

**Report on the Excavation of a 17<sup>th</sup> Century  
Lime Kiln at Town's Piece,  
Kilnsey, North Yorkshire, 2007**



**Report on the Excavation of a 17<sup>th</sup> century Lime Kiln at  
Town's Piece, Kilnsey**

**2007**

**David Johnson**

**AN INGLEBOROUGH ARCHAEOLOGY GROUP PUBLICATION**

**2008**

## Ingleborough Archaeology Group

Published 2008 by Ingleborough Archaeology Group  
Ingleborough Community Centre, Main Street, Ingleton  
via Carnforth LA6 3HG

Copyright © 2008 Ingleborough Archaeology Group  
and David Johnson

Ingleborough Archaeology Group gratefully acknowledges financial assistance from the  
Northern Mines Research Society for this project

## CONTENTS

	<b>Page</b>
Summary	5
List of Illustrations	5
1 Site Location	6
2 Aims and Objectives	6
3 Topography	7
4 Historical Background	7
5 Methodology	8
6 Excavation Results	9
7 Finds Report	16
8 Discussion and Interpretation	22
9 Conclusion	26
10 Notes	26
11 Personnel	26
12 Appendices	27
13 Illustrations	30

## ILLUSTRATIONS

- 1 Magnetometer plot
- 2 Resistivity plot
- 3 Topographic survey plot
- 4 Final excavation plan
- 5 Pre-excavation earthwork
- 6 Bowl wall (802) and bowl floor (810)
- 7 Stoke-hole (808) and flue (813)
- 8 Capstones to stoke-hole (813)
- 9 Limeash laminations (807)
- 10 Limeash spread (806)
- 11 Selected small finds
- 12 Selected small finds

## SUMMARY

*As described in the Summary to the Ingleborough Archaeology Group's publication on the Sow Kiln Project, five clamp - or sow - lime kilns were excavated through 2005 following on from the discovery of a well-preserved clamp kiln on the Group's Broadwood excavation site in 2003. The main project aimed to identify the form and structure of clamp kilns in the Yorkshire Dales, to see if they conformed to the Broadwood type, and to develop a typology of technology for such kilns.*

*In the autumn of 2006 this writer, the Project leader and excavation supervisor, was invited by Sonia Wilkinson to look at a shallow bowl-shaped hollow at the north end of a field called Town's Piece within the village of Kilnsey. It was felt that this might be a similar kiln.*

*Excavation, which took place in late August and early September 2007, unearthed a well-preserved example of a clamp kiln, clearly a lime kiln, complete with external flue and internal stoke-hole arrangement. Archaeomagnetic dating placed the final firing of the kiln between 1620 and 1670, contemporary with the rebuilding of Kilnsey Old Hall in 1648.*

*A large assemblage of artefacts was recovered from within the primary fill, including ceramic, glass, metal and animal bone. One horse mandible and some horse teeth were found, displaying no signs of butchery, possibly hinting at a connection with ritual horse burials from two kilns from the 2005 excavation season.*

## **1. SITE LOCATION**

The field is named Town's Piece on the 1845 Kilnsey Tithe Award and it is now owned by the Conistone and Kilnsey Parish Meeting. It lies between the fish ponds of Kilnsey Park and the modern line of Mastiles Lane. The excavation site lies at the north end of the field, at grid reference SD97282 67795, at an altitude of 195m OD. The kiln sits immediately south of and below a field wall which here is held together by lime mortar.

## **2. AIMS AND OBJECTIVES**

Excavation of this kiln followed on from the Group's two-year Sow Kiln Project which ran from 2005 to 2006, and this report acts as an adjunct to the main report on that project.<sup>1</sup> It is felt that the aims of that work were achieved, namely:

1. determining that the excavated kilns did not fit into the then accepted clamp kiln norm;
1. determining whether each of the kilns was a lime kiln rather than some other category of structure;
3. identifying the form and structure of each kiln;
4. determining if the Broadwood kiln was unique in North Craven in form and structure;<sup>2</sup>
5. disseminating the results of the work as a technical report and by public talks and articles.

