 in Sturgess and Lawson Jones 2006c). There is a similar proportion of identifiable objects as amongst the ironwork. In the case of 2 needles (GM/M/20) I am not clear what the material is, and would like to have them cleaned further to see if we can tell if they are base silver, or whether x-ray fluorescence analysis would be feasible. The other identifiable items comprise a ring and a mount from the rim of a horn or cup. There is a bar of uncertain function and a strip bent like a clip of a kind familiar from Anglo-Saxon burials.

All but one piece of the rest of the assemblage is made up of copper-alloy sheet that was almost certainly all scrap. One piece has been folded three times and one piece snipped. There is also a piece of copper alloy that had been melted, spilt and set in an irregular shape. This could have been obtained as scrap in this state and so is not conclusive evidence of bronze casting on site.

The copper-alloy harpoon-head is a remarkable item and I do not know of any immediate parallel to it. The material is startling for this period. Could this be a Bronze-age artefact redeposited in the post-Roman layers? I shall ask a Bronze Age specialist for any known parallels.

The amount of copper alloy found here is small in comparison with the ironwork. Half of the collection is scrap and indeed all of the pieces could serve as scrap. It would appear as a characteristic of material life at post-Roman Gwithian that there was only a low level of availability and use of copper alloy. This should be compared quantitatively with other sites in the South-West.

A further question to consider is the probable Roman origin of recycled copper alloy in the Early Middle Ages. X-ray fluorescence analysis is an option for exploring the composition of the objects. This would have value in contributing to a reference database, but it is not certain that the exercise would provide results beyond that.

The primary task for the final report will be to identify, classify and catalogue the copper-alloy finds.

6.4 Tin/Pewter

A sword(?) pommel in tin or pewter completes the metalwork assemblage. Artefacts in this material or lead have often been identified as models from which moulds for casting in copper alloy or silver are formed. We need to review the parallels to this find to see if it might nonetheless have been intended to serve as the finished object.

6.5 Overall

The principal value of the metalwork assemblage to a wider understanding of the occupation site lies in the representation and characterization of activity in the excavated part of post-Roman Gwithian. The immediate impression is of a largely utilitarian assemblage, implying a site for craftwork. In this regard, the questions of the supply and range of metals used here noted above become particularly interesting. Advanced metallurgical analysis of both the iron and the copper alloy could possibly attract special research funding from, say, the Society for Medieval Archaeology or Society of Antiquaries.

A full report on the metalwork should also include a full quantitative and qualitative comparison of the Gwithian assemblage with the published information from other late- and post-Roman sites, particularly in the South-West of England but also more widely around the Celtic and Irish Seas.

For cataloguing, classifying and discussing the finds in this way (not including any further analytical work), I would look to budget for 15 full working days from an experienced specialist in the field.

Table 6.1 Gwithian Ironwork Items to be investigated for possible/probable mineral-preserved organics

Material	Code	Object
Skin/leather	GM/M/79	Knife-blade
Textiles	GM/M/103	Blade-tip?
	GM/M/111	Rod. Textile possibly modern?
Straw	GM/M/104	Reaping-hook?
Horn	GM/M/19	Knife-tang
	GM/M/61	Knife-tang
	GM/M53	Knife-tang
Wood	GM/M/89	"Dagger"

SECTION 2

7 Gwithian Assessments from fieldwork at Bronze Age site GMXVII in 2005

7.1 Gwithian 2005: Soil Assessment

Dr Erika Guttmann, University of Cardiff

Dated: 19/07/2005

7.1.1 Introduction

The well-preserved Bronze Age soils at Gwithian are likely to hold cultural material and geochemical signatures which will provide a good indication of the intensity of past agricultural land use. These soils are important not only because of the excellent preservational conditions provided by the blown sand deposits which overlie them, but also because of the distinctive agricultural traditions of the region, which can be traced back to the Middle Ages. Arable soils in Cornwall have traditionally been improved by the addition of shell sand, seaweed and animal manures, and one of the aims of this project is to establish whether such practices may have originated in prehistory.

The site at Gwithian is of great importance because it is one of the few sites in the UK to retain evidence for the possible use of seaweed fertiliser in prehistory (Fowler 1983, 157). There is also evidence for ard and spade marks (ibid., p. 150 & 152), as well as buried soils containing domestic waste. The thin section, phosphate and magnetic analysis of the soils on this site will aim to identify the use of domestic waste and animal manures as potential fertilisers in the Bronze Age agricultural regimes.

The distinction between fertilisation with domestic waste and fertilisation with animal manures is an important one, because animal manures provide vastly more nutrients than hearth ash and kitchen waste (Guttmann in press). In Britain most of the evidence points to fertilisation with domestic waste in early prehistory, with the extensive use of animal manures only occurring in the Iron Age and after (Guttmann et al. in press). The actual type of fertiliser used at Gwithian is therefore an important research theme for this project, the key issues being:

- What fertilising materials, if any, do the soils contain? The type of material will be an indication of the intensity of arable production.
- How did this change over time?

7.1.2 Site visit

The site was visited and sampled on 23-25 June, 2005, and the samples are listed in Table 7.1, below. Thin section samples were taken in Kubiena tins, mostly across horizon boundaries. Geochemical samples (for both geochemistry and soil magnetism) were taken from the top, middle and base of each of the thicker layers, from the top and bottom of the thinner ones and from the middle of each of the two very thin basal layers.

The original plan for the geoarchaeological analysis was to sample and compare the individual layers that were exposed in the section face, but on-site discussions and observation of the section face made it clear that there were distinct layers within

several of the horizons that were originally thought to be single contexts. Five samples were therefore taken from each of these subdivisions (top, middle and base of each layer) so that statistical comparisons can be made between different parts of each individual layer, as well as between the different layers.

The control samples were taken in two clusters. Five samples were taken from the nearest modern analogue to the soils found on site, which was the turf formed on wind-blown sands on the hill immediately to the north of the site. A key difference between this modern analogue and the prehistoric soils is that today this area is heavily frequented by rabbits, which would have been absent in the Bronze Age; the rabbits serve to destabilise the soil with their burrowing, and also add phosphorus with their dung. It is worth noting that control samples of pure blown sand in other regions indicate that it is extremely low in phosphorus, and therefore the soil that develops upon it can also be expected to be relatively low in phosphorus unless it is affected by humans and/or their domestic animals.

The second control sample was taken from a Mesolithic soil, dated by the presence of artefacts scattered on the surface. This analogue has the advantage of predating all farming activity, having been sealed by blown sand which in this region is generally dated to the Neolithic and later (Roberts 1987). The layer has therefore probably not been affected by agricultural use- however, if it was an activity site it may have been enhanced by phosphates from other sources such as food waste. A further caveat is that this soil developed on Head, so is comparable to Layer 610 [=8] but not strictly comparable to the soils developed on blown sand.

7.1.3 Table 7.1: Description and sampling of deposits

Context	Description	Samples
601 [=3]	Buried Bronze Age ploughsoil with ard marks at the base.	Thin section: tins 1 & 2 Geochemical: 5 from top, 5 from middle, 5 from base
602 [=4]	Pale brown sand; this appears to be 3 distinct layers. Sand-filled ard marks at the base cut into layer 605, below.	Thin section: tins 3, 4, 9 Geochemical: 5 from top, 5 from middle, 5 from base
605 [=5]	Buried Bronze Age ploughsoil with ard marks at the base and the surface. This context probably represents 2 layers.	Thin section: 4, 5, 6 Geochemical: 5 from top, 5 from middle, 5 from base
606 [=6]	Light yellowish brown sand.	Thin section: 6 and 7 Geochemical: 5 from top, 5 from middle, 5 from base
608 [=7a]	Yellowish brown sand.	Thin section: 7 and 10 Geochemical: 5 from top, 5 from base
609 [=7b]	Dark yellowish brown sand	Thin section: 8 and 10

		Geochemical: 5 samples
610 [=8]	Stony brown clay; v. compact.	Thin section: 8 Geochemical: 5 samples
Control	Thin turf over blown sand. Acid heathland vegetation.	5 geochemistry samples taken from the hill above the excavation.
Control	Dark yellowish brown sandy clay over Head deposits. Soil contains Mesolithic artefacts.	5 geochemistry samples taken from soils exposed on the coast at around 5825/4270

The methods which will be used to investigate the soils will include thin section micromorphology, soil magnetism and phosphate analysis. The pH and organic content of the soils will be ascertained and compared with that of the uncultivated analogues using a pH meter and loss on ignition. Soil magnetism will be analysed using a Bartington susceptibility meter in order to roughly estimate the quantities of fuel ash which may have been added to the soil. While thin section analysis will be used to identify burnt material, tests for magnetism give better estimates of the amount of burnt material in the soil, so that variations between areas can be compared statistically. The soil phosphate will be assessed in order to ascertain whether organic material and/or kitchen waste including animal bone have been added to the soil; the materials will be distinguished in thin section. Analysis of shells within the buried arable soils, undertaken by Paul Davis, will be used to identify species that are associated with seaweed (*c.f.* Fowler 1983, 157; Milles 1994; Donaldson *et al*. 1981; Bell 1981).

The thin sections will be prepared as described by Murphy (1986) and soil magnetism will be assessed by mass susceptibility and frequency dependent susceptibility using a Bartington susceptibility meter; saturation anhysteretic remanent magnetisation may also be employed. The phosphates will be processed by acid extraction and the content will be assessed using ammonium molybdate colourimetry.

7.1.4 Updated research aims

The soil sequence at Gwithian is very similar to the sequences of buried soils and blown sands recorded on a number of prehistoric sites in the Northern and Western Isles of Scotland. Soils interleaved with blown sands were formerly thought to represent periods of decreased storminess, but detailed analysis of the soils and sediments on sites in the Western Isles has since demonstrated that many of the apparently natural soil horizons were in fact man-made, created by dumping midden material onto the shifting sands (Gilbertson *et al*. 1999). A similar attempt to stabilise blown sand with midden material is known from Orkney (Guttmann *et al*. accepted). The number of prehistoric ard mark horizons at Gwithian is striking, and indicates a long-term investment in this particular site, despite the difficulty of coping with the unstable environment. The key hypothesis for this analysis is:

- The sand horizon 602 [=4] is a blown sand deposit that has been stabilised through the addition of midden material. This is a departure from the interpretation suggested by Fowler (1983, 152), which assumed that the sand-filled ard marks represented not the continued cultivation of a soil after a

sand blow but rather the abandonment of the land following a storm in which the newly ploughed ard grooves were filled with sand.

Gwithian is a site of outstanding importance, and it is suggested that the land management system of this Bronze Age settlement may have more in common with coastal sites as far north as Orkney than with contemporary sites in the south of Britain.

7.1.5 References

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8 Gwithian 2005 – Land snail assessment

Dr Paul Davies, Bath Spa University

Dated: September 2005

8.1 Introduction and Method

A molluscan column (comprising 17 continuous samples) was obtained form the south facing section of GMXVII by Vanessa Straker (English Heritage), and subsequently provided to the author.

Each sample was air-dried and 0.5kg of each processed by dry-sieving through a nest of sieves consisting 2mm, 1mm and 0.5mm mesh sizes (following Evans 1972). Sieved fractions were assessed using a low-power zoom binocular microscope (x6-x40). Identifications were made to at least Family level (most to species), using Evans (1972), Kerney and Cameron (1979), and Kerney (1999) as aids to identification when required. Abundance was estimated using the following scale:

A (abundant) – 50+ individuals

C (common) – 10-50 individuals

R (rare) – less than 10 individuals

8.2 Results

Preservation was good to excellent throughout. However, the abundance of Mollusca was variable, the lowermost samples generally providing few shells. Relative abundance estimates are given as Table 8.1.

There are major changes in the fauna through the sequence, particularly concentrated on context 602a and context 601. Broadly, 4 molluscan zones (MZ) can be recognised at this stage:

116-44cm MZ1: low-diversity open-country type assemblages mainly comprising of *Pupilla muscorum*, *Cochlicella acuta*, 'other Helicidae' (at least 2 species), and *Vallonia* sp. Possibly a hint of increasing shade from 61-51cm.

44-39cm MZ2: A higher diversity assemblage with a strong catholic and shade-requiring component, principally *Carychium*, *Cochlicopa*, 'Other Zonitidae' (at least 3 species including *Aegopinella nitidula* and *A. pura*), *Vallonia*, *Punctum* and *Lauria*. Although in low numbers, the presence of *Acanthinula*, in particular, and also *Clausilia* are noteworthy here too. Open-country species generally are rare or absent. A well-shaded, stable environment is indicated, possibly woodland or scrub.

39-34cm MZ3: A very low diversity assemblage with low numbers of shells. Only open-country species represented plus a freshwater *Pisidium* spp. Also lots of plant

fragments and stony material with some marine shell fragments. Possibly derived (?dump deposit).

34-9cm MZ4: Initially a return to a higher-diversity assemblage with some shade-requiring species (as for 44-39cm). However, open-country species (as for 116-44cm) expanding, and becoming predominant in the upper two samples (29-9cm).

8.3 Discussion

At this stage, the sequence apparently shows open-country environment(s) (116-44cm) giving way to scrub or woodland (44-34cm) onto which material was also deliberately dumped (39-34cm). Subsequently, the environment reverts to open-country (34-9cm). If this is subsequently confirmed, it would indicate that following occupation (contexts 605b and a) the land reverted to woodland/scrub (ie. a relatively stable environment), onto which some material was deliberately dumped before a further occupation phase (context 601). This, however, remains a provisional assessment until further analysis of the assemblages and integration with other environmental data (soil micromorphology in particular) and recovered archaeology.

The sequence has similarities with respect to other land snail analysis previously undertaken at Gwithian by Penny Spencer (Spencer 1975), though the woodland component here is much stronger than in that found by her. More widely, the sequence is unusual in comparison to other snail sequences from western England and Scotland in seemingly having a strong woodland/scrub episode *within* a blown sand sequence. More usually, woodland environments are recorded before sand inundation and accumulation.

8.4 Recommendation

13 samples have excellent potential for full analyses, including all those samples pertinent to the open-shaded-open sequence covering Contexts 605b, 605a, 602b, 602a and 601 (and covering all four provisional molluscan zones). Further analysis of the lowermost open-country assemblages will allow an assessment to be made of the relative stability of the environment (mobile sand against relatively consolidated or stable surfaces). Additionally, further analyses of samples from 61-9cm will provide greater detail on the apparent open-shaded-open sequence.

8.5 References

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species/depth (cm)	**111-116**	**106-111**	**103-106**	**98-103**	**93-98**	**83-93**	**73-83**	**66-73**	**61-66**	**56-61**	**51-56**	**44-51**	**39-44**	**34-39**	**29-34**	**19-29**	**9-19**
Context	610	609	609	608	608	606	606	605b	605b	605b	605a	602b	602a	602a	601	601	601
Layer	8	8	7b	7a	7a	6	6	5	5	5	5	4	4	4	3	3	3
***Carychium* sp.**													A		A	R	R
Cochlicopa lubrica	R				C				C	C	C	C	C	R	C	C	
Pupilla muscorum					C	C		C	A	A	A	C		R	C	R	C
***Vallonia* sp.**	R	R		R	C	C		C	C	C	C	C	C		C	C	C
***Vitrea* sp.**												C			C		R
Vitrina pellucida				R							R	R					
Other Zonitidae										R			C		C	R	
Discus rotundatus													R		C	C	R
Acanthinula aculeata													R		R		
Lauria cylindracea													C				
Clausilia sp.			R										R				
Punctum pygmaeum						R					R		C				
Cochlicella acuta	R							C	A	A	A	A	R	R	C	C	A
Ashfordia granulata										R	R	R	R		C	C	C
Other Helicidae				R	A	C	R	C	C	C	C	R				C	

***Pisidium* sp.**														R			
Marine sp (frag Y/N)	Y	Y		Y	N	N	N	N	N	N	N	N	N	Y	N	N	N
Total (estimate)	**>10**	**>10**	**>10**	**>10**	***c.*50**	***c.*30**	**>10**	***c.*100**	***c.*150**	**150+**	**150+**	***c.*100**	***c.*100**	**>10**	***c.*100**	***c.*100**	***c.*100**

Table 8.1: Mollusca recovered from Gwithian 2005 (south facing section of GMXVII)

9 Gwithian, Cornwall. Assessment of soil samples from GM X and GM XVII

Vanessa Straker, English Heritage

Dated: October 2005

9.1 Introduction

Soil samples from sites GM X and GM XV11 were flotation sieved by Imogen Wood at HES, Truro. Floats were recovered on a 250 micron mesh and residues on a 500 micron mesh. The GM X samples were taken during the excavations in 1956 and stored in milk bottles. The GM XVII were taken during the excavation of a trench to examine the Bronze Age sequence in 2005.

9.2 Results

The summary results are presented in Tables 9.1 and 9.2. Most of the samples included varying concentrations of fragments of marine bivalves, mainly mussels, land snails and charcoal. The small amounts in GM X would not be worth taking to full analysis, but the samples from GM XVII have been assessed for their marine shell content and charcoal in separate studies. A series of duplicate samples was taken for land snail assessment.

Charred plant macrofossils, other than charcoal, were absent from GM X and very infrequent in GM XVII. The only identifiable remains were occasional grains of wheat, which were probably emmer, to judge from the humped dorsal surface, but no chaff, which would be more conclusive evidence of emmer, was present. One of the occasional barley grains was of the naked (free-threshing) variety. Both emmer and naked barley are common Bronze Age crops and naked barley particularly characteristic of cereal assemblages in Cornwall, most notably at Trethellan Farm and on Scilly at East Porth on Samson (Campbell and Straker, 2003).

9.3 Recommendations

Owing to the limited size of the assemblage, all the identifiable plant macrofossils were identified as far as is possible. No further analysis is recommended.

9.4 Reference

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Table 9.1 Gwithian 2005 GMXVII charred plant remains. Sieved samples, assessment of floats and residues

Context	sample	Soil sample vol (litres)	Float vol (ml)	Shell, bivalve	Shell, land snail	charcoal	Other	Charred plant
600	1 equivalent layer 3		625	freq. frags	freq.	freq.	-	-
601	2 equivalent layer 3		3000	occ	freq.	freq.		1 *Triticum* cf. *dicoccum* (cf emmer wheat): 1 cereal sp.;2 plant fragments, unidentified
602	5 equivalent layer 4		37		mod			1 *Triticum* cf. *dicoccum* (cf emmer wheat)
605	6 equivalent layer 5		200		freq.			2 seed frags, unidentified: 1 *Triticum* cf. *dicoccum* (cf emmer wheat); 1 *Sherardia arvensis* (field madder)
606	7 equivalent layer 6		30		freq.	occ		1 unidentified fragment
608	8 equivalent layer 7		60			occ		1 *Hordeum* sp. (barley); 1 cereal indeterminate; 1 stem fragment, unidentified
609	3 equivalent layer 7		75			freq.	1 bone frag	1 *Hordeum* sp. (barley, naked grain; 2 cereal fragments; 1 fragment unidentified
610	4 equivalent layer 8		115		Freq.	occ		1 ?tuber frag. Unidentified.

Key: occ: occasional, 0-15 items; mod; moderate, 15-30 items; freq, frequent >30 items

Table 9.2 Gwithian GMX Cutting 3 charred plant remains. Sieved samples, assessment of floats and residues

layers	Context details	Soil sample vol *(litres)*	Float vol *(ml)*	Residue vol (*ml*)	Shell, bivalve	Shell, land snail	charcoal	Other	Charred plant
0	V section 3		c. 7	< 5	occ	mod	Freq small	4 frags fired clay	1 frag, unidentified
2	V section 3		c. 10	< 5	occ	occ			
3	N Face		< 5	c. 10	occ	occ	occ		
4	N face		< 5	< 5	occ	1	occ	Occ frags ?crab claw	
5	N face		c. 1	< 5	-	-	-		
5a	N face		< 5	10	occ	1	occ	1 bone frag	
6a	N face		< 5	< 10	occ	occ	occ small	1 bone frag	
7	N face		c. 5	c. 5	occ	occ	occ		
8	N face		< 5	c. 10	Frags 1 valve	mod	occ		
9	N face		< 5	< 5	occ	Occ			

Key: occ: occasional, 0-15 items; mod; moderate, 15-30 items; freq, frequent >30 items

10 Gwithian – Pollen Assessment – 2005

Dr David Earle Robinson,

Dated: 09/05/2006

10.1 Material

Settlement layers: Five samples (ca. 50 g) were collected for pollen analysis from the section exposed during fieldwork in late June 2005 (fig. x. Samples 1, 2A and 2B came from the lower settlement/culture layer ("layers 8 and 7" respectively – that is Phases 1 and 2) which developed over the mineral soil. Sample 3 came from the middle settlement/culture layer ("layer 5" – Phase 3) and sample 4 from an apparent upper settlement/culture layer ("layer 3" – Phase 5). The settlement layers were characterised by a darker colour and a slightly elevated content of silt and organic material. They were separated by layers of apparently sterile blown sand. The latter were not sampled as they were thought extremely unlikely to contain preserved pollen. It was hoped that pollen was preserved in the settlement layers which could give information about the environmental conditions (vegetation etc.) and human activities in the immediate vicinity of the settlement.

Coprolites: One sample was also taken from one of a number of coprolites recovered during the main excavations in 1949 – 1963 (GM/X Bag 501; Cutting 21 Layer 3 - Phase 5). The form, consistency and conspicuous bone content of the coprolites suggested that they were from dog. It was hoped that preserved pollen could provide further information on the food consumed by the animal(s).

10.2 Methods

Three samples were prepared for analysis – two from the lower settlement layer (layers 7A and 8) which appeared to have the highest content of organic material and therefore the greatest chance of containing preserved pollen – and one from a coprolite which had disintegrated releasing a number of bone fragments. The latter were passed on to Andy Hammon for possible identification and assessment.

The samples were prepared using standard methods involving treatment with hydrochloric acid, potassium hydroxide, cold hydrofluoric acid and acetolysis. The resulting pollen was stained with aqueous safranin and mounted in silicone oil. The slides were examined at x400 using a Leitz Laborlux binocular microscope.

10.3 Results

Settlement layer: Both samples were found to contain pollen but this was very sparse and the grains recorded were almost all so degraded as to make identification impossible. Layer 8 contained the greatest concentration of pollen, but this was still very sparse. The few identifiable grains present were from open-habitat species (grass, dock and plantain). Two large grass pollen grains were encountered but these were probably from coastal grasses rather than cereals – further identification was impossible due to state of preservation. A full count could possibly be obtained from layer 8, but these data are unlikely to be either reliable or particularly useful, given the state of the pollen preservation.

Coprolite: No pollen whatsoever was detected in the sample.

10.4 Recommendations

No further work is recommended on either the settlement layers or the coprolites.

11 Gwithian, Cornwall: Assessment of charcoal from GM XVII 2005 and GM X Gwithian Archive

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Honorary Research Associate, Royal Botanic Gardens, Kew

Visiting Research Fellow of the Department of Archaeology, University of Reading

Dated:September 2005

11.1 Introduction

The current assessment includes eight samples (Layers 1-8) from the 2005 excavation of GM XVII and 10 samples from GM X (Layers 0 and 2-9, Cutting 3, North face). The latter were held in the Gwithian Archive but since they had been packed in bottles (with other material) and needed sorting, they were not included in the previous assessment.

Although not scheduled for C14 dating, suitable material is indicated in Table 11.1, should it be required.

11.2 Methods

Bulk soils samples collected during 2005 were processed by flotation and sieving. The resulting flots and residues were sorted by Vanessa Straker. Charcoal was generally very sparse (<10 fragments per sample) although samples 1, 2, 3 and 6 were more abundant. Archive samples from GMX were also sorted by Vanessa Straker but these rarely contained charcoal and, when present, it was exceedingly sparse.

The charcoal in all samples was friable and poorly preserved. When possible three fragments were examined from each sample to provide a baseline range of taxa present. These were prepared using similar methods to those described in the previous assessment.

11.3 Results

The results are presented in Table 11.1. Samples with suitable material for C14 dating are indicated in bold type. The taxa identified included:

- birch (*Betula* sp.)
- hazel (*Corylus avellana*)
- hawthorn/ *Sorbus* group (Pomoideae)
- gorse (*Ulex* sp.) or broom (*Cytisus scoparius*)
- oak (*Quercus* sp.)
- bramble (*Rubus* sp.) or briar (*Rosa* sp.)

11.3.1 Site GM XVII 2005

The 2005 excavation opened a trench in the central area of Bronze Age occupation, just south of midden GMX. Environmental samples were collected from Layers 1-8 and the charcoal fraction extracted from each. In most instances very little charcoal was present, especially in the lower layers. The origin of the charcoal is unknown; domestic fuel debris seems the likeliest source. Although less diverse, the range of taxa indentified (see above) corresponds to that named from contemporary archive material from GMX (see previous report).

11.3.2 GMX Gwithian Archive, Middle Bronze Age – Late Bronze Age

Of the ten samples examined from Cutting 3, North face, only four of the Layers contained viable charcoal and even this was extremely sparse. Oak was recorded in Layers 0, 4 and 5 (that is Phases 4 and 3); and the hawthorn group in Layer 8 (Phase 1).

11.4 Recommendations

GMXVII 2005

It is recommended that samples 1, 2, 3 and 6 are examined in full and the results incorporated with the main report (see Section 3, 25).

GMX Gwithian Archive

No further identification work is possible on these samples. The results obtained should be included in the main report (see Section 3, 25).

Table 11.1 Gwithian, Cornwall: Assessment of charcoal from GM XVII 2005 and GM X Gwithian Archive

Key. Number of fragments: x = <10; xx = 10 – 19; xxx = 20 – 50; h/w = heartwood; s/w = sapwood (diameter unknown)

C14. Charcoal suitable for dating is indicated in bold type.

Sample	Context	Context description	No of fragments	Species identified	Further work	Comments
GM XVII 2005						
1	600 equivalent layer 3	-	xxx	**2 x hawthorn/ *Sorbus* group (Pomoideae);** **1 x gorse (*Ulex* sp.) and broom (*Cytisus scoparius*)**	Yes	Smallish fragments
2	601 equivalent layer 3	Pale brown sand	xxx	**1 x hawthorn/ *Sorbus* group (Pomoideae);** **1 x hazel (*Corylus avellana*);** **1 x birch (*Betula* sp.)**	Yes	Small fragments in poor condition, but worth examining
3	609 equivalent layer 7	Dark yellowish brown sand	xx	2 x oak (*Quercus* sp.); **1 x hazel (*Corylus avellana*)**	Yes	Small fragments
4	610 equivalent layer 8	Stoney brown clay	x	2 x oak (*Quercus* sp.) h/w; **1 x hawthorn/ *Sorbus* group (Pomoideae)**	No	Insufficient for further work
5	602 equivalent layer 4	Pale brown sand	x	**3 x hawthorn/ *Sorbus* group**	No	Insufficient for further work

				(Pomoideae)		
6	605 equivalent layer 5	Buried B/A plough soil	xx	1 x oak (*Quercus* sp.) h/w; 1 x oak (*Quercus* sp.) s/w; **1 x gorse (*Ulex* sp.) or broom (*Cytisus scoparius*)**	Yes	-
7	606 equivalent layer 6	Light yellowish brown sand	x	**1 x *cf.* bramble (*Rubus* sp.) or briar (*Rosa* sp.)**	No	Stem diameter 3mm
8	608 equivalent layer 7	Yellowish brown sand	x	2 x oak (*Quercus* sp.) s/w; **1 x gorse (*Ulex* sp.) or broom (*Cytisus scoparius*)**	No	Small fragments
GM X – Gwithian Archive						
Layer 0		Cutting 3 North face	xx	**2 x oak (*Quercus* sp.) s/w**	No	Tiny and sparse
Layer 2		Cutting 3 North face	-	-	No	No charcoal
Layer 3		Cutting 3 North face	-	-	No	No charcoal
Layer 4		Cutting 3 North face	x	1 x *cf.* oak (*Quercus* sp.)	No	Very small frags.
Layer 5		Cutting 3 North face	x	-	No	No charcoal
Layer 5a		Cutting 3 North face	x	2 x oak (*Quercus* sp.) h/w	No	No further charcoal
Layer 6a		Cutting 3 North face	x	-	No	Insufficient for id
Layer 7		Cutting 3 North face	-	-	No	No charcoal

Layer 8	Cutting 3 North face	x	**2 x hawthorn/ *Sorbus* group (Pomoideae)**	No	Sparse; tiny fragments
Layer 9	Cutting 3 North face	-	-	No	No charcoal

12 Gwithian, Cornwall. Assessment of the vertebrate assemblage 2005 fieldwork (site GMXVII)

Dr. Andy Hammon, Environmental Studies, English Heritage, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, PO4 9LD. Tel: 02392 856789. Email: andy.hammon@english-heritage.org.uk

Dated: Thursday 29th September 2005

12.1 Background

Fieldwork at Gwithian in June 2005 produced a small animal bone assemblage, consisting of 301 fragments (Table 12.1). The assemblage derived from both hand-collection and sample heavy residues (washed over a 500µm mesh – Vanessa Straker pers. comm.).

The material was scanned using the methodology outlined in Hammon (2004: 4-5, see section 3, 22). Table 12.1 outlines the quantity of countable, ageable and measurable specimens the assemblage would produce: 28 countable and 9 ageable fragments, plus one measurable fragment.

In isolation, the assemblage has very little information potential regarding reconstruction of the site economy and husbandry practices. It would add very little to that from the assemblages previously considered (see Section 3, 22).

If the 2005 samples are representative they demonstrate that the hand-collected assemblages from the earlier excavations do not suffer from a significant degree of recovery bias. Although, the scarcity of bird remains and virtual absence of fish remains for the 2005 samples is curious.

12.2 Recommendation

It is recommended that the 2005 material be considered in conjunction with the other Gwithian assemblages. Doing so will have no additional cost implications; the 'task list' previously provided (Hammon 2004: 11) remains current.

12.3 Reference

Hammon, A, 2004. *Gwithian, Cornwall: Assessment of the vertebrate remains*. Unpublished report, English Heritage.

Table 12. 1 Summary of vertebrae remains from Gwithian 2005 fieldwork (GMXVII)

Context and equivalent layer (in bold) *phase shown italics*	**Bag comments**	**Collection**	**No. frags**	**Bone comments (Countable, ageable, measurable frags etc).**
600 **3** *Phase 5*	Cleaning below turf	Hand	9	inc. cattle maxillary molar (x2); cattle humerus
600 **3** *Phase 5*	Act(ual?) trench fill	Hand	11	-
600 **3** *Phase 5*		Hand	2	inc. sheep/goat metacarpal
601 **3** *Phase 5*		Hand	3	inc. cattle 1st phalange (ageable); pig mandible
601 **3** *Phase 5*		Hand	42	inc. cattle incisor & humerus (neonate): sheep/goat maxillary premolar, maxillary molar, mandible (ageable; measurable), humerus, radius, femur & metatarsal
602 **4** *Phase 4*		Hand	3	inc. sheep/goat tibia
605 **5** *Phase 3*		Hand	5	inc. sheep/goat pelvis (ageable; measurable; female)
Deturfing **3** *Phase 5*		Hand	2	-
U/S **3** *Phase 5*		Hand	2	inc. cattle scapula; sheep/goat/roe deer femur (ageable)
600 **3** *Phase 5*		Sample 1	31	inc. small rodent maxillary/mandibular incisor & tibia (ageable)
601 **3** *Phase 5*		Sample 2	106	inc. pig maxillary incisior; small rodent tibia
602 **4** *Phase 4*		Sample 5	28	inc. rat/water vole tibia (ageable) & 1st phalange; small passerine (songbird) carpometacarpus (ageable)
605 **5** *Phase 3*		Sample 6	53	inc. mouse maxilla; small rodent humerus (ageable); 1 fish bone (identifiable?)
608 **7A** *Phase 2*		Sample 8	4	-

13 Gwithian, Cornwall 2005: Marine shells assessment

Dr Janice Light

Dated 29th March 2006.

13.1 Background and principal objectives

In June 2005 a small-scale field investigation took place at the Bronze Age site of Gwithian. The principal aim of the exercise was to revisit the main stratigraphic sequence and to recover palaeoenvironmental samples. Bulk sampling took place for remains of macroplants, vertebrates and land snails, and samples for geoarchaeological, pollen and volcanic tephra analyses were taken. Sampling was also carried out in order that OSL dating could be attempted. A trench was hand dug and layers were excavated by hand. The trench lay within the heart of the Bronze Age site between sites GMX and GMIX, the location being determined by the presence of a previously documented intact stratigraphic sequence. Hand-collected marine shells were recovered during excavation and form the basis of this assessment. As most of the shells came from archaeologically sound layers the results of this assessment can be integrated into the existing marine shell assessment in order to enhance understanding of that pre-existing marine shell dataset (see Light in Nowakowski 2004 and section 3, 30).

13.2 Material available for assessment and analytical methodology

Eleven sample bags of shell were received (Table 13.1). During preliminary sorting for this assessment nonmarine shells were extracted from samples 1, 2 and 6 and sent to Dr Paul Davies. Marine shells were identified, quantified and examined for taphonomic and artefactual evidence. The results were then assessed in the light of the assessment carried out for the main marine shell archive (Light ibid). For comparison purposes, the marine shell from the original excavation was subjected to a rapid re-examination.

13.3 Results

Some 580 shells and fragments were identified. Of these, 237 were valves or umbonal units of mussel (119 MNI) and 263 items were mussel fragments other than umbones. (Bivalve umbones (hinge fragments) are used to obtain counts of numbers of shell valves. The total is then divided by 2 to obtain MNI). Of the remaining 80 items, 59 were limpet shell of which 51 were complete shells or apical fragments, 9 were dog whelk shells and there were 11 shells spread across 8 other species.

13.3.1 Patella spp. (Limpets)

The limpet shells were in an excellent state of preservation as has been noted in other Cornish coastal midden assemblages where the calcareous soils impede decalcification processes. The shells are mainly of medium size (2.5-3.5cm shell length) which accords with the size profile of limpets present in the shell middens at Atlantic Road, Fistral Bay (Light 2001). Small limpets are not worth harvesting and large ones are considered tough. Both *Patella vulgata* and *P. ulyssiponensis* are present in the Gwithian assemblage, the latter being a lower shore species and

considered by experts to be more palatable. (Modern day residents on Colonsay, who eat limpets occasionally, state that high shore limpets are much tougher and less tasty than low shore ones (Jones, 1985). This opinion is reinforced by S.J. Hawkins (pers. comm.) who advises that, in modern times, *Patella ulyssiponensis* is widely eaten in the Canaries, Azores, Madeira and Portugal.

13.3.2 *Mytilus* spp. (Mussels)

Based on the small sample examined, the relative proportion of mussel shells retrieved at Gwithian as whole valves was considerably higher than those retrieved at Atlantic Road. Many of the shells were evidently large individuals when harvested and at least 50% of the shells were *Mytilus galloprovincialis,* currently known as the Padstow mussel. It is considered to be a southern species, the shells being larger and flatter than the native *M. edulis.* It is principally known from the southwestern coasts of the UK. Some shells showed the abrasion features noted on the Atlantic Road mussels (Light 2001) and mussels in the Trevelgue Head samples (Light 2005a), where the blue outer surface layers of the mussels have been eroded to reveal facetted, nacreous areas on the shell exteriors. These repetitive patterns of wear were initially attributed to hand-working, either as a result of their use for some utilitarian purpose, or from deliberate modification in order to create a useful artefact or implement (Light 2005b). However the abrasion is attributed to progressive shell removal where densely packed mussels are jostled against each other in the high energy conditions of the north Cornish coastal environment.

13.3.3 Nucella lapillus (Dog whelks)

Dog whelks complete the trio of species which are consistent and important features of Cornish coastal midden assemblages. They are always considerably fewer in number than limpets and mussels and the purpose for their harvesting, whether for food or bait, has never been fully resolved. There were only 9 shells in the Gwithian 2005 assemblage. Of these, one was an apertural fragment, a second had been broken by removal of the shell apex, in a characteristic style noted and discussed elsewhere. Shells broken in this manner might have been damaged to remove the animal without breaking the soft tissue but for what purpose is unclear, whether for use as food, bait or dye production (Light 1995 re Duckpool). Such broken *Nucella* shells have also been retrieved from Atlantic Road and Trevelgue Head excavations (Light 2001, 2005a) and large mounds have been found at sites in Ireland (Murray 1999). A third *Nucella* shell has two small neat opposing perforations high on the body whorl. The holes are not the result of predation by gastropods which bore their prey (muricid and naticid snails) and are oriented such that they are capable of being threaded by a flexible thread (e.g. nylon fishing line) but, with one example, an interpretation of deliberate modification is speculative.

13.3.4 Buccinum undatum (Common whelk)

The single specimen of this species is of interest. During assessment of the main Gwithian dataset it was noted that this species recurred as a partial shell fragment. These consisted of the body whorls with the apical region removed. These shells were a feature of the Bronze Age sites GM/X (5n) and GM/XV (5n). The style of fracture is consistent, with the same region of shell removed. One additional example occurs in a GM/I sample, as well as a basal columellar fragment which does not appear to be 'natural'. There are no shells of *Buccinum undatum* in the Gwithian archive which appear to represent food debris.

13.3.5 Other species

The remaining 10 shells in the current assessment represent 7 of the 12 large bivalve species present in the main Gwithian assemblage, some of which are present in considerable numbers. All 10 bivalves retrieved in 2005 were evidently brought to the site as dead-collected shells and none is perforated or shows evidence of modification by the human hand.

Table 13.1 Gwithian GMXVII Assessment of marine shells

Sample number	context	Equivalent layer in BA sequence	*Patella* spp.	*Nucella lapillus*	*Buccinum undatum*
1	(608)	Layer 7 *Phase 2*	-	-	-
2	u/s	Probably layer 3 *Phase 5*	2 frags (1 apex)	-	-
3	(602)	Layer 4 *Phase 4*	2 shells	-	-
4	(609)	Lower half layer 7 *Phase 2*	1 shell	1 clipped. 1 apertural frag	-
5	ACT turf trench infill (600)	Upper part of layer 3 *Phase 5*	-	nil	-
6	(605)	Layer 5 *Phase 3*	6 shells plus 1 frag	Nil	-
7	(610)	Layer 8 *Phase 1*	2 shells	1 shell very fresh	-
8	(601)	Layer 3 *Phase 5*	29 items of which 25 shells or nearly so	2 shells	Body whorl and aperture frag
9	Cleaning below turf layer shell (600)	Layer 3 *Phase 5*	1 shell 2 frags (1 apex)	1 whole shell	-
10	(612)	Layer 3 *Phase 5*	7 shells, one large collar frag	1 fat shell	-
11	Cleaning below turf layer shell (600)	Layer 3 *Phase 5*	4 shells	2 whole shells (1 perf)	

13.4 Comparison with main Gwithian marine shell dataset

In all, 29 species were identified in the principal Gwithian assemblage assessed in February 2004. (This includes 3 species of limpet and 2 species of mussel). There are 13 species in the 2005 assemblage. Several of the taxa absent from the current assessment are occasional occurrences of species that might be regarded as adventitious rather than the result of deliberate collection, for example top shells and winkles and other taxa marked as Sporadic in Table 30.1 of Light (2004). However, notable is the absence of *Ostrea edulis* the native oyster which was present in assemblages from all Gwithian sites in the original excavation. Oysters are not common at Cornish archaeological sites and wild populations have suffered a severe decline in recent years. It is not at all clear to what extent oysters may have been a resource available for exploitation to earlier inhabitants of north Cornish coasts.

In the main Gwithian marine shell dataset there was a paucity of mollusc shell whose presence would be suggestive of food remains. The species profile of the Gwithian 2005 assemblage differs from the main archive in the dominance of mussel shells (500 of 580 shells and fragments). Limpets are the second dominant species. These presences go some way to mitigating (in a 'snapshot') the bias noted in the principal assemblage. There the paucity of mussel shell did not reflect the documented assumptions that the inhabitants "lived on shellfish, in enormous quantities, which they gathered from the creek or the shore, and the shells were buried, together with other rubbish, in pits in the sand all round", (Thomas 1958). The mussel shells are principally in samples 8 and 10 (Layer 3 - Phase 5) (601) and (612). Layer (601) forms the bulk of the Bronze Age horizon known as 'Layer 3' (Phase 5) and in addition to bone and stone including worked stone, a dense concentration of shell and charcoal was noted in the western section of the trench. This stratigraphic horizon represents the final major episode of Bronze Age settlement at Gwithian where houses, middens and fields are the main landscape features.

The shell from (612) was taken from the northwest part of the trench where a mixed spread of soil and sand contained large stones, apparently burnt clay fragments intermixed with charcoal and shell and was not considered a well-defined or distinct feature (Lawson-Jones in Nowakowski *et al*. 2005).

The shell retrieved from the 2005 excavation has provided a useful window into the extensively worked site at Gwithian. The retrieval of the mussel shells has provided a small sample of the substantial deposits described by Charles Thomas (1958). The substantial and diverse assemblage of shells that do not evidently represent food debris which are present in the main archive, is represented by a small subset of some of those species excavated in 2005. That main assemblage offers a unique opportunity to consider how the inhabitants of the settlements exploited shells beyond the prime purpose of food, and to speculate about the meaning that the shells, many of them bearing perforations of evidence of deliberate modification, may have had for the settlement inhabitants.

13.5 Recommendation

No further analysis of the Gwithian 2005 assemblage is recommended. The material considered herein results from a structured and exhaustive retrieval of all marine shell uncovered in the GM XVII trench. The foregoing results and observations can be used to augment and elucidate any future work on the main marine shell assemblage.

Table 13.2 Gwithian GMXVII Mollusc assessment

***Mytilius* spp.**	***Atrina fragilis***	***Pecten maximus***	***Venus verrucosa***	***Acanthocardia* sp.**	***Laevicardium crassum***	***Tapes rhomboides***	***Glycymeris glycymeris***	***Land snails***
36 frags (13 umbos)								Extracted and sent to Paul Davies
18 frags (5 umbos), flakes								Extracted and sent to Paul Davies
2 umbos plus 2 frags						1 valve, dead-coll?		
3 umbos, plus 6 frags, flakes								
1 umbo, 1 valve with abrasion		1 frag						
13 umbos plus 11 frags				1 marginal frag	1 valve almost complete			Extracted and sent to Paul Davies
7 frags (2 umbos)			1 umbonal frag					
88 valves/umbos and - 100 frags			1 valvae, 1 frag				2 valves unperf	
105 umbos plus – 100 frags	1 frag?							
7 frags (4 umbos)								Nil

Table 13.3 Gwithian 2005 GMXVII marine shell assessment

Ttl marine shells	**Comments**
38	Some umbones large
20	1 *Patella* with external calcification and serpulid inside, not food.
8	
10	
3	
33	*Patella* mostly *ulyssiponensis*
11	
225	*Buccium* frag like others (11n) seen in main assemblage
4	
215	
13	Includes *ulyssiponensis* and *vulgata*. One *Patella* juv.
580	

14 Gwithian 2005 The lithics

Anna Lawson-Jones, HES, Cornwall County Council

Dated: 03/08/2005

14.1 Introduction

A total of 11 pieces of worked flint were collected during the 2005 field work at site GMXVII, Gwithian, the majority coming from the basal layer. They are described below in order of stratigraphic recovery from top to bottom. All are of pebble flint origin and are likely to have been collected from local beaches. The colour and quality of the flint is variable, much of it mottled, some of it faulted and poor quality. All of the pieces have begun to repatinate, and two have been burnt with resultant crazing and blistering. There are at least two and possibly three cores, which represent the largest pieces (measuring 3.8cm max. across) in the assemblage.

14.2 Results

A single, faulted multiplatform flake core was found in **(600) ("layer 3"- Phase 5)**. It shows crushing or bruising on one edge indicative of secondary reuse as a hammer, and has been worked on a previously worked, re-patinated probable core. The reworking of flint is a frequently cited trait with middle and later Bronze Age flint, and would fit in well with known layer 3 Bronze Age associated activity. A second multiplatform, patinated, flake core with crushed bruising on one edge was found in **(608) ("layer 7A"- Phase 2),** again indicative of secondary hammer use. Context **(609) ("layer 7B"- Phase 2)** produced a badly faulted primary waste flake **<3>.** Context **(610) ("layer 8"- Phase 1)** produced eight pieces; a burnt and thoroughly blistered probable core; a burnt flakelette; two waste flakelettes (one primary, one secondary); a larger, faulted, secondary flake with remnant partial retouch along one straight corticated edge forming a cutting flake; and a probable core rejuvenation, tertiary piece from a flake core. The two remaining small find number **<4>** pieces consist of a minute flakelette and the bulbar end of heavily patinated blade with fine lateral retouch along one surviving length and opposing use or post-depositional damage.

The retouched knife blade represents the earliest identifiable piece in the collection and is potentially of later Mesolithic (possibly early Neolithic) date. The remainder of the pieces are not diagnostic forms. The cores/core tools with their apparently haphazard removals are more typically Bronze Age although the fact that they have seen subsequent crushing/ hammering use may imply some deliberation. The stratigraphically latest context to produce flint (context **(600)**), produced the only evidence for flint re-use. Re-use of flint is a frequently seen trait found in many Middle Bronze Age and later assemblages (see Edmonds 1995, Butler 2005, etc.). The identification of flint re-use implies the presence of a near-by (on-site?) source of residual flint. The ever present but varying levels of patination maybe related to soil alkalinity.

14.3 References

Butler, C, 2005. *Prehistoric Flintwork*. Tempus, Stroud.

Edmonds, M, 1995. *Stone Tools and Society.* Batsford. London.

15 Site GMXVII Bronze Age pottery and fired clay assessment

Henrietta Quinnell and Carl Thorpe

Dated May 2006

15.1 Pottery

Twenty eight sherds totalling 242g were found, average weight 8.6g. All except that from (610) were of gabbroic admixture fabric, soft with variations in reduction/oxidisation, and generally comparable to the fabric used in the assemblage in GMX/XI; burnt reduced inner surfaces are common. That from (610) is a fine gabbroic fabric without admixture.

Table 15.1 Details of pottery from 2005 excavation, presented in ascending stratigraphic order. *B/s = bodysherd*

Context	Description of context	Pottery	Abrasion
610	Brown clay, equivalent Layer 8	1b/s beaker, fine incised decoration	2
612	Spread with stones and charcoal within 602	1 plain b/s	1, 2
602	Pale grey sand, equivalent Layer 4	I plain b/s	1/2
601 <2>	Creamy sandy loam, equivalent main part of Layer 3	8 plain b/s. One has scrap of internal residue	1/2
600	Dark brown silty sand, equivalent upper part Layer 3	1 base angle, 1 b/s split along coil join, 4 b/s, all plain	1/2
600 <1>	" "	4 plain b/s	1/2
604	Sandy loam layer representing old turf line, beneath 603 and over 601, not distinguished in 1961	1 rim sherd, plain and flat-topped, scar for small circular lug on girth set within design of horizontal incised lines	1/2
u/s	Probably Layer 3	1plain b/s	1/2
-----	Cleaning below turf	3 plain b/s	1/2
-----	Deturfing topsoil	I plain b/s	1/2
-----	Backfill of ACT' trench	1 plain neck sherd	1/2

The beaker sherd from (610) has good similarities to those found previously in Layer 8, both with regard to decoration and to the comparatively high degree of abrasion. The decorated rim sherd from (604) has many parallels in the assemblage from GM X/XI Layer 3 (Phase 5) typical of this poorly made and poorly fired material with untidy incised decoration. The plain neck sherd from trench backfill is a shape common within Trevisker assemblages. All the material except the beaker sherd can be assigned with confidence to the distinctive Trevisker assemblage from GM X/XI Layer 3 (Phase 5).

15.2 Recommendation

This small collection can be included in analysis of the main GMX/XI assemblage without additional cost. Possible conjoins for the sherd from (604) should be sought, which merits illustration if none are found.

15.3 Fired clay assessment

One lump weighing 36g came from 600; this had the remains of a distinct smoothed surface. A second lump weighing 7g came from (601) and lacked any original surface. The fabric appears to be non-gabbroic and local, similar to that of the possible pieces from 'loomweights' from the main GMX/XI assemblage. It should be noted that only Layer 3 from this and other sites in GM produced pieces of fired clay likely to be artefacts as opposed to structural daub.

16 Gwithian site GMXVII Stonework assessment

Henrietta Quinnell and Carl Thorpe

Dated: 24/05/2006

16.1 Introduction

There are 16 artefacts (Table 16.1), all but four small fragments, and 31 pieces which show no signs of use. The latter have been retained, with an annotated archive list.

Table 16.1 Details of stonework from GMXVII presented in ascending stratigraphic order

Context	Description of context	Stonework
612	Spread with stones and charcoal within 602 (equivalent Layer 4)	1 fragment of cobble muller with heavily worn surface
601	Creamy sandy loam, equivalent main part of Layer 3	1 fragment of cobble muller with heavily worn surface 1 fragment of cobble muller 1 fragment from saddle quern working surface 1 fragment from saddle quern working surface; one edge has slight reworking ? for cutting 1 rubbing stone, re-used as hammerstone
600	Dark brown silty sand, equivalent upper part Layer 3	1 fragment of cobble muller with heavily worn surface 1 fragment of cobble muller working surface 2 fragments from working surfaces of different saddle querns 1 fragment granite saddle quern working surface 1 elongated cobble with slight use as flensing tool 1 fragment rubbing stone 1 flat cobble utilised as anvil 1 killas slab, edge use as whetstone
u/s	Probably Layer 3	I killas fragment, edge trimmed for cutting

16.2 Results

The types of artefacts are all well represented in the assemblage from GMX/XI. The rubbing stone re-used as a hammerstone from 601 demonstrates the frequent re-use of stone artefacts for different purposes which is a distinctive feature of that assemblage. A large number of the items, mullers and saddle querns, were used for cereal processing. The types of rock selected are generally hard, granites, elvans, greenstones, and most appear to have been waterworn and therefore to have come from beach or stream bed. The two pieces with secondary working to provide ad hoc cutting edges do not have comparanda in the assemblage from previous excavations. However all the material from previous collections represents either complete, or very

substantial parts of, artefacts, with few small fragments with suitable edges for trimming. Overall the fragmentary nature of the 2005 assemblage is marked, with most artefacts represented by pieces which are fist-size or smaller. Such small pieces do not appear to have been retained from the previous excavations and their presence suggests that the overall number of stone artefacts present on the site is larger than supposed. The process by which large artefacts such as querns became reduced to small fragments is unclear as no impact fractures are identifiable.

16.3 Recommendation

This material can be included for analysis with that from the previous excavations without additional cost. All items would need rapid expert petrological scanning to provide details of lithology but this can be carried out within the time allowed. No additional drawings would be required but one or more of the 2005 items might be selected for illustration in place of those from the main assemblage.

SECTION 3

17 The Gwithian Archive: Rapid appraisals and assessments carried out 2003-2004

17.1 Gwithian: Assessment of the prehistoric and Roman period pottery

Henrietta Quinnell with petrographic comment by Roger Taylor and input from Carl Thorpe

Dated: 10th March 2004

17.2 Overall Introduction

All the material was examined by Henrietta Quinnell and Carl Thorpe at the RIC, Truro, with details recorded on standardised appraisal forms. Because detailed stratigraphic data was not available and because the size of the assemblage overall had been demonstrated by the finds audit to be large, the examination was rapid and did not attempt to estimate some details such as proportions of fabrics present. An attempt has been made to indicate the likely work involved in analysis for publication linked to demonstration of the ways in which the assemblage is important. However this will need revision when fuller stratigraphic data is available.

The assemblage ranges in date from the Neolithic to the Middle Bronze and includes the Roman period with a few Later Iron Age sherds: almost all fabrics are gabbroic. Examples of these, together with those of other fabrics, were abstracted and listed as 'petrographic samples' prefixed PS hereafter. These were by microscopically examined Roger Taylor in Exeter. His detailed report is filed with the archive with summary details included here.

The assemblage is presented in five main groupings: **GMX/IX, GMXV,** and **Minor sites** are prehistoric and recommendations for further assessment and for analysis are considered together; **Crane Godrevy with Godrevy Hillside,** and **Porth Godrevy** are of the Roman period, with a few Iron Age sherds.

Much of the prehistoric material has not been washed – allowing good preservation of residues, and much has not been fully marked with site and bag number.

17.3 PREHISTORIC SITES: SUMMARY AND IMPORTANCE

17.3.1 Early Neolithic

Five small and abraded sherds were identified, of apparently similar gabbroic fabric with traces of black coating. Two from GMX Layer 8 included a simple rim; the others were from GMX Layer 2/5, GMXV Layer 8 away from house site and GMIX (no Layer). The two sherds from GMX Layer 8 were examined by RT as PS5 and described as an unusual gabbroic fabric containing much fresh crushed gabbro. The well-known comment by Peacock (1969b, 148 & Fig 1) that Neolithic sherds from Gwithian were gabbroic was based comparanda derived from fabric descriptions in interim reports; Peacock had not seen the sherds nor were they thin-sectioned.

One further body sherd may be Early Neolithic, a gabbroic sherd with angular vein quartz inclusions from GMX Layer 5; this was examined by RT as PS6.

These sherds are small, abraded and scattered. They indicate some Early Neolithic activity across the general area but provide no indication as to the nature of this.

17.3.2 Late Neolithic ?

Two sherds just possibly Grooved Ware were identified in GMX Layer 3 (see below). The identification rests on their decoration. The fabric is similar to the remainder of the GMX 3 assemblage.

17.3.3 Beaker

Sixteen small sherds were identified, all small and abraded, from a wide range of locations. Their fabric appears to be gabbroic, but the possible inclusion of grog in PS17 and one gabbroic admixture sherd indicates some variation. The sherds demonstrate, as do those of the Early Neolithic, general activity across the area but with no specific focus. (The house in GMXV previously considered to be of the Beaker period (Megaw 1976) is associated with later, Trevisker, pottery).

POTTERY

Location	Description	PS No	Fabric
GMX Layer 7 BN220	Comb stamped	17	Gabbro with ? grog
GMXVI no layer BN1	Plain rim		Gabbroic
GMXVI no layer BN4	Rim of S(outhern) type, incised horizontal lines		Gabbro admixture
GMXV Layer 5 away from house BN18	Neck sherd, incised chevrons		Gabbroic
GMXV Layer 5 away from house BN45	Cord impressed body sherd		Gabbroic
GMXV Layer 5 away from house BN57	Rusticated body sherd		Gabbroic
GMXV Layer 7 away from house BN50	Comb stamped body sherd		Gabbroic
GMXV Layer 8 away from house BN4	Plain rim with body sherd		Gabbroic
GMXV Layer 8 away from house BN42	3 comb impressed body sherds from different vessels	26	Gabbroic, one sherd PS26
GMXV Layer 8 'fill of palisade' in house BN242	Comb stamped sherd	25	Gabbroic
GMXV Layer 8 'house floor posthole' BN259	Cord impressed sherd		Gabbroic
GMXV Layer 8 'floor of house' BN149	Comb stamped sherd		Gabbroic

Table 17.1 Details of Beaker sherds; PS nos examined by RT

17.3.4 Trevisker

The remainder of the prehistoric assemblage of some 3000 sherds appear to be Trevisker in style and there is nothing of any subsequent date, that is Late Bronze Age or Later. Of this Trevisker material the greater part, *c* 1300 sherds from Layer 3 in GMX/IX with another 424 of similar character intrusive in other Layers or with uncertain records, have distinctive characteristics of form, decoration and fabric, accompanied by indicators of on-site potting of gabbroic clay; these, are summarised separately below. The remainder divide into two groups: 221 had some association with the GMXV house, formerly considered to be of Beaker date; 1055 occur in arable soils and associated features across a large number of cuttings including those in GMXV away from the house and in GMX/IX below Layer 3.

17.3.5 Standard Trevisker from the GMXV house and from all other contexts (except GMX/IX Layer 3)

These two groups are broadly similar in character and may be considered as 'standard' Trevisker material. Form and decoration are noted below but all belong to the range found on Middle Bronze Age settlement sites in Cornwall (see Parker Pearson 1990; Woodward & Cane 1991). Some of the material deposited in the house appears to result from structured deposition, while much of that occurring elsewhere is abraded and appears to result from the spread of refuse as manure on ploughed fields. Further analysis should establish any detailed similarities or definite differences between these two ceramic groups and so provide pointers to the relationship between the use of the house and the surrounding fields. Published comparanda indicate that Trevisker material in domestic contexts is likely to be Middle Bronze Age, that is the latter part of the 2nd millennium BC.

The majority of the assemblage was of well made gabbroic admixture, gabbroic clays with other added rock fragments; this is usual for MBA Cornish Trevisker (Parker Pearson 1990, 19). In addition some sherds were identified as gabbroic (without admixture) and some, around 5%, as broadly granitic. Examples of these three broad fabric groups were submitted to Roger Taylor for examination and the results suggest a rather more complex picture. *Gabbroic fabric* was confirmed in PS33, *loessic gabbroic* (probably with small quantities of admixture including serpentinite) PS9 PS30 PS31, *gabbroic admixture with granite* PS27 PS28, *gabbroic admixture with dark fine grained rocks* PS7 PS8, *gabbroic admixture with gabbro rock* PS29, *gabbroic admixture with hornblende schist* PS10, *with ?feldspar amphibole* PS32, *with dolerite or basalt?* PS34, *with serpentinite and gabbro rock* PS35. The granitic sherds selected for examination proved to be gabbro with added granite. There is no indication of where pots of these fabrics were made, but preliminary indications are that all clay, except granitic, could be sourced on the Lizard. These fabrics differ a little from those of Layer 3, which is why details have been included here.

17.3.6 Trevisker GMX/IX Layer 3 and the manufacture of gabbroic pottery

This assemblage appeared unusually cohesive both in form, decoration and fabric. Forms were dominated by straight walled as opposed to curved sided vessels and rims were simple out-turns without expansion; cordons and simple lugs were frequent. Decoration was all incised, very untidy; zones of decoration incorporating lugs and incisions on cordons and rims were common features. No other Trevisker assemblage

is known in which impressed cord decoration is absent. Numerous conjoins were present and several complete if irregular vessels had been reconstructed. The fabric was in general irregularly, sometimes over, fired, and spalling and refiring were subsequently noted in 1 in 6 sherds of a 250 sample. About 95% of the fabric was a coarse gabbroic admixture, with some granitic fabrics. It is considered highly likely that most of this pottery resulted from on-site bonfire firing. Dating is likely to fall at late stage in the Trevisker sequence towards the end of the 2nd millennium BC.

Manufacture sites are notoriously difficult to establish for prehistoric hand made bonfire ceramics because the indicators such as spalling can occur on pots in regular use; the summary of the evidence has recently been compiled by Hamilton (2002). It is the frequency of spalling, refiring, irregularities in firing which provide broad indication of probability. Only one site at which pottery making was probably the main activity has so far been identified in England, the recent find at Tinney's Lane, Sherborne (Pearce and Reed 2003; A Woodward pers comm). The probability of on-site manufacture at Gwithian is enhanced by the presence of unfired gabbroic clay (PS63). Activity in Layer 3 is unusual for Trevisker settlements. The structures are small sub-rectangular stone walled buildings as opposed to the usual regular round houses. They are accompanied by four small mounds with charcoal and sherds described in interim reports as 'cremation mounds' but possibly the sites of bonfire firing. The stone tools include a large number of simple pebble mullers, with very flat rough surfaces which would be appropriate for preparation of clay and inclusions. Some of the range of bone tools could be used in pot production. Indicators of other craft activities, such as the stone axe mould, and of long distance exchange, such as the unusual apparent presence of Kimmeridge shale may also be relevant to the usual nature of the site. The Layer 3 settlement may either have been domestic, with a strong craft specialisation in the production of pottery, or primarily a craft site; this is a matter for further analysis.

Trevisker pottery in gabbroic admixtures fabrics occurs widely in Cornwall on MBA domestic sites and spreads beyond into Devon. It has previously been suggested that clay, rather than pots, was been transported from the Lizard but there has been no specific evidence for this, in the form of actual manufacture or of inclusions which of a non-Lizard source. The principal reason for suggesting transport of clay appears to be the lack of identified manufacture sites on the Lizard. The general consensus view on the manufacture of Trevisker gabbroic clays has been that this occurred on the Lizard (see Parker Pearson 1990). The manufacture of pottery at Gwithian provides the first good indicator for the transport of clay. Analysis, with further study of firing features on the sherds, the nature of the stone and bone tools and of the contents of the 'cremation mounds' should consolidate this suggestion.

Layer 3 material was all very similar in style and may have occurred over a short time. However the manufacture of some pottery in gabbroic clays away from the Lizard will have considerable implications for interpretations of Middle Bronze Age patterns of interchange, and add an additional strand to its complexity. Much printed space has been devoted to exploring the potential chronological differences of variations in Trevisker style – broadly to what extent do forms of cord impressed decoration precede incised decoration. The current position appears to be that there is little chronological separation. If individual settlements such as Gwithian were making pottery and decorating it in their own individual style, and then exchanging this with other communities, decorative style may have to be considered a signifier of origin and connection between communities, not one perhaps primarily related to chronology. This aspect is sufficiently important to merit considerable exploration during analysis because of the implications for our understanding both of ceramic chronology and of the significance of artefacts to MBA communities.

One very important aspect of pottery manufacture will be to highlight the nature of the difficult evidence for this. It may be expected, once details have been published, that

evidence – if slighter – will be retrieved from other sites, probably even found in those which are already published. For this reason it is recommended that a series of photographs of manufacture features are included in the published report and that a sample of other Trevisker assemblages is examined to see whether these features are present.

The main fabric present is coarse gabbroic admixture. The inclusions present in *gabbroic admixture include pyroxene/amphibole (PS19-22), acid igneous rock (PS15)* of interest because this appears to be present in the unfired clay sample PS63, *basic igneous rocks (PS14, PS12, hornfels (PS13),* and *unidentified dark fine grained rock (PS11, 16).* There are some sherds which appear to be *gabbroic without other inclusions (PS23, 24).* The *c* 5% granitic fabrics divide into a *granitic derived group (PS1-3)* and a *fully granitic group (PS18).* The range within gabbroic admixture appears less wide than in the other Trevisker material from the site, but pyroxene/amphibole seems only to be present in Layer 3. The granitic and granitic derived fabrics have not yet been clearly identified except in Layer 3, while the loessic gabbroic fabrics do not occur in Layer 3. These differences will need to be as clearly established as is feasible during analysis as they indicate slightly different sourcing for different dates. For Layer 3, initial indications are that the granitic and granitic derived fabrics are in form and decoration from the same distinctive vessels as the gabbroic admixture; a few instances of refiring have also been observed. Further study of fabric and manufacture features should indicate whether small amounts of local granitic derived clays and granitic clay which must have been brought in from some kilometres to the east were also potted on site.

17.4 PREHISTORIC SITES GM X and GMIX

These sites are adjacent. Layer 3, with a distinctive gabbroic incised Trevisker pottery style probably made on site and associated with small subrectangular structures, is confined to these two sites. Layer 5 represents an agricultural soil with ard marks and some related features and contains Trevisker pottery. Lower soil layers also contain Trevisker pottery, with a little Beaker and Early Neolithic material, but there appears to have been minimal investigation below Layer 5 in GMIX.

17.5 General considerations and stratigraphic data

The assemblage from GMX consists of some 1714 sherds, 1536 stratified as in the Table and 178 unstratified; GMIX consists of 817 sherds, 513 stratified and 304 unstratified: the total from the sites together is 2531. Notes were made on appraisal sheets of Cutting, Layer, and any other stratigraphic detail for Layers 1 to 8 where recorded. The notes in the Finds Register make it clear that much additional stratigraphic data are available; for example Layer 3 in a particular cutting may be described as ‘midden’ or ‘House floor’ or ‘cremation mound’. These notes also record that Layer 3 was found both under, around and over Houses. A few Bag Numbers were recorded as Layer 3/5, 3/7 and 2/5. For some groups Bag Numbers were not present or the data available did not allow assignment to Layers; these are included with unstratified material. In the numerical summary no account is taken of Layers described as ‘disturbed’, but the Finds Register highlights numerous instances with some disturbance or where there may have been doubt about which Layer to assign finds to.

Because the character of the pottery in Layer 3 is so distinctive character, a short list is given as an Appendix for Bag Numbers where this material appears in other Layers and may indicate possible disturbance or other problem.

Layer	Sherds		Residue: some Bags have many examples		Drawings recommended	
	GMX	**GMIX**	**GMX**	**GMIX**	**GMX**	**GMIX**
1	1					
2	17				3	
3	943 includes 5 reconstructed vessels	379 includes 1 reconstructed vessel	19+	16	42	29
Probable Layer 3 eg 'top ginger', midden etc	93		7		7	
4	3					
5	137	3	2		6	2
5 judged disturbed because of type of ceramics	162	33	4		4	
3/5	131	98	4		1	
3/7	13		1		1	
2/5	1					
7	7				4	
8	21				8	
8 judged disturbed because of type of ceramics	1					

Table 17.2 Details of the GMX and IX prehistoric assemblage. A further 178 from X are unstratified: these are fewer than in the finds audit summaries as less material was assigned to Layers. 308 sherds unstratified from IX.

17.6 Chronology and the character of the assemblages in the Layers

Early Neolithic from GMX. Three distinctive sherds in thin gabbroic fabric with well finished darker surfaces, possibly black coated, were noted: two came from Layer 8 (Bag No 215) including a simple pointed rim, and one from Layer 2/5 (Bag No 819). Illustrated by Megaw 1976, Fig 4.6, No 10. It is likely that analysis will reveal further small sherds with similar fabric.

Petrography The two sherds BN 215 were examined Roger Taylor as PS5. He comments: sherds identical in temper and buff coloured matrix; gabbroic inclusions unusual in the angularity, splintered nature, and freshness of much of the feldspar. Largely composed of relatively fresh crushed gabbro rather than the more usual weathered fragments. Buff matrix suggests a relatively low-iron clay, unusual for gabbroic wares.

Later Neolithic? from GMX. It is just possible that two sherds of Grooved ware are present in Layer 3; (Bag No 487) has a broad area of deeply incised herring bone decoration, (Bag No 597) a group of closely spaced horizontal incised lines. Neither are closely comparable with Trevisker material. However the general character of the Layer 3 Trevisker assemblage is so unusual that these sherds may of this date. Their fabric is similar to that of the Layer 3 Trevisker assemblage and the sherds do not appear abraded.

Beaker from GMX. A single abraded sherd of comb impressed Beaker (Bag No 220) occurred in Layer 7. This appears to be of similar gabbroic fabric, broadly similar to the Beaker sherds in GMXV.

Petrography Examined by Roger Taylor as PS17 who comments that it is gabbroic with some similarity to the Early Neolithic PS5 but also may contain grog.

The Layer 8 material from GMX. Most of the 21 sherds are very small and generally abraded, some broken crumbs. Apart from the two Neolithic sherds, the remainder are good quality gabbroic admixture fabric, similar to that of the Trevisker material in Layer 5. One group included a plain rim with body sherds of distinctive Trevisker form.

The Layer 7 material from GMX. The 7 sherds include the abraded Beaker described above. The remainder are abraded to various extents and of good quality gabbroic admixture fabric. These include a body sherd with impressed plaited cord, another with simple impressed cord and two rims, one with impressed cord and one with incisions. The decorated sherds all appear to be Trevisker in character. The small and abraded character of the material suggests a soil in use over a long period of time in the general vicinity of occupation. All the forms of decoration present on the sherds are known to be present on Trevisker material during the Early Bronze Age (Quinnell in Nowakowski forthcoming) but could continue until well into the Middle Bronze Age.

The Layer 5 material from GMX/IX. This material is of a better made fabric than Layer 3, often with a burnished finish. Sherds of varied sizes but generally considerably eroded. A comparatively small number have distinctive form or decoration. There are two everted rims, one on a curved wall vessel decorated with a double zone of finger nail chevrons. Plaited cord, cord with parallel impressions and incised decoration are all present. Two lugs are broadly similar in form to those in Layer 3, one set within a zone of incised decoration, the other with a broad groove. The cord impressed decoration and the general quality of production contrasts with the irregular incised designs of Layer 3. The assemblage has too few distinctive pieces for detailed comment. All these would find comparanda, as does the Site XV Layer 5 material, with the Trethellan assemblage (Woodward & Cane 1991). Sherds occur in no particular concentration and probably represent deposition, perhaps in relation to the spreading of household waste as manure, over a long period.

Petrography The good quality gabbroic admixture was examined as PS7 and PS8 by Roger Taylor who comments that the gabbroic matrix contained dark fine-grained rock fragments. A small number of sherds had been considered to be gabbroic, without admixture inclusions. Two of these were examined by RT: PS10 was gabbroic but with quantities of hornblende schist and so a good quality admixture fabric; PS9 is described by RT as loessic gabbroic (see Harrad forthcoming) but again a good quality admixture as it contained fragments of angular serpentinite. A distinctive sherd PS6 was confirmed by RT as gabbroic with large vein quartz inclusions; such fabric is common amongst the Neolithic assemblage at Carn Brea (Smith 1981, 162) and this sherd may be Early Neolithic.

The Layer 5 material considered disturbed from GMX//IX. This is generally more similar to Layer 3 than Layer 5. Pieces are generally larger and little abraded with more soot and residue. In general the forms and decoration appear similar to those in Layer 3.

17.7 The distinctive character of the Layer 3 Trevisker assemblage from GMX/IX and the probability of on-site manufacture using gabbroic clay

17.7.1 Fabric and petrography

The fabric used is poorly made and finished. Many sherds are large and fresh, with frequent conjoins; several virtually complete vessels were reconstructed during the excavation by Professor Thomas. Many have charred material adhering to their inner sides, often appearing to permeate the fabric. There is considerable potential for examination for conjoins. Much of the pottery has indicators of irregular firing. A check of some 250 sherds showed that one in six was either spalled or refired, both features which relate to pottery manufacture. A sample cut from an unfired clay slab was examined as PS63 by Roger Taylor and shown to have a gabbroic matrix with inclusions of ?hornfels which may either be local or from the Lizard. Unfired gabbroic clay was therefore present on the site.

Most of the assemblage comprises gabbroic, mainly, admixture fabrics, though some, perhaps 5% are granitic; several of the granitic pieces have been refired. Four granitic sherds, PS1-3 and PS18; the first three are described by RT as granitic derived, using material from a stream sediment source which could occur fairly close to the site, the distance needing checking; PS18 is granitic, containing material from freshly eroded granite.

A little of the gabbroic assemblage appeared to contain no non-gabbroic material: PS23 and PS24 were confirmed by RT as fine-grained gabbroic fabric without other inclusions. The remainder all contained a range of non-gabbroic inclusions and was described as ‘coarse gabbroic admixture’. Eleven samples were examined by RT to cover the range – PS4, PS11-16 and PS19-22. Hornfels, hornblende schist, basic igneous rock, ?serpentinite and a variety of fine-grained dark rocks were among the inclusions identified. RT comments that the inclusions of rock in PS15 matched those in the unfired clay sample PS63.

The comments made about the shape and decoration below apply to the whole Layer 3 assemblage which appears stylistically cohesive. The spalling, refiring and general overfired condition of much of the material, together with the presence of unfired gabbroic clay, indicates a high probability that pottery was being made on site, from clay brought in from the Lizard. Previous discussions (see Parker Pearson 1990, 19) have put forward suggestions that gabbroic clay was moved to be potted elsewhere but there has never previously been any definite data in support of this. Such discussions had suggested that the inclusions in gabbro admixture clays were added from local sources to imported clay but Parker Pearson showed that all inclusions identified at the date of his paper did, or could, originate from the Lizard area. Analysis will establish whether the inclusions in the Layer 3 material are all sourced from the Lizard; Roger Taylor's initial studies suggest that they are but many need definite sourcing.

17.7.2 Shape and decoration

Vessel size is extremely varied from small bowls through medium sized jars up to very large containers. *Vessel shape* tends to straight rather curved sides and includes a number of bowls. *Rims* tend to be very simple or everted with an internal bevel; flat-topped and expanded rims are rare. *Decoration* is incised and may include finger nail; the only cord impressed sherd was extremely abraded. Much of the decoration was incised on wet clay. Patterns are irregular and include a number of simple geometric patterns. The decoration is not usually confined by borders at either the top or the bottom. Decoration tends to be around girths, although may sometimes extend towards the base on bowls. Flat girth *cordons* are common and some have incised decoration. *Lugs* again are common, either two or four on a vessel. They have a range of forms but most are squarish; a distinctive feature is a 'grooved' surface as though a finger has been drawn across the finished lug. Lugs tend to be set more or less centrally to decoration if present. Oblique incisions or finger nail impressions occur regularly on rims. *Cutting 2* contained a distinctive group of sherds, bowls with everted rims and decorated cordons; these have some resemblance to Food Vessel bowls. However as the fabric and finish appears similar to that in the remainder of the assemblage, it is probable that the Cutting contained sherds from vessels made in a particular variant of the Layer 3 Trevisker style, perhaps detritus from one short episode of manufacture.

While there has been a general tradition in the literature that incised vessels are late within the Trevisker sequence, the problems of its chronology are complex. Incised vessels appear along side those with cord impressed designs from sometime in the Early Bronze Age (Quinnell in Nowakowski forthcoming). During the Middle Bronze Age both cord impressed and incised vessels occur together on sites such as Trethellan (Woodward & Cane 1991) and Tredarvah (Pearce & Padley 1977). However recently work so far unpublished on excavations at Penhale Moor in advance of the A30 Indian Queens road works has indicated that there may be sites with only incised designs. However these designs tend to be more regular than those at Gwithian Layer 3 and to be generally constrained within borders. Current data indicate that the Gwithian Layer 3 material is late within the Trevisker sequence.

The only site with Trevisker occupation material so far published to the west of Gwithian is Tredarvah, near Penzance (Pearce & Padley 1977). The assemblage here includes a range of cord impressed vessels, but also has some which may be comparable to the Layer 3 material eg the bowl rim No 3, Fig 13. (The report on Tredarvah did not provide a petrographic comment; notes on one thin-section identified as 'gabbro?' has subsequently been published (Parker Pearson 1990, 28, No 54).) Further examination of the Tredarvah assemblage will assist understanding of the Layer 3 GMX material within the Trevisker sequence in West Cornwall.

Grain impressions. Two were noted on sherds in Cutting 11 GMIX, BN 171.

17.8 SITE GM XV

17.8.1 General considerations and stratigraphic data

The assemblage consists of 339 sherds with 21 unstratified. Site XV covered a wide area and included a timber house previously considered to be of Beaker date. The assemblage has been divided between the outlying Cuttings away from the house, in which the main features are arable soil layers, and the Cuttings in the area of the house (16, 19, 21, 22, 23, 24). In both, all the material can be assigned to Layers.

Cuttings away from the house (all cuttings except 16, 19, 21, 22, 23, 24).

Layer	Sherds	Drawings	Bags containing sherds with residue
2 or 2/5	4		
5	66	5	3
7	20	3	2
8	15		

Table 17.3 GMXV Sherds from Cuttings away from the house

Layer 2 or 2/5. Material generally similar to Layer 5

Layer 5. The material is generally abraded. There are three probable Beaker sherds, all very abraded; a neck sherd with fine incised chevrons, a cord impressed sherd and a rusticated sherd. These sherds are gabbroic; one was examined by RT as PS26 and confirmed as fine gabbroic fabric. The remaining sherds are Trevisker, with gabbroic admixture fabrics broadly fabric to those in GMX/IX Layer 5, a few gabbroic and a few granitic sherds. One gabbroic sherd PS33 was examined and confirmed by RT; one considered granitic PS27 examined by RT appeared to be gabbroic with granitic inclusions. The Trevisker material includes both incised and cord impressed decoration, the latter in various forms, plaited cord and parallel impressed cord, all probably from bordered designs with heavy and expanded rims; there is also a sherd of the comb-impressed vessel discussed further under Layer 5 house. At least three sherds have residue.

Layer 7. The material is generally abraded but in larger pieces than Layer 8 below it. There is one comb stamped Beaker sherd, very abraded. Trevisker material consists of one piece with plaited cord which is fresh, an abraded cord impressed and an abraded incised piece. The fabric appears similar to Layer 5. Two sherds with residue.

Layer 8. This material is generally small and abraded. There is one Early Neolithic sherd similar to those from GMX, and five Beaker sherds all of similar gabbroic fabric; these include three comb stamped body sherds from different vessels, one rim and one plain body sherd. A single sherd in coarse gabbroic admixture fabric is less abraded and has plaited cord decoration.

Cuttings in the area of the house (Cuttings 16, 19, 21, 22, 23, 24).

Layer	Sherds	Drawings	Bags containing sherds with residue
5	155	18	9
7/8	6	2	
8	60	8	3

Table 17.4 GMXV Sherds associated with, or in area of house

Layer 5 in area of house. This material is broadly regarded as coming from Layer 5 over the house. However some bags are marked 'inside house' which means the house had already been located and identified before some of Layer 5 was removed. This raises the possibility that some of Layer 5 was at a lower level than the remainder, perhaps infilling a hollow into which the house was set. This problem can only be resolved after further work on the stratigraphic record.

The sherds were well made: a few were gabbroic, most gabbroic admixture. However their size generally seems to be larger than those in Layer 5 elsewhere. The amount of abrasion varies but is generally less than other Layer 5 contexts. These two factors together may be a pointer to the presence of a small midden dump over the house, which in turn indicates the protection of some kind of hollow. However no obvious conjoins were noted. The two gabbroic sherds examined by RT, PS30 and PS31 were of sandy loessic gabbroic similar to PS9 in Layer 5 GMX/IX. The gabbroic admixture sherds, PS32, PS34-35, contained rock with feldspar/amphibole, with ?dolerite or basalt, and with ?serpentinite and gabbro rock.

All the material appears to be Trevisker but comprises the most varied range from all contexts at Gwithian. Vessel sizes are varied. Rims may have external expansion or be simply out-turned. Bordered designs include those with impressed plaited cord (rows of impressed cord with opposite twist), impressed cord with parallel twist, or with incision. There are less common features, a double row of circular impressions, a complex band of finger nail impressions. There are several sherds of a comb impressed vessel, probably from one vessel as published by Megaw (1976, Fig 4.7, No 6, published as from Layer 7). This vessel was considered by Megaw to belong to a non-Trevisker Beaker-related style, because at the time of writing no comb impressed Trevisker pottery was known and comb impressions were considered a Beaker trait. About 5% of the large assemblage from Trethellan Farm has comb impressed decoration (Woodward & Cane 1991, 106 and see Fig 40 No 7, Fig 46 No 38). A large comb impressed vessel also comes from the assemblage at Trelowthas barrow near Probus, with dates centering on the 18th century cal BC Quinnell in Nowakowski forthcoming). Comb impressed Trevisker is clearly distinguishable from Beaker as the impressions are larger and the fabric is different, thicker than that usual in Beakers and similar to other Trevisker material in the assemblages.

All this Layer 5 material, including the use of finger nail and of rows of circular impressions, has comparanda in the Trethellan Farm assemblage. It may be noted that, at Trethellan Farm, no contextual distinction could be made between vessels with plaited cord impressions, other cord impressions or incised decoration (Woodward & Cane 1991, 106).

Grain impressions. *Bag Number 240 Layer 5 contained a sherd with two grain impressions.*

Layer 8 material and the date of the house. (The small quantity recorded as Layers 7/8 appears to be similar and is not separately discussed). A number of bags are marked in the Finds Register with information such as 'inside house' 'floor of house' 2' E of ph 5'. The material divides clearly. There are three small Beaker sherds of gabbroic fabric, considerably abraded; one with cord impression comes from 'house floor p.h.', one comb stamped from 'floor of house', the third, comb stamped, from 'fill of palisade'. The last was examined by RT as PS25 and confirmed as gabbroic. The remaining 63 sherds are of different thicker gabbroic admixture fabrics and all formal and decorative features are Trevisker in character. These sherds are much larger than the Beaker pieces and are generally fresh. Conjoined sherds from the base and lower part of a vessel were found in 'slot ditch filling'; although no there is no surviving decoration the pot is large and in the Trevisker style. 'Slot ditch filling' would appear to refer to the structural slot forming part of the house plan (Megaw 1976, Fig 4.4) which also contained a body sherd with Trevisker plaited cord decoration. The Trevisker sherds come from vessels with bordered designs, plaited cord and parallel cord impressions with a single incised sherd; at least one sherd has finger nail decoration. Some of these pieces are specifically related to the house floor or recorded in relation to postholes. The material in general does not appear to differ from that in Layer 5 over the house. Two sherds PS28 & PS29 were examined by RT; PS28 appeared to be gabbroic with granitic inclusions – similar to PS27, PS29 to contain gabbroic rock inclusions.

The principal interim publication of the Site XV house is that by Megaw (1976) who argued for a Beaker date although pointing out (ibid, 58) that the Beaker sherds were 'considerably abraded'. It is now clear that construction and use of the house was related to Trevisker pottery and that the Beaker sherds are of the same small abraded character as were found in the outlying parts of Site XV and in Site X, part of a general sparse scatter connected with arable activity. The house was inserted into Layers 7/8 at a later date; it may be noted that no material is on record as coming definitely from Layer 7 in the area of the house, possibly because this layer had been removed by its construction. The ceramic sequence of South West Britain was even more poorly understood in the 1970s than it is now. Also, in the 1970s, permanent prehistoric structures of Beaker date were still being sought, whereas it is now recognised that domestic structures of this period and of Early Bronze Age were insubstantial compared to the circular houses introduced in the Middle Bronze Age. The interim account can therefore be viewed very much as a document of its time.

Megaw's (1976) account gives the impression that there was more Beaker pottery present than was actually the case, referring for example to two sherds from the filling of a posthole. Some misunderstanding may be due to misinterpretation of material; other discrepancies may relate to a rather broad interpretation of stratigraphy - the Trevisker comb stamped sherds from Layer 5 published by Megaw as from Layer 7 are an example of this. Megaw's report presents the house as of two phases. Further work

is needed on the stratigraphic archive to establish the validity of these and the relationship of the house to surrounding Layers. After this is done, the findspots of the pottery can be reconsidered and any discrepancies with the material as presented by Megaw addressed.

17.9 MINOR PREHISTORIC SITES

17.9.1 GMV

Probable continuation of soil layers with some associated features in Layer 5.The 18 sherds were treated as a single assemblage as insufficient data was available during appraisal to assign these to Layers. There were three post-prehistoric sherds, one of Bii amphora and two of Early Medieval fabric of the type found in GM1 grass-marked vessels. The remaining 15 sherds appeared to be in a well-made gabbroic admixture fabric similar to that in GMX Layer 5 and were abraded to varying degrees. Two body sherds had narrow and broad flat cordons respectively and a rim sherd had some degree of external expansion. As far as comment is possible for such a small group, this would appear to be Trevisker material in general comparable to that in GMX Layer 5. No sherds had residue appropriate for dating.

17.9.2 GMXI

Site contains arable soil with ard marks and associated boundary features. Only two fresh sherds were present from 'wall cutting', a body and a base angle sherd in well made gabbroic admixture fabric. No residue is preserved.

17.9.3 GMXIV

Probable continuation of soil layers with some associated features in Layer 5. Six fresh or slightly abraded sherds were present in well made gabbroic admixture fabric: one from Layer 5, one - a flat-topped rim - from Layer 7, and four from Layer 8 of which one had impressed plaited cord decoration. No residue is preserved.

17.9.4 GMXVI

Part of an enclosure ditch identified in Layer 5. Nine sherds were present, of which one was medieval. Available data did not allow this material to be related to Layers, but one sherd, in fresh fabric as GMX Layer 5, was Trevisker with an expanded rim and a neat incised chevron pattern, was recorded as Ditch 2' 5" Brown Fill. Other sherds were more abraded and included a gabbroic black-coated Early Neolithic body sherd, a plain rim in gabbroic fabric similar to the Beaker (PS17) in GMX, and another probable Beaker sherd rim, in a gabbroic admixture fabric, with the curved form of a Southern (S) Beaker and a decoration of incised horizontal lines. The remaining sherds were either similar to GMX Layer 5 fabric or to the GMX granitic fabric. No residue was recorded.

17.9.5 GMXXI

Probable continuation of soil layers beneath Post-Roman arable soil. Thirteen sherds in gabbro admixture fabric, one with incised and one with plaited cord decoration; Layers where noted are 7 or 8. No residue recorded.

17.9.6 GW

Probable continuation of Layer 5. Six sherds in gabbro admixture fabric. No residue recorded.

17.10 SANDY LANE (SL)

17.10.1 The assemblage

Among the Early Medieval assemblage from the midden deposit at Sandy Lane. About 20 sherds in hard gabbroic admixture were; one had an impressed plaited cord line (BN33) and the group may be presumed to be Trevisker. BN41 is the rim of a Type 4 Roman jar in a much reduced gabbroic fabric. The sherds of both Bronze Age and Roman date are of interest as they demonstrate the extent of past activity in the Gwithian area. No residue recorded.

17.11 FURTHER ASSESSMENT: PREHISTORIC POTTERY

1) Because the character of the GMX/IX Layer 3 Trevisker assemblage is so distinctive and because so many pieces have good quantities of residue, it is recommended that radiocarbon determinations be obtained at this stage to provide a reliable date to feed into work at the beginning of analysis for publication. Subject to EH advice, perhaps four samples might be dated.

2) Four grain impressions on sherds are noted above and more may be found during analysis. Advice should be sought from EH about appropriate procedures for identifying the cereals involved.

2) Recommendations made below for analysis will need review when the amount of stratigraphic data available is established. *5 days work* should be allowed for HQ for this and for providing liaison over the radiocarbon dating.

17.12 ANALYSIS FOR PUBLICATION: PREHISTORIC POTTERY

The pottery will be considered in four groups A) the scatter of Early Neolithic, ?Late Neolithic and Beaker sherds from all sites B) GMX/IX Layer 3 assemblage probably related to on-site pottery manufacture C) GMXV material from Layers on or over the house D) all other material from GMX/IX, GMXV and minor sites; this lacks the close relationship with function and activity relevant to B and C, although further stratigraphic work may cause adjustments. Timings take into account the need to incorporate new context numbers provided by further stratigraphic work and make some allowance for the additional contextual complexities which may need consideration. While completion of appropriate marking is recommended following discussion with the RIC, it is not recommended that any further washing takes place unless needed for fabric identification or for consolidation of conjoins.

17.12.1 NEOLITHIC AND BEAKER SCATTER

1) HQ will compile a catalogue of sherds - additional examples may be identified when the assemblage is studied for analysis. HQ will then provide a short synthesis placing Early Neolithic, Late Neolithic if verified, and Beaker within its local context. There are no residues for dating.

2) All Beaker and Neolithic sherds not already studied (*c* 15) will be examined microscopically. Thin section work is not appropriate because of small sherd size or damage to decoration for Early Neolithic and Beaker but one of the ?Late Neolithic sherds may need this.

17.12.2 GMX/IX LAYER 3

1) The whole assemblage needs to be laid out to allow a search for conjoins. HQ will work with CT on this. As well as conjoin work, HQ and CT will compile a catalogue of sherds, noting fabric (relating to groups established by RT), sherd weight and size, abrasion, and features such as spalling and refiring; sherds will also be examined for grain impressions. A representative series of vessels/sherds, probably around 50, will be selected for publication and provided with detailed descriptions. Note that the vessels already reconstructed will be retained in their present condition as significant artefacts in the sequence of Gwithian studies and corrections to shape will be adjusted in drawing. Any necessary marking will be completed. Radiocarbon dates were suggested for a stage of further assessment.

2) RT will visit Truro to examine the assemblage when laid out. He has already identified 6 gabbro admixture pieces for thin section (PS4, 12, 13, 14, 15, 19), one from granitic PS18, and one to be selected from granitic derived fabrics PS1-3; the clay sample PS63 will need an impregnated thin section: a further 2 thin sections should be allowed for. 6 days work for examining thin sections and providing input to the report. Total .thin sections required: 11.

3) CT will provide 50 drawings. Note that after conjoin work it is expected there will be a number of complete vessels to be drawn, in addition to those already reconstructed.

4) Photographs should be published of manufacture features such as spalling and refiring.

5) HQ will provide a synthetic discussion of the material, evaluating its importance for the manufacture and distribution of Trevisker pottery in Cornwall. This will include re-examination of some other Trevisker assemblages to see whether manufacture traces have been missed in the past and to provide some overview of the evidence for MBA pottery manufacture in Cornwall.

17.12.3 GMXV HOUSE AREA

1) HQ will catalogue the material in Exeter, noting fabric, abrasion, grain impressions, and ensure any necessary marking is completed; *c* 25 pieces for illustration will be selected. Material will be selected for radiocarbon dating of residues, with appropriate EH advice (this cannot be done until more detailed stratigraphy is available). After catalogue, petrography, radiocarbon dating and illustration, a synthetic discussion of the material will be completed. Note that this discussion will take into account possible structured deposition in the house (*cf* Megaw 1976, 53).