In brief, five of the six sites excavated were proven to be lime kilns with the last site, on Stainton Moor, being a probable prehistoric pit of doubtful provenance; in each case excavation was able to provide sufficient evidence of form and structure; and a typology of technological development of clamp kilns is being recognised. The report was published, as stated above, and various short articles have been published.<sup>3</sup> In addition, the project leader was a finalist at the 2006 Awards for the Presentation of Heritage Research in Norwich, speaking on the project, a talk which spurred the commissioning of an article by the editor of *Current Archaeology*. In August 2007 the project leader was invited to the national conference of the Association for Industrial Archaeology to receive their *Fieldwork and Recording Initiative Award* in recognition of the quality of work done in the field and in the report by the Group. An article is also in preparation, at the time of writing this report, for inclusion in the AIA's journal *Industrial Archaeology Review*.

The specific aim of the Kilnsey excavation was to investigate the possibility that the feature - if excavation proved it to be a lime kiln - might be contemporary with either the rebuilding of Kilnsey Old Hall in 1648 or with monastic occupation of this important Fountains Abbey grange. If a firm dating were achievable, the detailed form of the kiln could enable the provisional typology to be refined.

### **3. TOPOGRAPHY**

Town's Piece lies on a gently sloping incline, dipping down from north-west to south-east, at the foot of the steep slopes below Low Ox Pasture, slopes which are covered in their upper reaches by loose limestone scree. The kiln bowl was cut into a low natural bank, now edged with a mortared stone wall, that extends north-west from the kiln through a small paddock within which rank vegetation growth precludes identification of any topographical or archaeological surface features. A narrow and shallow linear depression runs in a direct line from the base of the scree towards the north-west wall of this paddock, with the hint of low banking parallel to the depression on its eastern side. Below the kiln site the incline is minimal for 50 metres or so before dropping off more steeply down to the fish ponds.

The track that runs alongside the kiln, on its southern flank, from the Old Hall into the wood, is the original line of the monastic Mastiles Lane, part of the major artery from Fountains Abbey across the Dales.

No archaeological surveying has been undertaken in Town's Piece but various earthworks can be made out to the south-east of the kiln site, representing possible building platforms and the footprints of actual built structures such as a lead smelting mill and corn drying kiln.

### **4. HISTORICAL BACKGROUND<sup>4</sup>**

A detailed overview of the history of lime burning and early lime kiln forms was provided in the technical report to the main project and will not be repeated here.<sup>5</sup>

Land at Kilnsey was granted to the Cistercian monks of Fountains Abbey in 1150 and 1156 by William de Forz, son of Duncan and nephew of the King of Scotland and his wife Alice de Romille. Other lesser landowners also granted lands to the abbey in the locality. Owing to its location on a major north-south highway, Kilnsey was developed as the main grange and administrative centre for Fountains' vast estates in the Yorkshire Dales which stretched right across Malham Moor beyond Malham Tarn, across Fountains Fell into Littondale, and to the east of the Wharfe valley. The monastic complex here is said to have consisted of a hall, chapel, domestic quarters for the lay brothers, bakehouse and other logistical buildings as well as a complex of farm buildings and stores, industrial mills and workshops, and fish ponds. There are documentary records proving that lime was being burned at Kilnsey during the mid-15<sup>th</sup> century, and despatched from there.<sup>6</sup>

For almost 200 years Fountains' lands in the Dales were held as demesne, worked by and for the abbey by lay brothers, farm labourers and servants, but the series of disasters that occurred through the first half of the 14<sup>th</sup> century led to a change of strategy. Scots raids, probably brought about by severe climatic deterioration, affected much of the Dales, and these two series of events in turn led to harvest failures and consequent famines and epidemics of human and animal diseases. During 1349-50 the monks and lay brothers were decimated by plague.

A severe shortage of labour ensued as the number of lay brothers and labourers had fallen below the sustainable level. The decision had been taken, and permission secured from Bernard of Clairvaux in 1336, to demise their lands for not more than five years, but

permanent change to Kilnsey's status came in 1363 when the abbey was granted licence to transform Kilnsey into a *vill*. The former farm labourers now became monastic tenants, working the land and tending their own flocks, paying annual rent to the abbey while also being paid to tend stock belonging to the abbey. Eight tenements were thus created in and around Kilnsey.

Following the Act of dissolution of monastic foundations in 1536, all Fountains' properties, including Kilnsey, were sold to Sir Richard Gresham, a rich London merchant, who probably saw his purchase as a lucrative but temporary investment opportunity and much of value was quickly sold off. In 1547 the property here was sold on to the Yorke family. By the middle of the following century, however, Christopher Wade was in possession of Kilnsey and it was he who rebuilt the monastic hall in 1648. Three generations of Wades occupied the hall until 1693 but after that it was let out until 1745 when the last of the male line, Cuthbert III, died without issue in 1745. The hall then fell into disuse as a residence and was consigned to use as a slowly decaying agricultural building until being rescued in 1999 by Sonia and Timothy Wilkinson who returned it to its former residential status following the lines of the original layout of the 1648 rebuilding.

Kilnsey's industrial functions continued into early modern times. In 1735 a lead smelt mill was commissioned for the Duke of Devonshire within Town's Piece, to the south-west, to work ores mined to the north-west of the village and in Littondale. This closed down in the mid-19<sup>th</sup> century. The Tithe Map (dated 1845) shows a corn drying mill within Town's Piece, again south-west of the kiln site. The most recent - and most intrusive - element of the village's industrial past is Cool Scar Quarry which produced crushed limestone from sometime in the 19<sup>th</sup> century (the first definite date is 1880) until closure in 1998, and the tarred road past Kilnsey Old Hall was created as the quarry access road.

## **5. METHODOLOGY**

### **Geophysics**

An initial geophysical survey of a 10m by 10m square was carried out by the IAG's Arthur Batty in the summer of 2006, using a Geoscan Fluxgate gradiometer model FM36, with readings logged at half-metre spacing. The plot proved indecisive with high readings only apparent at the foot of the field boundary wall and at the south-central part of the area surveyed (Fig.1). It was not possible to identify any bowl form from this plot. A further geophysical survey was carried out by Dr Roger Martlew of the UWHG in August 2007. A magnetometer survey was completed using a Geoscan FM256 gradiometer and a resistivity survey using a Geoscan RM15 instrument. This was rather more useful in that higher readings did congregate in a generally circular form (Fig.2). As the geophysical trace for a proven sow kiln site from the 2005 excavation programme was also inconclusive, the lack of a strong signal at the Kilnsey site was not seen as a setback.<sup>7</sup>

### **Topography**

A topographical survey of the site was also undertaken by members of the UWHG using two Thales ProMark 3 GPS receivers. The resultant plot clearly shows the form of a bowl

with a surrounding penannular bank and an entrance on the lower side (Fig.3). Heights were fixed with a Quickset level and staff on a 1m grid.

## **Recording**

Trench recording was carried out following the IAG's context recording system based on that used by English Heritage's Centre for Archaeology, using context record, photographic record and object *proforma* sheets. A comprehensive photographic record of digital colour images and 35mm colour slides was compiled (see Appendix 1). The structure was planned on completion of the excavation phase. All finds were logged, bagged and processed by members of the Group. Bone was examined by Andy Bates and non-bone finds by Chris Howard-Davis, both of Oxford Archaeology North.

## **Excavation**

The actual excavation phase was undertaken over five days between 30<sup>th</sup> August and 5<sup>th</sup> September 2007 while final recording and planning were done on 12<sup>th</sup> and 13<sup>th</sup> September.

All work was carried out manually, including de-turfing and backfilling, to avoid compromising the site. Excavation utilised 100mm pointing hand trowels, hand shovels and buckets, with limited use of a mattock on consolidated primary backfill material within the kiln bowl. The final plan was drawn in the conventional manner using a square 1m by 1m drawing frame, tapes, plumbline, pegs and cord.

Weather conditions throughout were ideal with no rain at all – most days were bright, warm and wind-free.

## **Archive**

A site archive was maintained and it has been added to the main Sow Kiln Project file, stored at the Ingleborough Community Centre in Ingleton, and it can be accessed by arrangement with the Centre Manager. Artefacts from the excavation are to be deposited, by arrangement with Conistone and Kilnsey Parish Meeting, at the Craven Museum in Skipton.

## **6. EXCAVATION RESULTS**

*See Appendix 2 for Context descriptions.*

### **Narrative**

Plan reference no. 1526 (Fig.4).

The site is centred on NGR SD97282 67795, and it showed on the ground as a very shallow, almost imperceptible, depression cut into banking at the head of Town's Piece (Fig.5) It was surrounded by a vague penannular bank which was broken at the lower side of the feature by a funnelled entry point.