2) The Trevisker gabbroic, gabbroic admixture and loessic fabrics need further study: 9 thin sections covering the range have already been selected – house area PS28, 29, 31, 32, 34, 35; away from house PS 27; from GMX Layer 5 (included here for convenience) PS7,10); a further thin section should be allowed to investigate granitic fabrics. RT days study and input into the report 4 days. Total 10 thin sections.

3) 25 drawings by CT.

4) Any radiocarbon determinations possible

17.12.4 OTHER MATERIAL FROM GMX/IX, GMXV AND MINOR SITES

1) HQ will catalogue the material in Exeter, noting fabric, abrasion, grain impressions, and ensure any necessary marking is completed. It seems unlikely that radiocarbon dating will be possible from residues as these are limited in number and not closely related at present to specific features but further stratigraphic work may define contexts which may be dated from bone or charcoal. *c* 37 drawings will be selected: these will include all Beaker sherds not included in B and a range of Trevisker material which supplements B; 25 pieces from GMX/IX, 8 from GMXV, 2 from GMV and 2 from GMXVI. After all these tasks a synthetic discussion will be completed, including a brief summary for each minor site.

2) *c* 37 drawings by CT.

NOTE Some time will be needed for identification of grain impressions.

17.13 CRANE GODREVY (CG)

17.13.1 Description of assemblage

The assemblage consists of *c* 59 sherds, all washed and marked but with no surviving residues. All sherds except three appear to be of standard Romano-Cornish gabbroic fabric: the others are a South Devon jar rim of Roman date, and two body sherds with cordons in different fabrics. Details written on the bags indicate that the majority of the assemblage came from the round ditch, probably from upper levels; the material here is fresh, in fairly large pieces, and suggests some form of midden dump in the ditch. This midden dump contains the South Devon sherd which is a jar rim likely to be 3rd to 4th centuries in date (PS36), and one of the cordoned sherds (PS39). The gabbroic material in the ditch includes three jar rims of Type 4 (Quinnell 2004). Some of these were illustrated by Thomas (1964, Fig 21). There are also sherds of a Type 9 bowl or jars, a form likely to be 3rd to 4th century in date: this was illustrated by Thomas (1964, Fig 21, CG431) and compared to Late Iron Age Breton material but is now a clearly recognised Romano-Cornish form. It should be noted that this drawing has a superficial resemblance to carinated Early Iron Age forms, which may have given rise to some misconceptions about date. A small group of material came from 'wall packing' from a medieval structure and included further Type 4 jar sherds. The second cordoned sherd of unusual fabric (PS38) was found in a posthole in 'Pen Isaf' (Thomas 1964, Fig 21, CG309). Note that three amphorae sherds stored among the medieval material have been examined by Carl Thorpe who considers these may be Bv.

Two sample sherds of gabbroic fabric were examined by Roger Taylor, PS37 and PS40; he confirms that are typical of Roman period gabbroic fabrics. The South Devon sherd PS36 was confirmed as of granitic fabric appropriate for South Devon ware. The cordoned sherd PS39 from the ditch was confirmed as gabbroic. The second cordoned sherd PS38 was identified as being of granitic derived temper with some similarities to Medieval material from production sites at Mawnan and St Germans: I am grateful to John Allan for subsequently confirming this as a Cornish micaceous fabric of the 15th-16th centuries AD; it has been passed to C Freeman for consideration with the other Medieval material during analysis. No further petrography on these local wares is appropriate (except for Medieval PS38).

All the pottery could be 3rd to 4th centuries AD in date. The single cordoned sherd is of well-made gabbroic fabric appropriate to Cordoned wares dating from the 1st century BC to the mid 2nd century AD; however its apparent presence in a dump with 3rd to 4th century AD material suggests that it may have been curated. The assemblage is very small for the provision of a secure date and contains no bowls which provide the best indicators for chronology within the Roman period. There is no South Western Decorated ware of the Later Iron Age. The significance of the Cordoned ware sherd for any start of occupation before the full Roman period is uncertain.

17.14 Godrevy Hillside (GH)

Some eight gabbroic sherds are either of Later Iron Age or Roman date. Six come from 'occupation Layer 4' in Cutting 7 and include the rim of a large Later Iron Age jar in well-made gabbroic fabric; such jars occur during the currency of South Western Decorated ware from, possibly the 4th century BC, until the early 2nd century AD. The remaining sherds include a well-made body sherd with a groove and four less well-made sherds which are likely to be Roman in date. Two sherds come from 'Ginger Layer' in Cutting 4 and both are in well-made gabbroic fabric which was not produced after the mid-2nd century AD. Both contexts have also produced Medieval material and cannot therefore be regarded as closed. However the range of pre-Medieval material could include pieces earlier than any from Crane Godrevy but which may have comparanda among the pre-structural material at Porth Godrevy.

17.15 The importance of the Crane Godrevy assemblage

The assemblage is important because it relates to the round at Crane Godrevy. Rounds are the predominant settlement type during the Later Iron Age and Roman periods in Cornwall but more common in the latter. Although there has been excavation, generally small scale, on nearly 20 of these sites in Cornwall (Quinnell 2004, Table 12.1), chronological information is still sparse. Further study of date of the Crane Godrevy assemblage should both provide more accurate chronological data for activity at the round, and, within the Gwithian landscape, the relationship of the round, presumptively one of some status, to the structure at Porth Godrevy. Initial study of the assemblages from the two sites suggests at least some overlap in use.

17.16 ANALYSIS FOR PUBLICATION

1) Presentation of the assemblage by fabric and form. Discussion of chronology and a presentation of a detailed comparison with the Porth Godrevy assemblage. A brief descriptive summary without drawings should be included on Godrevy Hillside. This work includes consideration of stratigraphic data likely to be available during analysis. Note that as the material is well washed no radiocarbon dating of residues is feasible.

2) Six drawings by CT.

17.17 PORTH GODREVY (GT)

17.17.1 Description of the assemblage

The assemblage consists of *c* 748 sherds which have been washed and marked with Bag Numbers but often without the site code. Assessment treated the material as a single group; re-establishment of stratigraphic groups will only be possible after reworking of the data in the site archive.

The site was published by Fowler (1962) before the distinctive gabbroic pottery of Roman Cornwall had been recognised. Illustration numbers were not written on to finds bags during the publication process but were tentatively ascribed from the published report when the finds were recorded for the current project. At least half these illustrations do not fully represent actual vessel form and two, Fig 9, No 8 and Fig 11, No 3, are misleading (see below).

The majority of the assemblage is standard Roman period gabbroic with a small quantity in well-made gabbroic fabric which is not thought to have been produced much after the mid 2nd century AD. Well made sherds include Fig 10, No 17 which appears to be a Later Iron Age jar rim and Fig 12, No 5, a Cordoned ware sherd likely to have been produced *c* 50 BC - AD 150. The majority of vessels appear to be jars of Type 4 (Quinnell 2004) dating from *c* AD150 to AD 400+. Type 16 storage jars, current in the 3rd and 4th centuries and possibly later, are also present; body sherds of these were illustrated (Fig 12, Nos 1-4) but two distinctive rims with frilled edges, Fig 9, No 8 and Fig 11, No 3, were drawn without showing this feature. Bowls of Type 20 and 21 bowls are present, late 2nd to possible 4th century in date; there are also a few Type 22 Cornish flanged bowls late 3rd to 4th century or later. The preliminary impression is that pottery forms all could relate to occupation broadly spanning the 3rd century, with a small scatter of material relating to previous use of the area in the Later Iron Age and early Roman period.

Two of the jars (Fig 9, Nos 7, 13) were set within the floor and so survived virtually complete. This is now recognised as a very unusual feature for Roman Cornwall and may relate to the function of the structure.

Eight samian sherds from five Central Gaulish mid or late 2nd century vessels were published. While the report indicated that these sherds were not closely stratified and suggested that the material had been brought on to the site in an incomplete state, the presence of part of perforation suggesting reworking of the samian sherds was not noted.

One sherd of South East Dorset black-burnished ware and two of amphorae (PS41) were not referred to in the published report.

Five sherds from the gabbroic fabrics (PS42-46) present were examined by Roger Taylor and confirmed as gabbroic; no further work is considered necessary. The amphorae sherds (PS41) were examined by Ray McBride, Archaeology Department, Tyne and Wear Museums who comments: *These are almost certainly from a South Spanish amphora. Despite the abraded condition of the sherds, surface texture, inclusions and colour allow the fabric to be identified as that of the ubiquitous Dressel 20 (Peacock & Williams 1991, Class 25). The sherds form part of the neck of the vessel, thickening towards the triangular rim, only part of which is present. Dressel 20 amphorae were by far the commonest type to reach Britain from the late 1st to the mid 3rd century AD. They were principally containers for olive oil. The sherds do not merit illustration.*

17.17.2 The importance of the assemblage

The initial publication of the site over 40 years ago needs revision now that the general character of structures in Roman Cornwall is better understood (Quinnell 2004, Chapters 10 & 11). The probable presence of briquetage and the complete jars set in the floor indicate a special function for Porth Godrevy relating to exploitation of coastline resources such as salt. While the assemblage is not large, it should allow some comparison with those from other coastal sites connected with salt production such as Trebarveth T3 (Peacock 1969a) and Carngoon Bank (McAvoy 1980) as well as those from farming settlements situated in rounds such as Trethurgy (Quinnell

2004). The latter publication includes a full examination of current knowledge of ceramics in Roman Cornwall and provides the background against which the Porth Godrevy assemblage should be reassessed.

Revised publication of the Porth Godrevy assemblage will provide a comprehensive statement based on current knowledge about the chronology and function of the site, its place in the Gwithian landscape, and its relationship to the round at Crane Godrevy.

17.18 FURTHER ASSESSMENT

Advice will be needed from English Heritage with regard to any analysis of any residues remaining in the jars set in the floor which may be indicative of function.

17.19 ANALYSIS FOR PUBLICATION

1) Presentation of the assemblage by fabric and form. Discussion of chronology and a presentation of a detailed comparison with the Crane Godrevy assemblage, with salting sites Trebarveth T3 and Carngoon Bank and with Trethurgy. This work will include consideration of stratigraphic data likely to be available during analysis. As the material is well washed no radiocarbon dating of residues is feasible.

2) A brief re-examination of the samian to include any necessary update and comment on its reworking. (I am grateful to Dr Peter Webster for advice; the original author G Simpson may be available, if not Dr Webster will look at the material; no costs are likely to be involved).

3) Between 25 and 30 drawings by CT. These will include all those vessels whose form can be clearly established and allow the main Roman assemblage from Gwithian to be presented visually to the same format as assemblages of other dates.

4) The two vessels set in the floor, retaining no apparent surface residue, should be examined to see whether any form of analysis would provide indication of function. Any costs would depend on advice during further assessment.

5) Marking the sherds with the site code is advised by the RIC.

17.20 APPENDIX GMX/IX

Below are listed groups in which the character of the ceramics suggests there may be disturbance or other context problem.

1. GMIX Pottery

Bag numbers and Cuttings in which Layer 5 appears to have material indistinguishable from Layer 3 and may therefore be disturbed

Cutting 2/3 Bag No 20

Cutting 3 Bag Nos 3, 5, 22

Cutting 4 Bag Nos 64, 79, 91, 83

2. GMX Pottery

Bag numbers and Cuttings in which Layer 5 appears to have material indistinguishable from Layer 3 and may therefore be disturbed

Cutting 1 Bag No 473

Cutting 20 Bag Nos 383, 390, 400, 420, 422, 432, 502, 512, 513, 531, 832, 814, 833, 843, 551, 564, 567

Cutting 21 Bag Nos 708,554, 806

Cutting 27 Bag Nos 661, 757

Cutting 28 Bag Nos 725, 824

Cutting 31 Bag Nos 604, 631, 697, 713

Cutting 37 Bag No 839 grass-marked sherd

Bag numbers and Cuttings in which Layer 8 appears to have material indistinguishable from Layer 3 and may therefore be disturbed

Cutting 1 Bag 379.

18 Gwithian: Baked clay

Henrietta Quinnell with petrographic comment from Roger Taylor

Dated: 10th March 2004

18.1 The assemblage from Site GMX and GMIX

About 208 pieces weighing around 2545g were present, all certainly or probably from Layer 3. These divide into two groups:

1) Of these eight pieces or joining fragments, Bag Numbers 122, 126, 227, 260, 466, 527, 607 and 705 were dense in fabric and had parts of curved surfaces present, generally somewhat abraded. No 466 was examined under a microscope by Roger Taylor as PS60: he comments that the clay was smooth with very few voids and that it contained a few grains of quartz and a fragment of slate/hornfels which indicated a local origin. These fragments appeared to have come from some kind of artefact; no piece had any shape or character indicating possible briquetage. The curved surfaces would point to a traditional interpretation as 'loomweights' which are usually of cylindrical shape in the Middle Bronze Age (eg Nowakowski 1991, 138). However recent work both on triangular and cylindrical weights points to alternative interpretations as oven bricks and as supports within simple firing structures (C Poole in Barrett *et al* 2000, 212-4; A Woodward per comm). These baked clay fragments therefore may be significant because of the probable on-site manufacture of pottery in Layer 3. None was sufficiently complete to merit illustration or to determine with certainty original form.

2) The remaining material was softer and more open, as though it had contained organic inclusions. There were two distinct fabrics, reddish and primrose/buff in colour respectively. Roger Taylor has examined a piece of each under a microscope: PS62 (Bag Number 607) – the reddish fabric contained a scatter of slate fragments, some grains of quartz and a few flakes of muscovite; PS61 (Bag Number 509) – the primrose fabric contained similar slate and quartz. Dr Taylor considers both to originate very close to the site and that the difference in colour results from the reddish fabric having been subject to greater heat and to have oxidised. No pieces were larger than about 150mm in overall length and most were very small. A few showed parts of impressions, some of apparent roundwood, others more angular and possibly split roundwood forming lathes. This material has been classified as 'structural daub'. It may have come from parts of the buildings which had accidentally come in contact with fire, or, given that the buildings were of stone, from fittings such as shields round hearths. It is unlikely that any reconstruction could be usefully attempted.

Pieces of clay moulds from Bag Numbers 28, 46 and (no Bag Number) were passed on for metallurgical comment, as were possible mould fragments Bag Number 80 described as being of 'sand rock'.

18.2 Material from GMV and all other sites included in the ceramic assessment

A few fragments recorded as baked clay from GMV are in fact concreted sand and need no further action. Less than five small pieces of baked clay are recorded from this and each of the other sites assessed; they generally remain bagged with pottery.

Visual examination indicates local origin as with the structural daub from GMX. None shows any formal features and it is recommended that no further work be done. The apparent absence of baked clay from Site GMXV with its house site, in contrast to GMX, may be noted.

18.3 ANALYSIS FOR PUBLICATION

A simple catalogue should be prepared for the GMX/IX Layer 3 material, including the results of any further stratigraphic work. The 'artefacts' or 'loomweight' fragments need brief discussion in the context of current knowledge about pottery manufacture in the Middle Bronze Age.

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19 GWITHIAN: Stone Artefacts

Henrietta Quinnell (HQ) with assistance from *Carl Thorpe* (CT), input from *Sue Watts* (SW) and petrographic comment from *Roger Taylor* (RT)

Dated: 10th March 2004

19.1 General comment on the assemblages and their importance

Large quantities of stone artefacts were found during the sequence of excavations. All stone was retained from most contexts as being obviously imported into sandy soil layers and most of this, on examination proved to show signs of use and/or modification and shaping. A few of the smaller pieces were recorded by Bag Number and are lodged in the Royal Cornwall Museum. The majority were recorded on a Stonework Register using paired letters, eg AB, AC, etc, prefixed by GM but in most cases not by the site number: this material was all examined at Lambessow. Some small noteworthy artefacts have also been retained at Lambessow. All stone has been adequately washed and marked.

Stone artefacts from all sites were grouped during assessment in the same series of categories, many using terms developed for specific artefact groups by Charles Thomas. Many of the categories merge and many items may have subsidiary marks left by a second or even third form of usage eg a rubbing stone may have also been used as a whetstone. The categories should be regarded only as the starting point for the study of the assemblage and may well be altered or refined during future work. It is also highly likely that the small part of the assemblage which shows no detectable usewear was in fact used, but not to the extent of leaving marks detectable to the naked eye.

The assemblages are important for the way in which local material, mainly from beach deposits, have been selected and used. A basic range of tools appears to have been in use from the Bronze Age until the Post-Roman period. The circumstances of site formation have ensured that surfaces are exceptionally well preserved. Traces of usewear show clearly under a microscope with no subsequent damage and potential for functional identification is considerable; while it is not proposed that detailed usewear studies, relating patterns observed on artefacts to those produced for comparative purposes, form part of the present project, it is expected that analysis will identify a number of potential studies for which the Gwithian artefacts could be used. The large size of the main groups within the assemblages provides the potential for the study of the choice of stone for specific functions. Stone tools, unless of elaborately modified form, have tended to be neglected in past studies. The sequence of Gwithian assemblages presents the opportunity for a detailed diachronic study of stone type, shape and function which should be of value to all future work on coastal sites. The suggested presence of pottery production in GMX/IX Layer 3 permits a critical study of tools such as mullers and saddle querns usually related to food processing, as these will need examination against the possibility that a principal use was the processing of materials for potting. Because of the collection size, date range and good preservation, it is proposed that a comprehensive study be undertaken of artefacts from key groups.

Analysis will focus on assemblages from the GMXV house, GMX/IX Layer 3, Porth Godrevy, GMI and Crane Godrevy, with the caveat that most material at Crane Godrevy could be either Roman or Medieval. Artefacts from other sites and contexts will not be published unless there are special features not otherwise represented. Work

for analysis has been costed for these assemblages together and not broken down site by site. Analysis will be divided into three sections dealing with different groups of artefacts, supported by background geological study.

1. Cereal processing equipment – saddle and rotary querns, mullers, pivot stones, totalling 106 objects – will be studied by Sue Watts who is expert in this field; illustration of 1/3rd of these, 35, will provide full coverage of the range.
2. The remaining 348 tools listed in categories in the Tables below will by studied by Sue Watts in conjunction with Carl Thorpe. CT will provide initial assistance with categorisation and provide input to the final report on categories of which he has particular knowledge, such as flensing tools and fishing equipment. All tools will be petrographically identified for a published catalogue. An average of two in each category from the five focus assemblages, 136 items, will be described in detail and illustrated.
3. 'Special artefacts', a total of 35 listed under site headings below. These artefacts range in date from Mesolithic to Medieval and include many which are either rare or unique in Cornwall. Significant artefacts include several pebbles with incised patterns of Mesolithic type, two Bronze Age amulets – one decorated, an MBA ard point possibly of Shropshire picrite, an MBA stone axe mould, 2 MBA slates with incised pattern relating to the pottery manufactured in GMX/IX Layer 3, a possible MBA slate pottery stamp, a Roman period stone bowl and a slate block incised with a scene with moored boats, all meriting detailed individual study. HQ will produce the report on these, assisted by appropriate experts to be identified at a further stage of assessment and *c* 30 will need illustration.
4. A study of the local geology, including beach deposits, by RT will support that of the artefacts and provide data for an introductory section to the report as a whole.

For 1) and 2) RT will provide petrographic descriptions according to a standard terminology which he will devise. For 3) RT will produce detailed descriptions as appropriate supported where necessary by thin-sections. HQ will contribute advice on the production of the report as a whole, ensuring matters of structure and cohesion, as well as studying the special artefacts.

The costings have been worked out to provide a reasonable indication of what is likely to be involved in the final analysis for publication. However because SW has not seen the stonework except for the rotary querns, because the amount of additional stratigraphic data which will become available is still unclear, and because the overall format of the report has still to be determined, some additional time has been allowed for revisiting these figures in a second stage of assessment, and to allow SW carry out a rapid scan of the other stonework.

19.2 Categories used for tools from GMX, IX, XV and minor prehistoric sites

Muller. Oval, with one slightly convex worn surface, used for grinding on saddle querns. Usually made from split cobbles without modification around edges, GM X, IX; those in GMXV generally dressed.

Saddle quern. Only fragments are present except for complete elvan example now set in Lambessow garden. Dressing only noted on fragments from GMXV. Most fragments burnt, small (hand) size.

Rubbing stone. Cobbles, or occasionally large pebbles, with one or opposed surfaces worn smooth but not glossy. Usually quartzite or similar. Sometimes pecked or notched on edges to provide grip. Sometimes with hammerstone use on end(s) and edge(s) occasionally used as whetstone. Assumed to have been used on a lapstone for working leather.

Slickstone. Cobbles, sometimes pebbles, with parts or whole worn to gloss. Usually hard igneous rocks. Sometimes pecked on edges to provide grip. Occasional percussive use of end as hammerstone. Assumed to have been used in the final dressing of cloth and leather. GMIX OU has two angled facets.

Whetstone. Cobbles, occasionally large pebbles, usually narrow but sometimes broad or oval, with long concave wear facet(s). May have striated areas and occasionally distinct grooves. Sometimes percussive used of one or both ends as hammerstones. One or two GMXV edge-modified for grip. Assumed to have been used for sharpening metal.

Hammerstones. Cobbles of various shapes including spherical with dents from percussive use, sometimes on small areas but may extend over entire artefact. Edges may pecked to provide grip, sometimes in opposed areas on either side of tool. More elongated examples can have end with one or two worn bevelled facets.

Cobble/slate anvils. Flat cobbles with areas of pecking in centre of slightly concave face. Pieces of slate may be used, sometimes shaped as discs. Occasionally double-sided. Use uncertain, possibly small lapstones.

Lapstones. Cobbles, small boulders, flattish slate pieces with naturally flat surfaces with smoothed or polished areas sometimes worn slightly concave. Occasional areas with pecking indicate some use as anvil. Slate slabs may be edge-trimmed. Assumed to have been the base on which materials such as leather worked with rubbing stones.

Perforated slabs. Slate usually trimmed to rectangular or other shape. Hourglass or straight perforation usually showing some signs of wear on one part. Probably some form of weight.

Cupped pebbles. Term in frequent use for oval flattish small cobbles with pecked and sometimes worn cupmarks on one or both surfaces; when on both the depressions are usually symmetrical. XVX has multiple impressions on both sides, some irregular. Slate pieces usually roughly trimmed may also sometimes have cupmarks.

End-worn elongated cobbles and spongefinger stones. Smooth usewear around narrow end(s). Sometimes pecking for grip on sides. Examples of very regular shape may be described as sponge fingers. Possibly relate to flensing tools; probable use relates to working of leather.

Flensing tools. Broad elongated cobbles with wear around one end, pecking to provide grip on one or both faces on opposite end to wear. Term developed by Charles Thomas for large leather working tools, and validated by local butchers as appropriate for removing skin from animals.

Bevelled pebbles. Term common in Mesolithic literature for elongated pebbles or small cobbles with one, angled, or two opposed worn facets at one or both ends (Berridge & Roberts 1986, 20). GMIX PR subsequently used as whetstone.

Slate discs. Slate slabs 5-250mm across trimmed, occasionally ground to a circular shape of various degrees of regularity and with varying parts of perimeter ground. Can have straight or hourglass perforations, which may sometimes be worn. The traditional explanation is as 'potlids' but the category may cover a range of functions. On perforated examples wear sometimes suggests suspension as weights, occasionally circular movement as in a flywheel. Occasional small examples are on split pebbles or on rocks apparently not slate.

Slate ovals. As the above but oval in shape. Flat cobbles sometimes used.

Line winder. Flat slate cobbles with one or two pairs of opposed notches on longer sides and often some wear on one end. Thought to have been used for fishing lines (Charles Thomas comment from local fishing practices)

Notched slates. Trimmed slate piece or flat slat cobble up to 250mm in length with a single notch in one long side.

Note: A number of elongated cobbles and large pebbles, often now broken, have a flake or opposed flake facets on a narrow end. It is unclear how far these facets are accidental; the examples with more extensive facets may in fact be some form of chopper. It is possible that these end-flaked pieces had a range of functions. They have not been separated from the general category of 'cobbles/pebbles with unclassified usewear'.

19.2.1 Additional categories not found on the Bronze Age sites

Rotary quern.

Netweights. Flattish cobbles, usually of long oval shape, with two opposed notches on the shorter ends. Broken cobbles may sometimes be used. Range between 90mm and 130mm in overall length.

Socket stone. Thick slabs of local slate, in one instance vein quartz, with deep irregular small hollow in the centre of one flat face. May be a little wear on base but no sign of any rotary motion. These appear to be settings for uprights which did not move, as opposed to pivot stones.

Pivot stone. Slate slab or re-used artefact with circular hollow around wear indicates circular motion. Not recorded at Crane Godrevy but at Porth Godrevy and GM1.

Roof slates. Pieces of slate of regular thickness which have been trimmed around the edge, often with neat bevels. Perforations survive on some fragments, some small enough to be described as nail holes. Traces of mortar survive on some. Some pieces appear to be of local slate, others of a finer black slate which appears similar to Delabole; the identification of Delabole slate has been confirmed by RT.

Paving stone. Local slate which has been trimmed on sides and has wear on surface.

Pebble counters. Small pebbles, usually white and spherical, often very glossy between 10mm and 20mm in size. Only GM1 and related sites. Large group found together

The assemblage from GMX

STONE

	Layer 1	**Layer 2** *Phase 6*	**Layer 3** *Phase 5*	**Layer 4** *Phase 4*	**Layer 5** *Phase 3*	**US or incomplete data**
Unused	1	2	37		1	19
White pebbles			6			
Pebbles			6		1	
Cobbles with usewear			15		1	1
Modified cobbles with usewear			4			
Saddle quern frags, one complete			7			
Mullers			42			1
Rubbing stones		1	16		2	2

Slickstones	1	1	31		2	4
Whetstones		2	17		3	4
Hammerstones			7			1
Cobble/slate anvils		1	9	1		2
Lapstones		1	7		1	4
Perforated slabs			6			2
Cupped pebbles	1		1		1	1
Endworn elongated pebbles			3		1	
Flensing tools			6			
Bevelled pebbles		1	2			
Slate discs			15		1	
Slate ovals			2			
Line winders			5			1
Notched slates			7		2	2
Special objects			7			
Totals (330)	3	9	258	1	15	44

Table 19.1 Stone from Site GMX. Note (1) that all categories may include fragments as well as complete artefacts (2) that Layer 3 includes all likely artefacts eg those marked 'midden', 'disturbed occupation', Layer 3 or Layer 5

The '**special artefacts'** from GMX all come from Layer 3 (Phase 5) and consist of

1. Slate amulet Bag No 740; 25mm square black slate, neatly worked with hourglass perforation
2. Micaceous siltstone amulet GM ME; 60 by 50 by 7mm, this has an hourglass perforation surrounded by 13 radial lines with a groove which runs symmetrically up to its top. A photograph and description of this has been published, together with some Cornish comparanda, in discussion of a similar pendant from the Isle of Man. RT comments that thin-section unlikely to be helpful.
3. Possible Neolithic axe fragment Bag No 643; broken and burnt conjoined pieces with the appearance of an axe but in a soft rock. RT comments that thin-section might be useful.
4. Cushion-shaped disc (no Bag No); 90mm across of trimmed sandstone, convex surfaces and flat-ground perimeter.
5. Incised slate (no Bag No or letters); slightly waterworn, 95mm long, incised with sharp fine lines forming a rectilinear pattern on one side - the design is reminiscent of the pattern on pottery in Layer 3
6. Bronze Age axe mould, two joining pieces GM OK and GM LF; these pieces have been published by Burgess (1976 including a drawing Fig 4.8) and assigned to the Pennard phase of the Middle Bronze Age. The axe rock is described on the label in the Royal Cornwall Museum at which it is currently displayed as 'chlorite' but the object does not appear to have been sliced. RT describes this as 'a coarse textured, heavily foliated, chlorite schist, possibly from the Start Head area of S Devon or less likely from the Lizard: a thin-section might be helpful.
7. Small slate pillar with large cup mark, now set in concrete in Lambessow garden. Dimensions above ground 380mm by 260mm by 160mm.

Two items from GMX were sectioned by the CBA Implement Petrology Committee and published in lists eg Clough and Cummins 1988. These are No 1475, a broken hammer stone GM IN from Layer 5, published as an axe fragment of greenstone, and No 1476, a cobble anvil fragment GMNB from Layer 3, published as a pounder of epidiorite. Copies of the detailed reports on these artefacts are filed with the archive.

Among the items presented in the table as 'slate discs', GM OL and GM MB from Layer 3 are regularly worked stone discs with hourglass perforations which look rather like small maceheads; the perforations are worn and they may in fact be weights.

The assemblage from GMIX

	Layer 3	**Layer 5**	**Outlying Cuttings**
Unused	5		
White pebbles	2		
Pebbles	1		
Cobbles with usewear	7		1

Modified cobbles with usewear	0		
Saddle quern frags, one complete	3	1	
Mullers	2		
Rubbing stones	7		
Slickstones	4		
Whetstones	7		
Hammerstones	1		
Cobble/slate anvils	1		1
Lapstones	0		
Perforated slabs	2		
Cupped pebbles	0		
Endworn elongated pebbles	2		
Flensing tools	0		1
Bevelled pebbles	2		
Slate discs	3		
Slate ovals	2		
Line winders	0		
Notched slates	0		
Special objects	2	1	
Totals (58)	53	2	3

Table 19.2 Stone from Site GMIX. Note (1) that all categories may include fragments as well as complete artefacts (2) that Layer 3 includes all likely artefacts eg those marked 'midden', 'disturbed occupation' (3) External Cuttings: flensing tool from 'midden' Cutting 1, pebble anvil fragment Cutting 1 Layer 8, pebble with usewear Cutting 4 Layer 3/5.

The majority of the material comes from the central area in which Layer 3 occurs. A few artefacts occur in outlying Cuttings 1 and 4 - see caption to Table 19.2.

'Special' objects

1. From Layer 3 Bag No 119, an elongated broken cobble *c* 40mm long with a mesh of very fine incised lines very similar in style to those made by flint on small cobbles during the Mesolithic at Rhuddlan, Clwyd (Berridge 1994)
2. From Layer 3 OO, a slate fragment *c* 100mm by 30mm with a rectangular pattern incised on one side - the incisions are broader than those on BN119 and the pattern reminiscent of those on the pottery in Layer 3

3. A pointed stone fragment from the base of Layer 5 Bag No 164; examined by the CBA Implement Petrology Committee and published (Clough and Cummins 1988, No 1197) as a 'miscellaneous artefact' of unidentified rock but was too powdery to section. This may be an ard point (Check PWCFC for 1961)

A hammerstone GM OT from Layer 3, was also sectioned by the CBA Petrology Committee and published No 1477 as a 'pestle ?' of greywacke.

The assemblage from GMXV

	Layer 8 House	**'Objects on Plan' = House**	**Layer 5 over House**	**Layer 5 Cuttings away from House**
Unused	3	2	2	0
White pebbles	0	1	2	0
Pebbles	4	0	13	2
Cobbles with usewear	4	6	1	0
Modified cobbles with usewear	0	0	2	0
Saddle quern frags	2	1	2	0
Mullers	2	0	6	2
Rubbing stones	2	4	6	0
Slickstones	5	2	2	0
Whetstones	5	5	2	2
Hammerstones	0	1	2	0
Cobble/slate anvils	1	5	1	0
Lapstones	0	1	0	0
Perforated slabs	0	0	1	1
Cupped pebbles	0	1	0	0
Endworn elongated pebbles	0	0	1	0
Flensing tools	0	0	0	0
Bevelled	0	1	1	0

pebbles				
Slate discs	2	1	0	0
Slate ovals	1	0	1	0
Line winders	1	2	1	0
Notched slates	2	0	1	0
Special objects	1	1	1	1
Totals (125)	35	34	48	8

Table 19.3 Stone from Site GMXV. Note (1) that all categories may include fragments as well as complete artefacts (2) not included in Cuttings away from House are 4 unused pebbles and one with usewear from Layer 7 and 4 unused pebbles from Layer 8

The general quality of the stone artefacts is noticeably better than those in GMX/IX because there has been more modification. Saddle querns and mullers have been dressed before use and slate discs are carefully trimmed or ground. Given that the overall numbers are not as high as on GMX/IX, the significance of absence of certain types of artefact from GMXV can not be assessed at this early stage.

'Special' objects

1. From Layer 8 House is the apparent remnant of a small stone axe Bag No 140 - this artefact was sectioned by the CBA Petrology Committee (Clough & Cummins 1988, No 1195) and published as an axe fragment of Group 1a with a presumptive West Cornish source; this artefact was recorded as 'the central portion of decayed small axe, found outlined by 'axe-shaped stain'.
2. Recorded as 'Objects on plan' is an unusual tool XVC used for grinding, a flat facet across one end and peck patches for grip on the sides.
3. From Layer 5 over House Bag No 141 is a notched slate possibly to be identified as a pottery stamp. This was referred to as such by Megaw (1976, 61) although as from Layer 7 and considered to be appropriate for the sherds illustrated in Fig 4.7 No 6 (Ibid). This match has not been tested but appears possible. The confusion between Layers 5 and 7 over the House was noted in the comments on pottery and may be due to a temporary reassignment of Layer 5 over the House to Layer 7.
4. In Layer 5 away from House was Bag No 228 found in the base of a furrow. This was sectioned by the CBA Petrology Committee and published (Clough & Cummins 1988, No 1196) as 'miscellaneous, ?ard point' and identified as Group XII, picrite probably to be sourced from the Shropshire/Montgomery border. The piece appears to be a flake from a cobble.

19.3 The assemblage from GMXI

Two burnt conjoined fragments of a granite saddle quern, recorded in the finds register as Layer 3 although Layer 3 does not appear to occur in GMXI. The quern has been dressed and appears similar to material in GMXV.

19.4 The assemblage from GMXX

Two artefacts, a broken flensing tool and a cobble with usewear, are recorded from 'Dark Age Layer'.

19.5 The assemblage from Crane Godrevy (CG)

Notes

1. Unused stone is not listed except for certain pebbles. These are in the size range 20-64mm; a group of 34 was found together in the ditch fill. The size appears appropriate for slingstones.
2. Very limited stratigraphic information was available when the assemblage was appraised. The majority of material appears to come from the interior. Except for pieces directly connected with the Medieval building, no assumptions about date can be made at this stage.
3. More work needs to be done on the finds lists. A number of pieces assessed do not appear on the finds records previously completed.
4. The initial impression was that slightly different rock types, amongst locally available cobbles, were being selected for eg lapstones, as opposed to those used on the Bronze Age sites.
5. While the saddle quern could have been in use in the Roman period, the burnt fragments appear similar to those on the Bronze Age sites and have been worn after breakage. They suggest that previously used material was being brought up to Crane Godrevy.

Pebbles	60
Rotary quern fragments - all from different artefacts	7
Saddle quern frags	2
Mullers	0
Rubbing stones	3
Slickstones	12
Whetstones	7
Hammerstones	0
Cobble/slate anvils	0
Lapstones	3
Perforated slabs	0
Cupped pebbles	0
Endworn elongated pebbles	0
Flensing tools	1
Bevelled pebbles	0
Slate discs	2
Slate ovals	0

Line winders	4
Notched slates	2
Roof slates	16
Paving stones	2
Socket stones	4
Special objects	3
Totals	128 (68 if pebbles are excluded)

Table 19.4 Stone artefacts from Crane Godrevy. Note that fragments are included with complete artefacts

The **'special' objects** are

1. Bag No 62 Part of a possible bakestone, flat stone used for baking. Worked around surviving edge. Probably non-local stone.
2. Bag No 31 Small broken cobble which has a pecked groove around circumference below break. Unique object at Gwithian. Possibly a special net or line sinker (cf Evans 1957, Fig 74, No 1).
3. Block of local slate found built into structure, with, upside down, the incised detailed depiction of a large and a small boat tied up by a ? reed bed. Object at Lambessow but unavailable December 2003. Clear drawing by Carl Thorpe in C Thomas' collection. Simplified version appeared on cover of *Cornish Archaeology* **6** for 1967. This appears to be the earliest illustration from Cornwall showing boats and of importance for the study of medieval shipping.

19.6 The assemblage from Godrevy Hillside (GH)

This site produced a broken whetstone and two small white pebbles.

19.7 The assemblage from Porth Godrevy (GT)

The structure at Porth Godrevy was published by Fowler (1962). However it is important that the stone artefacts are re-examined as part of the sequence of stone material from Gwithian. Their study should contribute to the reassessment of the function of the site. Review of the artefacts against modern standards shows that the illustrations (Fowler 1962, Fig 14) do not have the detail to correctly convey artefact function and that some are based on misinterpretations: some objects not originally depicted need illustration to convey the full range of the assemblage. A paragraph in the excavation report (ibid, 58) suggests that a quantity of pebbles was not retained because they had only slight, or no apparent, traces of use. Discard of material is confirmed by Professor Thomas. Two large artefacts described in the report, a slate slab with a pivot hole (ibid, 56) and a mortar stone (ibid, 56, Fig 7b) appear to have been left on site.

19.7.1 The assemblage from Porth Godrevy (GT)

The artefacts are treated here as a single assemblage. Stratigraphic data was not available during appraisal for those not published. Published details suggest that some

artefacts eg stone bowl (ibid, Fig 14, No 1) were within wall make-up or beneath paving slabs; others eg rubbing stone (ibid, Fig 14, No 12) were within the bank surrounding the structure. These details suggest both reworking of the structure and possible incorporation of earlier artefacts.

Unused	10
Pebbles, white quartz and other, found as one group	11
Cobbles with usewear	5
Rotary quern fragments: complete granite upper stone, lower elvan fragment	2
Saddle quern fragments	2
Mullers	1
Rubbing stones	1
Slickstones	4
Whetstones	15
Hammerstones	0
Cobble/slate anvils	0
Lapstones	2
Perforated slabs	1
Cupped pebbles	0
Endworn elongated pebbles	0
Flensing tools	1
Bevelled pebbles	0
Slate discs	5
Slate ovals	0
Line winders	1
Notched slates	12
Roof slates	0
Paving stones	0
Pivot stones (left on site)	1
Special objects	8
Totals	82

Table 19.5 Porth Godrevy stone artefacts. Listed items may include fragments as well as complete artefacts.

Special objects:

1. Greisen bowl (Fig 14, No 1)of a type now recognised as distinctive of Roman Cornwall and, with this simple rim, of the 3rd century or later (Quinnell 1993)
2. Fragment of another greisen bowl (published as No 1 but in fact not the same)
3. Greisen bead (Fig 14, No 2) (not available for examination)
4. Grinding tool (Fig 14, No 11) with flat ground surface (illustration suggests use as hammerstone which is not indicated on artefact)
5. Amulet ? (Fig 14, No 15). Perforation regularly set in trimmed slate piece with natural 'slickenside' finish. Larger, but possibly comparable to, the suggested amulets in GMX
6. Artefact with two small perforations joined by grooves (Fig 14, No 21). Function unknown at present but similar artefact from GMI
7. Small stone basin with further depression in interior, base used (re-used ?) as muller (Fig 14, No 19). With PJ Fowler and not examined. Found in mortar stone No 8 below. Complex or multiple use artefact.
8. Mortar stone (Fig 7b & p56), left on site. Description (as boulder mortar or basin) and discussion make it clear that this was used in cereal preparation.

Some initial comments may be made. The large number of whetstones foreshadows the situation on GMI although the latter tend to be larger. The absence of spindle whorls, indeed from all Gwithian sites, is surprising. The continued use of saddle querns and mortar stones alongside rotary querns in the Roman and indeed the post-Roman period for different aspects of cereal preparation is now well established (Quinnell forthcoming, 6.11.3).

19.8 The assemblage from GMI

	Layer C	Layer B	Layer A	No Layer assigned
Pebble counters	12	6	0	281
Cobbles with usewear	0	3	0	3
Rotary quern fragments	0	8	1	5
Mullers	1	3	0	0
Rubbing stones	0	1	0	0
Slickstones	0	9	6	2
Whetstones	5	24	6	5
Hammerstones	1	1	0	0
Cobble/slate anvils	0	2	0	0
Lapstones	0	6	1	0
Endworn elongated pebbles	0	0	0	3

Flensing tools	0	15	2	3
Slate discs	0	2	0	1
Notched slates	0	1	1	0
Pivot stones	0	1	0	0
Special objects	0	5	1	2
Totals (429) 130 without pebble counters	19	87	18	(305) 24 without pebble counters

Table 19.6 Stone artefacts from GMI. Categories may include fragments. Unused material is not included. 250 of the pebble counters not assigned to Layer were found as a group. Rotary quern fragments from Layer B are all from different artefacts but the 5 small pieces unassigned to Layer may be from the same stone.

'Special' objects

1. Layer B GM/N. Dressed oval granite muller, with complete off-centre pivot hole and a second pivot towards edge damaged by breakage. Presumably a muller re-used as the base for equipment
2. Layer B GM/CP. A piece of slate with incised lines including two very fine parallels
3. Layer B GM/W. A small piece of slate with a ground point. RT comments that this and No 4 are probably naturally formed and selected for their shape.
4. Layer B Bag No 15 1956. A small double-ended ground slate point.
5. Layer B Bag No 324 1956. A broken small cobble with a pattern of narrow incised criss-cross lines
6. Layer A GM/KM. A carved stone weight of the type common in Roman and Post-Roman Cornwall built into wall of House. This weight was published with an illustration in the Appendix to Quinnell 1993 but examination shows that more detail should have been noted
7. Not assigned to Layer α & β 1963. A small elongated piece with a perforation at either end and three incised crosses on one face. Similar to the double perforated object from Porth Godrevy but without the grooves linking the perforations
8. Not assigned to Layer. Cresset stone: dressed pillar 250mm high with 70mm depression at top, grooves carved around top and base, damage to top. Published as a simple drawing and description by Adams (1967, Fig 13 No 3 and p 51)

GM/DY from Layer C was sectioned by the CBA petrology committee and published by Clough & Cummins (1988, No 1474) as a greenstone axe fragment of greywacke. It is in fact a hammerstone with one end extremely battered and possible battering on second end; it might be classed as a pestle, possible hafted.

19.9 The assemblage from GMA and GMB - subsidiary cuttings to GMI

	Layer C	Layer B	Layer A	No Layer assigned
Pebble counters	0	2	0	14
Cobbles, usewear	0	0	0	1
Mullers	0	0	0	2
Slickstones	0	0	0	1
Whetstones	0	1	1	5
Slate discs	0	0	0	1
Line winders	0	0	0	1
Special objects	0	0	6	0
Totals (35)	0	3	7	25

Table 19.7 Stone artefacts, including fragments, from GMA. Unused material not included.

'Special' objects

1. Layer A Bag No 15. 4 ? ground slate points; these could possibly have been selected from beach as appropriately worn pieces
2. Layer A Bag No 15. Slate with fine incised lines
3. Layer A Bag No 47. 1 ? ground slate point

The only artefact from (Layer A) GMB is a whetstone.

19.10 The assemblage from GME/VIII and GMIV – subsidiary cuttings to GMI

	GME/VIII no Layers assigned	GMIV no Layers assigned
Pebble counters	11	0
Whetstones	4	3
Flensing tools	1	1
Line winders	0	1
Special objects	0	1
Totals	16	6

Table 19.8 Stone artefacts, including fragments, from GME/VIII. Unused material not included.

'Special' objects:

1. GMIV GM/L. Cobble with end flattened from use as pestle.

Initial impressions are that the GMI assemblage is dominated by whetstones and flensing tools, an impression probably also true for the subsidiary sites. While rotary quern fragments are present, many of these were re-sued as hearth surrounds. The assemblage looks as though it was used for some specialised activity rather than resulting from the regular domestic round of food preparation. The whetstones are much larger than on other sites, complete examples being up to 500mm in length, and many are characterised by deep grooves, often multiples. These whetstones appear to have been used on large objects (such as scythes?) or to have been selected because exceptional use was anticipated. Ironstaining was noted on many. None are modified before use. The flensing tools have distinct opposed, pecked but smooth, depressions on one end and may also have subsidiary use as whetstones. The slate discs include well made examples with central perforations much worn; these are likely to have had some specific function.

19.11 FURTHER ASSESSMENT

It will be necessary for SW to examine a sample of stone tools at Lambessow. This will involve one day at Lambessow with CT and time for working on the Project Design.

In addition

1) Time should be allowed for RT to review estimates for analysis given below

2) Time should be allowed for HQ to review estimates and to make further enquiries about specialists who may need to be involved in aspects of the special artefacts.

19.12 ANALYSIS FOR PUBLICATION

A) Geological background

RT will visit beaches and locality to observe details of local geology and of the pebbles/cobbles available on beaches. This will be incorporated into a general geological description for publication in the report but will also inform the study of stone.

The work will involve 2 site visits and time for writing up.

B) Stone tools

1) General categories - tools other than cereal processing equipment

i) SW and CT to work together checking through the categorisation produced for this appraisal and separating out the cereal processing equipment for subsequent study. This work should take place involving ACT at Lambessow.

ii) Predictions have been made on the categories as described above. It is recommended that an average of two examples should be studied in detail and drawn from each of the categories listed from layers associated with the GMXV house, GMX/IX Layer 3, Porth Godrevy, Crane Godrevy and

GMI. This gives a total of 136 artefacts to be studied in detail but a published catalogue will list all categorised tools with their petrography, an additional 212 artefacts.

iii) Production of a catalogue of these artefacts at Lambessow; with time for CT to make an input on interpretation and on the features for illustration.

iv) Production of an interpretative report for publication including liaison with CT, RT and HQ.

v) 136 drawings by CT.

vi) SW will need 16 days in Truro.

vii) RT will devise a standard petrographic terminology to record these categorised tools and cereal processing equipment; work on this and on providing input into the reports on the lithology of stone tools and function

viii) RT will work at Lambessow with SW and CT to provide identifications for the 136 objects studied in detailed and for 212 further artefacts to be included in catalogue, together with the 106 cereal processing items.

2) Cereal processing equipment

i) A total of 106 artefacts have been identified - rotary and saddle querns, mullers and pivot stones. SW will produce a catalogue of all these items and then a report in which discussion and interpretation focusses on a selection of these. It is envisaged that 1/3 of the items will need illustration including all querns with distinctive features.

ii) Initial examination and production of a catalogue. Time for SW at Lambessow.

iii) CT will work with SW at Lambessow on initial identifications and discussion of drawings

iv) 35 drawings by CT.

v) Completion of report by SW including liaison with CT, RT and HQ.

3) Special artefacts

i). A total of 35 objects have been listed under this category, 7 from GMX, 3 from GMIX, 4 from GMXV, 3 from CG, 7 from GT, 7 from GMI, 3 from GMA, 1 from GMVIII. Detailed study of these will be carried out by HQ, with additional specialist advice which may be identified at a further stage of assessment. Time which includes a general overview of the stone artefact report as a whole is required. Two days in Truro.

ii) 30 drawings by CT.

iii) All will need detailed petrographic descriptions, supported in 4 cases by thin sections (GMX Nos 3& 6; GMIX No 3; CG No 1). This work will include re-examination of thin sections already made and stored at Taunton. iv) Four thin sections.

20 GWITHIAN SHALE

Henrietta Quinnell with comment from Roger Taylor and Ramues Gallois

Dated: 10th March 2004

20.1 Introduction

Seven pieces, all from GMX and IX, have been recorded as shale. All have been treated with PVA and are currently held at Lambessow. All have been rapidly examined by Roger Taylor who considers it probable that all but the two described in the Table as 'local slate' are shale, probably from Kimmeridge in Dorset. On his advice, Dr Ramues Gallois has been contacted with regard to feasible identification procedures.

SHALE

Context details	Bag No	Description	Rock type
GMIX Cutting 5 Layer 3	57	Fragment of bracelet, flat cross-section 25mm across, overall diameter 120mm	Kimmeridge ?
GMIX Cutting 5/6/7 Inside House Layer 3	87	Fragment of bracelet, flat cross-section 35mm across, overall diameter *c* 140mm	Local slate, roughly trimmed
GMIX Cutting 5/6/7 Inside House Layer 3	87	Fragment of bracelet, flat cross-section 35mm across, overall diameter 120mm	Kimmeridge or local slate, roughly trimmed
GMIX Cutting 5/6/7 Inside House Layer 3	87	Fragment of bracelet, flat cross-section 30mm across, overall diameter *c* 140mm	Kimmeridge or local slate, roughly trimmed
GMX Cutting 18 Layer 4	659	Part of flat-sectioned ring *c* 30mm overall diameter	Local slate
GMX Cutting 3 Layer Midden	74	Fragment of bracelet, flat-sectioned 25mm across, overall diameter *c* 110mm	Kimmeridge
GMX Layer 3?	-	Part of D-sectioned bracelet, overall diameter 140mm. Lathe-turned. Roman period	Kimmeridge

Table 20.1 Details of shale artefacts from GMX and IX

20.2 Results

The D-sectioned bracelet, probably lathe-turned, is almost certainly of Roman date, just possibly Late Iron Age. It is visually identical to Kimmeridge shale bracelets of these dates. It is presumably intrusive and relates to Roman activity in the general area. However it should be noted that bracelets of this type were considered to be present in Later Bronze Age contexts at Flag Fen (Pryor 2001, 322), a report which provides references to other possible occurrences of similar date.

The remainder of the items appear from their context to be of Middle Bronze Age date and are unusual. BN 74 appears to be shale and is well-finished. The other bracelets are less well-made, just possibly roughouts or unfinished; BN 87 'local slate' appears to copy the shale bracelets and to indicate on-site craft activity. No precise comparanda have so far been located although occasional use of Kimmeridge shale for bracelets has been noted in the Dorchester area (eg Seager Smith 1997). No shale artefacts appear to be recorded before the Iron Age in Devon or Cornwall. This group *appears* to represent the import of shale items in the MBA, possibly to be finished, probably to be copied, during activity in GMX/IX Layer 3. No immediate parallel can be found for this practice which adds to the interest of Layer 3 activity as a focus of craft production with pottery and metalwork.

The confirmation of the apparent source of the shale artefacts as Kimmeridge is obviously important. Dr Gallois advises that, while a range of techniques are available including X-rays to identify micro-organisms specific to particular locations, definitive identification will depend on the character of the shale used: a number of different locations yield rocks with similar chemical signatures.

20.3 Further assessment

Dr Gallois will examine the artefacts and will then recommend any appropriate work likely to assist with their sourcing; there will be no fee for this. HQ's time correlating further assessment is included with that for Stonework.

20.4 Analysis for publication

1) A catalogue of the artefacts should be published, which will include details of manufacture from study under a microscope. A commentary should consider the artefacts in the context of what is currently known about the range of Middle Bronze Age shale artefacts, their production and exchange.

2) Appropriate work on sourcing recommended by Dr Gallois should be carried out.

3) All seven pieces should be illustrated.

21 Gwithian: Post-Roman Pottery - Initial Appraisal

Charles Thomas (ACT), Carl Thorpe (CT), Henrietta Quinnell (HQ)

Dated: 10th March 2004

21.1 The assemblage from GM1

This appraisal is based on a rapid scan of the material by CT and HQ and on a series of publications, interim reports and a specially written overview by ACT. It relates to GMI and its subsidiary sites GMA, GMB, GME/VIII and GMIV, which were the focus of Post-Roman activity and provided a good stratified sequence. A very small number of sherds occurred as scattered finds on some of the other sites, eg one of Bii amphora from GMV and one of ARSW from Crane Godrevy.

The stratigraphy at GMI and its subsidiaries was recorded as a sequence of Layers, A, B and C, each with a range of complexities, separated by blown sand. However this Layer enumeration was not introduced until 1955. In 1953 and 1954 sherds were individually numbered and recorded. Elsewhere in this report a reconstruction of the stratigraphy using a sequence of context numbers to produce a matrix is recommended. Until this has been done, no detailed work on the ceramics can be usefully carried out. The Table 21.1 illustrates the situation. While 'Unassigned' includes some sherds recorded as unstratified, nearly 2/3rd of the assemblage needs detailed allocation to the stratified sequence and the 1/3 for which Layers are recorded needs grouping more precisely within those Layers where the contextual record allows.

Post-Roman Pottery

Site	Unassigned	Layer A	Layer B	Layer B/C	Layer C	'tramlines	Totals
GMI	1949	20	371	149	352	27	2868
GMA	94	32	48	0	0	0	174
GMB	6	6	0	0	0	0	12
GME/VIII	18	0	0	0	0	0	18
GMIV	35	0	0	0	0	0	35
Totals	2102	58	419	149	352	27	3107

Table 21.1 Current position for stratigraphic record of the Post-Roman assemblage: all fabrics including import wares

	Unassigned	Layer A	Layer B	Layer B/C	Layer C	U/S	GMA etc	Totals
Bi	8	1	2	7	6	4	4	32
Bii	9	0	6	1	17	14	2	49
Bv	1	0	0	0	0	0	0	1
ARSW	1	0	0	0	0	1	0	2

PRSW	2	1	0	0	1	0	0	4
Oxford	1	0	0	0	0	0	0	1
Coarse ware	3	0	0	0	0	1	0	4
E	18	0	30	6	41	22	1	118
Totals	43	2	38	14	65	42	7	211

Table 21.2 Import wares from GM1 based on detailed record in archive prepared by Carl Thorpe. Details for GMA and other subsidiary sites expanded in following Table.

	GMA occupation	**GMB Layer A**	**GME unstratified**	**GMIV unstratified**	**GMIV unassigned**	**Totals**
Bi	1	2	0	0	1	4
Bii	0	0	0	2	0	2
E	0	0	1	0	0	1
Totals	1	2	1	2	1	7

Table 21.3 Import wares from GMA and other sites subsidiary to GM1

The Post-Roman assemblage contains 211 sherds of imported wares. The majority of sherds however are of gabbroic fabric in a sequence of styles. The association between the imported wares and a long, stratified, sequence of local, Post-Roman/Early Medieval styles, is unique in Cornwall, and its detailed elucidation and dating is of the highest importance. The following summary is based on numerous publications by ACT and on a rapid scan in 2003 by CT and HQ of the local gabbroic material. For his publications and general research ACT made provisional allocations of much of the material, including the imported wares, to Layers.

The rapid scan showed most of the local material to be unwashed, the imports washed. Many local sherds therefore retain residue with potential for radiocarbon determinations. The scan also noted that most of the local material had fresh breaks, with good potential for conjoins. However some of the imported wares were considerably abraded and some had been cut rather than broken, suggesting reworking for objects such as spindle whorls.

The local material all appears to be gabbroic and the presence of an unbaked gabbroic clay sample PS64 raises the question of local manufacture, a question linked to similar local manufacture of gabbroic clays in the Bronze Age.

21.2 The local ceramic sequence and its importance

21.2.1 The Gwithian Style

The Gwithian Style material all appears to be of one gabbroic fabric, generally finer and more hard-fired than Roman gabbroic ware as represented at Porth Godrevy (Gwithian GT) and on other Cornish sites. Surfaces are better finished, sometimes wiped, sometimes slightly burnished with some patterning in the burnish. Five sherds were examined by Roger Taylor (PS48-52) and described as ‘gabbroic with sparse (c

5%) and generally fine-grained inclusions'; note that one of these, PS48 had been selected as a possible import; note also that one example of the few abraded sherds which appeared similar to Roman gabbroic ware was examined by Dr Taylor (PS47) and described as typical gabbroic coarse ware with 10% inclusions. The gabbroic fine wear appears to be the predominant pottery of Layer C. A fairly detailed description of forms is given as, compared to subsequent styles, published descriptions have been general and have not included drawings.

Forms consist of the following:

Jars which initially appear generally similar to Romano-Cornish Type 4 jars (Type nos following Quinnell 2004), but the rims of which are much less everted. A marked feature on some smaller jars is a concave internal rim bevel, something never found on Type 4 jars. It does however occur on E2 imported beakers.

Shouldered jars or bowls with short upright rims. A few examples present. These might relate to Type 6 jars, loosely dated to the 3rd and 4th centuries but the resemblance is not close.

Platters. These have very low walls, a few no walls at all, and many appear to be of large diameter. Bases frequently have sand impressions and base angles may be rounded. There is considerable use of thumbed decoration on top of the wall, or around the edge of discs without walls. There is also a range of incised and impressed decoration on the rims and the inside and the outside of walls, more extensive than on later, grass-marked, platters. These platters bear no relation at all to anything in the Romano-Cornish gabbroic repertoire. Their introduction might be expected to be related to some change in the preparation and serving of food. Effectively they replace the bowls of Type 4 in the Roman assemblages, which are appropriate for sloppy foods such as stew or porridge.

Large flat-rimmed bowls. These bowls are generally large, with thick curved walls and flat, out-turned rims. The rim edge on one example from GME is heavily thumbed. There is a general resemblance to Roman Type 20 bowls but these were not, at Trethurgy, thought to continue up until the end of the 4th century. There is some similarity in shape, though not in rim form, to E3 bowls.

The Gwithian Style was described by ACT as a sub-Roman ware, considered to show continuance into the 5th and 6th centuries of Roman styles. The assigned date was influenced by the presence of imported Post-Roman slipped wares and amphorae in Layer C, although E ware was also present. The absence of the Gwithian Style from Trethurgy, marked differences in form from Roman period gabbroic wares now the subject of much study, and some similarities to E ware all mean reconsideration of its derivation and date. The Gwithian Style has not been clearly identified in the literature at any other site although both Goldherring and Carngoon Bank have platters without grass-marking and the latter also has vessels which may belong to other forms (eg McAvoy 1980, Fig 18, No 73). The establishment of the date and geographical extent of the Gwithian Style is of great importance for the whole chronology of early Post-Roman settlement in West Cornwall.

21.2.2 Early grass-marked ware

This has two forms, platters and jars, both grass-marked on their lower exteriors. The platters relate to those of the Gwithian Style but have less decoration and generally higher walls. The jars are straight-sided with large flat bases and simple rims which may have incised or finger nail decoration: they have no precursors in Cornwall. The fabric is gabbroic but softer, thicker and generally less well finished than that of the Gwithian Style. Three sherds were examined by Dr Taylor (PS53, 55, 56) and described as gabbroic coarse ware with 10-15% inclusions; note that PS53 included some 1% of organic material in the fabric matrix. Examination of a grass-marked clay sample PS64 by Dr Taylor indicates that it was formed as follows a) a layer of leaves and other dry plant matter b) mud forms and dries over the plant matter c) plastic unfired gabbroic clay was dropped/put onto the mud d) sand was forced down over the clay; this sample comes from Layer B but it could relate to bar-lug rather than Early grass-marked pot production.

A range of vessels has been illustrated in Thomas 1968, Fig 72. Early grass-marked ware appears to be the predominant form in Layer B but occurs in both C and A. It has been considered a late 6th century introduction, continuing to overlap with bar-lug ware in the 9th century. The principal import ware in Layer B was E ware although some imported Post-Roman slipped wares and amphorae were present.

Early grass-marked wares have been found on many sites in West Cornwall and the Isles of Scilly and the introduction of grass-marking has high potential as a chronological indicator for Post-Roman settlement in the area. Any reconsideration of the date of the Gwithian Style may affect that of the introduction of Early grass-marked ware, on the assumption the two did not have any substantial overlap. There is a clear need to establish whether early grass-marked ware was a ceramic style chronologically separate from grass-marked bar-lug ware, as previous considerations of the Gwithian stratigraphy have indicated. Both platters and the general form of jars are similar in both styles and bar-lugs *might* be a contemporary functional variant only in use on, or surviving on, some sites.

21.2.3 Grass-marked bar-lug ware

Grass-marked platters continue but the straight-sided cooking pots have opposed suspension bars inserted into their rims which may be heavier than previously. The fabric is similar coarse gabbroic to the early grass-marked ware. This has been confirmed by examination of PS54 by Dr.Taylor; this bar-lug sherd contains 25% inclusions and also *c* 1% plant matter. Bar-lug ware appears in Layer B but is the predominant fabric in Layer A. A range of vessels has been illustrated in Thomas 1968, Fig 73. Its date range has been considered 9th to 11th centuries. (The rapid scan showed that Layer A contained a few unusual vessels in the same apparent fabric, notably a large jar with everted rim and both vertical and horizontal rows of impressions).

Bar-lug ware occurs widely in Cornwall, with grass-marking in the area west of Newquay and without to the east but its chronology is still not clearly understood, and this is a matter of great importance for studies of early Medieval period in the South West. While the style survived to occur on early Norman sites such as Launceston Castle, the date of introduction needs more data.

21.2.4 Late grass-marked pottery - Sandy Lane Style 1 (SL1): Sandy Lane Styles 2 & 3

The sequence of local styles at GM1 continues at Sandy Lane. Sandy Lane Style 1 includes grass-marked platters but the cooking pots become smaller, have no bar-lugs, there may be vertical finger marks on the walls above the base, and the rims may have rolled internal expansions or be everted. SL1 may be broadly 11th century. A range of vessels has been illustrated in Thomas 1968, Fig 73, and ‘all that can be profitably

illustrated' from Sandy Lane in Thomas 1964, Fig 17. SL1 vessels were not considered to be present at GM1 but this needs confirmation. The SL1 and successor Medieval SL2 and SL3 Styles from Sandy Lane are considered by Catherine Freeman in Section 3, 24.

21.3 FURTHER ASSESSMENT

The potential of this assemblage for the clarification of the Post-Roman to early Medieval ceramic sequence in Cornwall cannot be set out in detail until as much work as is feasible is done on the archive to relate sherds to Layers and to specific contexts within layers. Once this stratigraphic work has been carried out, the following recommendations are made.

1) CT and HQ will work through the whole assemblage, taking into account new stratigraphic data. They will compile a catalogue of variations in form and decoration in the Gwithian Style and in the subsequent early grass-marked and bar-lug styles. Variations in abrasions will be noted as will details of residues. In view of the presence of unburnt grass-marked clay, any indicators of pottery manufacture will need noting. The basic catalogue work will need premises where the whole assemblage can be laid out. It will be arranged for a time when ACT is available to provide comment and advice. Both CT and HQ will need time each to provide a written report to which ACT will contribute. The data recorded will form the basis for analysis for publication and will include recommendations on the following points:
   a) the questions which analysis can reasonably be expected to address; these will include matters such as the relevance of the ceramics to the function of the site at different stages as well as the chronology of styles and fabrics
   b) the number of drawings with accompanying detailed descriptions to be published
   c) a programme of radiocarbon determinations based on residues
2) Petrography of the local material will be checked against the samples already examined by Dr Taylor as part of the cataloguing and examined for any traces of plant inclusions. Dr Taylor will visit for one day while the assemblage is laid out to advise and check on any anomalies.
3) Any further petrographic work on import wares will need advice from ACT
4) Recommendations need to be considered for the study of the plant remains which have left grass-marks.

21.4 ANALYSIS FOR PUBLICATION

It may be helpful to provide some indication of the work likely to be involved in analysis for publication at this stage, although details will need revision when the further assessment work has been carried out.

1) The catalogue will be expanded into a detailed series of descriptions for publication, taking into account fabric, abrasion, and changes in form and decoration. This work will involve CT and HQ with input from ACT.
2) The programme of radiocarbon dating may be expected to be in the order of 10 samples, to provide good coverage of the three identified styles and of sequence within the Layers.
3) The petrography of the local gabbroic material will be further studied by five thin-sections, two each on the fine and the coarse gabbroic fabrics, and one on the clay sample PS64; these will allow Dr Taylor to compare these fabrics to other gabbroic material and to check on the inclusions of any diagnostic components. Dr Taylor

stresses that thin-section work is unlikely to provide much assistance with the plant inclusions, due to their small quantity. Five thin-sections.

4) The petrography of the import wares may need further checking.
5) Any recommended work on examination of plant remains used in grass-marking.
6) Other collections will be examined for comparanda, especially for the Gwithian Style. A catalogue of this Style should be prepared as an appendix to the report. ACT to work with CT and HQ.
7) CT will draw 100 sherds/vessels; this approximate figure is based on notes taken during the rapid scan in 2003 and on publications by CT. (This allows 20 drawings each for bar-lug and early grass-marked; notes suggest 40 drawings might be needed for the Gwithian Style; 20 drawings for imports).
8) Preparation of a report for publication which will address the questions identified during the further assessment stage. It is expected that this will form the definitive report on Post-Roman to Early Medieval ceramics in Cornwall. This will be prepared by ACT with assistance each from CT and HQ.

22 Gwithian: Assessment of the vertebrate remains

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Dated: 2nd February 2004

22.1 Introduction

This assessment report considers the various vertebrate assemblages produced by the excavations at Gwithian, Cornwall. A series of Bronze Age, post-Roman and medieval sites at Gwithian were excavated in the 1950-60's principally by Prof Charles Thomas (see Fowler 1962; Thomas 1958). Jacky Nowakowski of the Cornwall Archaeological Unit approached the author and Dr Polydora Baker to assess the material. This was to form part of an updated project design and funding proposal to English Heritage to finance the post-excavation analysis and publication of the Gwithian sites.

This report follows MAP2 guidelines (English Heritage 1991), and comments on the quantity, quality and information potential of the recovered material, as well as providing a timing for full analysis. No interpretation or synthesis has been attempted at this juncture.

22.2 Sites and phasing

This information has been summarised from the 'animal bone summary' document, dated 27/10/03, and the individual site summaries, dated variously 2003, supplied by the Cornwall Archaeological Unit.

CG	SW 58936 42662; Crane Godrevy: Iron Age/Romano-British enclosure and medieval settlement
GE	SW 58905 42115; post-Roman settlement site (subsidiary of GMI)
GH	NGR not provided; Iron Age/Romano-British activity
GF	SW 58800 42670; undated field boundaries
GM IV	SW 58900 42100; post-Roman midden and metalworking site
GM V	SW 58995 42285; Bronze Age pits and plough-marks
GM VII	SW 58925 42130; post-Roman settlement (subsidiary of GM I)
GM IX	SW 59040 42280; Bronze Age settlement with associated domestic and agricultural activity
GM X	SE 59040 42290; Bronze Age settlement with associated domestic and agricultural activity, plus human inhumation and cremation burials (Layers 3 & 5)
GM XV	SW 59060 42290; Bronze Age settlement with associated domestic and agricultural activity (Layer 5)
GM XX	SW 59050 42200; post-Roman field system
GM XXI	SW 58750 42250; post-Roman field system
GM A	SW 58926 42128; post-Roman settlement (subsidiary of GM I)
GM B	SW 58923 42125; post-Roman settlement (subsidiary of GM I)
GM I	SW 58930 42130; post-Roman settlement

GT SW 58100 42800; Romano-British settlement

SL SW 58400 41400; medieval midden

22.3 Recovery

All the bone fragments considered in this assessment report were hand-collected during the course of excavation. As a consequence, retrieval may have favoured the larger anatomical elements from the large mammalian species. This would have been at the expense of the smaller elements, and also all the anatomical elements from smaller species of mammal, birds, fish and amphibian. Despite this cautionary tale, however, it was noted that in general, the level of recovery at Gwithian had been reasonable and the assemblages contained fragments of both small species of mammal and bird (see below). Fish remains were also present, but these almost exclusively consisted of large vertebrae and rib fragments.

22.4 Residuality and contamination

Estimating the residuality of animal bone is notoriously difficult. Various methods have been employed, such as indices based on bone colour and surface abrasion, all of which have their own methodological problems (see Dobney *et al*. 1996 & 1997). One of the most common methods used to infer animal bone residuality is to utilise information from other, intrinsically dateable, finds categories as a baseline. Different types of artefact may have no direct correlation however, because of their different depositional pathways (see Evans & Millett 1992; Tomber 1991), so this approach also has to be treated with caution.

Because of the stage at which the Gwithian project stands very little detailed information exists on the probable levels of residuality. They are thought not to be prohibitively high. Aeolian sand has sealed most deposits, which have not been disturbed by subsequent activity (Jacky Nowakowski pers. comm., 2004). Most deposits and their contents are, therefore, assumed to be stratigraphically secure. The problem of residuality will have to be re-assessed once detailed work on the archive and other artefact types has been carried out (see below).

Despite the problematic use of bone colour and abrasion indices it was noted during the assessment that the post-Roman and medieval material from Gwithian (sites CG and GM I, plus GM A and GM E) demonstrated considerable homogeneity within individual deposits, thus supporting the view expressed above. The Bronze Age Layers 3 and 5, from sites GM IX and GM X, and GM XV respectively, are more problematic. Each contained bone fragments that demonstrated a range of preservation from ‘poor’ to ‘good’ (see below). This may indicate a degree of mixing and will have to be investigated further.

A relatively low level of gnawing was observed throughout the Gwithian assemblages. As an indicator, it is not uncommon for a third of British vertebrate assemblages to be gnawed, and the Gwithian material was generally below this frequency. This would suggest that the majority of securely stratified animal bones were recovered from their original anthropogenic place of deposition, rather than from secondary deposition caused by scavenging dogs and pigs.

The presence of a range of intrusive burrowing species was noted during the assessment. Rabbit, small rodent, small seabird and amphibian remains were recovered from CG, GM X and GM I. The as yet unidentified small seabird remains could conceivably belong to a burrowing species, such as puffin or one of the shearwaters. Layer 3 at GM X was affected by intrusive material. Certain intrusive

species will be easier to identify and exclude than other species, for instance rabbit, which was not introduced until the Norman Conquest (Yalden 1999: 138).

22.5 Context

The Gwithian bones derived from a range of deposit types, which included curvilinear ditches, pits, postholes, occupation layers, middens and hearths. Much of the material, however, appears to derive from layers of aeolian sand that has been inter-mixed with occupation debris. This phenomenon accounts for Layers 3 and 5 for the Bronze Age sites (GM IX, GM X and GM XV) and Layers A, B and C for the post-Roman sites (GM A, GM E and GM I), in particular. At this stage of the assessment procedure it has not been possible to consider in detail the spatial, and likely functional, context of the assemblages because the site archives have yet to be re-analysed and interpreted (see below).

22.6 Preservation

Preservation of the Gwithian material fluctuated greatly. It ranged from poorly preserved to well preserved. The former was characterised by bone surfaces that had suffered extensive abrasion and exfoliation, whereas the latter had suffered minor degradation and displayed a high level of cortical integrity. Most individual deposits demonstrated reasonable homogeneity, although certain deposits appeared mixed, especially 'Layer 3' from the Bronze Age sites (GM IX and GM X), and to a lesser degree 'Layer 5' (GM XV).

Much of the material was etched by root action and this will obscure other forms of surface modification (principally butchery and gnawing).

22.7 Fragmentation

The severity of fragmentation can be gauged by calculating the proportion of isolated maxillary and mandibular teeth within an assemblage. The assessed Gwithian sites produced the following frequency

CG	43%
GM IV	44%
GM IX	54%
GM X	64%
GM XV	49%
GM A	44%
GM I	43%

When this information is summarised by chronological period, it confirms the pattern demonstrated by surface preservation (see above); the older the material, the more degraded it has become:

Bronze Age	59%
Post-Roman	43%
Medieval	43%

These levels of fragmentation within the identifiable bone assemblages are not overly prohibitive to the overall information potential of the Gwithian assemblages.

22.8 Storage

The assemblage is currently housed at the Royal Cornwall Museum at Truro. The assemblage is presently stored in approximately 22 'museum' boxes, although their final archiving has yet to take place.

22.9 METHODS

22.9.1 Assessment sample

The Gwithian assemblages available for assessment comprised the following numbers of fragments (Cornwall Archaeological Unit 'animal bone summary', dated 27/10/03):

CG	1799 stratified and 3 unstratified bone fragments
GE	1 unstratified bone fragment
GH	3 stratified bone fragments
GF	47 stratified bone fragments
GM IV	31 stratified and 305 unstratified bone fragments
GM V	38 stratified bone fragments
GM VII	1 unstratified bone fragment
GM IX	223 stratified and 712 unstratified bone fragments
GM X	290 stratified and 984 unstratified bone fragments
GM XV	281 stratified bone fragments
GM XX	8 stratified and 90 unstratified bone fragments
GM XXI	9 stratified bone fragments
GM A	365 stratified and 44 unstratified fragments
GM B	28 stratified bone fragments
GM E	305 stratified bone fragments
GM I	1089 stratified and 270 unstratified bone fragments
GT	10 stratified bone fragments
SL	57 stratified bone fragments

Based on these summaries, the following sites were assessed: CG, GM IV, GM IX, GM X, GM XV, GM A, GM E and GM I. Sites GM IX and GM X were sub-sampled and numbers for the entire assemblage estimated (see below). Numbers for the subsidiary sites GM IV, GM A and GM E were extrapolated from GM I; prior to this the material was scanned to determined whether it differed significantly from that of GM I. Sites GE, GH, GF, GM XX, GM XXI and GM B were not assessed because they were comprised of small amounts of material generally of uncertain provenance. This material will not alter the overall conclusions reached by this assessment report.

22.10 Recording

The material was scanned by the author and Dr Polydora Baker at the Royal Cornwall Museum, Truro between 14-15th January 2004 with the assistance of Mr Carl Thorpe.

Prior to assessing the Gwithian material it was decided that the application of a diagnostic zone system (such as that devised by Davis 1992 and developed by Albarella & Davis 1994) would be inappropriate, due to the scarcity of faunal remains

from Cornwall, especially prehistoric. It was, therefore, decided that a more inclusive approach to maximise Gwithian's information potential should be utilised. To this end, the recording system devised by Serjeantson (1996) has been employed.

The following anatomical elements were considered 'countable' for the Gwithian assessment: horncore, cranial elements, maxillary teeth, mandibular teeth, atlas, axis, humerus, radius, ulna, carpals, metacarpals, pelvis, femur, tibia, fibula, tarsals, metatarsals and phalanges. With the exception of the atlas and axis, vertebrae were not considered, neither were the ribs. To summarise Serjeantson's (1996) system, it divides most of the aforementioned anatomical elements (exceptions being the teeth, most of the cranium, carpals and tarsals) into eight zones and at least 50% of one zone has to be present for the fragment to be recorded. This approach generates higher fragment counts, plus more information on body part distribution, fragmentation and butchery than an equivalent diagnostic zone system (see above); it does not generally provide any more ageing or biometrical data.

The 'ageability' of mandibular teeth was assessed using the wear stages of Grant (1982) for cattle and pigs, and Payne (1973 & 1987) for sheep/goats.

The biometrical potential of the Gwithian assemblages was assessed accordingly: Von den Driesch (1995) defines the majority of measurements that would be taken. Pig measurements would follow the definitions of Payne & Bull (1988). Humerus 'HTC' and 'BT' would also be taken for all species, as defined by Payne & Bull (1988). Additional distal metapodial measurements (BatF, 1, 2, 3, 4, 5, 6, a & b) would be taken for cattle, sheep and goats according to Davis (1992). Mandibular equid teeth would be measured using Davis (1987).

For the assessment no attempt was made to separate the following:

- sheep (*Ovis aries*)/goat (*Capra hircus*)
- the equids (*Equus caballus* & *E.asinus*)
- the lagomorphs (*Lepus* sp. & *Oryctolagus cuniculus*)
- small rodents (Murinae & Microtinae)
- chicken and related species (*Gallus gallus*, *Numida* sp. & *Phasianus* sp.)
- duck (*Anas* sp. & *Aythya* sp.)
- crow (*Corvus corone*)/rook (*C.frugilegus*)
- seabirds (principally Procellariidae & Laridae)
- small songbirds (Passeriformes)
- frog (*Rana* sp.)/toad (*Bufo* sp.)

Full speciation would be attempted during the final analysis.

22.11 OVERVIEW

22.11.1 Fragment counts

Table 22.1 outlines the Numbers of Identifiable Specimens (NISP) that the Gwithian assemblages would produce by site and major taxon, using the methodology of Serjeantson (1996; see above). To summarise, the assessed sites would produce a total NISP of 4039, which divide by site accordingly:

CG 865

GM IV 179

GM IX 311

GM X	857
GM XV	219
GM A	179
GM E	357
GM I	1072

When considered by broad chronological period, the Gwithian assemblages produce the following NISP values (Table 22.2): Bronze Age 1387, post-Roman 1787 and medieval 865. Approximately 40-50% of each assemblage consists of isolated maxillary and mandibular teeth, but does not overtly limit its potential (see above). The sites not assessed would produce very few additional identifiable fragments and would, therefore, not alter these estimated values substantially (see above).

All the assemblages are dominated by the major domesticates. Cattle are the most numerous species for both the Bronze Age and post-Roman sites, followed by sheep and relatively small numbers of pig. These proportions are typical of both periods. The medieval assemblage is dominated by sheep/goat, followed by cattle and small numbers of pig. Again, these proportions are typical of the period. Small numbers of other domestic and wild mammals were also present (summarised in the 'Other' category in Tables 22.1-22.2). For the most part, equids, red deer, dog and lagomorphs (hares and rabbit) are the main constituents. Mustelids (including otter) and small rodents were also noted. Two battered pieces of cetacean bone, probably vertebrae or long-bone epiphyses, were noted from GM X. Bird species mainly consisted of domestic fowl and small seabirds, plus the occasional corvid and columbid. Larger fish bones were also present, although no attempt was made to identify them at this stage. This range of species is fairly typical of a hand-retrieved assemblage (see above). These quantities and the range of species encountered would certainly aid our understanding of each site, especially the Bronze Age and post-Roman sites. The level of fragmentation (isolated teeth; see above) would have to be taken into consideration when reconstructing body part distributions.

22.11.2 Ageing data

Table 22.3 outlines the numbers of mandibles (two or more cheek teeth), isolated mandibular teeth and post-cranial epiphyses from the major domesticates (cattle, sheep/goat and pig) that would produce useful ageing data by site; Table 22.4 summarises the same information by chronological period. To summarise the chronological distributions:

	Mandibles	**Isolated teeth**	**Epiphyses**
Bronze Age	51	224	154
Post-Roman	53	203	245
Medieval	60	102	102

Cattle and sheep/goat would provide the vast majority of the ageing data (reflecting the fragment counts; see above). From these numbers it will be possible to gain some indication of the likely husbandry practices pursued at the Gwithian sites for each phase of activity. It was noted that the majority of ageable fragments belonged to sub-adult or adult animals (although some neonatal and very young specimens were also present). Fragments of very young individuals may be under-represented within the assemblage, a factor that will have to be taken into consideration during the full-analysis. Two factors almost certainly account for this bias: the differential

preservation of very young elements within the burial environment (see Munson 2000; Munson & Garniewicz 2003) and the preferential retrieval of older specimens during excavation (see above). It will be possible to counter this by determining how much the mortality profiles produced by mandibles/teeth and post-cranial elements respectively differ from one another.

22.11.3 Biometrical data

Table 22.5 outlines the volume of biometrical data (number of measurable specimens and total number of measurements) that each site would produce by taxon; Table 22. 6 summarises the same information by broad chronological period. To summarise, the period totals:

	Measurable specimens	Number of measurements
Bronze Age	212	394
Post-Roman	291	560
Medieval	242	527

Cattle and sheep/goat fragments would produce the majority of the biometrical data. A high proportion of these measurements would derive from isolated teeth. This volume of data will enable diachronic change in husbandry practices and stock improvements to be assessed. Pooling measurements, using the log ratio technique of Simpson *et al*. (1960), will enhance the potential of the biometrical data, especially when comparing Gwithian to analogous material.

22.11.4 Comments

A variety of pathological conditions and congenital non-metric traits were noted in the assemblage. Pathological conditions mainly consisted of new bone growth affecting articular surfaces. This probably relates to degenerative joint disease, either activity related or conceivably arthritic in origin. It will, therefore, be possible to infer something regarding species utilisation and husbandry practices from these conditions. Non-metric traits generally consisted of absent teeth or morphological variation in teeth. These were mainly noted in cattle. These too, can be utilised in furthering our understanding of husbandry practices.

Two (1 sheep/goat and 1 dog) semi-complete articulated skeletons were noted from the GM IX.

Human remains were noted in the GM I assemblage: A neonatal probable radius and an adult first phalange.

Worked bone from the Gwithian excavations was also scanned to determine species and anatomical element wherever possible, prior to a worked bone expert analysing the material. Table 7 outlines the results.

22.12 POTENTIAL

The Gwithian material has considerable potential, based on the numbers of identifiable fragments, ageable and measurable elements it would produce. Individual assemblages from the largest sites, e.g. CG, GM X, GM I and GM E, will provide an insight into their likely function (producer versus consumer, species exploited and husbandry regimes). However, due to the size of the remainder, little can be confidently inferred from them. It is, therefore, fortunate that many of the individual ‘sites’ actually relate to the same settlements/areas of activity, thus making their pooling into board chronological periods more logical. This will be particularly useful in

regard to the Bronze Age and post-Roman material because of its scarcity within Cornwall and will make regional (and national) comparison more valid.

22.12.1 Local

The Bronze Age, post-Roman and medieval assemblages from Gwithian will all produce useful data sets. To differing degrees, this will allow the reconstruction of husbandry practices and land-use around Gwithian and Navax Point. The larger bone assemblages will also provide an insight to site specific activities and function (principally CG, GM X, GM E and GM I).

22.12.2 Regional

The Gwithian assemblages will advance our understanding of Cornish land-use and animal exploitation through time. To date, very few Bronze Age or post-Roman sites in Cornwall and been identified and systematically excavated. When sites have been excavated, they often produce only small, poorly preserved assemblages that have very little information potential. This is mainly because of the underlying geology of the region inhibiting the long-term survival of deposited bone (see above). The Gwithian Bronze Age and post-Roman assemblages are, therefore, virtually unique and should be utilised to their fullest potential.

It will be particularly useful to compare the post-Roman material from Gwithian to the Romano-British assemblage from Atlantic Road, Newquay (Ingrem 2000). A direct comparison will be made easier because the same methodology was applied to both sites (see above). It will, therefore, be possible to assess whether any downturn in the pastoral economy, or husbandry practices, occurred in the immediate post-Roman period in Cornwall (see below). The assemblage from Duckpool, Morwenstow (Powell & Serjeantson 1995) will also be useful in this respect, although it produced a smaller volume of material. The large urban Romano-British and medieval assemblages from Exeter, Devon (Maltby 1979) can also be utilised and used to evaluate the likely regional trade of agricultural produce in relation to Gwithian.

The measurements provided in Chaplin & Coy (1964) for the pre-Roman Iron Age site at The Rumps, Wadebridge may be of some use when assessing diachronic changes in regional husbandry practices.

When assessing the likely exploitation of wild mammals at Gwithian and across Cornwall, the work of Turk will be useful (mainly in *Cornish Archaeology*), notwithstanding Turk (1969, 1970) because it incorporates segments of the Gwithian assemblages to be re-analysed.

22.12.3 National

Numerous analogous assemblages from southern Britain can be utilised to place the Gwithian assemblages into a national context. As the Gwithian Bronze Age assemblage will produce a reasonable volume of data, especially biometrical, every effort should be made to compare it with other Bronze Age settlement sites. Possible Bronze Age settlement sites for comparison include:

Barrows Hills, Radley, Oxfordshire (Levitan & Serjeantson 1999)

Eton Rowing Lake, Windsor (Jones in prep)

Runnymede Bridge, Surrey (Done 1980; Serjeantson 1996)

Whitecross Farm, Chosley, Oxfordshire (Clark & Powell 1996)

Yarnton, Oxfordshire (see Hey & Bell 2000)

Other non-settlement sites may also produce valuable comparable data, for instance:

Caldicot, Gwent (McCormick 1997)

Possible Romano-British sites for comparison include:

Balksbury Camp, Andover, Hamsphire (Maltby nd)

Old Down farm, Andover, Hampshire (Maltby 1981)

Greyhound Yard, Dorchester, Dorset (Maltby 1995)

Portchester Castle, Hampshire (Grant 1975)

The traditional view that the demise of the Roman Empire led to the collapse of agricultural production is now thought spurious. Recent research, for example at Wroxeter, Shropshire (Hammon forthcoming) suggests the pastoral economy carried on virtually unchanged. It will, therefore, be interesting to consider the Gwithian post-Roman material with this in mind. Finding comparable medieval settlements to place Gwithian into its national setting should present no problem, due to the wealth of analogous material currently available.

22.13 RECOMMENDATIONS

22.13.1 Pre-analysis

Prior to analysis of the Gwithian bone assemblages all the work relating the stratigraphy, phasing and possible levels of residuality should have been carried out. It is essential that this work is carried out beforehand, otherwise it will not be possible to commence the analysis, for the following reasons:

GM IX — approximately 96% of identifiable fragments from 'Layer 3' (essentially forming the entire assemblage) have no additional contextual information

GM X — approximately 76% of identifiable fragments from 'Layer 3' (essentially forming the entire assemblage) have no additional contextual information

GM XV — approximately 99% of identifiable fragments from 'Layer 5' (essentially forming the entire assemblage) have no additional contextual information

GM I — approximately 48% of all identifiable fragments come from mixed bags, where individual bones have been marked with the original 'bag numbers'

22.13.2 Analysis

If the problems associated with the contextual information are resolved, then the Bronze Age, post-Roman and medieval vertebrate assemblages from Gwithian deserve to be analysed in full. The Bronze Age and post-Roman material provides an almost unique opportunity to advance our understanding of these periods in Cornwall (and beyond). The more 'inclusive' methodology of Serjeantson (1996; see above) should be employed to this end. This will maximise the information potential of the Gwithian assemblages. It will also make inter-site comparison with analogous

assemblages easier and more valid; especially Atlantic Road, Newquay (Ingrem 2000), Duckpool, Morwenstow (Powell & Serjeantson 1995), Barrow Hills, Radley (Levitan & Serjeantson 1999) and Runnymede Bridge, Surrey (Serjeantson 1996) because they use the same technique.

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Site	Cattle		Sheep/Goat		Pig		Other		Bird	Fish	TOTAL	
	Teeth	Bone	Teeth	Bone	Teeth	Bone	Teeth	Bone	Bone		Teeth	Bone
CG*	100	151	202	186	51	54	17	35	26	43	370	495
GE/	not assessed; 1 unstratified bone fragment											
GH/	not assessed; 3 undated bone fragments											
GF/	not assessed; 47 post-Roman bone fragments											
GM/IV estiamted total*	42	39	28	17	7	4	1	2	4	36	78	101
GM/V	not assessed; 38 Bronze Age bone fragments											
GM/VII	not assessed; 1 unstratfied bone fragment											
GM/IX assessed total	66	61	38	29	2	2		8				
GM/IX estimated total*	110	99	55	34	3	2		9			167	144
GM/X assessed total	108	98	249	119	51	16	11	7	5	2		
GM/X estimated total*	139	121	328	152	67	20	12	8	6	3	547	310
GM/XV*	97	101		1			11	9			108	111
GM/XX	not assessed; 8 post-Roman & 90 unstratified bone fragments											
GM/XXI	not assessed; 9 post-Roman bone fragments											
GM/A estiamted total*	42	39	28	17	7	4	1	2	4	36	78	101
GM/B	not assessed; 28 post-Roman bone fragments											
GM/E estiamted total*	84	79	56	33	14	7	1	3	7	72	155	202
GM/I*	252	236	167	100	43	22	3	10	22	217	465	607
GT/	not assessed; 10 Romano-British bone fragments											
SL/	not assessed; 57 medieval bone fragments											
TOTAL	866	866	863	539	192	112	45	78	69	407	1967	2072

***Table 22.1**: Estimated number of identifiable teeth and bones by site and principle taxon (based on Serjeantson 1996)*

* indicates figures used to calculate totals; Teeth = isolated teeth; Bone = mandibles (2 or more cheek teeth), cranial and post-cranial elements (see 'Methods')

Site	Cattle		Sheep/Goat		Pig		Other		Bird	Fish	TOTAL	
	Teeth	Bone	Teeth	Bone	Teeth	Bone	Teeth	Bone	Bone		Teeth	Bone

Bronze Age	346	321	383	186	70	22	23	27	6	3	822	565
Post-Roman	420	393	278	167	72	37	5	17	37	362	775	1012
Medieval	100	151	202	186	51	54	17	35	26	43	370	495
TOTAL	866	866	863	539	192	112	45	78	69	407	1967	2072

***Table 22.2**: Estimated number of identifiable teeth and bones by chronological period and principle taxon (based on Serjeantson 1996)*

Teeth = isolated teeth; Bone = mandibles (2 or more cheek teeth), cranial and post-cranial elements (see 'Methods')

Site	Cattle			Sheep/Goat			Pig			TOTAL		
	MD	Teeth	Bone	MD	Teeth	Bone	MD	Teeth	Bone	MD	Teeth	Bone
CG*	8	16	55	36	77	37	16	9	10	60	102	102
GE/	not assessed; 1 unstratified bone fragment											
GH/	not assessed; 3 undated bone fragments											
GF/	not assessed; 47 post-Roman bone fragments											
GM/IV estiamted total*	2	11	15	3	8	8	1	1	2	5	20	25
GM/V	not assessed; 38 Bronze Age bone fragments											
GM/VII	not assessed; 1 unstratfied bone fragment											
GM/IX assessed total	4	7	7	4	15	10		1	4			
GM/IX estimated total*	6	12	12	5	25	10		1	4	11	38	26
GM/X assessed total	24	79	27	9	20	40		13	8			
GM/X estimated total*	30	104	34	10	26	51		17	10	40	147	95
GM/XV*		39	34								39	34
GM/XX	not assessed; 8 post-Roman & 90 unstratified bone fragments											
GM/XXI	not assessed; 9 post-Roman bone fragments											
GM/A estiamted total*	2	11	15	3	8	8	1	1	2	5	20	25
GM/B	not assessed; 28 post-Roman bone fragments											
GM/E estiamted total*	3	22	29	6	17	17	2	2	3	11	41	49
GM/I*	9	67	88	17	50	50	6	5	9	32	122	147
GT/	not assessed; 10 Romano-British bone fragments											
SL/	not assessed; 57 medieval bone fragments											
TOTAL	59	282	281	79	211	182	26	36	39	164	529	503

***Table 22.3**: Estimated number of ageable teeth and bones from the major domesticates by site (based on Serjeantson 1996)*

* indicates figures used to calculate totals; MD = mandibles (2 or more cheek teeth); Teeth = isolated teeth; Bone = post-cranial elements

Site	Cattle			Sheep/Goat			Pig			TOTAL		
	MD	Teeth	Bone	MD	Teeth	Bone	MD	Teeth	Bone	MD	Teeth	Bone
Bronze Age	36	155	79	15	51	61		18	14	51	224	154
Post-Roman	15	112	147	28	83	83	10	8	15	53	203	245
Medieval	8	16	55	36	77	37	16	9	10	60	102	102

TOTAL	59	282	281	79	211	182	26	36	39	164	529	501

***Table 22.4**: Estimated number of ageable teeth and bones from the major domesticates by chronological period (based on Serjeantson 1996)*

MD = mandibles (2 or more cheek teeth); Teeth = isolated teeth; Bone = post-cranial elements

Site	Cattle		Sheep/Goat		Pig		Other		Bird		**TOTAL**	
	Spec	Meas	Spec	Meas	Spec	Meas	Spec	Meas	Spec	Meas	Spec	Meas
CG*	50	106	128	228	27	81	23	77	14	35	242	527
GE/	not assessed; 1 unstratified bone fragment											
GH/	not assessed; 3 undated bone fragments											
GF/	not assessed; 47 post-Roman bone fragments											
GM/IV estiamted total*	13	27	13	22	2	4		1	1	2	29	56
GM/V	not assessed; 38 Bronze Age bone fragments											
GM/VII	not assessed; 1 unstratfied bone fragment											
GM/IX assessed total	7	12	17	45			4	8				
GM/IX estimated total*	10	16	23	53			4	8			37	77
GM/X assessed total	34	57	76	152	8	17	1	1	4	7		
GM/X estimated total*	41	67	99	193	11	23	1	1	5	9	157	293
GM/XV*	17	22					1	2			18	24
GM/XX	not assessed; 8 post-Roman & 90 unstratified bone fragments											
GM/XXI	not assessed; 9 post-Roman bone fragments											
GM/A estiamted total*	13	27	13	22	2	4		1	1	2	29	56
GM/B	not assessed; 28 post-Roman bone fragments											
GM/E estiamted total*	26	54	25	45	4	7		2	2	5	58	112
GM/I*	79	161	76	134	12	22	1	5	7	14	175	336
GT/	not assessed; 10 Romano-British bone fragments											
SL/	not assessed; 57 medieval bone fragments											
TOTAL	249	480	377	697	58	140	30	97	31	74	745	1481

***Table 22.5**: Estimated number of measureable teeth and bones by site and principle taxon (based on Serjeantson 1996)*

indicates figures used to calculate totals; Spec = measureable specimens; Meas = number of measurements

Site	Cattle		Sheep/Goat		Pig		Other		Bird		TOTAL	
	Spec	Meas	Spec	Meas	Spec	Meas	Spec	Meas	Spec	Meas	Spec	Meas
Bronze Age	68	105	122	246	11	23	6	11	5	9	212	394
Post-Roman	132	268	127	223	20	37	1	8	12	23	291	560
Medieval	50	106	128	228	27	81	23	77	14	35	242	527
TOTAL	249	480	377	697	58	140	30	97	31	67	745	1481

***Table 22.6**: Estimated number of measureable teeth and bones by chronological period and principle taxon (based on Serjeantson 1996)*

Spec = measureable specimens; Meas = number of measurements

GM X	Layer 3	Med mammal ?femur	
GM X	Bag 69; Cutting 4	Lrg mammal rib	
GM X	Bag 161; Cutting 2; midden	Cattle femur	
GM X	Bag 386; Cutting 3; House 1; south of baulk; Layer 3	Red deer antler	
GM X	Bag 77; Cutting 3; midden	Sheep/Goat tibia	
GM X	Bag 242; Cutting 3; Layer 3	Lrg mammal long bone shaft	
GM X	Bag 120; Cutting 3A; midden	Lrg mammal rib	
GM X	Bag 363; Cutting 3; midden	Red deer antler	
GM X	Bag 87; Cutting 3; midden	Pig 1st phalange	Partially digested
GM X	Bag 603; Cutting 23; south side cremation; Layer 3	Lrg mammal rib	
GM X	Bag 791; Layer 5	Med mammal ?rib	
GM XII	Bag 92	?Lrg mammal	
GM XV	Bag 88; Cutting 16; inside house; Layer (?)8	Sheep/Goat/Roe deer radius	
GM XV	Bag 153; Cutting 19; south half; Layer 5a/b	Lrg mammal ?long bone shaft	
GM XV	Bag 209; Cutting 22; north of 16	Lrg mammal long bone shaft	
GM XV	Bag 177; cutting 19; west side; Layer 5a/b	Lrg mammal long bone shaft	
GM XV	Bag 32; Cutting 9; Layer 8	Lrg mammal ?long bone shaft	Worked?
GM XX	28	Cattle/Red deer femur	Eburnation?
GM B	1955; Small find 15	Cattle/Red deer femur	
GM E	1955	Pig scapula	

Table 22.7: Comments on worked bone fragments

23 Gwithian: Flint Assessment

Anna Lawson-Jones

Note: This assessment does not deal with the major Mesolithic collections in the Gwithian archive.

Dated: 08/01/2004

23.1 Introduction

This assemblage consists of a total of two hundred and sixty two worked pieces. Additional larger unmodified pieces of flint and chert may be included within the main stonework register assemblage, and if so these will be separately assessed by Henrietta Quinnell. In addition there are eleven references to flint in the finds registers which have not been found. Since these entries did not have associated counts, the total number of missing pieces is unknown. It is, however, known that two arrowheads are missing (one from site GM/XIV and one from GM/X).

During the excavations flint and chert was collected when seen, although many of the smaller pieces could very easily have been missed since many of the excavated layers were heavily dominated by sand and crushed shell. Crushed shell can closely resemble small scale flint and chert chips and knapping debris, in terms of both colour and shape.

The assemblage comes from twelve different site coded sites; GM/I, GM/A, GM/B, GM/IV, GM/V, GM/IX, GM/X, GM/XI, GM/XIV, GM/XV, GM/XXI and CG, and were collected throughout the Gwithian project. Variable amounts of worked flint and chert were collected from the majority of recorded site layers. The main Bronze Age sites, layers 3, 5, 7 and 8 produced the largest collections, (layer 3 producing the most). Much of this material appears to be reasonably *in-situ*, although post-depositional disturbance caused by subsequent feature excavation is probable in some cases (and needs to be considered further). No flint came from sand inundation layers 4 and 6. Post Roman homestead/midden sites GM/I, GM/A and GM/B produced flint from layers A, B and C. Post Roman ridge and furrow site GM/XXI additionally produced a quantity of material from 'ploughsoil'. This represents disturbed rather than *in-situ* material.

The following three tables present basic information for all flint producing sites found during the Gwithian project. They are arranged into Bronze Age, post Roman and medieval site assemblages.

GM/IV				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	A 1956	Bottom of 1955 trench.		Nodular. Soft hammered ? gunflint shaped scraper.
Total = 1			**0**	
GM/V				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	NE quad.	E half of ritual pit		Split pebble with ? scraper use
1	NE quad.	Trench across		Fine retouched blade/bladelette – small knife?.

		road		
Total = 2			**0**	
GM/IX				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
2	1	?8		Blade core, flake core
1	4	3		Pebble chopper/core
8	5	3	1	Fine blade (shouldered), 2 x pebbles, waste, tried core
4	5/6/7	3		Blade core reused as a burin, waste, flake core/scraper, utilised flake
1	6	3		Knife
1	8 (E half)	5		Utilised primary flake
2	11	3		Flake with broad retouched concave edge, Multi-platformed flake and blade core
1	11	3a		Core/flake with possible former hammerstone use and patch of gloss
1	11	3a-c		Utilised point
1	U/S	U/S		Split pebble
Total = 22			**1**	
GM/X				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	1	2		Pebble tool
1	1	7		Chert flake
6	1	8	1	End scraper, blade and 2 x cutting flakes and waste
1	2	Below turf		Pebble tool
1	2	Midden		Scraper
1	3	2		Blade core
4	3	?3		Blade core/scraper, waste, bladelette and split pebble tool.
27	3	3	4	Utilised quartz crystal piercer (abraded point), squat flake core (with a later break), blade core, waste, thick triangular blank/flake with utilised point/borer, pebble, burnt knife?, miscellaneously used pieces, recently broken flake?, multi-platformed flake/blade core, convex scraper, flake core, blade core, broken knife.
2	3	5		Pebble core tool, elongate slice.
1	3A	3		Fabricator?
3	3A	3 ?		2 x pebble tools and a mid blade section (post depositional breaks)
2	3A	? (? Poss. 8 based on flint)		2 ? microliths
2	¾	3		Piercer, fine blade
1	3/5	3		Recent damage
2	4	3 ?		Waste and tried core?
1	4	? 3 (3-5)		Waste
11	5	8		Nodular x 1. Microburin, bilaterally worked knife, tried pebbles/tools?, waste
2	5/6	3		Waste and broken piercer?

1	6	3		Pebble
1	6	C		Multi-platformed flake core.
1	6	Λ α		Multi-platformed flake core with crushed reused edge.
1	8	? NE corner of grid		Probable core rejuvenation / trimming flake
6	10	3		Thick flake blank, multi-platformed flake core, ? core rejuvenation / trimming flake, waste, large flake and possible knife.
1	12	3		Thick utilised flake
2	17	5		Rejuvenation / trimming flake and hammerstone
3	18	3		Bladelette, waste flake, pebble core tool.
2	18	5		Blade core and waste
7	20	5		Knife/scraper, flake core, snapped stone?, waste pieces etc (one or two of which may have been used as polishers).
2	20	8		Rejuvenation / trimming flake, large thinning flake / arrowhead blank?
8	21	3	1	Quartz crystal, 2 x blade cores, ?axe trimming flake, waste, poor burin.
1	21	5		Core/scraper.
1	22	3		Awl
1	22/23/24	3		Rejuvenation / trimming flake
11	23	3		Multi-platformed core, abraded flake from House 4 floor, rejuvenation / trimming flake, steep scraper, notched point, waste and miscellaneous retouched pieces
1	23/24	2		Bilaterally worked, probably hafted knife blade with short scraper edge
2	23/24	3		Waste, battered abandoned flake core
2	23/24/25	House 4 floor		Pebble, flake from a broken hammerstone?
1	24	3		Scraper
1	26	3		Battered waste flake
1	26/27	3/5		Broken utilised blade
1	26/27	?		Scraper
1	28	5		Abandoned flake core
2	32	8		Waste and point
1	36	2		Long white blade with abraded serrations.
1	37	2/5		Rejuvenation / trimming flake?
1	U/S	3		Knife
3	U/S	Surface	3	Waste, adjoining pieces of a notched piece – shaft straightener?
2	U/S	?		2 x quartz crystals, one has an abraded/scratched point and one has a crushed/abraded edge.
1	U/S	[6]		Piece with short utilised edge
1	U/S	[6], <3>		Knife/scraper
1	U/S	?		Flake with recent break
Total = 141			**9**	

GM/XI				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
2	C	8		Heavy triangular point/possible projectile head ? (heavily corticated), and a rejuvenation / trimming flake.
Total = 2			**0**	
GM/XIV				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
2	N	8		2 x broken blades
2	?	7	1	2 x broken knives
4	?	8		2 x bladelettes (possible 1 x microlith)
Total = 8			**1**	
GM/XV				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	1	7		Waste
8	1	8		Microlith, primary and other waste
3	3	8		Flake core and primary waste
1	4	7		Secondary waste
1	5	8		Blade core
1	6	5T		Primary waste
1	9	5		Scraper
10	9	8		9 x knapping waste
2	10	5		Fine blade and waste
6	10	8	1	Mostly waste
9	16	8	2	Flake and blade core, tried core, 2 x piercers, waste
7	16	8 ?		Tried core/chopper, sling shot ?, waste
1	16/22	5b		Recent damage
9	16/22	8		Fine bladelette, rejuvenation / trimming flake from a blade core, abandoned hammerstone, waste
6	16/22	?8 ditch fill	1	Modified flake, waste, piece with burin removals.
2	16/22/19	8		Waste
6	19	7/8		Fine blade, other blade material and waste
1	20	5		Waste
2	21	5		Split flint cobble with crushed edge and waste
1	22	5a/b		Complete flint hammerstone
2	22	7/8		Rejuvenation / trimming flake with ? scraper reuse, waste.
1	24	5		Tried core
1	35	5	1	Broken retouched tool, shouldered/hafted?
1	U/S	5 surface find		Thumbnail scraper
1	U/S	?5		Abraded knife/scraper
3	U/S	8	1	Waste and ?blade core rejuvenation / trimming flake
1	U/S	?		Cutting flake ?
Total = 88			**6**	

Table 23.1*. Simplified details for Bronze Age site assemblages showing number of pieces, location (by site, cutting and layer), number of burnt pieces and rapid identification details.*

GM/I				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	GM/AF	A		Side scraper/knife.
1	GM/BR	A		Scraper/knife. ?Portland chert
1	GM/BQ	A		Knife
1	GM/I (P19)	A		Knife?
1	? 1956 E end house 1	B	1	Split pebble
1	GM/AY	B		Knife
2	? 1956	C	1	Split flint cobble, split cobble/core?
Total = 8			**2**	
GM/A				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	α 1955	?A		Knife/scraper
Total = 1			**0**	
GM/B				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	U/S 1956	?		Fine blade.
Total = 1			**0**	

Table 23.2. *Simplified details for post Roman site assemblages showing number of pieces, location (by site, cutting and layer), number of burnt pieces and rapid identification details.*

GM/XXI				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	1	Ploughsoil		? Hammerstone
2	1	7/8? W end		1 x chip
13	3	Ploughsoil	1	Knapping debris, blade pieces, scraper, burin, knife pieces
2	4	?see section?		Scraper and ? serrated cutting flake
2	6	Ploughsoil		Cutting flake and blade
Total = 20			**1**	
CG				
Count	**Cut**	**Layer**	**Burnt**	**Comment**
1	P3	Occup. Under S wall		Chert saw ?
1	Pen Isaf	Blown sand / top of occup.		Waste (tertiary)

Total = 2			**0**	

Table 23.3*. Simplified details for medieval site assemblages showing number of pieces, location (by site, cutting and layer), number of burnt pieces and rapid identification details.*

23.2 Raw material and differential preservation

The assemblage consists predominantly of pebble flint (probably collected from the immediate beaches), occasional nodular flint (imported from further east – see Tingle 1998 for Beer Head in SE Devon and Newberry forthcoming for other closer nodular sources), chert (probably collected from the local beaches), occasional Portland chert pieces (which could have been imported or collected locally from the beach), and quartz crystals (which probably came from local soils). The predominant use of pebble flint, with its smaller parent size and less predictably good quality is a factor in both the reduction techniques and the production of diagnostic tool types. This is due in part to differential knapping techniques, particularly the use of anvils. Some evidence for the use of anvils during knapping was seen within the assemblage via distal shattering.

The assemblage exhibits a huge range in levels of patination/cortication, (caused by surface water loss and silica dissolution). Although the precise agents are contentious both alkalies and various acids have been suggested as the cause (M.J.Reynier, 2000, 33-46). The exact formation of the soils and various layers at Gwithian, and the potential variation within and between layers and features (of both anthropogenic and natural sand blow episodes) in terms of acidity and/or alkalinity has not yet been looked at. When it is better understood this may well have some considerable bearing on the patination levels. Certainly these variations do not seem to strongly relate to chronology alone (based on stratigraphic or diagnostic traits).

Occasional pieces within the assemblage have been recently broken or crushed. This has been attributed to either excavation or post-excavation damage. None of the assemblage has the fresh granular appearance of recently knapped material or of pristine preservation, but a number do show only a very minimal sheen (associated with post-production surface 'decay' of the flint). This was seen in layer 3 and occasionally earlier layers, (including 7 and 8). A number of the pieces show a light blue colouration indicative of incipient cortication rather than full-blown patination. Interestingly this was most marked with some of the Mesolithic / Early Neolithic looking blades and finer blade cores found within layers 7 and 8 and occasionally layer 5. A number of pieces show a more pronounced level of cortication, visible on many of the thicker flakes and tried pebble/pebble tools. This was noted for a number of the layer 3 finds, but also occasionally in layer 5. Occasional pieces, however, showed such pronounced levels of cortication that it was impossible even to decide whether they were flint, chert or some other coarser grained stone! The characterisation, date and location of these pieces need to be looked at further.

Differential abrasion and non-recent breakage was noted within the assemblage. The number of pieces displaying notable levels of abrasion and/or high levels of damage appeared to be very small in number. There may, however, be broad patterns between layers. Layers 7 and 8 contained a number of complete, relatively delicate blades with no sign of post-use/post-deposition abrasion or damage. This would suggest that the layers were either formed and sealed relatively quickly (reducing the potential for damage and abrasive wear or weathering), or that the site saw little disruptive activity following on from their deposition (accidental or otherwise). Theoretically this might suggest fleeting occupation at this earlier date, but the relevant assemblage is very

small (and needs further detailed study). Interestingly layer 3 did not appear to contain any significantly abraded or broken material (despite being a larger assemblage).

Thermally fractured pieces were noted periodically throughout the assemblage. No immediately obvious conclusions have been drawn from this. However, it is felt that more might have been expected given the known presence of houses, hearths, cremation pits and cremation heaps? Interestingly it was noted that one piece of flint listed in the register as coming from a cremation heap (GM/X, cutting 8, layer 3) was not burnt.

23.3 Technology and tools

There are two discernable trends visible within the Bronze Age site assemblages (see table 1). These can be simplistically summarised as a move from thinner, longer more regularly shaped pieces and large good quality flakes (relating to the Later Neolithic/Earlier Bronze Age period), to thicker, broader, more irregularly shaped material with a tendency towards squat, stunted flakes and often poorly worked cores (dating to the Middle Bronze Age period), (see Brown 1991: Harding 1992 etc.,).

Lithics from the non-prehistoric post-Roman and Medieval sites (tables 2 and 3) are considered to be residual, background noise, pre-dating and un-related to the main excavated sites. The pieces fall within the basic trends referred to above.

The earliest material is principally/predominantly blades and bladelettes, their production, use and associated waste. Blades and bladelettes have been identified on the basis of their length to width ratio (at least 2:1). They display broadly parallel long edges, frequently display dorsal parallel blade scarring, normally show bulbar preparation and often have feathery terminals. Cores are predominantly either single or opposed platform types, some had been discarded (often the result of raw material quality and/or faulting), in addition occasional ‘bladey’ core rejuvenation or trimming flakes were found. Occasional microliths, a fine end scraper, snapped blades and bladelettes and at least one probable microburin were noted. Some of this material has been modified via retouch. In addition a number appear visually, (although this is subjective) to show unmodified usage, and the majority of pieces are predominantly soft hammered. Material belonging to this Late Mesolithic/Early Neolithic phase of technology (Edmonds 1995, 35) primarily came from layers 8 and 7. Although dominated by blades, flakes were also made during this period, but the technology was ‘geared’ towards blade production and use.

The second technological trend covers the production, use and modification primarily of flakes (and occasionally flakelettes) and associated waste. It primarily dates to the Middle Bronze Age. Many, but not all of these pieces have been hard hammered. Many of the flakes are moderately large and thick butted. A number of multi-platformed flake and flake/blade cores exist within the assemblage, many of these having come from layers 3 and occasionally layer 5. In addition a number of knives made on thick blades were found (again within the layers 3 and 5), some displaying partial invasive retouch. Many of these knives are likely to be Bronze Age, although they are also a common Late Neolithic feature in assemblages. A variety of scrapers were noted, but few of these are easily classifiable or diagnostic. A single probable horseshoe scraper and a single thumbnail scraper were identified within the collection dating to the Neolithic and the Bronze Age periods respectively.

Within this second trend there is a tendency towards larger quantities of thick primary waste, plus a larger number of abandoned cores and tried pebbles. The comparative number of rejuvenation or core trimming flakes and larger ‘cutting’ flakes (flakes which

have seen either minimal modification or obvious use-related wear) reduces in number in layer 3, while abandoned cores, hinged thick primary flakes, pronounced bulbs and core tools increases. This has been noted elsewhere with Bronze Age assemblages (see Ballin 2002, 20, etc.,).

23.4 Discussion

The assemblage as a whole is reasonably small in relation to the quantity of other finds, particularly the larger stonework, pottery and bone assemblages. This may in part be a reflection of the later prehistoric date associated with the sites as a whole. Middle (and Later) Bronze Age flint assemblages are often smaller than their earlier settlement related counterparts and frequently characterised by a simple core/flake technology (Edmonds 1995, 184). Conversely, Neolithic and Early Bronze Age sites are often characterised by a reasonably high flint finds ratio (Edmonds 1995, 176). The assemblage contains a broadly diagnostic range of pieces, but does superficially seem to be lacking in classic tool types, for example arrowheads or distinct knife and scraper forms (although it should be noted that two arrowheads have been lost since excavation).

The assemblage gives the general impression that some of the evidence for knapping, in terms of the potential waste generated, is missing. This is particularly the case for the earlier layers and material, but may also be a feature of the later phases too. GM/I for example has a very high tool ratio (of Bronze Age character) for such a small assemblage and no specific waste. It is doubtful whether this is purely a reflection of recovery strategies during excavation. It does suggest that knapping floors were extant in the locality/vicinity but were beyond the excavated areas, or that knapping took place primarily on the surrounding beaches. In the case of GM/I, GM/A, GM/B, GM/IV, GM/XXI and CG the assemblages do not relate to the 'main' excavated complex, but instead predate them as residual 'floating scatters'. Despite this the lithics found conform with the two trends discussed above.

This is not an essentially unusual range of material for a Neolithic and Bronze Age dated coastal Cornish assemblage. What is unusual is the survival, recognition and collection of other tools, contemporaneous with the flint tool repertoire (particularly for the Bronze Age). The large range of bone tools (including a number of awls and awl-like pieces) is potentially of interest since very few awls and points have been found within the collection, despite being a moderately common Bronze Age element within many flint assemblages. The wide range of other stonework contemporary (and presumably associated) with the use of flint is also of interest in that both the stone and bone suggests leather working and yet the range of scrapers (frequently cited as being wood and leather working related) is not large.

This assemblage reflects a chronologically diverse collection of material, associated with both a coastal/semi-estuarine location and a non-marine based economy. The main (Bronze Age) phases of the site are known to have had access to a wide variety of food resources in particular, evidenced by the substantial quantity of domesticated (and un-domesticated) animal bone, fish, shellfish etc. Further analysis and comparison with similarly located and dated sites with flint and a diverse economy will help to place the Gwithian flint assemblage within its broader context.

23.5 Recommendations

It is recommended that a more detailed assessment should take place.

- Assessment to concentrate on stratified material from prehistoric (Bronze Age) sites. Spatial/feature-linked distributions to be worked on following the results of stratigraphic reconstruction.

- Clarify whether there are significant Late Neolithic/Early Bronze Age distributions/concentrations of lithic material.
- Consider the slightly limited number of awls, scrapers and burnt material for a purely domestic site? Implications re: nature/use of site.
- Production of plans showing concentrations of material by site, layer and cutting, (and perhaps by feature). The aim would be to create chronological layers, potentially highlighting areas of *in-situ* activity, intermixing and disturbance, and to clarify the nature of activity by phase.
- Production of a more detailed breakdown of the various categories of tool, core and waste, and a more detailed assessment of the significant variation in patination levels within the assemblage (drawing on anticipated new environmental/finds data), allowing for contextual analysis.
- Assess the potential for microwear analysis in the light of the results of other artefact (bone, stonework, pottery etc) assessments.
- Quantification of abraded material should also be undertaken in order to clarify any patterning within/between layers.
- Research and comparison into other similarly dated and positioned sites (both in Cornwall and beyond).
- Final selection and illustration of significant pieces representing main technological trends within the assemblage, including cores and tools. Provision should be made for up to a maximum of twenty drawings.
- Interpretation of other data relating to the main sites – 1st draft comments and revisions.

23.6 References

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24 Gwithian: Medieval and Post- Medieval Pottery Assessment

Catherine Freeman

Dated: 13th February 2004

24.1 Introduction

Three boxes of pottery from Sandy Lane (unmarked) and 6 from Crane Godrevy (marked but unwashed) have been rapidly assessed, together with a reconstructed bowl and a candlestick from CG which were boxed separately. In addition a vessel marked/labelled OLS was with the SL material (Bag 2). A 4th box from Sandy Lane was found to contain no ceramic material apart from a small fragment of clay pipe stem. (There was also some stone in Sandy Lane Box 2 (Bags 21 'whetstones' and 22, disc-shaped)).

The Crane Godrevy boxes are listed as:

Box 1 1955/6

Box 2 1957

Box 3 1958

Box 4 1958

Box 5 1969

Box 6 'Post-Medieval'

24.2 Overall comment on condition

The last box (6) consists of rims, handles, and bases which have at some time been extracted from their context bags (and in some cases come from bag numbers for which there is no other pottery or information, e.g. 127, 1958 Bag 429). Much of this material is post-medieval, (North Devon), in the sense of being C16th, as is much of the pottery in boxes 1-4, but some is not, or in the case of Cornish (micaceous) sherds, need not necessarily be. These bags contain sherds of vessels seen elsewhere on the site and should be reunited with them. It was immediately noted after examining Box 1 that no rims were present and that the numbers of sherds stated to be in the bags was not always correct (e.g. 419, 383). On the archive Finds Lists it is stated that to save time it was decided not to re-bag this material individually and record context details for it. Nor is there time or in the latter case is it possible to do this within this assessment, but it is essential that it is done before any further work is undertaken.

The other main problem with Crane Godrevy, as stated in the appraisal, is the dirty condition of much of the material, which makes it impossible to make an exhaustive list of fabrics present, and, to a lesser extent, identify sherds of individual vessels and join them together.

24.3 The Rapid Assessment

For the purposes of this assessment the Crane Godrevy contexts have been grouped by year and cutting and corner of building as logically as possible and brief notes made on forms provided (HQ's).

There seemed to be no purpose in doing this for the Sandy Lane material which is unstratified. Again rims and other feature sherds have been separately bagged and it would be useful to know if there is any rationale behind the division of the material into 51 bags, and if it bears any relation to the order in which the material was excavated.

The whole assemblage of 2616 sherds from Sandy Lane is intact, although at some stage and somehow a theoretical division into early medieval (1763 sherds) and medieval (761 sherds) has been made (with additionally 69 post-medieval, 21 Bronze Age and 2 IA/RB). The possible Bronze Age sherds were already isolated in bags 1, 3, 7, 8 and 24. There is a cord-impressed sherd from Bag 23 and an RB rim in Bag 41 which have been confirmed by HQ. The presence of this material questions the date of other material presumed to be medieval, especially isolated sherds. The curve on the interior of the RB rim is repeated on other SL material, and in some cases the rims appear to have been made separately from the bodies of the pots (referred to elsewhere as internal expansions). The method of manufacture and dating of this material needs to be investigated as this is an unusual shape for medieval pottery.

24.4 STATEMENT OF POTENTIAL

24.4.1 SANDY LANE

This material is vital to the necessary re-assessment of grass-marked pottery and Sandy Lane Styles 1-3, and consideration of whether the three styles could be contemporary. The division into 51 bags should be retained if it may reflect some order in which the material was dug. There were apparently at least 4 layers intercalated with sand. Reference is made (Thomas 1964 p 50) to Style 3 sherds being collected from the surface of the midden but there is no way of knowing which bags these are in. A quantity of the SL pottery is not gabbroic but of thin-walled oxidised jug sherds (similar to Stuffle fabric A4). Illustrated sherds SL 1 and SL 2 (which are marked with these numbers and can be identified) are amongst this material and recorded as coming from the surface of the midden (Thomas 1964, 58: Fig.19, 59).

There may now be no records for the stratigraphy of the Sandy Lane midden, but the excavators obviously knew the order in which the material was dug, and created a sequence from a selection of what they observed. Identifying illustrated vessels and relating these to bag numbers may be the only way of recreating this order. Only a few of the illustrated vessels are marked with the numbers in the report (Thomas 1964), and it is possible that some sherds are missing from the present collection.

The sequence of Styles 1, 2 and 3 has now been confirmed on evidence from many other sites in the area and is generally accepted by Cornish archaeologists.

In summary the styles are:

1 Small bucket-shaped vessels with grass-marked bases. C11th

2 Everted-rimmed cooking-pots with grass-marked bases. C12th

3 Everted and other-rimmed cooking-pots with sagging bases. Late C12th-early C13th

All 3 Styles may have decorated rims.

There are some variations in different publications (eg as to grass-marking of Style 2 and wheel-throwing of Style 3) but this is not surprising as ideas have changed over the many years since the site was excavated and more material has become available from other sites. The use of the name SANDY LANE is questionable, especially in the case of Style 3, which appears to encompass a broad range of material, but it is now indelible, and will remain in the literature, evoking happy summer days. The division into Styles is an attempt to impose precision and order on medieval pottery manufacture, which cannot always respond to it, generated as it was out of poverty and circumstance, subject to vagaries of weather and available materials.

Grass-marking is still little understood and the phenomenon of pots with grass-marks partway up the exterior walls and even on the rims (Thomas 1991) particularly hard to understand with the current explanation that the pots were laid on grass to dry. Is it possible that grass (wood being scarce) was the fuel used? Pots resting *in* the fuel will have marks on the bases and lower walls, *on* the fuel on the bases only. 'Decoration' may be confined to the rims because this is in fact grooving where an upper layer (of consequently ungrass-marked and possibly 'undecorated' pots) can rest. Some pots may have been inverted on the grass, or fallen over in the firing process, resulting in grass-marked rims. The atmosphere created by burning possibly damp possibly salty grass may be responsible for creating the brown colour characteristic of this pottery, an unusual colour shared by Stuffle B5, one vessel of which is found at Old Lanyon with a grass-marked base (O'Mahoney 1994,156).

This use of grass for fuel, for other uses as well as firing pottery, could explain why 'the coastal dunes, bereft for some reason of the thin grass cover which had stabilised them, were moving inland, covering arable and choking entire settlements' (Thomas 1964, 51), and the exhaustion of this grass could also explain the end of grass-marking.

24.4.2 CRANE GODREVY

Box 5, the 1969 material, particularly that from Bag 34, could add significantly to the understanding of the transition between 'early medieval' and 'medieval' Cornish pottery, (containing as it does large parts of individual vessels including a grass-marked platter, the large grass-marked bowl, and an oxidised (pink) (baseless) cooking-pot which is possibly in a finer version of the gabbroic fabric).

Although there are very precise details for layers and cuttings across the rest of the site much of the material does not justify closer examination, and there are few contexts which can be regarded as having chronological integrity (Although this could change when Box 6 contents have been returned to their contexts). Often there are small numbers of or individual sherds of large vessels of North Devon gravel-tempered, gravel-free or calcareous wares which are obviously not in their place of primary deposition (found in rubble or blown sand) and cannot be used to date the Cornish material they are associated with. Some have residues and are heavily sooted but we already know that pancheons were used to heat milk for making cheese.

The assemblage as a whole can be used to establish the relative wealth or poverty of the homestead. There appear to be no foreign imports and only a few isolated probably

regionally imported jug sherds (one Ham Green). There is little North Devon medieval material suggesting that it was not required or only came as containers. The general impression is of isolation, self-sufficiency, it was just a farm. Roofing material is present only in the form of a fir-tree incised finial but ridge tiles should be expected to support this. There was however only limited excavation and more in certain areas could contradict this impression. The 'Southernmost' cutting provides a wider variety of wares than elsewhere. Cuttings across the main rooms (where most are) would not provide much pottery as these would have been regularly cleaned out and only the fragments from the last days of occupation remain. Other cuttings eg AH etc, have very little material.

The pottery can also be used to date the end of occupation. The lack of or general scarcity of certain wares suggests this was pre 1620.

24.4.3 SANDY LANE and CRANE GODREVY

Scientific analysis using modern techniques could help establish an independent Cornish pottery form and fabric sequence for the medieval and early post-medieval periods (1200-1600). This would use a combination of traditional binocular examination of fabrics and thin-sectioning with ICP-AES (for an example of how this can be used see Allan 1999) and possibly RC dating from residues. This could determine when gabbroic clays stopped being used and place other fabrics more precisely within the broad tradition of South-west Micaceous wares. At present dating of Cornish pottery relies strongly on evidence from Devon, as there has been no local dating evidence, but this may be entirely wrong. Cornwall, consisting largely of coastline, is open to a wide variety of other influences, and surely is capable of generating its own pottery traditions. Thus there is a need for dating evidence (for start of wheel-thrown jugs, jars, bowls, glaze etc.), independent of Devon. The presence of a large grass-marked hand-made bowl at Crane Godrevy is a glaring example of this. At present this appears to be an anomaly, as bowl forms are not found until the C16th in Devon. There is good documentary evidence for medieval and post-medieval potters in Cornwall (Douch 1969) and a background of petrological work of matching sherds to known production centres such as Lostwithiel and St. Germans against which to place new work (Taylor 1998-9).

The quality of Cornish medieval and early post-medieval pottery appears to have been fairly low, with either slip or glaze or decoration, rarely a combination, and the only decoration wavy or horizontal incised lines. There appear to be Cornish versions of standard North Devon post-medieval products, using imported North Devon clay with added tempering.

FORMS PRESENT

- Platter
- Cup/bowl (OLS only)
- Bucket shaped cooking-pot
- Jars (cooking pot)
- Bowl
- Flanged bowl
- Handled bowl
- Pancheon
- Jug
- Jar (storage)

- Basket handled jar
- Cistern
- Chafing-dish
- Lid
- Candlestick
- Roof furniture
- Dish
- Skillet

Note: No pipkins, flasks or costrels, drinking mugs

FABRICS PRESENT

- Gabbroic coarse and smoothed (the difference may only be that of post-depositional environment)
- Stuffle A1, A3. A4
- North Devon medieval (some slip dec) (rare)
- Exeter/Dorset/ Somerset glazed and unglazed sandy wares (rare)
- Granular sandy wares
- Lostwithiel types
- St. Germans (only one sherd noted)
- Other Cornish
- Reduced Cornish
- Non-micaceous wares
- C16th Regionally imported sandy ware
- North Devon Gravel-tempered, Gravel-free and Calcareous wares
- Cornish equivalents of these (North Devon clay with micaceous additions)
- Redware slipwares
- Stoneware

24.5 PROPOSED ANALYSIS

TASKS (3-10 are times for SL and CG combined)

1 Marking SL.

If the numbering of the bags definitely has no significance, the material could be amalgamated during the process of sorting into fabrics, forms, and reconstructable individual vessels, otherwise it should be marked with bag numbers before this is done, possibly a wise precaution in case records are ever discovered anyway.

2 Selective washing CG to examine fabrics, vessels etc. (Not NDGT unless possible Cornish) Returning CG Box 6 sherds to their contexts could be combined with this.

3 Re-marking CG sherds if necessary.

4 Sorting into fabrics, vessels.

5 Reconstruction of vessels (only where appropriate (needed for illustrations)).

6 Recording/cataloguing.

7 Identification of previously illustrated vessels and sherds (Thomas, 1964, 1968) and comparison of vessels with them.

(At present no whole profiles appear to be represented in the collection (apart from the large grass-marked bowl which is not illustrated) and drawings (e.g. Thomas 1968 Fig 74 Nos 1, 2 and 6) have been done from rims and bases, conjecturing the areas between them (Thomas 1964)).

8 Illustrations.

9 Preparation of reports.

10 Revision of reports.

24.6 Integrated Tasks

- Examination of vessels rather than sherds to look for **sooting patterns and wear-marks,** possible suspension holes in SL pot. Also investigate possibility that unusually thin deep grooves on some rims were used in some way for material for suspension post bar-lug.

- Pick out sherds for **thin sectioning**, any other scientific analysis. There are a number of sherds with residues from both sites which are not burnt which could be analysed for their own sake (urine/dairy etc).

- Selection of vessels with charcoally residues for **scientific (radiocarbon dating).** So far 3 grass-marked base sherds with charcoal residues have been isolated but other parts of these vessels will need to be identified (to link rims with bases and assign to styles) to make RC determination worthwhile for dating purposes.

- Arrange experimental firing if the project as a whole is interested and we can find suitable clay. (Have not had time to research what has already been done). Experimental pottery-making and firing to try to produce grass-marked, not grass-marked, hand-made and wheel thrown pottery from gabbroic clay, using grass as fuel.

24.6.1 TIMETABLE

- Suggest start on Sandy Lane and complete first while further work on CG archive (eg finding context details for sherds in Box 6 pot) is being done.

24.7 References

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25 Gwithian Archive: Charcoal Assessment

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25.1 Introduction

This report presents an evaluation of 104 samples of charcoal from nine sites included in the Gwithian Archive. The charcoal represents Bronze Age, Romano-British and medieval occupation of the area. Particularly large assemblages were recovered from the Bronze Age and medieval settlements GMX, GM/I and GM/E. Many of the samples were closely associated with dwellings and have been attributed as domestic fuel. In addition, there was some evidence to implicate industrial fuel residues at the medieval site GM/I. The sites include:

CG/- 12 samples

GM/IV – 1 sample

GM/V – 1 sample

GM/X – 30 samples

GM/IX – 6 samples

GM/XIV – 1 sample

GM/I and GM/E – 53 samples

GM/M – 1 sample

GT/- - 3 samples

The samples were assessed for their potential for C14 dating.

25.2 Methods

The charcoal was collected by hand and thus mainly consisted of fairly large fragments (usually more than 5mm in radial cross section). Most of the samples contained less than 10 fragments, often only two or three pieces and sometimes just a singleton. The charcoal was relatively poorly preserved; samples from GM/X were particularly friable.

In view of the paucity of fragments each sample was examined in its entirety. The samples were prepared using standard methods (Gale and Cutler 2000) and examined using a Nikon Labophot-2 microscope at magnifications up to x400. The anatomical features were matched to reference slides of modern wood. In order to provide adequate material for the programme of C14 dating, the maturity of the wood was recorded, although owing to the poor condition of some charcoal this was not always possible.

25.3 Results

The results are presented in Table 25.1. Samples containing charcoal suitable for C14 dating are indicated in bold type on Table 25.1.

The range of taxa identified included:

- alder (*Alnus glutinosa*)
- ash (*Fraxinus excelsior*)
- birch (*Betula* sp.)
- blackthorn (*Prunus spinosa*)
- gorse (*Ulex* sp.) and/ or broom (*Cytisus* sp.)
- hawthorn/ *Sorbus* group (Pomoideae)
- hazel (*Corylus avellana*)
- heather (*Erica* sp./ *Calluna vulgaris*)
- holly (*Ilex aquifolium*)
- oak *(*Quercus *sp.)*
- willow (*Salix* sp.) or poplar (*Populus* sp.)
- pine (*Pinus* sp.) – species unknown but not Scots pine

25.3.1 Site CG/- 1955-8 – Crane Godfrey

This area included an Iron Age and Romano-British enclosed site and a medieval settlement. Twelve samples were examined from both Romano-British and later contexts. The taxa identified included mostly roundwood from gorse (*Ulex* sp.) or broom (*Cytisus* sp.), oak and ash. In addition, an exotic species of pine (*Pinus* sp.) was present in two contexts associated with a medieval house; this was almost certainly collected as driftwood and probably used as fuel.

25.3.2 Site GM/V

A single sample included oak (*Quercus* sp.) heartwood.

25.3.3 Site GM/IX – Gwithian Midden, Bronze Age

The site consisted of a large mound south centre of the 1960 main grid. Six samples were examined from the layer 3, associated with the occupation of a house. By implication the charcoal originated from domestic fuel and indicated the use of firewood obtained from oak (*Quercus* sp.), alder (*Alnus glutinosa*) and shruby species including blackthorn (*Prunus spinosa*) and the hawthorn/ *Sorbus* group (Pomoideae).

25.3.4 Site GM/X - Gwithian Midden, Middle Bronze Age to Late Bronze Age

The site included the main Bronze Age settlement. Thirty samples were examined, representing layers 2, 3, 5, 7 and 8, associated with the occupation of the site, including a deposit from the cremation mound 4 (layer 3). The charcoal probably derives mostly from domestic hearths. The taxa identified included a high proportion of oak (*Quercus* sp.), including both heartwood and more juvenile wood, but also blackthorn (*Prunus spinosa*), holly (*Ilex aquifolium*), elder (*Sambucus* sp.), hazel (*Corylus avellana*), hawthorn/ *Sorbus* group (Pomoideae), alder (*Alnus glutinosa*), gorse (*Ulex* sp.) or broom (*Cytisus* sp.), willow (*Salix* sp.) or poplar (*Populus* sp.) and

birch (*Betula* sp.); the last taxon was from the "cremation mound". Most samples included suitable material for dating.

25.3.5 Site GM/XIV – Gwithian Midden, Bronze Age

A single sample from disturbed marine sand consisted of a thin sliver of charcoal embedded in clay. There was insufficient structure to identify the charcoal.

25.3.6 Site GM/XV – Gwithian Midden, Bronze Age

A single sample was obtained from a posthole in layer 8 and included oak (*Quercus* sp.).

25.3.7 Sites GM/1 and GM/E – Gwithian Midden, post Roman (?early medieval)

These areas related to the main post-Roman/ early medieval occupation. The forty seven samples were examined included charcoal recovered from the excavations in 1953–6 and 1958. These samples were obtained from occupation layers A, B and C, which included the remains of dwellings, and are likely to represent domestic fuel debris. The taxa identified included oak (*Quercus* sp.), hazel (*Corylus avellana*), blackthorn (*Prunus spinosa*), gorse (*Ulex* sp.) or broom (*Cytisus* sp.), elder (*Sambucus* sp.), heather (*Erica* sp./ *Calluna vulgaris*) and alder (*Alnus glutinosa*). A flue, possibly for industrial use, was located in layer C. Associated charcoal consisted of high ratio of roundwood from oak (*Quercus* sp.), hazel (*Corylus avellana*), gorse (*Ulex* sp.) or broom (*Cytisus* sp.), heather (*Erica* sp./ *Calluna vulgaris*) and also alder (*Alnus glutinosa*) and birch (*Betula* sp.).

25.3.8 Site GT/-, Gwithian Porth Godrevy, Roman

Three samples were examined from contexts associated with a building, which included a hearth context. Firewood consisted of oak (*Quercus* sp.), hazel (*Corylus avellana*) and gorse (*Ulex* sp.) or broom (*Cytisus* sp.). Charcoal collected from within pot 101 was identified as oak (*Quercus* sp.) and willow (*Salix* sp.) or poplar (*Populus* sp.).

25.4 Statement of potential

Although many of the samples are comparatively small, the collective data from the assemblage is of considerable significance. Species identification has provided the opportunity to examine the economic use and exploitation of woodland resources in this coastal region of Cornwall over a long spatial period. The charcoal also provides important environmental evidence for an area in which the local topography is of special interest, partly because of periodic changes due to shifting sand but also owing to the unusual edaphic conditions (alkaline sand). The charcoal deposits, although undoubtedly biased in favour of economically relevant species, reflect the overall character of the arboreal assemblage of the region for the periods under consideration.

25.5 Recommendations for further work, aims and objectives

No further identification work is necessary. It is recommended that an analysis of the results obtained from the current assessment for sites CG/-, GM/IX, GM/X, GM/I and GM/E, and GT/- should be compiled in a full report with reference to the following:

1. The range of taxa identified
2. The use and exploitation of woodland resources for domestic and ?industrial fuels, including driftwood.
3. Evidence of spatial and temporal differences in fuel selection and use.
4. Environmental evidence including woodland management.
5. The effects of alkaline sand and local topography on woodland composition.
6. Data from other sites in the area.

25.6 References

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GWITHIAN ARCHIVE CHARCOAL: ASSESSMENT

Table 25.1. Assessment of Gwithian archive charcoal

Key. Number of fragments: x = <10 fragments, xx = 10-20, xxx = 20-50; hw = heartwood, r/w = roundwood, s/w = sapwood

C14 dating: Taxa suitable for dating are indicated in bold type.

Bag no	Context details	Date of recovery	No of frags	Species identified	Further work	Comments
Site CG/- 1955/1956/1957/1958						
16	CG/- charcoal from wall fitting at 2'6" approx.	29/3/56	-	-	-	Hard black substance with no evidence of plant structure
20	CG/- charcoal from R/B level of cut 1	3/4/56	x	**2 x gorse/broom**	no	-
45	CG/- Cutting 4 layer – rubble core	10/4/56	x	**4 x oak r/w**	no	-
67	CG/- Cutting V layer = top of ditch rubble depth 1'0"	12/4/56	x	**1 x gorse/broom r/w**	no	R/w diameter: 8mm
97	CG/- Extension W end 1'6" depth rubble core	16/4/56	x	**1 x oak r/w**	no	-
140	CG/- Cutting 12. Below turf, on or by wall rubble – sherds	11/4/57	x	**1 x ash r/w**	no	-
156	CG/- Cutting? Check 15/4/57	15/4/57	x	1 x pine (not Scots pine)	no	From largewood

173	CG/- Cutting P3 layer, soil and stones. P3 on S side of house wall. E of interior wall 2'6" soil and stones below sand. Midden mat?	17/4/57	x	**1 x gorse/broom r/w**	no	R/w diameter: 10mm
185	CG/- Cut P2 layer – W end of living room, around/ in hearth	20/4/56	x	7 x pine (not Scots pine); **4 x gorse/broom**	no	-
187	CG/- Cut P2 layer bank at back of W wall of living room	20/4/57	x	2 x oak h/w; **2 x gorse/broom**	no	-
204	CG/- Cut 5 layer 20/3/58 killas rubble above 11th century house	20/3/ 58	x	**2 x gorse/broom r/w**	no	-
267	CG/- W. s end. Humus, rubble and sand	3/4/58	x	**9 x gorse/broom**	no	-
Site GM/V						
2	Cutting SW layer?	1955	x	2 x oak heartwood	no	-
Site GM/IX						
14	GM/IX Cutting 5 layer 3 **(1048)**	1960	x	1 x oak h/w	no	-
17	GM/IX Cutting 5 layer 3 **(1048)**	1960	x	5 x oak h/w	no	Very degraded
35	GM/IX Cutting 5 layer 3 **(1048)**	1960	xx	11 x oak h/w; **2 x oak s/w; 1 x alder**	*no*	-

42	GM/IX Cutting 5 layer 3 **(1048)**	1960	x	1 x oak h/w	no	-
72	GM/IX Cutting 5/6/7/ layer 3 **(1048)**	1960	x	1 x oak h/w; 1 x oak s/w; **3 x hawthorn type**	no	-
110	GM/IX Cutting 5/6/7 (inside house (1079)) **layer 3 (1071)**	1960	x	**3 x oak s/w;** **1 x blackthorn**	no	-
Site GM/X						
14	GM/X Cutting 1, layer 2 **blown sand = (1)**	1956	x	*5 x oak, maturity unknown*	no	-
83	GM/X Cutting 4, layer 3 **(56) = occupation layer**	1956	x	5 x oak h/w	no	Small fragments
118	GM/X Cutting 3A Midden occupation **(176)**	1956	x	1 x oak ?s/w	no	-
129	GM/X Cutting 3a house occupation **(175)**	1956	x	**5 x elder;** **2 x birch**	no	-
146	GM/X Cutting 3a layer 2	16/4/56	x	1 x oak h/w; **4 x oak s/w**	no	-
195	GM/X Cutting 6 displaced occupation **(215)**	1956	x	*2 x oak h/w;* ***2 x oak s/w;*** ***1 x oak r/w***	*no*	Roundwood diameter:12mm
223	GM/X Cutting 5 (re cut s. side) layer 8	1957	x	1 x oak h/w; **2 x oak s/w;** **2 x holly**	*no*	-
227	GM/X Cutting 6, layer 3 **pit (220)**	30/3/57	x	**2 x oak s/w;** 2 x oak ?maturity	*no*	-

276	GM/X Cutting 12 (NE corner) **posthole filling (41)**	?	-	-	no	Insufficient charcoal for id
341	GM/X Cutting 18 layer 3 **(117)**	26/3/58	x	2 x oak; **4 x blackthorn**	no	Very degraded
358	GM/X Cutting 1 layer Top (occup?) ginger (top part) **(720)**	6/4/58	x	2 x oak h/w; 1 x oak s/w; **1 x blackthorn; 1 x hazel**	no	-
369	GM/X Cutting 1 layer 7 **(718)**	9/4/58	x	*1 x oak; 1 x oak s/w;* **1 x hawthorn type; 2 x blackthorn**	no	-
375	GM/X Cutting 1 layer 8 **(719)**	9/4/58	x	**4 x *cf.* blackthorn**	no	-
377	GM/X Cutting 1 (extension) layer 8 **(719)**	10/4/58	x	*3 x oak;* **1 x *cf.* gorse/broom**	no	-
504	GM/X Cutting 20 (NW corner) **top of layer 5 (191)**	1960	x	4 x oak h/w	no	Some from largewood
512	GM/X Cutting 20 layer 5 **top of layer 5 (191)**	1960	x	1 x oak s/w; **3 x hazel**	*no*	-
542	GM/X Cutting 23 (NE) layer3 (upper) **(464) midden**	1960	x	1 x oak h/w	no	-
557	GM/X Cutting 23 (west) layer 3 (upper) **(464) midden**	1960	x	2 x oak	no	Very degraded
583	GM/X Cutting 3 unprovenanced	1960	x	**6 x blackthorn**	no	Incl. r/w diameter 8mm

646	GM/X Cutting 21 **(cremation mound 4) layer 3 (260)**	1960	x	**1 x birch**	no	-
648	GM/X Cutting 27 layer 2 **Blown sand (543)**	1960	x	1 x oak h/w	no	-
687	GM/X Cutting 32 layer 8 **(591)**	1960	x	**2 x *cf.* hazel**	no	Extremely friable
722	GM/X Cutting 26/27 layer 3-5 **thin top of layer 3 (544)**	1960	x	2 x oak h/w; **1 x oak s/w;** **1 x *cf.* willow/ poplar**	*no*	Willow/ poplar very degraded
745	GM/X Cutting 3 layer 5 (**435)**	1960	x	4 x oak h/w; **4 x oak s/w**	no	-
765	GM/X Cutting 3 layer 5 **(435)**	1960	x	7 x oak h/w	no	-
797	GM/X Cutting 3/18 layer 5 **(435)**	1960	x	**3 x alder**	no	-
808	GM/X Cutting 21 layer 5 **(267)**	1960	x	2 x oak s/w; **2 x willow/ poplar**	*no*	-
826	GM/X Cutting 3 **hearth (349)**	1960	x	**1 x oak r/w; 7 x hazel**	no	-
?	GM/X Cutting 23 layer 3 bag no. unknown **(473) lens of charcoal**	1960	x	1 x oak; **4 x blackthorn;** **1 x *cf.* hawthorn type r/w**	no	R/w diameter: 3mm
?	GM/X layer 3 Cutting and bag no. unknown	1960	xx	2 x oak; **1 x oak s/w**	no	-
Site GM/XIV						
717	?Cutting layer 8. Disturbed	1960	x	-	no	Thin sliver of

	(3010) marine sand					charcoal embedded in clay. Insufficient for identification.
Site GM/XV						
?	GM/XV Cutting 16/22 centre posthole layer 8 **(1535) posthole 8**	1961	x	1 x oak h/w; **1 x oak r/w**	no	-
Sites GM/I and GM/E						
1953 excavation						
?	Charcoal from "square" **Possibly context (2216) ash layer**	Easter 1953	xxx	*23 x oak h/w;* **1 x hazel r/w**	no	Large chunks of oak from wide r/w, incl. both fast- and slow-grown wood: 50% subsampled
1954 excavation						
33	GM/I consolidation nos. House II, Tr 4 (3/2) baulk **Layer A/B (2236)**	16/4/54	x	1 x oak heartwood	no	-
34	GM/I consolidation nos. House II, outside wall on SW **layer A/B (2236)**	16/4/54	x	2 x oak s/w; **1 x gorse/broom;** **1 x blackthorn**	*no*	-
47	GM/I charcoal layer B	11/4/54	x	1 x oak h/w; **3 x gorse/broom**	no	-
?	GM/I central pit hearth	-	xxx	2 x oak h/w; 1 x oak s/w;	no	Sufficient for

	rectangular cut layer B **(2229)**			**33 x hazel r/w**		conventional dating
1955 excavation						
?	GM/I Cutting House I. W step layer B	1955	x	3 x oak h/w	no	-
? **sample 1**	GM/I 1 baulk. N. side. Rectangular new cut, W end layer B **U/S large lump of charcoal**	29/3/55	x	5 x oak h/w; **1 x blackthorn**	no	Including oak from largewood
Samp 2	GM/I shell pit, baulk on S side. Layer B rectangular new cut E end. **Pit (2266) fill (2268)**	29/3/55	xx	25 oak h/w and unknown maturity; 6 x oak s/w; **4 x hazel**	no	-
41	GM/I layer B **or C (2209)**	7/4/55	x	1 x oak h/w; 2 x oak s/w; **1 x hazel; 1 x gorse/broom**	no	-
Samp 6	GM/I NE corner cutting 2, from hearth in pit Peg Q 7'6" W Peg 12'3"s. Depth 5' **(2273) possible furnace pit**	7/4/55	-	-	no	Dark sand and shell; no charcoal present
Samp 9	GM/E cutting 5 charcoal mass	7/4/55	x	-	no	Charcoal too degraded to id.
138	GM/I layer B **or C (2210)**	18/4/55	x	**1 x gorse/broom r/w**	no	-
151	*GM/I ginger layer* **(2276)**	20/4/55	x	**1 x oak r/w**	no	-
1956 excavation						

9	GM/I "A" baulk A and B **(2225)**	22/3/56	x	2 x oak h/w	no	-
13	GM/I house I, baulk layer A **(2203)**	22/3/56	x	2 x oak h/w; 2 x oak s/w; **3 x oak roundwood**	no	-
48	GM/I mid house I under old "A" baulk layer B **(2208)**	29/3/56	x	1 x oak h/w	no	-
65	GM/I mid house I layer **B?C (2210) note AMS date SUERC- 6158 cal AD 540-660**	1/4/56	x	**2 x hazel**	no	-
70	GM/I E end house I layer B **(2208)**	30/3/56	x	**1 x hazel r/w**	no	-
84	GM/I outside W end house I layer B **(2208)**	3/3/56	x	**2 x gorse/broom**	no	-
87	GM/I E end house I layer C **(2210)**	31/3/56	x	2 x oak h/w; 2 x oak knotwood	no	-
95	GM/I W end house I layer **B/C (2209)**	1/4/56	x	1 x oak; **2 x heather r/w; 1 x gorse/broom r/w**	*no*	-
97	GM/I E end house I layer B **(2208)**	1/4/56	x	**1 x hazel**	no	-
105	GM/I W end house I under wall layer B/C **(2209)**	2/4/56	x	**3 x hazel r/w** **1 x alder r/w**	no	R/w diameters: 20mm
108	GM/I N wall Hut 2 layer B **(2234)**	2/4/56	x	4 x oak h/w	no	Probably from roundwood

116	GM/I layer B, E end of house I **(2208)**	2/4/56	x	2 x oak h/w	no	-
Samp 18	GM/E cutting N **Ashpit** SE corner exposed by slip **(2017)**	19/4/56	xx	14 x oak h/w; **1 x oak s/w**	no	-
140	GM/I E end house I layer B **(2208)**	3/4/56	x	2 x oak h/w; 1 x oak s/w; **1 x hazel**	no	-
158	GM/I W. end house I layer B/C **(2209)**	4/4/56	x	**5 x hazel r/w**	no	-
161	GM/I W. end house I layer B **(2208)**	4/4/56	x	**1 x gorse/broom;** **1 x elder**	*no*	-
167	GM/1 outside wall of house 1 against W baulk layer B/C **(2209)**	4/4/56	x	1 x oak s/w; **4 x hazel r/w**	no	Hazel with insect bore-holes
171	GM/I underlying N. wall, hut 2 layer B **(2328) construction cut of house 2 wall**	4/4/56	x	4 x oak h/w; **3 x gorse/brooom r/w**	no	-
212	*GM/I W end house I layer C* **(2210)**	7/4/56	x	1 x oak h/w	no	-
221	GM/I E end house I layer B **(2208)**	7/4/56	x	*2 x oak h/w;* **3 x blackthorn**	no	-
228	GM/I A pit feature in SW corner of hut 2 layer B **pit (2310)**	8/4/56	x	*2 x oak h/w; 2 x oak s/w;* **2 x *cf.* alder**	no	-

240	GM/I E end house I layer C **(2210)**	9/4/56	x	3 x oak h/w; **1 x hazel**	no	-
267	GM/I E end house I in and under wall layer B **(2346)**	11/4/56	x	**1 x elder;** **3 x willow/poplar**	*no*	-
295	GM/I E end house I layer B **(2208)**	16/4/56	x	2 x oak h/w; **2 x oak r/w; 2 x hazel r/w**	*no*	Very friable
318	GM/I under houses I and II above clean sand **U/S**	19/4/56	x	1 x oak s/w; **1 x alder;** **1 x hawthorn type**	*no*	-
319	GM/I under houses I and II layer above clean sand **U/S**	19/4/56	x	2 x oak h/w	no	-
327	GM/I NW corner baseline, outside W wall, House I, layer C, black ashy deposit **flue (2324)**	20/4/56	xxx	**32 x oak r/w;** **7 x hazel r/w;** **6 x gorse/broom**	no	Large frags from fast-grown oak stems, diameters: *c.*40+mm; hazel diameter 15mm, 4 growth rings, fast grown, insect bore-holes. Sufficient for conventional dating.
338	GM/I outside E end house I **layer B (2208)**	20/4/56	x	**2 x hazel**	no	-
342	GM/I under hut 3 ?layer C **(2233)**	22/4/56	x	**3 x gorse/ broom r/w**	no	-
351	GM/I NW corner flue layer C **flue (2324)**	22/4/56	xx	**2 x oak s/w; 2 x hawthorn type; 2 x gorse/broom;** **2 x hazel; 4 x alder**	no	-

359	GM/I NW corner flue layer C **flue (2324)**	23/4/56	xx	**5 x oak r/w;** **2x gorse/broom r/w;** **8 x birch**	no	oak r/w fast-grown
363	GM/I NW corner flue layer C **flue (2324)**	24/4/56	x	1 x heather; 1 x gorse/broom r/w; **1 x hazel**	no	-
1958 excavation						
58.16	GM/I NW corner house I layer C **(2210)**	3/4/58	x	3 x oak h/w **3 x alder r/w**	*no*	-
58.34	GM/I kiln trench NW corner "flue kiln" layer C **black fill of kiln (2324)**	17/4/58	xxx	4 x oak h/w; 14 x oak r/w; **7 x gorse/broom;** **10 x hazel r/w**	*no*	Oak r/w incl. both fast- and slow-grown wood
Site GM/M						
?	Stratified from geological section. Details of context unclear.	?	-	-	no	Mostly clay, charcoal very sparse and too degraded for id.
Site GT/-						
94	Cutting 10 hearth area	19/4/57	xx	15 x oak h/w; **1 x oak s/w**	*no*	Heartwood from largewood
173	Hearth 3 in and around hearth 3, immediately to west side of drain 3, inside hut on hut floor	11/4/58	xx	1 x oak s/w; **9 x hazel r/w;** **1 x gorse/broom r/w**	*no*	Gorse/broom r/w with oblique toolmark

174	Cutting 6 W end immediately under corner formed by enclosure wall and tumble of stones. 1'8" – 2'3" in from turf	3/4/58	x	6 x oak h/w; 2 x oak s/w; **1 x willow/ poplar**	no	Charcoal from pot 101

26 Gwithian, Cornwall (GM/X): Human Bone Assessment

Jacqueline I. McKinley

Dated: February 2004

26.1 Introduction

Material from 22 Middle-Late Bronze Age contexts was received for assessment. All the material was subject to a rapid scan, the results of which are presented in Table 26.1. Where human remains were identified, age and sex were assessed within the limited scope of the scan (Buikstra and Ubelaker 1995; Scheuer and Black 2000).

26.2 Results

Five of the deposits contained no osseous material: three held some form of mineralised concretion which is unrelated to human bone or the cremation process, one also included fragments of ?burnt clay; one comprised clay; one pebbles, again with no apparent relationship to the cremation process. Osseous material in the form of fragments of unburnt animal bone was recovered from 10 contexts: some of these contexts also contained other substances including, in two cases, burnt material. In no instance is there any indication that these deposits were related to the cremation process.

Human bone was recovered from eight contexts including the remains of an inhumation burial, the rest being cremation-related. The available context data is limited, but the contents of pits (?graves) 1-4 each included relatively large quantities of charcoal-stained cremated human bone and may represent the remains of cremation burials with fuel ash inclusions or deposits of redeposited pyre debris.

The unburnt human bone is well preserved and a large proportion of the skeleton survives, but it has been treated at some stage with what appears to be PVA solution. The cremated bone is all slightly worn and chalky in appearance and relatively few fragments of trabecular bone were apparent in the scan. The surviving bone all appears to have been fully oxidised and there was no evidence of deliberate fragmentation. The bone from each context represents the remains of adult individuals, the probable sex of only one being assessed at this stage.

26.3 Potential and recommendations

It is clear that the ‘cremation mounds’ (see Table 26.1) were not related to the cremation process in any way and are likely to represent the remains of domestic or other waste as suggested by their position exterior to the houses.

Further analysis of the cremated human bone from pits (?graves) 1-4 and layer 3 should enable recovery of further demographic detail, and some comment with respect to pyre technology and cremation ritual, particularly if data relating to the context and position of the deposits can be acquired. The neonatal remains need to be recorded in accordance with standard requirements, but little further data relating to the individual is likely to be forthcoming.

The cremated bone will need some extra cleaning prior to analysis.

26.4 References

Buikstra, JE and Ubelaker, DH, 1994. *Standards for data collection from human skeletal remains* Arkansas Archaeological Survey Research Series **44**

Scheuer, L and Black, S, 2000. *Developmental Juvenile Osteology* Academic Press: London.

Table 26.1: Human cremated bone: Summary of results from scan

context (from descriptions on bags/boxes) note in bold updated context data 2005-2006	bone wt./ % skel. rec.	age & sex	comment
Non-cremation-related contexts			
'display sample'			No human bone; no burnt bone; unburnt pig bone & some form concretion
1			No human bone; no burnt bone; some form of concretion rich in shell & fragments fired earth?
2			No human bone; no burnt bone; unburnt animal bone (pig?); fragments charcoal & fired earth/clay?
3			No human bone; no burnt bone; some form of concretion rich in shell
4			No human bone; no burnt bone; 6 small fragments animal bone
5			No human bone; no burnt bone; some form concretion
bag 230; cutting 5-6; layer ?3 **GMX (541)**			No human bone; no burnt bone; Unburnt cattle bone & tooth + 1 small fragment burnt animal bone. Stone , sand & shell; some form of concretion rich in shell
bag 630; cutting 23, layer 3 (house 4 floor) **GMX ?(470)**			3 fragments sheep bone - ?slightly heat discolour but not really 'burnt'
bag 615; cutting 21; layer 3; 'cremation' mound 4 **GMX fill (587) see below**			Fragment unburnt, immature animal
bag 568; cutting 23, layer 3 ('cremation' mound) **GMX (472)**			3 scraps unburnt ?animal bone
bag 587, cutting 21, layer 3 (outside houses) **GMX (273)**			c. 10 heavily degraded scarps unburnt ?animal bone

Cremation-related contexts			
U/S; a			no burnt or human bone; unburnt animal bone.
U/S; b			3 pebbles!!!
U/S: c			fragment unburnt ?animal bone; clay; sand
U/S: d			?clay
Pit 1 **Cut [584] GM/X (cutting 31) fill (583)**	309.2	adult c. 20-45 yr. ??male	includes poorly oxidised animal bone (pyre goods); 28.9g burnt & u/b sea shell; bone charcoal stained
Pit 2 **Cut [205] GM/X (cutting 20) fill (204)**	443.1g	adult >18 yr.	unburnt animal bone (sheep?; incidental or deliberate inclusion?); light worn & chalky appearance, & charcoal stained. 11g burnt & u/b sea shell
Pit 3 **Cut [207] GM/X (cutting 20) fill (206)**	324.0g	adult >18 yr.	includes 1.8g ?antler/animal bone (?pyre goods); slightly chalky & charcoal stained.
Pit 4, cutting 21, layer 3 **GM/X Cut [588] fill (587)**	98.6g	adult >18 yr.	moderately worn & chalky, no trabecular bone. Charcoal stained.
layer 3	342.7g	adult >18 yr.	slightly worn & chalky; charcoal stained.
layer 3	1 frag.		Black (charred) fragment large long bone, ?human (?femur).
bag 845, cutting 20/31, layer 5 **GMX layer 5 (581)**	2.6g		fully oxidised, chalky appearance; ?human
Inhumation burial			
GM/X cutting 3 (436)	*c.* 90%	neonate	mv – wormian bones ; some skull & hand bones with vertebrae; pelvis, skull & vertebrae mixed; much of bone has had preservative painted on; good condition (0). Some bone seems very white as if bleached?

27 Gwithian: Assessment of artefacts from Bronze Age, RB, post-Roman and Medieval sites

(Rapid survey of metalwork, clay moulds, sand object, stone mould and briquetage)

Note a fuller assessment of the post-Roman metalwork and clay moulds were carried out in September 2006 (see Section 1, 4 and 6).

Dr Jennifer Foster

Dated: January 2004

27.1 Metalwork

The metalwork is in astonishingly good condition (thanks partly to the conservation it received soon after excavation), and almost all the objects are easily recognisable. Therefore few pieces need X-raying to determine shape, or conservation. It should be possible to measure and draw (where necessary) most pieces for publication, perhaps with the exception of some iron nails.

A Bronze Age bronze pin from Gwithian has been missing since the 1960's. It was last known to have been in the Ashmolean Museum, Oxford, where I work part-time. I have made preliminary enquiries, though so far no one recollects seeing it. A research assistant will be starting work fairly soon on a collection of material; the pin may be in this group. I will continue investigations.

27.1.1 Recommendations

- Vanessa Fells recorded the pieces for Xray and conservation. Both Vanessa and I felt that all the objects should be rebagged or boxed in suitable modern containers.
- Most of the metal objects are worth publishing and should be drawn for publication. A selection of nails could be drawn. I would suggest that the published objects should be redrawn and republished for consistency.
- I recommend that David Dungworth (or someone he recommends) should analyse the bronzes from Gwithian Bronze Age site, by XRF in the first instance.

27.2 Gwithian post-Roman metal objects

- GMM 84 lead or tin or lead/tin scabbard chape or dagger hilt. Analyse metal by XRF in first instance.
- GMM 89 Dagger blade with wood on both sides. ?Analyse wood.

27.3 Porth Godrevy RB

- 128 Bronze cross bow brooch. Analyse metal.
- 130 Iron object with wood. ?Analyse wood.

27.4 Crane Godrevy RB and Medieval

- Merovingian buckle. Analyse metal

- David Dungworth may want to look at the ironwork, especially the knife blades from Gwithian early Medieval site, with a view to metallurgical analysis, eg thin sections.

27.5 Clay moulds

Several fragments of clay bronze casting moulds were identified from Gwithian Bronze Age site (4) and Gwithian early Medieval site (1)

GM IX bag 46 cutting2/3 layer 3/5: 2 piece mould, possibly rapier.

GMXV Bag 28 Cutting 4 layer 3: 1 frag

GMXV no provenance: 2 frags

GM/1 Bag 168 1955 Post Roman: 1 frag

27.5.1 Recommendation

XRF analysis may be profitable to identify the metal cast in these moulds.

27.6 Sand object: from GM X Gwithian Bronze Age site.

Sand concretion with hollow which appears to have been heated to low temperature, leaving a ridged impression. Carl suggested a wooden post burnt in situ, but where is the charcoal?

I suggest it could be a hole dug to support a mould, eg the stone mould; if bronze was poured into the mould, the mould would heat up and cook the surrounding sand concretion. This could be a most important piece of evidence: it is always assumed that moulds were put into the ground for casting, but there is no archaeological evidence for this.

27.6.1 Recommendations

- That David Dungworth has a look at this. Can he: a). confirm that it has been heated? B). identify the temperature reached? C). Estimate heat produced by stone mould during casting?
- Does the origin of the silicified sandstone itself require investigation? (eg Pleistocene fossil beach?)
- Could we take a cast of the interior?

27.7 Stone mould

27.7.1 Recommendation

- Redrawing with a reconstruction of how it would be used (2 axes could be made at the same time. In view of the above (sand object), I don't think this mould would have fitted into this hole in the sand, when the front and back were fitted on as well, but it would be worth trying!.

27.8 Briquetage from Porth Godrevy

Very interesting collection of briquetage, likely to have been used for making salt on the site. At least 3 pieces of trough (perhaps for drying the salt) can be identified.

27.8.1 Recommendations

- Diagnostic pieces should be drawn for publication (after analysis).
- It might be worth thin-sectioning pieces to confirm where the clay comes from, although this may be possible by a visual examination. If the clay is local they are likely to be salt production troughs.
- If they are not local, and you think they need thin-sectioning, Dr Elaine Morris may be interested to look at them:

At Centre for Applied Archaeological Analyses

Dept of Archaeology

University of Southampton

Avenue Campus

Highfield

Southampton SO17 1BF.

28 Gwithian, Cornwall: Excavations 1949–1963 Appraisal and assessment of conservation requirements

Vanessa Fell

Dated 24th January 2004

28.1 Introduction

This assessment report relates principally to the metalwork from Crane Godrevy, Porth Godrevy and Gwithian. A few other classes of material were rapidly scanned for possible conservation requirements during a visit 22-23 January 2004. The present rapid appraisal will probably also fulfil most of the requirements for the assessment report without an additional visit to examine the material.

28.2 Method of assessment

All metal finds were individually examined, visually and rapidly, in conjunction with Jennifer Foster and Carl Thorpe.

28.2.1 Material examined and quantification

The finds were examined at two locations: at Charles Thomas's house, Lambessow and at the Royal Cornwall Museum, Truro. The principal groups examined were:

At Lambessow, Truro:

Crane Godrevy (CG), medieval	1 copper alloy
Porth Godrevy (GT) IA/Romano	2 copper alloy
Gwithian Bronze Age	10 copper alloy
Gwithian Midden (GMI etc)	
post-Roman/Dark Age	5 copper alloy
	1 lead alloy
	c. 28 iron

At Royal Cornwall Museum, Truro:

c. 300 iron finds and a few copper alloy and lead, from the following groups:

Crane Godrevy Boxes CG 25, 26, 27, 28, + misc

Porth Godrevy Box GT misc

Gwithian Box GM 27

28.2.2 Records of previous treatments

Apparently many finds including pottery and metalwork were coated and consolidated with polyvinyl acetate solutions (PVA) by Charles Thomas and his team. Some other

metal finds were sent to ‘hist arch’ for conservation according to a note on one sheet of drawings. The details of these treatments are not known.

28.3 CONDITION OF THE MATERIAL

28.3.1 Metalwork at Lambessow

These are some of the better preserved and more important items, spanning Bronze Age to medieval periods. They are currently packed in cotton wool within matchboxes or similar, or are loose in a tray, and are normally stored at ambient conditions. All or most have been illustrated in the past, some as outline drawings, and a few have been provisionally published or included in interim reports.

28.3.2 Copper alloy

Several of the copper alloy are whole objects which are robust and in excellent condition. Two at least have been stripped to metal but others are well patinated and all appear to be stable. These objects have been coated with consolidants.

Of the items not treated, nine objects (8 bags) are probably Bronze Age and include a length of rapier blade which is in the condition as found. The others are very small fragments of sheet metal, plus a metal spillage and bar of small cross-section. There are also six fragments of sheet from post-Roman contexts.

The rapier blade has a patinated blade which is disturbed by areas of severe (warty) corrosion. There are also shelly deposits on the surface. One end has a recent fracture showing a core of cuprite, suggesting that the condition along the length may not be very robust. In addition, there are a few fine cracks running longitudinally. It is not advised that the accretions are removed because this could disfigure the surface and destabilise the artefact. For the purpose of illustration, the cross-section can be obtained from the blade and from the fracture.

28.3.3 Lead alloy

A post-Roman dagger hilt (GM/M/84) may be made of lead or tin-lead alloy. The condition is very corroded but it is stable and robust.

28.3.4 Iron

In general the condition of the ironwork is fairly good despite some items appearing to have flaked superficially. In a few cases there are recent fissures or fractures but modern corrosion damage is not a great problem for the group. Most items are coated with PVA or other consolidants and this has held the flakes together. A few items look as if they have been chemically or electrolytically stripped in the distant past (possibly these are finds treated by ‘hist arch’ noted above). Others may have had surface soil and other deposits removed mechanically. The accretions that remain are in general not thick or too obscuring. Generally the artefacts seem to be stable.

28.4 Finds in the Royal Cornwall Museum, Truro

28.4.1 Copper alloy

Porth Godrevy coins

The coins are flaking at the edges and are very fragile. None has been cleaned although some are clearly radiates. The surfaces are obscured by superficial accretions of copper corrosion products mixed with soil/shelly deposits.

Other copper alloy

There are few other copper alloy finds and these appear to be stable and not obscured by accretions.

28.4.2 Lead alloy

Window cames are clean, consolidated, and appear to be stable.

28.4.3 Iron

Some of the iron finds are flaking or are fissured but the majority seem to be reasonably stable. In particular this applies to the finds which are of small cross-section and thus are likely to be totally corroded. Many items have been coated with a consolidant and to some extent this must be holding together those which have fractured. In general, the corrosion layers are not thick, possibly because loose soil and other accretions were removed at the time of excavation.

Some finds, perhaps about 10 or 20 percent and mainly nails, are very fragmentary and have shattered. Finds in this condition are unlikely to repair satisfactorily because shattered ironwork has usually expanded in size and does not repair fully. Nor will these items survive much handling or travelling. For these reasons, radiography is not a sensible option because little information would be gained.

28.4.4 Glass (Crane Godrevy)

Small sherds of glass, mainly window glass from the manor house, are friable and fragmentary and have deteriorated during storage. However, these are not painted sherds and are of not of great significance to the understanding of the site. There are also a few sherds of vessel glass, which, on the basis of their condition, are probably post-medieval or even modern. (Some of these glass sherds were originally catalogued as ‘horn’.)

28.4.5 Pottery

A few reconstructed vessels were examined briefly. CAU has already decided not to take down and reconstruct those vessels where original constructions are now seen as inaccurate.

Apparently the collection has numerous sherds of pottery with food residues including many sherds which have not been over cleaned or consolidated. These sherds will probably form the principal type of C14 dateable material.

28.5 Long-term Storage Requirements

28.5.1 Metalwork at Lambessow

The need for repackaging and boxing of the small finds is known to Cornwall Archaeological Unit but the finds are in the landowner’s possession. Possibly this task could be taken on by CAU during the finds archive preparation and consolidation. Or perhaps the owner could be encouraged to repackage and rebox these items himself, using for example acid-free tissue and polystyrene (‘crystal’) boxes.

28.5.2 Finds in the Royal Cornwall Museum

The finds and their labels have been transferred from paper packets into new polythene bags and into archival acid-free storage boxes. Many of the metal and other

small finds are still within the original matchbox or similar box of card, wood or metal. These inner boxes have usually been retained in order to limit the disruption to flaking and fragile objects, some of which are balanced together by the original cotton wool. About half of the iron objects, the glass sherds and some other finds (not the coins) are currently stored this way.

For longer-term storage, the unit or museum should probably consider replacing these boxes with more stable materials, such as polystyrene ('crystal') boxes with acid-free tissue or foam as support materials.

Because the metalwork has been stored at ambient humidity for some decades, none has been placed in desiccated storage in order to avoid physical shock. At present this is probably a wise decision but should probably be reviewed after a few years.

28.6 Potential for conservation and Scientific analysis

For publication purposes, conservation requirements are fairly minimal and could be limited to x-radiography of metalwork, treatment of the Roman coins, and some analyses as detailed below. X-radiography listed under (2) and (3) below could occur during the assessment stage or later – if this avoids additional handling. The previous consolidation of the metal finds may be detrimental to the identification of organic materials.

28.7 CONSERVATION REQUIREMENTS

28.7.1 Assessment stage

1) Copper alloy coins from Porth Godrevy

These ten Roman coins could be x-rayed before the numismatist makes his assessment.

2) *X-radiography of iron and copper alloy at Lambessow*

The iron finds would benefit from careful radiography, often two exposures for each item, either at different kV in the same plane where blades are concerned, or at right angles for riveted handles and other complex items. The sheet copper alloy would also benefit from radiography because these items are very fragmentary and fragile and will be difficult to handle for illustration. The items are:

- 1 rapier blade fragment (Bronze Age, GM no no.)
- 9 fragmentary Bronze Age copper alloy (GM:24; 85; 169; 189; 205; 389; 556; 744; 744)
- 7 fragmentary post-Roman copper alloy (GM: 34 or 57; 65; 95; 93; 109; 110; 117)
- c. 28 iron objects (GM).

3) *X-radiography of ironwork at the museum*

A small proportion (10 objects) has been identified for x-radiography for the purpose of assisting identification, description and illustration:

GT 83/86 flanged iron implement

GM 11-12strip

GM 13-15?tiny saw + handles

GM 22 Strip?

GM 25 Head of nail or stud or?

GM 72 Small knife blade?

GM 76 Small knife? + riveted item

GM 82 Pin/needle? (in 3 pieces)

GM 100 Short length of blade with notch

GM 103 Blade fragment

There could be additional x-ray requirements identified during the analytical stage, although this is unlikely to amount to more than say 20 additional objects, the bulk of which will be small items such as stems of possible pins, awls and other tools and small implements.

Radiography of the other ferrous items would probably not contribute much to their descriptions or illustration because these have in general already been cleaned free of soil, and in any case are not complex artefacts. For these finds it seems sensible to avoid any undue stress from travelling.

28.7.2 Analysis stage

1) Copper alloy coins from Porth Godrevy (GT/-)

The numismatist may suggest that some or all of the 10 coins should to be cleaned and consolidated.

2) Investigative conservation

It seems unlikely that very much investigative conservation will be required because of the condition of the finds including the presence of consolidants (but see below).

3) Identify organic materials

The iron dagger blade (GM/M/89) appears to have wood attached, which may be the remains of a sheath. Closer examination should confirm this and may allow for identification. However, identification to species may be restricted by the consolidation (identification using the scanning electron microscope may not be possible).

29 Gwithian: Metallugical debris

Gareth Hatton, Centre for Archaeology, English Heritage

Dated: 14th February 2004

29.1 Introduction

The West Cornwall Field Club carried out excavations in the Gwithian area during the 1950s and 60s. These were all undertaken as part of a landscape study. Gwithian (SW585 414) is located on the eastern side St Ives Bay but the sites are spread over an area of around 10km^2. The excavations uncovered three main phases of occupation in different areas around Gwithian; these were Bronze Age (GM/V), post-Roman (GM/I and GM/XX) and medieval (CG/-).

The early phase of the site, GM/V, was according to Thomas (1958) a small burial mound with two pits. The excavation of this mound was undertaken in the spring of 1955 where it was determined that the structure was Bronze Age though further excavations revealed that it was not a burial mound. GM/I, the largest of the assemblages studied, was found by the excavators to be a post-Roman settlement consisting of houses complete with pits hearths and a possible pottery kiln. The excavation of GM/XX, the post-Roman field system, revealed ridge and furrow ploughing. The medieval site of Crane Godrevy, CG/-, was discovered in 1951 through documentary evidence and was excavated 1956-1958 with an additional season in 1969. It was found that the settlement lay within an Iron Age enclosure, which probably continued in use until the Romano-British period.

The metalworking debris from the excavations were investigated, the results are reported here.

29.2 Methodology

Density and visual appearance was used to discriminate between types of material. All terms used to describe the material can be found in Centre for Archaeology Guidelines, *Archaeometallurgy* (Bayley *et al*. 2001). All pieces were categorised, counted and weighed. **Run slag** refers to pieces of slag which resemble tap slag but are smaller and less distinctive while retaining their ropey appearance. **Other** refers to non-metallic material such as stones, which were collected during excavation.

Table 29.1 *Summary of material by weight (g)*

Phase	GM/V	GM/I	GM/XX	CG/-	Total
Non diagnostic		1536	22	237	1795
Run slag		322	28		350
Iron object		73	47		120
Smithing hearth bottom		121		247	368
Tap slag		312			312
Fuel ash slag		58			58

Other	47	28		151	226
Total	47	2450	97	635	**3229**

For full material list see Table 29.2

29.3 Sites and major periods

29.3.1 GM/V Bronze Age pits and plough marks

There are three finds in this phase, a piece of burnt clay, compacted sand containing shell fragments, and a stone relatively rich in iron (around 20% Fe_2O_3). The stone could not have been used as an ore as it is not rich enough. None of these items are evidence for any metalworking

29.3.2 GM/I Post-Roman settlement and GM/XX Post-Roman field system

The presence of hearth bottoms shows that iron smithing was carried out; the run and tap slag are suggestive of iron smelting. The quantity of material found implies that there was limited iron smelting and working. The material found in GM/XX is generally more fragmented.

29.3.3 CG/- Crane Godrevy RB and medieval settlement

The presence of a smithing hearth bottom in context 335 indicates metalworking in the medieval phase of the site. The find of iron ore is not significant enough to suggest smelting as the other debris from this phase is non-diagnostic.

29.4 Conclusions

The material from the Bronze Age phase of this site does not provide any evidence for metalworking.

The majority of the iron-working material was concentrated in GM/I (the Post-Roman context).

The range and quantity iron working slags are not sufficient to suggest any major metal working on this site. There is however minor evidence for limited production and smithing on the site.

29.5 Recommendations

The small quantities of iron working slag recovered do not warrant further study.

The iron working material should be retained and are stable, therefore do not need any special storage conditions.

29.6 References

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Table 29.2 Metallurgical Debris: all material by weight (g) and number of fragments

		Non diagnostic		Run slag		Iron object		Smithing hearth bottom		Tap slag		Fuel ash slag		Other	
Phase	*Bag no*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*
CG/-	*255*													2	151
CG/-	*335*	4	237					2	247						
GM/I	*3*	1	5												
GM/I	*5*	2	38												
GM/I	*19*	2	10												
GM/I	*20*					1	7								
GM/I	*38*	1	5												
GM/I	*48*	1	3												
GM/I	*77*	1	6												
GM/I	*87*	5	150			1	27							1	1
GM/I	*105*	1	47												
GM/I	*112*											1	8		
GM/I	*142*	1	1									3	6		
GM/I	*151*	1	30			1	11								
GM/I	*166*	3	26												
GM/I	*192*	2	8												
GM/I	*202*	1	90												

		Non diagnostic		Run slag		Iron object		Smithing hearth bottom		Tap slag		Fuel ash slag		Other	
Phase	*Bag no*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*
GM/I	*204*	1	10												
GM/I	*221*	4	27												
GM/I	*240*	7	30												
GM/I	*247*									1	32				
GM/I	*262*									1	55				
GM/I	*268*							1	121						
GM/I	*282*	4	252												
GM/I	*297*	7	30												
GM/I	*303*									1	34				
GM/I	*313*			2	151							1	15		
GM/I	*324*	3	42	5	45							2	29		
GM/I	*340*	1	14												
GM/I	*352*	3	18												
GM/I	*?*	35	513	2	38	2	28			1	83			2	27
GM/I	*Various*	9	181	3	88					2	108				
GM/V	*15*													2	42
GM/V														1	5
GM/XX	*8*	1	17												
GM/XX	*14*					4	8								

		Non diagnostic		**Run slag**		**Iron object**		**Smithing hearth bottom**		**Tap slag**		**Fuel ash slag**		**Other**	
Phase	*Bag no*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*	*Number*	*Weight*
GM/XX	*27*	9	5			1	39								
GM/XX	Unknown			2	28										

30 Excavations at Gwithian, Cornwall 1969-1963: Assessment of mollusc shell deposits

Dr Janice Light

Dated 27th February 2004

30.1 Background and principal objectives

Between 1949 and 1963 a major archaeological campaign was carried out by Prof. Charles Thomas on the landscape of Gwithian Towans, north Cornwall. The results were recognised to have national significance, especially in respect of evidence assigned to the Neolithic and Bronze Age periods: the remains of houses dating to the 3rd and 2nd millennia BC were uncovered together with middens, fields, associated enclosures and evidence for funerary and ritual activities alongside domestic structures. Other important discoveries relate to the Iron Age, Romano-British, early medieval and medieval settlement and land use. The results of that Gwithian campaign have never been fully published and are considered to merit reappraisal. The current project proposes an assessment of the entire results of the work carried out between 1949-1963, and a landscape appraisal which will be viewed within a wider historic landscape perspective. The extensive Gwithian archive, which includes paper and photographic materials and a wide range of environmental finds will be revisited and assessed, for the purposes of carrying out a programme of analyses and work to bring the results of this important project to a wider audience (Nowakowski 2002).

30.2 Material available for assessment

Nine skeleton boxes and one small cardboard box principally containing bagged mollusc shells, but with some crab and barnacle remains, were received for assessment. The archive consists of 1616 marine and 185 non-marine shell remains. These finds had been stored at the home of Prof. Thomas at Lambessow, St Clement, Truro from where they were prepared, with the assistance of Carl Thorpe, for specialist assessment. In addition to the shells, find summaries for the shells and an archive inventory identifying site and finds codes were available. For each chronological period pertinent to the mollusc analysis, schedules giving site location, dates, types and history of investigation, overall interpretation, and details of primary and research archive materials which are available, were provided at the assessment stage.

30.3 Preliminary observations

The range of species present in the entire assemblage is given in Tables 30.1 and 30.2. The majority of shells are in an excellent state of preservation.

30.3.1 Neolithic/Bronze Age - site code GM/X

This site has yielded the most extensive dataset of mollusc shells from Gwithian. Some 119 bags contain 661 marine shells consisting of single specimens or low numbers of the following gastropods: limpet, dog whelk, common whelk and top shell and bivalves of the genera *Glycymeris, Mytilus, Ostrea, Pecten, Acanthocardia, Laevicardium, Callista, Venus* and *Anomia.* There are also 6 bags of larger numbers

of unstratified bivalves. Many of the bivalves in the samples bear perforations resulting from diverse processes both natural and unnatural. Crab claw remains are present and there are minor fragments of cuttlefish (*Sepia officinalis*). In addition to perforated shells, some show evidence of modification by the human hand. There are eight bags of non-marine shells (155m) from a limited range of species. (Reference to the Mollusc Archive schedule for GM/X indicates that some of sample bags are missing and these absences have been notified to Jacky Nowakowski).

30.3.2 Neolithic/Bronze Age - site code GM/XV

Twenty-eight bags contain marine shells (242n) spanning a similar spectrum of species to that observed in the assemblage from GM/X, section 3.1 above. In addition, the profile presented by these samples is similar: there are perforated shells and common whelk shells which have been worked including an exceptional specimen with the apex removed and bearing eight similarly sized holes spaced equally around the body whorl from apex to aperture. There is one bag of land snails (18n).

30.3.3 Bronze Age - site code GM/IX

Seventeen bags contain 95 marine shells and 12 land snails. The species assemblage is consistent with sites described above (sections 30.3.1, 30.3.2) and there is a significant proportion of perforated shells.

30.3.4 Post-Roman - site code GM/I

Eighty bags containing 156 shells (almost exclusively marine) have been assessed. Fourteen of these bags were not listed on the inventory accompanying the mollusc assemblage. Although the species profile is consistent with other sites described above, there is a noticeably greater abundance of oyster shells (*Ostrea edulis*) and an apparent absence of perforated shells, although some appear to have been unnaturally modified, including an intriguing limpet shell with an apical coralline algal encrustation which appears to have been worked.

30.3.5 Post-Roman/Early Medieval - site code GM/A, subsidiary of GM/I

Sixteen bags contain some 22 shells of the bivalves *Glycymeris, Ostrea, Callista,* the gastropod, *Buccinum undatum* and a minor occurrence of crab claw and barnacle. The large whelk shell (*Buccinum*) has been worked in a style noted from earlier sites.

30.3.6 Post -Roman/Early Medieval - site code GM/B, subsidiary of GM/I

There is only one sample bag listed for this site, which was absent from the assemblage received for assessment. The bag contains a barnacle sample. However, the schedule for this site which accompanies the Gwithian mollusc assemblage describes a shell midden as one of the features uncovered at this site. The implications of this are discussed in section 5 below.

30.3.7 Medieval Manor and Iron Age/Romano-British Enclosure - site code CG

Fifty bags containing 253 marine shells, 14 land snails and 36 crab shell fragments were received for assessment. Unlike earlier sites (Neolithic/BronzeAge) where large bivalves are numerous in comparison to other species, the species profile from this site shows a greater influence of dog whelk shells and edible species such as limpet (*Patella* spp.) and mussel (*Mytilus* spp.).

30.4 Proposed analysis and presentation of results

1. Preliminary identifications of the shell species present in the assemblage have been given in Tables 30.1 and 30.2 which accompany this assessment. A close examination of all the shells will be carried out and occurrences of these species will be quantified and detailed by site code and sample number, noting preservational states.
2. A complete catalogue of the Gwithian shells will be drawn up.
3. The species compositions in the assemblages will be analysed to derive any patterns or trends in species exploitation at Gwithian.
4. In association with the paper and photographic archives, a spatial analysis will offer the potential to elucidate the purposes for collection and the significance of the distributions of the shells in the Gwithian assemblage.
5. There are many shells in the assemblage which either bear perforations resulting from both natural and unnatural processes, or have been modified or worked either in the open environment or by man. They are not believed to be food remains. These occurrences need to be considered in the light of, *inter alia,* other evidence from the site for ritual/burial practices.
6. There is a paucity of mollusc shell in the samples whose presence is suggestive of food remains. The absence of substantial deposits of edible shells in the samples needs to be addressed, especially in the light of reference to the heavy reliance of the settlement inhabitants on 'shellfish in enormous quantities' (Thomas 1958) and regular references to 'shell middens' in the documentation associated with the Project Design and in published papers (see section 30.5 below).
7. Once the analysis is complete the significance of the assemblage from the site will be described, in conjunction with relevant documentation and after consultation with Professor Thomas.
8. The Gwithian assemblage will be compared to other archaeological mollusc deposits from recently worked/reviewed neighbouring sites at Atlantic Road, Fistral Bay and Trevelgue Head.
9. Consideration will also be given to the significance of the Gwithian assemblage in both regional and national contexts.

30.5 Summary of Potential

To the best of my belief there is no other site in Cornwall which has yielded such an extensive and diverse assemblage of shells which do not evidently represent food debris. The Gwithian assemblage therefore offers a unique opportunity to consider how the inhabitants of the settlements exploited shells beyond the prime purpose of food, and to speculate about the meaning that the shells may have had for the settlement inhabitants. In the absence of comparable sites in the region (and possibly nationally) we can look further afield to the Mediterranean area where congeneric taxa e.g. *Glycymeris* sp. and *Acanthocardia* sp. have been retrieved from contemporary ritual/burial contexts (see review in Light, 2003).

There is a wealth of shells (principally bivalves) bearing perforations and other shells showing evidence of deliberate modification, i.e. the body whorls of large whelk shells with the apical region removed, are a particular feature of the earlier phases of site occupation. One whelk shell (Bag 86, site GMXV) has been intensively worked: the apex is missing and the specimen bears eight rounded holes arranged at regular intervals around the shell. I am not aware that such an example has been reported any other archaeological sites in the British Isles.

In view of the large numbers of limpets and mussels which have been excavated from other sites in Cornwall and on Scilly (e.g. Duckpool, Light 1995; Porthkillier, St Agnes, Light 1998; Atlantic Road, Newquay, Light 2001) the apparent absence of substantial deposits of these common and edible species in the Gwithian assemblage under assessment requires consideration and explanation. It is scarcely credible that the settlement inhabitants did not exploit a valuable food resource at such proximity. Rogers (1910) identified a large kitchen-midden (50yds long) on Godrevy Towans which contained limpet shells. In any event Thomas (1958 p.20) records that the inhabitants "lived on shellfish, in enormous quantities, which they gathered from the creek or the shore, and the shells were buried, together with other rubbish, in pits in the sand all round." Middens are recorded from all the sites for which schedules were received for this assessment, sections 30.3.1 – 30.3.6 above, but not for site CG section 30.3.7. However none of the site shell assemblages received for assessment contain substantial deposits of edible marine shells. In particular, site GMB is described as having a shell midden, yet no mollusc shell appears to have been excavated from this site.

For the purposes of interpreting the settlement inhabitants' mollusc exploitation strategies it is important to clarify the paucity of, for example, limpets and mussels from the samples. There are, however, sporadic, exceptionally large whole mussel valves in the samples which may have had some utilitarian purpose beyond being food remains. Were they selectively excavated? Therefore discussions with Prof. Thomas will shed light on the mollusc species occurrences in the assemblage and identify whether the paucity of limpets and mussels are genuine absences or whether they represent selective archaeological excavation practices.

30.5.1Recommendation

It is recommended that an analysis be carried out as outlined in section 4 of this assessment. This will result in a full report on the role of mollusc shells at the Gwithian archaeological site(s) and yield a detailed catalogue of the shells in the assemblage, tied to context, which can be correlated with other environmental finds in order to elucidate the organisation and uses of the various sites at Gwithian in time and space. In addition to the practical shell analysis it is recommended that time be assigned to a study of those parts of the paper archive that are relevant to the mollusc analysis including site plans, and parts of the photographic archive which may elucidate details of features and structures, and styles of deposits which contain shells where such exist. It is strongly recommended that after the practical analysis has been carried out, some time be allocated to a meeting with Prof. Thomas in order to discuss the shell occurrences in the samples in the light of his unique knowledge of the Gwithian excavations.

- To carry out the analysis, as detailed in section 30.4 above and compile catalogue
- To review documentation relating to the Gwithian excavation including selected parts of the paper archive
- Review analysis and discuss with Prof. Thomas including 2 x ½ days' travelling
- Subject to availability/relevance, review photographic archive
- To write the report

30.6 References

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Table 30.1 *Marine mollusc species, listed in taxonomic order, which are present in the Gwithian archaeological assemblage*

Species name	Common name	Abundance	Site occurrences
Patella sp.	Limpet	Common	All except GM/I, GM/A
Monodonta lineata	Thick top shell	Sporadic	GM/XV
Gibbula magus	Painted top shell	Sporadic	GM/X
Gibbula cineraria	Grey top shell	Sporadic	GM/X
Calliostoma zizyphinum	Common top shell	Sporadic	GM/X, GM/I

Littorina littorea	Edible winkle	Sporadic	GM/I
Littorina obtusata	Flat top winkle	Sporadic	GM/I
Capulus ungaricus	Hungarian cap shell	Sporadic	GM/X
Ocenebra erinacea	Sting winkle	Sporadic	GM/A
Nucella lapillus	Dog whelk	Common	All except GM/A
Buccinum undatum	Common whelk	Sporadic	GM/X GM/XV GM/I
Hinia reticulata	Netted dog whelk	Sporadic	GM/I
Antalis vulgaris	Common tusk shell	Sporadic	GM/IX
Glycymeris glycymeris	Dog cockle	Common	All except GM/V
Mytilus edulis	Common mussel	Common	All except GM/A, GM/V
Pinna fragilis	Fan mussel	Sporadic	GM/X
Ostrea edulis	Common oyster	Common	All
Chlamys varia	Variegated scallop	Sporadic	GM/I
Pecten maximus	Great scallop	Sporadic	GM/XV, GM/I, CG
Anomia ephippium	Saddle oyster	Sporadic	GM/X
Laevicardium crassum	Smooth cockle	Common	All except GM/A, GM/V
Acanthocardia sp.	Prickly cockle	Common	All
Cerastoderma edule	Common cockle	Sporadic	GM/I
Venus verrucosa	Pale venus	Common	All except GM/A
Tapes rhomboides	Banded carpet shell	Sporadic	GM/X
Callista chione	Smooth venus	Common	All except GM/V
Sepia officinalis	Common cuttle	Sporadic	GM/X, GM/XX

Table 30.2 *Non-marine mollusc species, listed in taxonomic order, which are present in the Gwithian archaeological assemblage*

Species name	**Common name**	**Abundance**	**Site occurrences**
Oxychilus sp.	Glass snail	Sporadic	GM/X
Candidula intersecta	Wrinkled snail	Sporadic	GM/X
Cernuella virgata	Striped snail	Sporadic	GM/X, GM/XV
Cochlicella acuta	Pointed snail	Sporadic	GM/X
Monacha cantiana	Kentish snail	Sporadic	GM/X
Arianta arbustorum	Copse snail	Sporadic	GM/X
Cepaea nemoralis	Brown lipped snail	Sporadic	GM/IX, GM/XV, GM/I
Helix aspersa	Garden snail	Sporadic	GM/X, CG

SECTION 4

31 OSL dating report

Optically stimulated luminescence (OSL) dating of sands from a Bronze Age archaeological site at Gwithian, West Cornwall, U.K.

H.M. Roberts

Optically stimulated luminescence (OSL) dating of sands from a Bronze Age archaeological site at Gwithian, West Cornwall, U.K.

H.M. Roberts

Summary

Two wind-blown sand units found at the Bronze Age site at Gwithian, near Hayle, West Cornwall, were dated using optically stimulated luminescence (OSL) applied to coarse (sand sized) quartz grains. The quartz proved sufficiently sensitive to enable well-resolved dating using the Single Aliquot Regenerative dose (SAR) measurement protocol.

The OSL ages are indistinguishable within errors, showing that the two sand units were deposited in relatively rapid succession approximately 3500 years ago, with only a brief period of stabilisation due to cultivation in between. The OSL ages are in agreement with independent evidence from radiocarbon dating of intervening and overlying stratigraphic units.

Keywords

Optically stimulated luminescence, OSL, dating, coarse grained quartz, SAR, Bronze Age, aeolian sand

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31.1 Introduction

This report describes the measurements and findings of an optically stimulated luminescence (OSL) dating study undertaken as part of a project undertaken by the Historic Environment Service of Cornwall County Council in collaboration with English Heritage, studying the Bronze Age archaeological site at Gwithian, near Hayle, West Cornwall (Fig 1). The site at Godrevy Towans was originally excavated during the 1950's and 1960's under the direction of Professor Charles Thomas. The present study forms part of a project re-examining the Bronze Age sequence at Gwithian, in which further samples were taken to enhance the original data sets, and reflecting more recent developments in archaeological practice. In June 2005, samples were taken for palaeoenvironmental reconstruction, and also for dating using optically stimulated luminescence (OSL). This report discusses the findings of the OSL work.

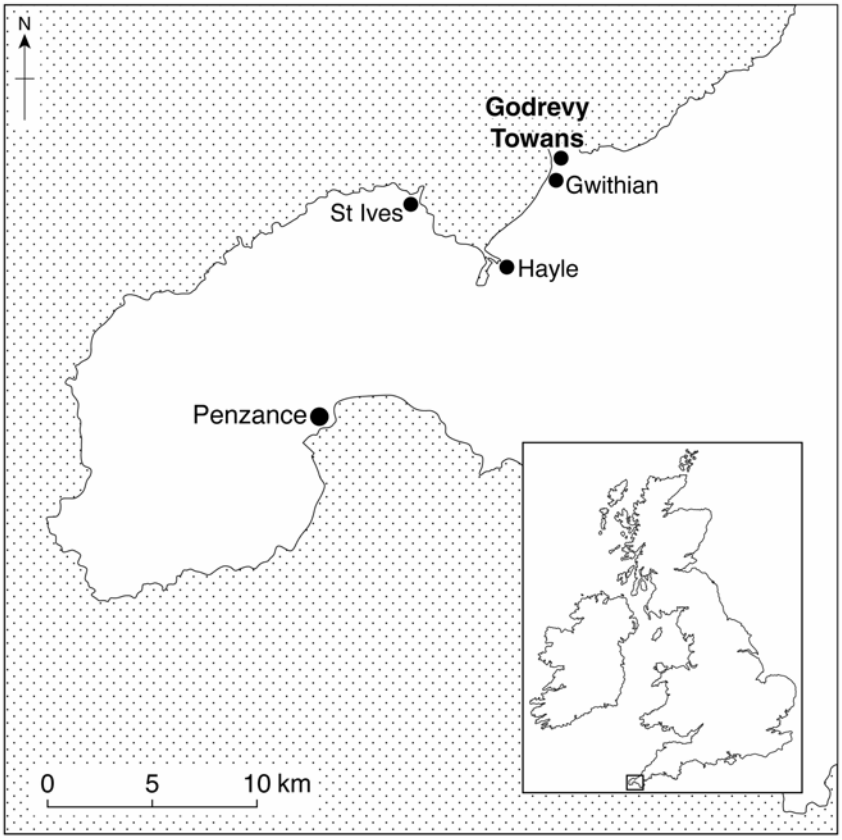


Figure 1: Location of study site at Godrevy Towans, Gwithian, near Hayle, West Cornwall, UK.

31.2 The principles of optically stimulated luminescence dating

Optically stimulated luminescence (OSL) dating examines the time-dependent signal that arises from the exposure of naturally occurring minerals, typically quartz and feldspar, to ionizing radiation in the natural environment. This dating technique can be applied directly to the mineral grains that make up sediment deposits, and here the event being dated is the last time the mineral grains were exposed to sunlight ie the time the sediments were deposited and buried by further sediments. The technique relies upon the principle that any pre-existing luminescence signal contained in the sediment grains is lost on exposure to sunlight during transport, prior to deposition. Once the sediments are deposited and shielded from light exposure by the deposition of further sedimentary material, the luminescence signal re-accumulates over time through exposure to cosmic radiation, and to radiation from the decay of naturally occurring radioisotopes of uranium, thorium and potassium located within the surrounding sediment. The luminescence signal is measured in the laboratory by stimulating small sub-samples, or aliquots, of prepared mineral grains with light – hence the term 'optically stimulated luminescence' or OSL. The size or intensity of the OSL signal observed in the laboratory is related to the time elapsed since the mineral grains were last exposed to sunlight. The OSL age is determined by calibrating the intensity of the OSL signal against known laboratory-administered radiation doses in order to determine how much radiation the sample was exposed to during burial (termed the equivalent dose, D_e, or the 'burial dose'). This value is divided by the radiation dose to which the sample was exposed each year since deposition and burial (termed the 'annual dose rate'), to give the OSL age (see Equation 1). Further details on OSL methods are given in Aitken (1998), and in recent reviews by Stokes (1999) and Duller (2004).

Equation 1

$$\text{OSL age (years)} = \frac{\text{Burial dose}}{\text{Annual dose rate (Grays per year)}} \quad (\text{Grays})$$

(1 Gray = 1 Joule/kg)

In this study, the D_e was obtained using the Single Aliquot Regenerative dose (SAR) measurement protocol (Murray and Wintle 2000), applied to coarse-grained quartz (ie grains > 90μm diameter). Working with quartz offers the advantage that it is not subject to anomalous fading, unlike some feldspars (eg Spooner 1994; Huntley and Lamothe 2001). The SAR protocol uses the response to a fixed test dose to correct for any change in luminescence sensitivity occurring in the sample during laboratory measurements (e.g. as a result of thermal pretreatments), with all of the measurements necessary for the determination of D_e being made on a single aliquot. By measuring several aliquots, many independent determinations of D_e can therefore be obtained. Figure 2 illustrates how D_e is obtained from the SAR measurements made. Following measurement of the natural luminescence intensity (denoted by the square symbol on the y-axis of Fig 2), the response (L_x) to a series of artificial radiation doses is measured, and normalised to the response (T_x) to a fixed test dose. A normalised dose-response or 'growth' curve can then be constructed by plotting the ratio L_x/T_x as a function of radiation dose. This enables the natural luminescence intensity to be calibrated to these responses to a given laboratory radiation dose, thereby determining the laboratory equivalent dose, D_e.

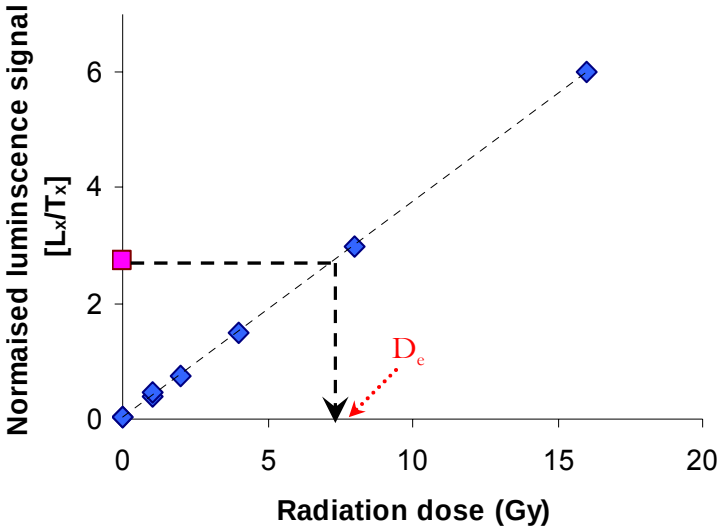


Figure 2: Dose-response or 'growth' curve (diamond symbols) generated from measurements made using the Single Aliquot Regenerative dose (SAR) measurement protocol, used in this study. The natural luminescence intensity (square symbol) of the aliquot is calibrated against the response to these known artificial irradiation doses to determine the laboratory equivalent dose, D_e.

31.3 Sample site and OSL sample collection

In this project, OSL dating was to be used to date the wind-blown ('aeolian') sands lying between the archaeological units (including ploughed units) at one exposed section of the Gwithian site. For this pilot study, samples were selected from homogeneous sand units and taken as far away as possible from any change in stratigraphic unit, to minimise potential complications from any differences in dosimetry. Field gamma spectrometry measurements were also made at the point from which the OSL sample was taken to record the *in situ* dose rate to the sample.

One sample was taken from each of two sand units in the south facing section GMXVII using a 25cm length of 5cm diameter opaque plastic pipe driven horizontally into the sand units. The samples were taken from context 602a and 606, and given the laboratory codes *Aber*-101/GWT-4 and *Aber*-101/GWT-6, for the upper and lower units, respectively (Fig 3).

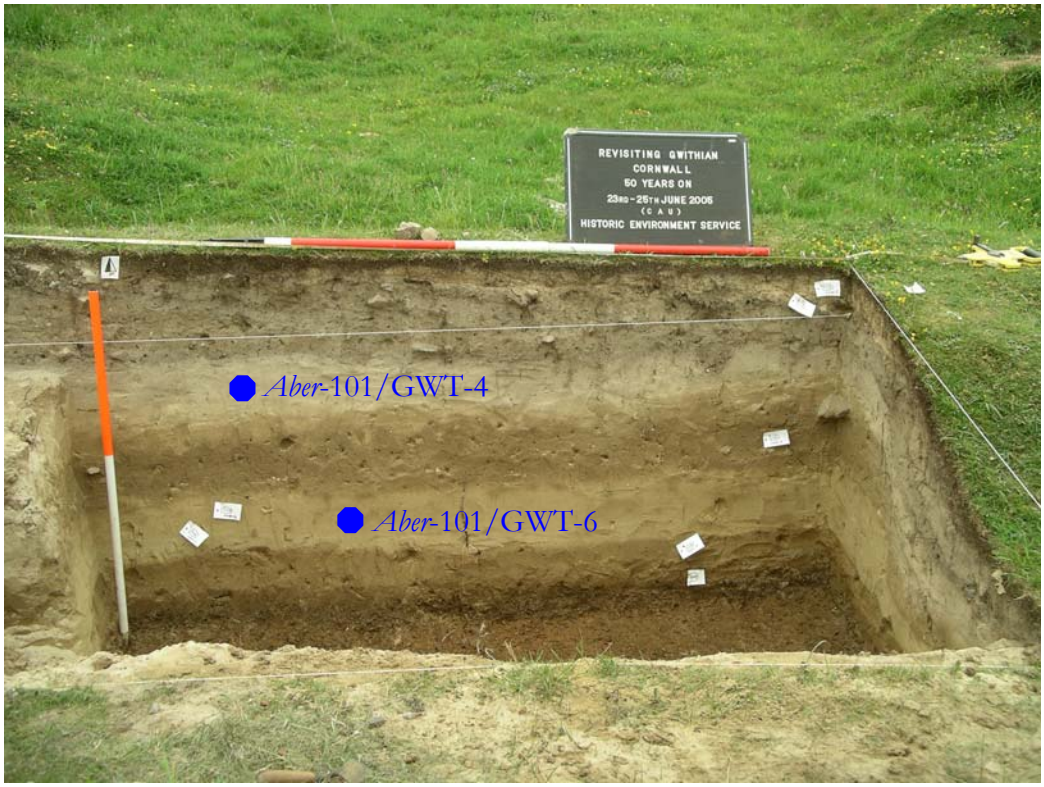


Figure 3: Section GMXVII at Gwithian, sampled 23rd-25th June 2005. The OSL sample locations are shown along with Aberystwyth Luminescence Research Laboratory codes; sample *Aber*-101/GWT-4 was taken from context 602a (part of "Layer 4" in the original excavation), whilst sample *Aber*-101/GWT-6 was taken from context 606 (formerly termed "Layer 6").

31.4 Methodology

31.4.1 Laboratory preparation

Samples were taken for preparation for OSL measurements by excavating material from the leading edge of the plastic sample tube (ie. the material from deepest into the section) under subdued red lighting conditions in the luminescence laboratory. The first 1cm of the sample that had been exposed to daylight during sampling and retrieval was removed prior to the excavation of sample material for luminescence dating. Coarse-grained quartz was prepared using standard methods, outlined below.

Samples were pre-treated with a 10% v.v. dilution of concentrated (37%) hydrochloric acid (HCl) to remove carbonates and surficial coatings, then washed three times in distilled water. Samples were then treated with 20 vols. hydrogen peroxide (H_2O_2) to remove organic material, and then washed as previously. Samples were dried and then sieved using the following mesh sizes: 355, 300, 250, 212, 180, 150, 125, 90 micron diameter mesh.

Grains of 180-212 µm diameter were selected for OSL dating, and refined using a solution of sodium polytungstate ('heavy liquid') to separate out the quartz material from the feldspar and heavy mineral fractions of the sediments, on the basis of differences in density. The quartz-rich fraction of the sediments (density between 2.62 – 2.70 gcm^{-3}), was treated with 40% hydrofluoric acid (HF) for 45 minutes, to remove the alpha-irradiated surface of the quartz grains and to dissolve any remaining feldspar material, followed by a further 45 minutes in concentrated (37%) HCl, to dissolve any fluorides formed during the etch procedure. The samples were rinsed a minimum of 3 times in distilled water, centrifuging between washings, and then dried at 50ºC, prior to re-sieving. This final sieving acts as a further quartz purification step, as it removes feldspar grains which have not been totally dissolved with HF, but which have been significantly etched and therefore reduced in diameter. The final quartz is then ready for OSL measurements to determine the 'burial dose' or equivalent dose, D_e.

The light-exposed material removed from the end of each OSL sample tube was suitable for laboratory-based measurements of water content and dosimetry as these measurements do not require un-exposed sample material. The light-exposed portion of each OSL sample was weighed prior to drying at 50ºC. Drying continued until a constant mass was recorded, to establish the field water content at the time of sampling. These measurements of conditions at the time of sampling provide a benchmark for the water content values employed in the final age calculations (shown in Table 3). After drying, the light-exposed material was then crushed to a fine powder using a ball mill, prior to beta counting (discussed further below, section 4.2).

31.4.2 Equipment and Methods

All OSL measurements were conducted using an automated *Risø* TL/OSL reader, equipped with a combined high-power blue LED/ infra-red laser diode OSL unit, and a beta source for irradiations. The combined OSL unit was employed at 80% of full diode current, providing approximately 17mW/cm^2 power from the blue LED unit (470nm), and 370mW/cm^2 from the IR laser diode (830nm). All measurements were made whilst holding the sample at 125°C, and OSL was detected using 7.5 mm Hoya U-340 filters.

Measurements of OSL were made on coarse-grained quartz, using the Single-Aliquot Regenerative-dose (SAR) protocol of Murray and Wintle (2000). The advantage of SAR over previous measurement protocols is that it uses a measurement of the luminescence production per unit dose to monitor and correct for changes in luminescence sensitivity that have occurred as a function of time, temperature, and past-radiation exposure (Wintle and Murray 2000). The SAR procedure permits the determination of an equivalent dose (D_e), and hence potentially an OSL age, for each aliquot examined.

As part of the sequence of OSL measurements made, outlined in Table 1, a minimum of four regenerative beta doses were applied to each aliquot, bracketing the expected natural dose. Two zero beta doses were also included towards the beginning and end of the measurement

cycle to monitor recuperation, and the first regenerative dose (applied at the end of the measurement protocol) was repeated to monitor the sensitivity correction applied (this is sometimes referred to as monitoring of the 'recycling'). Following measurement of each natural or regenerative-dose signal, a fixed test dose was applied, with a cut-heat of 160°C, to monitor and correct for sensitivity change during the measurement procedure. Measurements were made for a range of pre-heat temperatures (held for 10s) to enable D_e to be obtained as a function of pre-heat temperature: 24 aliquots were examined at preheat temperatures ranging between 160-300°C in 20°C step intervals, with 3 aliquots at each temperature.

Dose-rates were determined using a *Risø GM-25-5* beta counter for laboratory-based beta counting, applied to finely ground bulk sample material, and a portable MicroNomad gamma detector fitted with a 2" crystal was used in the field (section 3). The cosmic ray dose was estimated from the burial depth (Prescott and Hutton 1994). Water contents were determined in the laboratory from sealed field samples (section 3), and the values employed in the calculation of ages are presented in Table 3. Moisture and beta attenuation factors are given in Aitken (1985). The beta and gamma counting results, cosmic dose rates, water content values, and the dose rates calculated using the conversion factors of Adamiec and Aitken (1998), are given for each sample in the final age table (Table 3).

Table 1: Outline of the SAR measurement protocol applied to each aliquot in this study. A minimum of four regenerative doses were employed in this study, designed to characterise the dose-response curve and bracket the natural signal.

Step Number	SAR sequence description
1	Preheat: (160-300°C), heating rate 5°C/s, hold at temperature for 10s
2	Measure natural or regenerative dose signal ('L_x'): 100s OSL @125°C
3	Apply Test Dose
4	Cut heat: 160°C, heating rate 5°C/s
5	Measure test dose signal ('T_x'):100s OSL @125°C
6	Apply 0Gy dose ('recuperation' check)
7-11	*Repeat steps 1-5*
12	Apply regenerative dose 1
13-17	*Repeat steps 1-5*
18	Apply regenerative dose 2 (larger than dose 1)
19-23	*Repeat steps 1-5*
24	Apply regenerative dose 3 (larger than dose 2)
25-29	*Repeat steps 1-5*
30	Apply regenerative dose 4 (larger than dose 3)
31-35	*Repeat steps 1-5*
36	Apply 0Gy dose ('recuperation' check)
37-41	*Repeat steps 1-5*
42	Apply regenerative dose 1 ('recycling' test)
43-47	*Repeat steps 1-5*

Results of experimental tests

As part of the OSL measurements made in this project, a series of tests were undertaken to monitor the OSL measurement procedure, the response and behaviour of the samples, plus the choice of grain size and aliquot size. These experimental checks are discussed below.

31.5 Aliquot size

Prepared quartz grains for each sample were presented for OSL measurements by mounting the grains in a monolayer onto 1cm diameter aluminium discs, sprayed lightly with Silkospray™ silicone oil to hold the grains in place during measurement. The discs, or aliquots, may be prepared using various amounts of sample. In this study, initial tests showed that signal levels were low due to the material being relatively insensitive and/or due to the relatively young age of the material. Large aliquots (8mm diameter, giving >1000 grains per aliquot) were therefore examined throughout this study, to maximise the luminescence signal observed from each aliquot.

31.5 OSL signal checks

The OSL signal of each aliquot measured was examined visually, to check the initial signal intensity and the form of the decay curve. A typical decay curve is shown in Figure 4, and shows a rapid decrease in signal which is characteristic of the decay of a signal from quartz. Routinely, the D_e values were calculated using the first two data channels (0.8 s stimulation) and the background was taken from the end of the decay curve (channels 230-250, the final 8.4 s stimulation). This maximised the contribution of the fast component of the OSL signal (Bailey *et al* 1997; Murray and Wintle 2003), and typically represented ~15-35 % of the total OSL signal.

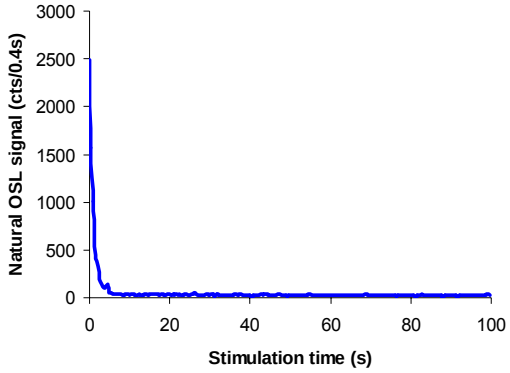


Figure 4: Typical OSL signal for aliquots in this study. The example shown is from an aliquot of sample *Aber*-101/GWT-6 which was preheated to 220°C/10s. The very rapid decrease in signal, quickly reaching a steady low background is a form which is frequently observed in the study of quartz aliquots. The signal integrated to derive the value of D_e is that from the first 0.8s of optical stimulation.

The form of the dose-response or 'growth' curve was also examined, and a minimum of four artificial irradiation doses were used to define the growth curve for each aliquot, designed to bracket the 'natural' signal and hence determine the value of D_e. Figure 5 shows a typical growth curve; error bars are shown, calculated following Banerjee *et al* (2000) and Galbraith (2002), and generated by *Analyst* (written by Dr. Geoff Duller, University of Wales, Aberystwyth).

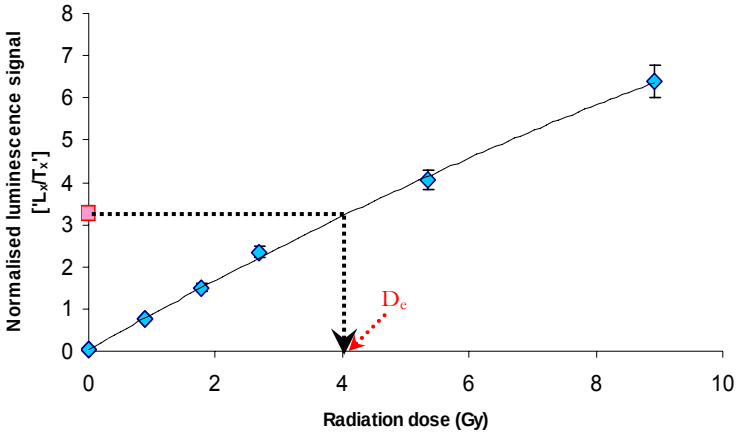


Figure 5: Typical growth curve constructed for aliquots in this OSL dating study. The example shown is from an aliquot of sample *Aber*-101/GWT-6 which was preheated to 220°C/10s.

Once the sequence of dating measurements was completed, each aliquot was irradiated and then stimulated using infra-red (IR) laser-diodes at a temperature of 125ºC to check the purity of each aliquot. Stimulation with IR was proposed as a check on the purity of prepared quartz material by Stokes (1992). Feldspathic minerals respond to simulation with IR, giving a rapidly decaying signal, however, quartz does not appear to respond to stimulation with IR (Spooner and Questiaux 1989). There was little evidence of any response above background signal levels to stimulation with IR for any aliquot in this study (a typical IR stimulated luminescence signal response is shown in Fig 6). No feldspar contamination was therefore considered to be present in any quartz separates prepared for this OSL dating study.

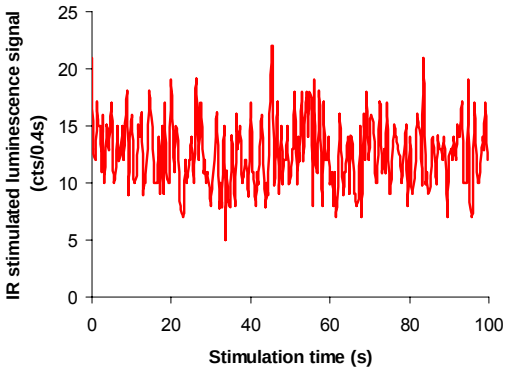


Figure 6: Typical response to stimulation with IR. The signal level is very low, being approximately at background levels, thereby suggesting that no feldspar is present in the quartz material prepared for OSL dating. The example shown is from an aliquot of sample *Aber*-101/GWT-6 which was preheated to 220°C/10s.

31.6 Recovery of a known laboratory irradiation dose

An important test of any luminescence dating protocol employed is whether the value of a previously delivered laboratory irradiation dose can be accurately and precisely determined. This is sometimes referred to as a 'dose-recovery' test and should be conducted on material which has not previously received any thermal pre-treatments. This fundamental test was conducted for both samples in this dating study using three aliquots of unheated material to study the dose recovery across a range of preheat temperatures (160-240ºC for sample Aber-101/GWT-4, and 160-300ºC for sample Aber-101/GWT-6).

The laboratory beta dose chosen for the dose-recovery experiment was 2.7Gy. Between 15 and 24 aliquots of each sample were prepared in the same way as the aliquots used for dating. The natural signal was removed from each aliquot by 2 x 1000s stimulation with blue diodes at room temperature, with a 10,000s pause between each stimulation; a beta dose was then applied to each of the aliquots in the dose recovery experiment. The SAR protocol was then applied using regeneration and test dose values of the same size as used in the dating measurement sequences, and applying a preheat of between 160-300ºC for 10s, and a cut heat of 160°C.

The beta dose recovered for each set of sample aliquots is shown in Figure 7 relative to the beta dose applied, and is also shown numerically in Table 2 as mean dose recovery values for each preheat temperature. With the exception of one aliquot of sample *Aber*-101/GWT-6 which is clearly anomalous (Fig 7b), the ratio of the beta dose applied to the dose recovered is within ± 10% of unity for both samples using a range of preheat temperatures. The SAR measurement protocol therefore seems to be appropriate and working well for the sample material used for dating in this study, even at high and low preheat temperatures.

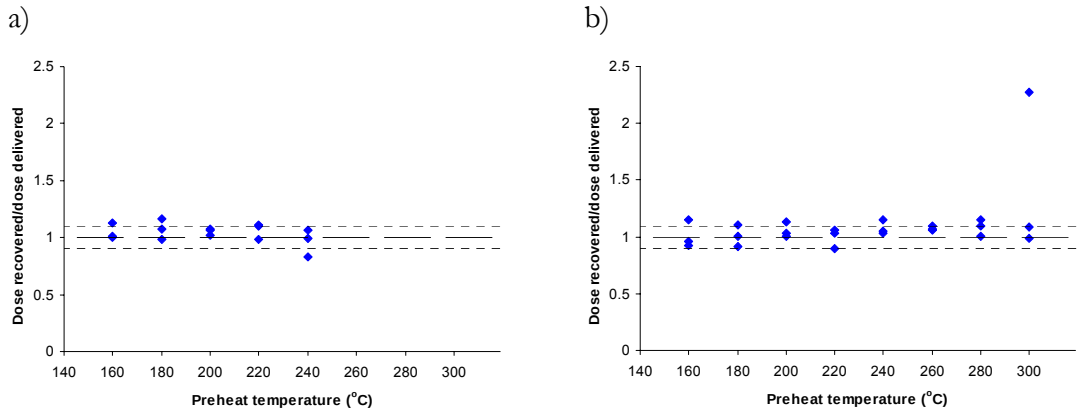


Figure 7: Dose recovery test results for sample a) *Aber*-101/GWT-4 and b) *Aber*-101/GWT-6, showing the dose recovered relative to the dose applied for each of the three aliquots measured using a range of different preheat temperatures. Unity and the error limits at ± 10% are indicated as dashed lines.

Table 2: Recovery of a known beta dose for three aliquots prepared from each sample dated in this OSL study. The dose applied to sample *Aber*-101/GWT-4 for recovery was 74% of the natural D_e, and for *Aber*-101/GWT-6 the dose to recover was 71% of the natural D_e.

Sample	Dose applied (Gy)	Dose recovered / Dose applied (mean and s.d. of 3 aliquots)
101/GWT-4 160ºC	2.68	1.05 ± 0.07
101/GWT-4 180ºC	2.68	1.07 ± 0.09
101/GWT-4 200ºC	2.68	1.05 ± 0.03
101/GWT-4 220ºC	2.68	1.06 ± 0.07
101/GWT-4 240ºC	2.68	0.96 ± 0.12
101/GWT-6 160ºC	2.68	1.01 ± 0.12
101/GWT-6 180ºC	2.68	1.01 ± 0.09
101/GWT-6 200ºC	2.68	1.06 ± 0.07
101/GWT-6 220ºC	2.68	0.99 ± 0.09
101/GWT-6 240ºC	2.68	1.08 ± 0.06
101/GWT-6 260ºC	2.68	1.07 ± 0.02
101/GWT-6 280ºC	2.68	1.08 ± 0.07
101/GWT-6 300ºC	2.68	1.04 ± 0.07*

* The anomalous dose recovery point shown in Fig 7b and discussed above is omitted here; the mean shown is therefore that of two aliquots for this preheat temperature.

31.7 OSL dating measurements and checks

The SAR measurement sequence employed in this study has several checks built into it to monitor the behaviour of the sample and the efficacy of the sensitivity correction. For each sample, 24 aliquots were examined to establish D_e values for use in determining an OSL age. The advantage of working with single-aliquot, rather than multiple-aliquot methods, is that each of the 24 aliquots measured gives rise to an independent assessment of D_e, and hence, potentially to an OSL age.

Working with a number of aliquots offers the advantage of making measurements using a range of thermal pre-treatments, to compare the D_e values determined for aliquots using different preheat temperatures. Thermal pre-treatments are employed in order to remove any unstable trapped charge prior to measurement of either the natural or an artificially irradiated OSL signal. However, high preheat temperatures are sometimes problematic for young samples, and can lead to erroneously high D_e values being determined due to thermal transfer of trapped charge from relatively stable yet optically-insensitive traps into OSL traps during preheating (eg Bailey et al 2001). Given the likely young age of the samples in this study, it was therefore of particular importance to make OSL measurements using a range of preheat temperatures to try to establish a preheat plateau where common values of D_e could be identified and any erroneously high D_e values could be discounted. A range of preheat temperatures was therefore investigated during OSL dating measurements of each sample, increasing to the

given temperature at a rate of 5ºC/s and held for 10s on reaching the required temperature; a minimum of three aliquots were examined at each of 8 preheat temperatures (160 – 300 ºC).

The preheat plots generated for the samples in this study are given in Figure 8, showing D_e values for each of three aliquots measured using one of eight preheat temperatures. All aliquots measured are shown in Figure 8, including those rejected from the final age determination (Table 3). Aliquots were rejected on the basis of several criteria: where recycling ratios exceeded ± 10%, where the maximum error on the test dose or the D_e exceeded 10%, and where signal intensities were <1000 counts/0.8s stimulation. The plateau test, suggests that a wide range of preheat temperatures are suitable for dating these samples; furthermore, thermal transfer of trapped charge does not seem to be a problem here.

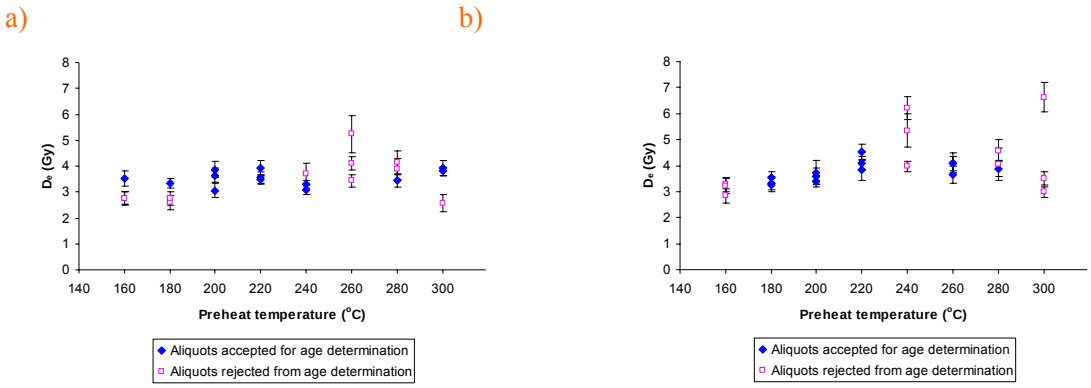


Figure 8: Preheat plots for a) sample *Aber*-101/GWT-4, and b) sample *Aber*-101/GWT-6, showing the D_e value determined for each of the three aliquots measured using a range of different preheat temperatures. The associated error in D_e is from the error on 'n' as defined by Galbraith (2002) from counting statistics and the error associated with curve fitting as used in *Analyst* (written by Dr. Geoff Duller, University of Wales, Aberystwyth).

Other criteria may also be used to evaluate the behaviour and reliability of the aliquots used for dating. One of the most powerful of these tests arises from the use of the SAR protocol for the OSL dating measurements. In this measurement procedure, the natural luminescence signal is measured, followed by the response to a series of artificial laboratory beta doses of increasing magnitude designed to bracket the intensity of the natural signal (Table 1). In the SAR measurements made in this study, a low irradiation dose was repeated, or recycled, and applied at the end of the measurement cycle for all aliquots to test how well the sensitivity correction procedure is working. If the sensitivity correction is adequate, then the ratio of the signal arising from this repeated regenerative dose at the end of the measurement sequence to that of its earlier regeneration dose (eg Table 1) should fall within the range of 1.0 ± 0.1 (Murray and Wintle 2000). Only 2 of the 48 aliquots examined for OSL dating failed this 'recycling test', indicating that the sensitivity correction in the SAR measurement procedure is working well for these samples in monitoring and correcting for changes in luminescence sensitivity that may have occurred as a function of time, temperature, and past-radiation exposure.

A further test of the reliability of the sensitivity corrected growth curve generated using the SAR measurement protocol is a check on the 'recuperation' of signal (Murray and Wintle 2000) following the application of a regeneration dose of 0 Gy at both the beginning (following measurement of the natural signal) and towards the end of the measurement cycle (following the largest regeneration dose and prior to the application of the recycling regeneration dose). No significant net OSL signal should be observed following this 0 Gy beta dose if the sensitivity

correction is working correctly. For the two samples in this study, no recuperation in OSL signal was observed at low through to high preheat temperatures, and the dose-response or 'growth' curve generated passed through the origin (eg Fig 9a and b). This suggests again that thermal transfer of charge from optically insensitive traps into OSL traps is not a factor in this study.

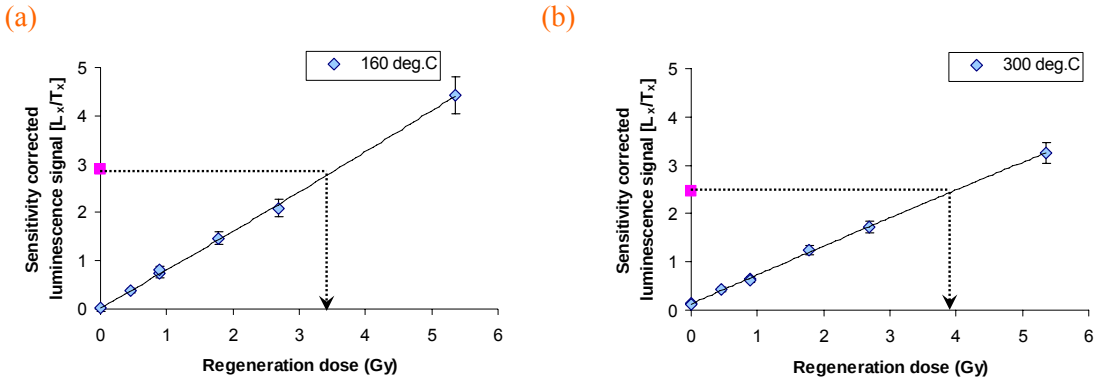


Figure 9: Sensitivity corrected dose-response or 'growth' curves measured following (a) low (160°C) and (b) high (300°C) preheat temperatures for the aliquots shown in the preheat plot of Figure 8a (sample *Aber*-101/GWT-4). In both cases, the dose-response curve passes through the origin, and no increase in recuperation of the OSL signal is observed between the beginning and the end of the measurement sequence. The aliquot also passes the recycling ratio test (repeating a regeneration dose at the end of the measurement sequence, here of ~0.9 Gy).

31.8 Determination of the equivalent dose for use in the final OSL age calculation

The aliquots on which OSL dating measurements were conducted were screened for their suitability for use in the final age equation using the series of tests described and discussed above. These checks included examination of signal intensity levels, decay curve shape, growth curve shape, recycling ratio, recuperation, preheat plots, and feldspar contamination checks using IR stimulation. The most common reason for rejection of aliquots (accounting for 91% of the aliquots rejected) was on the basis of low signal levels, causing errors on the test dose and D_e to exceed 10%. In spite of this, the number of acceptable aliquots combined to determine a final OSL age for each sample was 13.

For each sample, the D_e values of the aliquots accepted following screening were normally distributed (an example is shown in Fig 10). The simple arithmetic mean of these D_e values was therefore taken for calculation of the final OSL age. The error on each determination of D_e was calculated using the standard error (ie the standard deviation divided by the square root of the number of estimates of D_e). The D_e and standard error are given for each sample in the final OSL age table (Table 3).

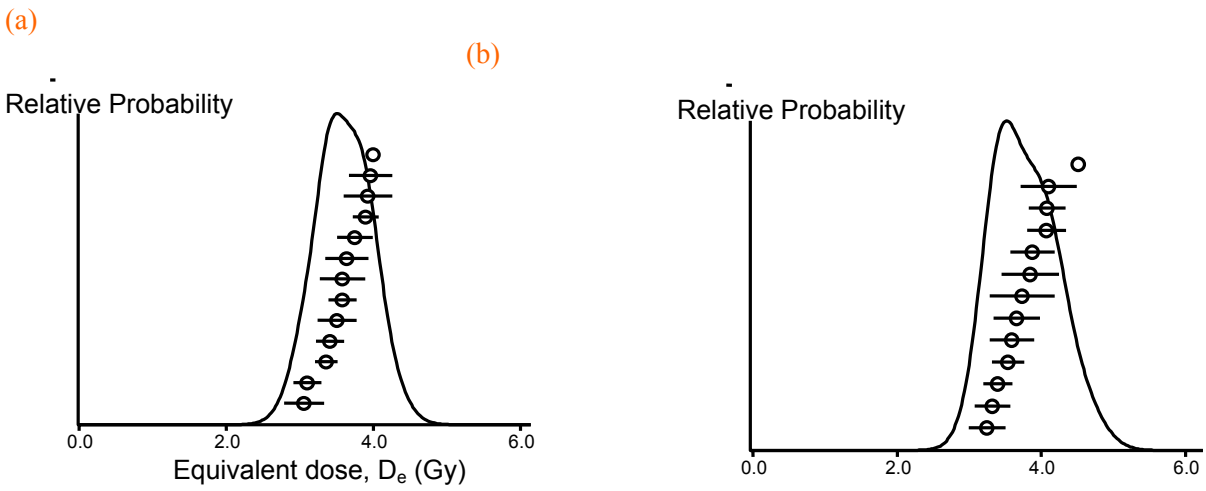
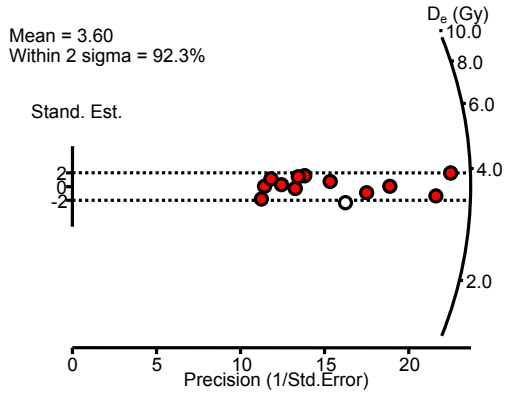


Figure 10: The distribution of D_e values obtained for a) sample *Aber*-101/GWT-4, and b) sample *Aber*-101/GWT-6. Each of the 13 points shown is an individual aliquot, which is plotted with the associated error. The probability density plots demonstrate that the D_e values of both samples are normally distributed.

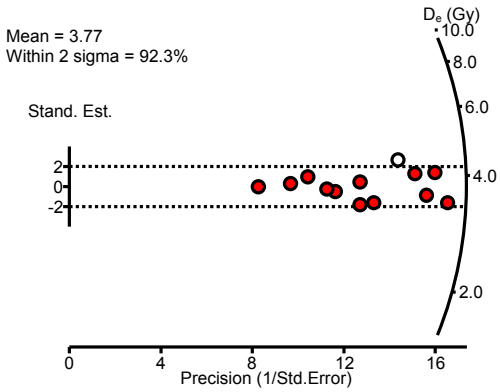
The aliquots which were accepted following all the screening tests (Fig 10) are also shown replotted for both samples in this study in Figure 11. Here, the distribution of D_e values are presented as radial plots (Galbraith 1990), with the D_e of each aliquot being shown as a single point on the plot. These plots are presented as a visual aid to the data only, and displaying the data on such plots offers the advantage of showing the precision to which each data point is known. The precision is displayed on the x-axis, with data of high precision being plotted towards the right hand side of the plot. The y-axis shows the number of standard deviations away from a central value for each D_e value, whilst the radial scale displays the D_e value. The horizontal dotted line extending from 0 on the y-axis is the mean D_e calculated for the sample. The dotted lines extending from the y-axis to the radial scale in Figure 11 are placed at two standard deviations, and any points falling within these limits (indicated by infilled circles) therefore lie within two standard deviations of the mean D_e value. Ideally, the data for all aliquots will fall within this band indicated on the diagrams, indicating one population of D_e values. The data for both samples in this study show very little scatter in the distribution of D_e values obtained following screening (Fig 11), suggesting only one population of D_e values for each sample.

Figure 11: Distribution of equivalent dose (D_e) values used for the determination of OSL ages for a) sample *Aber*-101/GWT-4, and b) sample *Aber*-101/GWT-6.

a)



b)



31.9 OSL age determinations

The equivalent dose (D_e) data (discussed in section 5) and the results of laboratory dosimetry measurements were combined for each sample, with corrections being made for attenuation by water and for grain size, to give an OSL age for both samples in this study. These data, including the final age determinations, are presented in detail for each sample in Table 3. The error shown for the D_e determination of both samples (Table 3) is the standard error (see section 7.6) (ie the standard deviation divided by the square root of the number of independent estimates of D_e). The average percentage error on the OSL ages is small, being < 5.0 %.

The finalised OSL ages are also shown in Figure 13, superimposed on a photograph of the Gwithian section. Although the ages central are not in stratigraphic order, they are consistent with each other within 1σ errors. The fact that the ages cannot be resolved, in spite of their high precision, suggests that the sand deposition was rapid, with only a brief period of stabilisation due to cultivation occurring in between as indicated by the intervening Bronze Age plough-soil (context 605, formerly 'layer 5'). These OSL ages are in agreement with radiocarbon dates obtained from the intervening layer 5 (c. 1400-1300 cal BC) and from layer 3 (located above layer 4, giving c. 1000 cal BC) (Nowakowski, pers. comm.).

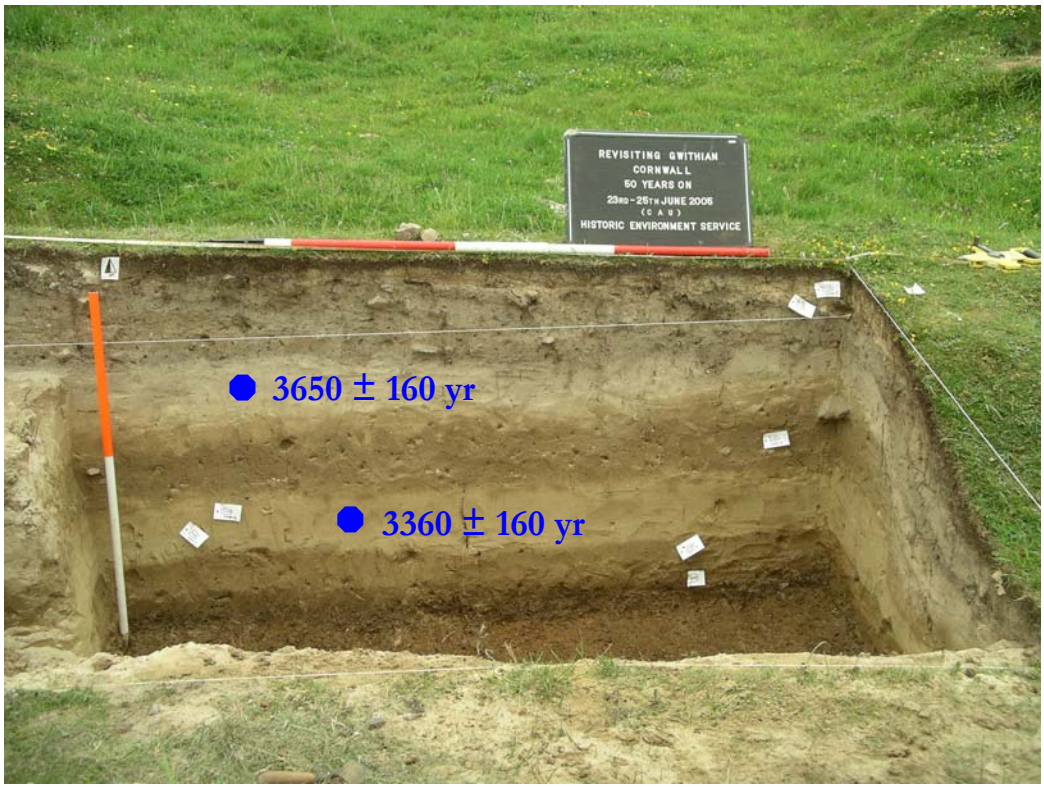


Figure 12: The OSL ages of the two sand units dated for Gwithian (see Table 3 for full details of the OSL age determinations). The uppermost sample, *Aber*-101/GWT-4, was taken from context 602a (part of "Layer 4" in the original excavation), whilst the lower sample, *Aber*-101/GWT-6, was taken from context 606 (formerly termed "Layer 6").

Table 3: OSL sample details, equivalent dose and dose rate data, and OSL ages.

Gwithian OSL samples		
Aberystwyth Lab. number	**101 GWT 4**	**101 GWT 6**
Sample description	**Context 602a**	**Context 606**
Depth down-section (m)	0.45 ± 0.02	0.85 ± 0.02
Material used for dating	Quartz	
Grain size (μm)	180-212	180-212
Preparation method	Heavy liquid separation (sodium polytungstate); 40% HF etch 45 mins	
Measurement protocol	SAR; OSL 470nm; detection filter 7.5mm Hoya U-340	
No. aliquots measured	24	24
No. aliquots used for D_e	13	13
Equivalent Dose, D_e (Gy)*	**3.60 ± 0.09**	**3.77 ± 0.10**
Water content (% dry mass)	7 ± 5	7 ± 5
U (ppm)	0.62 ± 0.04	0.63 ± 0.04
Th (ppm)	1.71 ± 0.11	2.49 ± 0.14
K (%)	0.65 ± 0.05	0.73 ± 0.05
Layer removed by etching (μm)	10 ± 2	10 ± 2
Infinite β dose rate (Gy/ka)	0.599 ± 0.008	0.734 ± 0.015
External β dose rate 'wet' (Gy/ka)	0.484 ± 0.029	0.593 ± 0.036
External γ dose rate 'wet' (Gy/ka)	0.287 ± 0.020	0.340 ± 0.022
Cosmic (Gy/ka)	0.214 ± 0.002	0.189 ± 0.002
Total dose rate (Gy/ka)	**0.99 ± 0.04**	**1.12 ± 0.04**
OSL Age# (a)	**3650 ± 160**	**3360 ± 160**

[#] Ages are expressed as years before 2005 AD, rounded to the nearest 10 years. All calculations were performed before rounding.

[*] The error shown is the standard error on the mean.

Dr. Helen M. Roberts, Luminescence Laboratory, University of Wales, Aberystwyth

31.10 Summary and Conclusions

Two sand units, interpreted to be aeolian in origin, found at the Bronze Age site at Gwithian were dated using OSL applied to coarse-grained quartz. The OSL measurement procedure employed was the Single Aliquot Regenerative dose (SAR) protocol which corrects for sensitivity change. Several checks and screening criteria were applied to the OSL dating aliquots and also to additional aliquots prepared from the samples to ensure that the data included in the final age calculation were of the highest quality. The SAR measurement protocol was appropriate for these samples and the sensitivity correction worked well. Using large aliquots, the samples studied proved sufficiently sensitive and responsive to facilitate well-resolved dating using OSL.

The final OSL ages generated were both accurate and of high precision, being supported by other independent dating evidence from radiocarbon. The OSL ages of the two units dated were indistinguishable, in spite of the high precision obtained. This implies that the deposition of the two wind-blown sand units was rapid, and took place at approximately 3500 years ago, with only a brief period of stabilisation due to cultivation in the intervening time.

Acknowledgements
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32 Gwithian: Scientific dating (AMS programme)

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32.1 Radiocarbon Dating

A total of 20 carbonised residue samples adhering to the interior of pottery sherds were submitted for dating by Accelerator Mass Spectrometry (AMS) to the Scottish Universities Environmental Research Centre (SUERC), East Kilbride and the Oxford Radiocarbon Accelerator Unit (ORAU) in 2005. The samples submitted to SUERC were prepared using methods outlined in Slota *et al* (1987), and measured as described by Xu *et al* (2004). Those submitted to ORAU were prepared according to methods given in Hedges *et al* (1989) and measured as described in Bronk Ramsey *et al* (2004).

In addition, one sample of unidentified, bulk charcoal was submitted to the National Physics Laboratory (NPL) in 1961. The sample was prepared according to methods outlined by Callow *et al* (1963) and measured by gas proportional counting (carbon dioxide).

Both the SUERC and ORAU laboratories maintain continual programmes of quality assurance procedures, in addition to participation in international inter-comparisons (Scott 2003). These tests indicate no laboratory offsets and demonstrate the validity of the measurements quoted.

The calibrations of these results, relating the radiocarbon measurements directly to calendar dates, have been calculated using the calibration curve of Reimer *et al* (2004) and the computer program OxCal (v3.10) (Bronk Ramsey 1995; 1998; 2001). The calibrated date ranges for these samples are given in Table 1 and have been calculated using the maximum intercept method (Stuiver and Reimer 1986). The calibrated date ranges cited in the text are those for 95% confidence. They are quoted in the form recommended by Mook (1986), with the end points rounded outwards to 10 years if the error term is greater than or equal to 25 radiocarbon years, or to 5 years if it is less. The graphical distributions of the calibrated dates, given in outline in Figures 1-5, are derived from the probability method (Stuiver and Reimer 1993).

32.2 Optically Stimulated Luminescence Dating

Two sand units, interpreted to be aeolian in origin, were sampled by the Aberystwyth Luminescence Research Laboratory for a pilot study examining the feasibility of using optically stimulated luminescence (OSL) dating at this site. Samples were collected using using a 25cm length of 5cm diameter opaque plastic pipe driven horizontally into the sand units. The dose rate (Gy/ka) to each sample was determined using in situ field gamma spectrometry coupled with laboratory-based beta counting of finely ground bulk sample material. Coarse-grained quartz of 180-210 µm diameter was prepared in the laboratory using standard methods (outlined in Table 2). Measurements were made using an automated *Risø* TL/OSL reader equipped with a combined high-power blue LED/ infra-red laser diode OSL unit, and a beta source for irradiations. The combined OSL unit was employed at 80% of full diode current, providing approximately 17mW/cm^2 power from the blue LED unit (470nm), and 370mW/cm^2 from the IR laser diode (830nm). The OSL measurement procedure employed was the Single Aliquot Regenerative dose (SAR) protocol (Murray and Wintle, 2000) which corrects for sensitivity change (see Table 2 for further details). Several checks and screening criteria were applied to the OSL dating aliquots and also to additional aliquots prepared from the samples, to ensure that the equivalent dose (D_e, Gy) data included in the final age calculation were of the highest quality (Roberts, in press).

The SAR measurement protocol was appropriate for these samples and the sensitivity correction worked well. Using large aliquots, the samples proved sufficiently sensitive and responsive to facilitate well-resolved dating using OSL. A comprehensive account of the OSL dating is given in Roberts (in press). The equivalent dose (D_e) data, the results of laboratory dosimetry measurements, with corrections being made for attenuation by water and for grain size, and the final age determinations, are presented in detail in Table 2. The error shown for

the D_e determination (Table 2) is the standard error (ie the standard deviation divided by the square root of the number of independent estimates of D_e). The average percentage error on the OSL ages is small, being < 5.0 %.

32.3 General approach

The Bayesian approach to the interpretation of archaeological chronologies has been described by Buck *et al* (1996). It is based on the principle that although the calibrated age ranges of radiocarbon measurements accurately estimate the calendar ages of the samples themselves, it is the dates of archaeological events associated with those samples that are important. Bayesian techniques can provide realistic estimates of the dates of such events by combining absolute dating evidence, such as radiocarbon and OSL results, with relative dating evidence, such as stratigraphic relationships between radiocarbon samples. These 'posterior density estimates', are not absolute. They are interpretative estimates, which will change as additional data become available or as the existing data are modelled from different perspectives.

The technique used is a form of Markov Chain Monte Carlo sampling, and has been applied using the program OxCal (v3.10) (http://units.ox.ac.uk/departments/rlaha/), which uses a mixture of the Metropolis-Hastings algorithm and the more specific Gibbs sampler (Gilks *et al* 1996; Gelfand and Smith 1990). Details of the algorithms employed by this program are available from the on-line manual or in Bronk Ramsey (1995; 1998; 2001). The algorithms used in the models described below can be derived from the structure shown in Figures 1–5.

32.3.1 Aims

The scientific dating programme for the project had three main aims:

1) to test whether the proposed Bronze Age sequence of 'Layers' (eight principal archaeological horizons or banded phases of archaeological activity;1–8) identified across the site in the 1950's and 1960's can be verified by dating the carbonised residues surviving on the internal surfaces of pottery sherds.

2) to test whether the proposed post-Roman sequence of 'Layers' (three principal archaeological horizons or banded phases of archaeological activity;A-C) identified across the site in the 1950's and 1960's can be verified by dating the carbonised residues surviving on the internal surfaces of pottery sherds.

3) to determine the applicability of OSL dating to the aeolian sand units found between the main occupation horizons at Gwithian.

The sampling strategy for the first two aims was to submit a minimum of 15 pottery sherds with carbonised residues from throughout the sequence of each of the two identified occupations – Bronze Age and post-Roman. Fifteen sherds from Bronze Age deposits were identified during the assessment, however, only five from post-Roman deposits could be obtained.

To achieve the third aim, a 2x4.6m trench (site GMXVII) was excavated in 2005 between GMX and GMIX, as it was expected that sand phases 6, 4, and 2 would be fully exposed in the profile at this location. However, Phase 6 was no longer visible and so samples were taken from phases 4 and 2.

32.4 The Bronze Age Sequence

32.4.1 Layers

Two carbonised residues on sherds from different vessels, both are undecorated body sherds of Trevisker style vessels, were dated from (1507) a house floor level identified at site GMXV and assigned to phase 1. The two measurements (OxA-14490; 2961±36 BP and OxA-14568; 3430±30 BP) are not statistically consistent (T'=59.0; v=1; T'(5%)=3.8; Ward and Wilson, 1978) and are clearly of different ages.

A single carbonised residue (OxA-14488) when submitted was thought to come from the upper horizon of phase 1, however, subsequent analysis of the stratigraphy suggests that it might actually be either this horizon or Phase 3.

A single OSL sample (ABER-101/GWT-6) was taken from phase 2, a layer of windblown sand which sealed the earlier horizons (ie Phase 1).

The unidentified bulk charcoal sample from the four cremations pits identified in Phase 3 or 5 (NPL-21) provides a *terminus post quem* for the funerary activity. In addition two carbonised residue samples were dated from phase 3 site GMXV (1512) and GMXV (1504), OxA-14489 and SUERC-6167 respectively. Both contexts were linked to the ruined building (1503) during Phase 3 at site GMXV.

Phase 4 had previously been interpreted as representing a sand inundation that covered part of the entire site, sealing all traces of human activity beneath it (belonging to Phase 3) Subsequent analysis following fieldwork in 2005 though indicates that interpretation of phase 4 as being a wholly natural sand blown deposit unaffected by anthropogenic activity might need to be reconsidered. A single OSL sample was obtained (ABER-101/GWT-4).

Six carbonised residues were dated from Phase 5; OxA-14590 comes from the central hearth (1088) of posthole structure [1134] and SUERC-6163 comes from the fill of gully (343) to the south of structure [724/725], House 1. Two samples come from contexts that are part of Phase 5: OxA-14527 from site GMX (576) and OxA-14589 from GMX (546).

Two samples were submitted from (433), a general context number given to all contexts within phase 5 in the area of structure [724/725]. Replicate measurements (OxA-14525; 2946 ± 29 BP and SUERC-6162; 2835 ± 35 BP) on sherd GMX 27 are not statistically consistent (T'=6.0; v=1; T'(5%)=3.8; Ward and Wilson, 1978). This might be due to different residues being dated or due to one of the measurements being a statistical outlier. Even at the two sigma error term (±2σ) there is still a 1 in 20 chance that the true age of a sample lies outside this range (Bowman, 1990).

Sherd GMX 26 (SUERC-6161) was submitted as it was an example of an unusual ceramic style with incised close-set rows of herringbone to date unique in Cornwall. This is a decorated body sherd intrusive within the midden in which it was found.

32.4.2 Contexts

The Layers as recorded by the Gwithian team in the 1950's and 1960's are a cultural concept and in essence represent what could be termed an "activity horizon" related to a specific period of time. The use of such an approach and terminology to understanding the site today would be viewed as too simplistic, given the obvious episodic nature of activities across the site and between structures, etc. As a result of re-analysis of the stratigraphy it is therefore possible to construct a model based only on the stratigraphic relationships between samples as would be defined by modern excavation.

Unfortunately given the original aims of the scientific dating pilot project, material was not preferentially selected from contexts with direct stratigraphic relationships, which were unknown during the initial selection process. Therefore the stratigraphic model only contains a relatively small number of samples that can be directly related to one another. From GMXV cutting 22 the two residue samples from (1507) (OxA-14490 and OxA-14568) are overlain by OxA-14489 (1512) that in turn is overlain by SUERC-6167 (1504). The other two samples with an identifiable relationship are the OSL samples from GMXVII Phase 2 and Phase 4.

32.5 Results

32.5.1 The Bronze Age Layers model

This model is based on the eight principle archaeological horizons identified during the 1950s and 60s excavations at Gwithian. These have now been identified as major phases (see above). The model (Figure 1) shows poor overall agreement ($A_{overall}$=0.0%) indicating that the scientific dating results and stratigraphy as outlined above are not in agreement. A number of samples show very poor individual indices of agreement (OxA-14490, SUERC-6161, and OxA-14489).

Because this model makes it very difficult to evaluate the reliability of the questionable samples to date their associated phase, a second model was constructed using the stratigraphic relationship between individual samples outlined above. This model is shown in Figure 2**.**

32.5.2 The Bronze Age context model

The overall index of agreement for the model shown in Figure 2 is poor ($A_{overall}$=18.2%). Two samples have low individual indices of agreement (OxA-14490 and SUERC-6167). OxA-14490 is a small sample and easily could have moved down or fallen out of the baulk. SUERC-6167 appears to have been glued together, most probably with HMG glue a cellulose nitrate adhesive, although this would not contain “old” carbon and therefore does not provide an explanation for the older than expected date. It is thus more likely that the sample (OxA-14489) stratigraphically below SUERC-6167 is too young.

The OSL measurements from Site GMXVII show good agreement and suggest they provide accurate ages for the sand horizons (phases 2 and 4). On the basis of these results therefore, OSL dating seems to hold excellent potential for dating the sand levels across the site.

32.5.3 The Bronze Age Layers model (ii)

In the model shown in Figure 3 we have chosen to exclude OxA-14490, SUERC-6161 and OxA-14489 for the reasons outlined above. Even with these three measurements excluded the model still only just shows agreement between the scientific dating results and the stratigraphy ($A_{overall}$=63.2%), just above the rejection threshold ($A_{overall}$=<60%; Bronk Ramsey, 1995)

One sample (Aber101/GWT-4) has a low individual index of agreement (A=31.3%) suggesting the OSL date is inconsistent with its stratigraphic position. This deposit was sampled based upon the assumption that it was a sterile aeolian sedimentary unit, however, the subsequent geoarchaeological and land snail assessments suggest that attempts to stabilise this horizon were also evident (Guttmann; 2006; Davies, 2006). Furthermore, there is evidence of plough marks at the top of the context immediately below the one that was sampled, and therefore indicating that ploughing through the sampled context (602a) and (602b) most likely took place. The associated anthropogenic processes could account for the incorporation of older material into the unit sampled, giving an older date than expected.

Although in an ideal situation this would be investigated through the use of smaller aliquots (2mm diameter) or even single-grain measurements, this is unlikely to be feasible in this case due to the already low-levels of light emitted from the larger (8mm diameter; >1000grains) aliquots used.

The model suggests that the broad site horizons termed ‘Layers’ proposed by the Gwithian team in the 1950s and 1960s is correct. However, this sequence needs further investigation and clarification. One way this might be possible is through targeted OSL sampling of sand units (phases 6, 4, and 2) in areas of the site where firstly there is little disturbance through agriculture, and secondly there are already radiocarbon dates on carbonised residues or the potential to submit further samples with a secure taphonomic relationship to their context.

32.5.4 The Bronze Age context model (ii)

The model shown in Figure 4 also excludes OxA-14490, SUERC-6161, and OxA-14489), increasing the overall index of agreement for the Context model to $A_{overall}$ =76. 7%, showing that the radiocarbon results and stratigraphy are in good agreement.

32.6 The post-Roman Sequence

Stratified occupation 'Layers A, B and C' (Phases 4, 3, and 2) were recorded during the excavations at GMI and dated by pottery to the post-Roman period. The artefactual record from the horizons suggests a developing sequence.

The three samples from phase 2 (OxA-14528, OxA-14529 and SUERC-6158) are statistically consistent (T'=4.5; v=2; T'(5%)=6.0; Ward and Wilson, 1978) and could therefore be of the same actual age.

Replicate measurements on sherd GMI 7 (OxA-14526; 1448 ±28 BP and SUERC-6159; 1525 ±35 BP) from phase 3 are statistically consistent (T'=3.0; v=1; T'(5%)=3.8; Ward and Wilson, 1978) and allow a weighted mean to be calculated before calibration (GMI 7; 1478 ±22BP). Unfortunately no samples from Phase 4 could be obtained as part of the assessment.

32.6.1 The post-Roman Layer model

This model is based on the three principle post-Roman archaeological horizons identified during the 1950s and 60s excavations at Gwithian. The model (Figure 5) shows good overall agreement ($A_{overall}$=85.1%) indicating that the radiocarbon measurements and stratigraphy as outlined above are in agreement.

32.7 Discussion

The pilot scientific dating programme at Gwithian has shown that the combination of radiocarbon and luminescence dating, does provide a broad chronological framework for interpreting activity at the site. However, to provide a more precise chronology and a better understanding of the intra-relationships between features/contexts and excavated parts of the site, the dating programme would need to be extended. To do this requires:

1) evaluation of the potential residues on pottery sherds not considered for the pilot study (ie those that had not previously been assigned to Layers).

2) list of all other potential samples meeting strict taphonomic criteria so that they provide a date for their context (ie articulated/articulating bone, charcoal with a direct functional relationship to contexts (eg hearths).

3) identification of areas with low human impact and opportunities for subsequent fieldwork to undertake an extensive OSL sampling programme.

Table 1: Gwithian radiocarbon dating results[1]

Laboratory Number	Sample ID	Phase	Context	Material	δ ^{13}C (‰)	Radiocarbon Age (BP)	Calibrated Date (95% confidence)
OxA-14488	GMXV 22	BA 3 or later 1	none	carbonised residue, undecorated body sherd	-27.3	3245 ± 40	1620-1430 cal BC
OxA-14489	GMXV 20	BA 3	(1512)	carbonised residue, decorated rim sherd	-26.5	3039 ± 37	1410-1130 cal BC
OxA-14568	GMXV 25A	BA earlier 1	(1507)	carbonised residue, undecorated body sherd	-28.0	3430 ± 50	1890-1610 cal BC
OxA-14490	GMXV 25B	BA earlier 1	(1507)	carbonised residue, undecorated body sherd	-26.2	2961 ± 36	1310-1040 cal BC
SUERC-6162	GMX 27	BA 5	(433)	carbonised residue, decorated rim sherd	-27.4	2835 ± 35	1120-900 cal BC
OxA-14525	GMX 27B	BA 5	(433)	carbonised residue, decorated rim sherd	-26.5	2946 ± 29	1270-1040 cal BC
OxA-14526	GMI 7	PR 3	(2208)	carbonised residue, undecorated body sherd	-25.9	1448 ± 28	cal AD 560-660
SUERC-6159	GMI 7B	PR 3	(2208)	carbonised residue, undecorated body sherd	-26.7	1525 ± 35	cal AD 420-610
weighted mean	**GMI 7**	PR 3	(2208)	T'=3.0, T'(5%)=3.8, v=1		1478 ± 22	cal AD 545-640
OxA-14527	GMX 16	BA 5	(576)	carbonised residue, undecorated body sherd	-26.2	2878 ± 29	1190-940 cal BC
OxA-14528	GMI 1	PR 2	(2210)	carbonised residue, Gwithian-style base sherd	-27.3	1460 ± 27	cal AD 550-650
OxA-14529	GMI 9	PR 2	(2210)	carbonised residue, base	-26.3	1534 ± 29	cal AD 420-600

[1] No *posterior density estimates* are quoted because at present we do not have a preferred model.

				sherd			
OxA-14589	GMX 17	BA 5	(546)	carbonised residue, Base sherd with matting impressions on exterior of base	-25.0	2944 ± 33	1270-1020 cal BC
OxA-14590	GMIX 30	BA 5	(1088)	carbonised residue, undecorated rim sherd	-27.1	2836 ± 32	1120-900 cal BC
SUERC-6158	GMI 6	PR 2	(2210)	carbonised residue, undecorated body sherd	-27.2	1455 ± 35	cal AD 540-660
SUERC-6160	GMI 13	PR 3	(2238)	carbonised residue, grass-marked base sherd	-26.1	1310 ± 35	cal AD 650-780
SUERC-6161	GMX 26	BA 5	(433)	carbonised residue, sherd with incised herringbone decoration	-28.3	3430 ± 35	1880-1630 cal BC
SUERC-6163	GMX 28	BA 5	(343)	carbonised residue, decorated body sherd	-26.6	2980 ± 35	1380-1110 cal BC
SUERC-6167	GMXV 19	BA 3	(1504)	carbonised residue, base sherd	-26.2	3180 ± 35	1520-1400 cal BC
NPL-21	GMX	BA 3 or 5	---	charcoal, unidentified, bulk from four features		3070 ± 103	1530-1010 cal BC

Table 2: Gwithian OSL sample details, equivalent dose and dose rate data, and OSL ages

Gwithian OSL samples – section GMXVII		
Aberystwyth Luminescence Research Lab. number	**101 GWT 4**	**101 GWT 6**
Sample description	Context 602a (Phase 4)	Context 606 (Phase 2)
Depth down-section (m)	0.45 ± 0.02	0.85 ± 0.02
Material used for dating	Quartz	
Grain size (μm)	180-212	180-212
Preparation method	HCl (10% v.v.); H2O2 (20 vols.); dry sieving; density separation (sodium polytungstate); 40% HF etch 45 mins; 37% HCl 45 mins; re-sieve	
Measurement protocol	SAR; OSL 470nm; detection filter 7.5mm Hoya U-340; OSL measurements made @ 125°C; preheat range 160-300°C	
No. aliquots measured	24	24
No. aliquots used for D_e	13	13
Equivalent Dose, D_e (Gy)*	**3.60 ± 0.09**	**3.77 ± 0.10**
Water content (% dry mass)	7 ± 5	7 ± 5
U (ppm)	0.62 ± 0.04	0.63 ± 0.04
Th (ppm)	1.71 ± 0.11	2.49 ± 0.14
K (%)	0.65 ± 0.05	0.73 ± 0.05
Layer removed by etching (μm)	10 ± 2	10 ± 2
Infinite β dose rate (Gy/ka)	0.599 ± 0.008	0.734 ± 0.015
External β dose rate 'wet' (Gy/ka)	0.484 ± 0.029	0.593 ± 0.036
External γ dose rate 'wet' (Gy/ka)	0.287 ± 0.020	0.340 ± 0.022
Cosmic (Gy/ka)	0.214 ± 0.002	0.189 ± 0.002
Total dose rate (Gy/ka)	**0.99 ± 0.04**	**1.12 ± 0.04**
OSL Age# (a)	**3650 ± 160**	**3360 ± 160**

Ages are expressed as years before 2005 AD, rounded to the nearest 10 years. All calculations were performed before rounding.

* The error shown is the standard error on the mean.

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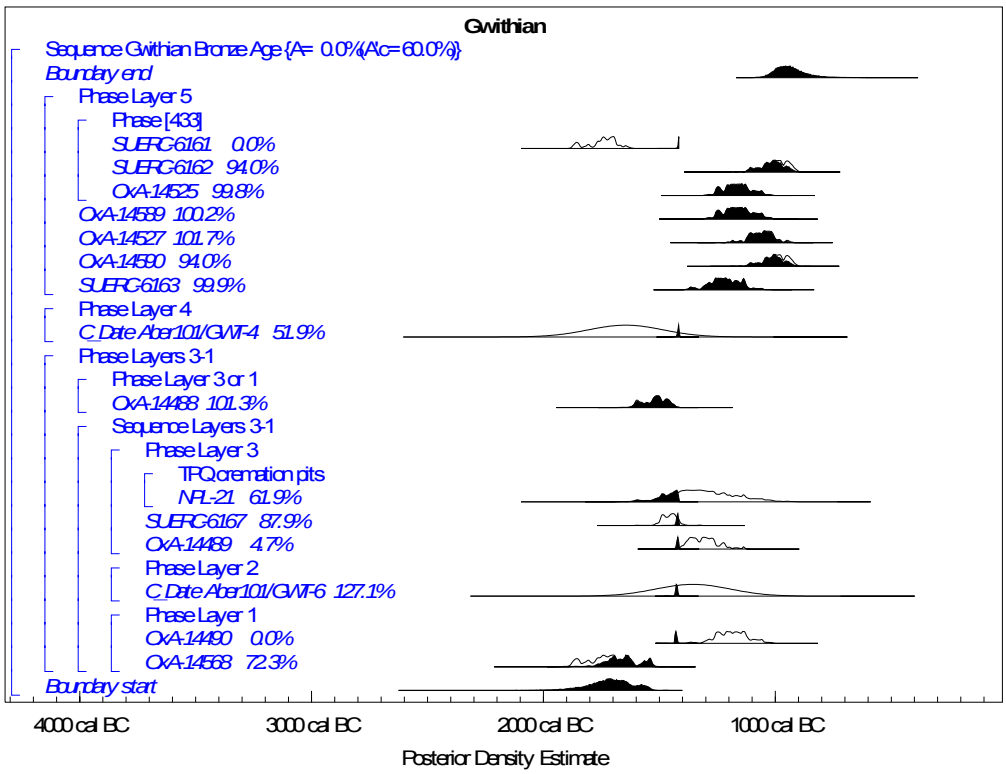

Figure 1. Probability distributions of dates from Gwithian (Bronze Age Layers): each distribution represents the relative probability that an event occurs at a particular time. For each of the radiocarbon and OSL dates two distributions have been plotted, one in outline, which is the result of simple calibration, and a solid one, which is based on the chronological model used. The large square brackets down the left hand side along with the OxCal keywords define the model exactly.

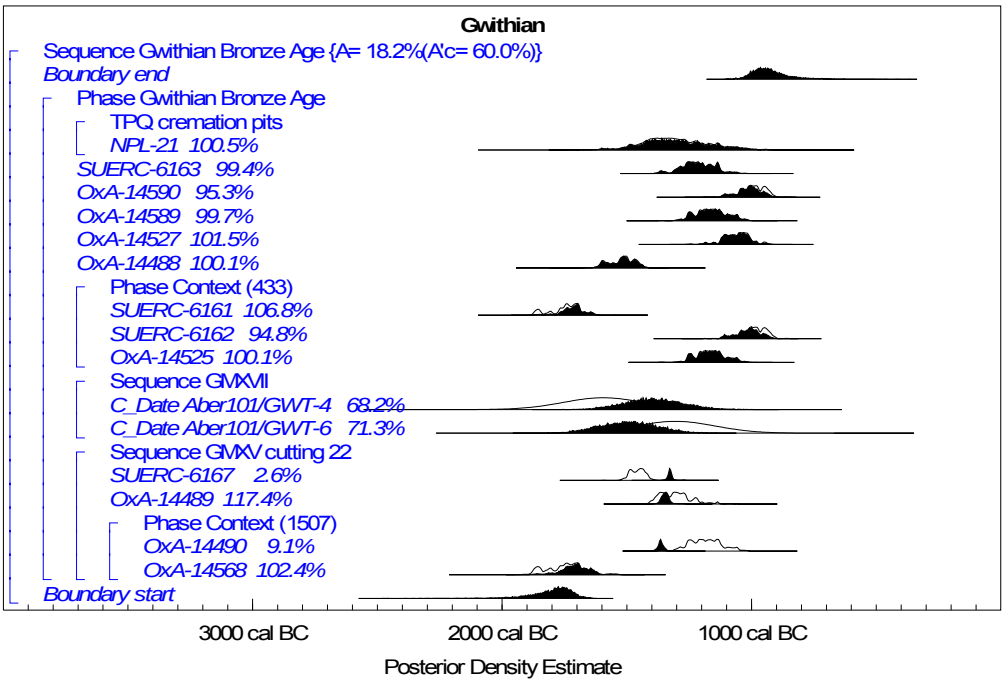

Figure 2 Probability distributions of dates from Gwithian (Bronze Age Contexts): each distribution represents the relative probability that an event occurs at a particular time. For each of the radiocarbon and OSL dates two distributions have been plotted, one in outline, which is the result of simple calibration, and a solid one, which is based on the chronological model used. The large square brackets down the left hand side along with the OxCal keywords.

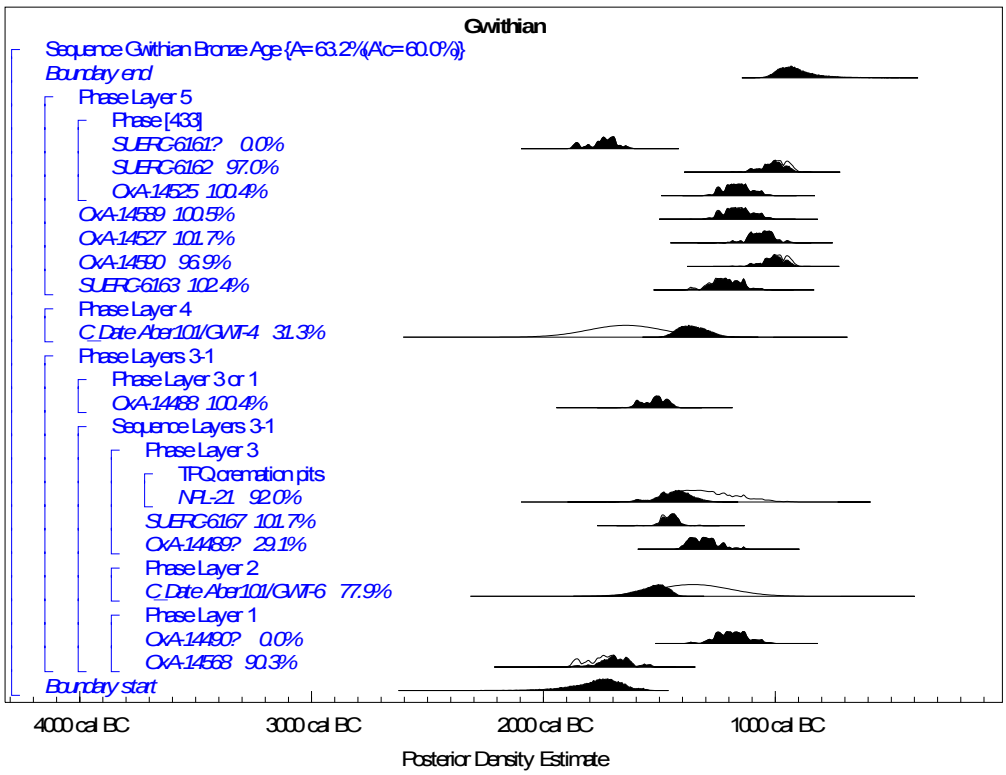

Figure 3 Probability distributions of dates from Gwithian (Bronze Age Layers): each distribution represents the relative probability that an event occurs at a particular time. For each of the radiocarbon and OSL dates two distributions have been plotted, one in outline, which is the result of simple calibration, and a solid one, which is based on the chronological model used. A question mark (*?*) indicates that the result has been excluded from the model. The large square brackets down the left hand side along with the OxCal keywords.

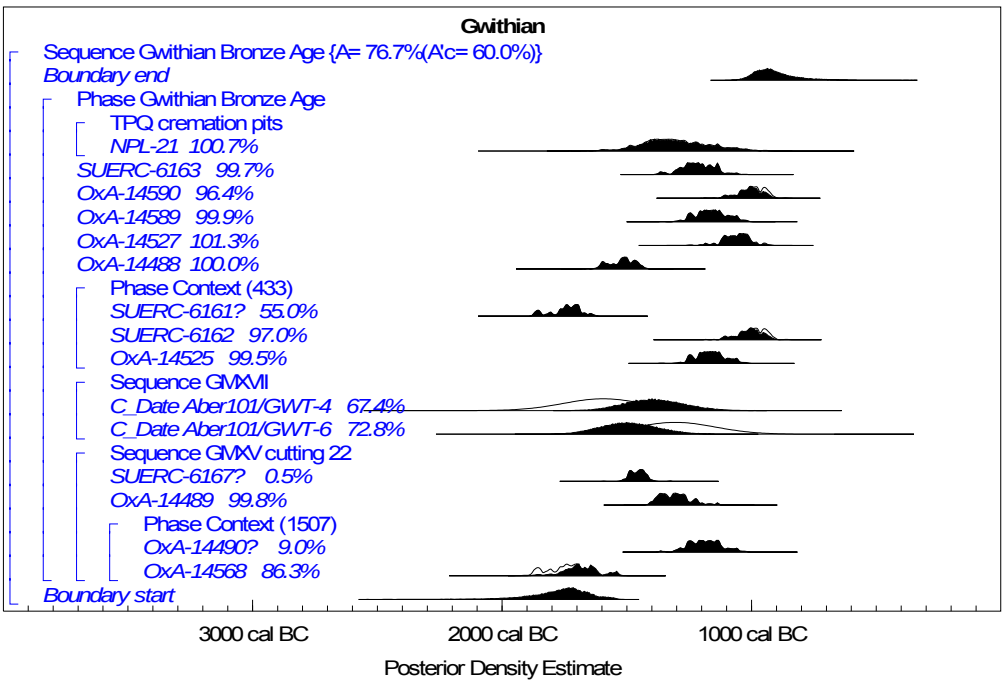

Figure 4 Probability distributions of dates from Gwithian (Bronze Age Contexts): each distribution represents the relative probability that an event occurs at a particular time. For each of the radiocarbon and OSL dates two distributions have been plotted, one in outline, which is the result of simple calibration, and a solid one, which is based on the chronological model used. The large square brackets down the left hand side along with the OxCal keywords.

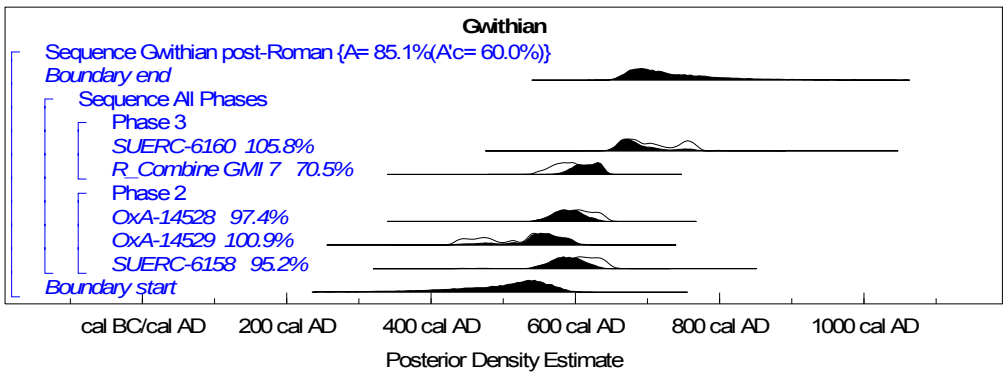

Figure 5 Probability distributions of dates from Gwithian (post-Roman Layers): each distribution represents the relative probability that an event occurs at a particular time. For each of the radiocarbon dates two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model used. The large square brackets down the left hand side along with the OxCal keywords define the model exactly.