The original intention was to open up a trench taking in 50 per cent of the area of the assumed structure. Prior to excavation it was not known for certain that the hollow

represented anything let alone a lime kiln. Trench 8 was marked out 6m on the long axis and 2.50m on the shorter axis, aligned north-west to south-east. The western half of the depression was opened up, though there was no specific reason for this choice. As excavation proceeded it became apparent that the structure was indeed a lime kiln with well-preserved features *in situ* so the decision was taken to open up the full extent of the kiln. This entailed extending the trench to the east by 1.50m along a length of 3.40m, and this was given the annotation E2. A further small extension was also made towards the north-west corner of the original trench, running 850mm along the north edge of the original trench and 780mm from the edge. This was designed to determine if the cobbled layer identified within trench 8 underlay the boundary wall: this small trench was noted as E1.

After completion of the excavation and planning phases, the high magnetic anomaly outside the trench was investigated by lifting the turf off an area 560mm by 560mm, 100mm beyond the southern edge of the main trench. This was denoted E3.

Topsoil (context 800) was removed from the entire trench: its depth varied from 24mm outside the kiln bowl to 155mm in the bowl centre. Quantities of burnt limestone, burnt lime and lime mortar, as well as fragments of lime mortar, coal and charcoal, were recovered from within 800 thereby rapidly confirming the likelihood of the structure as a lime kiln.

Removal of 800 revealed a cobbled area (801) that covered the entire area of the original trench and extensions outside the bowl, excluding the part that lay south of the kiln. It appeared as a broadly even surface with small sub-angular limestone cobbles of more or less uniform size with an average long axis of 100mm. At least 90 per cent of the area of 801 consists of such stone. The context was not excavated further, as it appeared to have been laid on top of the banking thrown up by excavation of the kiln hollow during its initial construction. The cobbles are generally well-compacted. No finds came out of 801.

The facts that the cobbled layer extended round the entire bowl, except at its entry point, and that it was even in form, were interpreted as its having been a working surface - the kiln *bed* - constructed to provide a firm and dry surface for loading and unloading the kiln. It would also have helped to prevent collapse at the edge of the kiln when stone and fuel were brought down by sled or cart.

During construction an oval hollow was cut into the pre-existing slope to accommodate the kiln. This cut was then graded to an angle of 70 degrees from the horizontal and the bowl wall (802) was built of coursed limestone blocks with a small number of sandstone blocks inserted at intervals, apparently randomly (Fig.6). The bowl rim had either been deliberately slighted or had decayed during the primary backfilling process. In terms of surface area the banking consisted of over 90 per cent angular limestone pieces of variable size pressed into the surface: this was interpreted as bank revetment behind the coursed facing stones. At the rim the bowl is 2.60m in diameter from north-west to south-east and 2.90m west to east, making it oval or sub-rounded with a circumference of 8.70m. The bowl depth at centre, measured from turf level to floor, is 1m with a further 600mm from floor level to the base of the stoke-hole (811), making total depth 1.60m.

At floor level (810) the bowl has a basal circumference of 6.50m (Fig.6). The floor was not excavated, to avoid compromising the kiln's structural integrity, but it is clearly

composed of compacted clay, at least in its upper layer. What lies below this is unknown. The base of the kiln bowl is at a higher level, by 600mm, than the actual base of the cut hollow. Observation within the internal stoke-hole (see below) confirmed that the bowl lining extends beneath the bowl floor to the base of the cut, on a gradually declining angle of slope. The floor, especially on the eastern half of the bowl, is plastered with a veneer of burnt limeash and fuel residue. Each half section of the floor, either side of the stoke-hole, is 700mm in diameter laterally but slightly irregular in longitudinal diameter: 1.80m along the western edge of the stoke-hole and 2m on the eastern, though overall floor diameter is 2.20m. Charcoal fragments, some pot sherds and animal bone were recovered from the floor surface.

Built across the base of the hollow, and seemingly cut into the bowl floor, is the internal stoke-hole (809). It was lined with coursed walling, built drystone, mainly of limestone with some sandstone and the odd gritstone cobble intermingled (Fig.7). The external flue dips down into the bowl and continues as the stoke-hole within the bowl. The height of the retaining walls varies from 550mm to 600mm and width averages 500mm throughout. The east wall of the flue extends further out from the bowl than its western counterpart, which latter was buried at the outermost end by a build-up of red burnt material. The total length of the flue passage and stoke-hole together is 3.75m.

Both flue passage and stoke-hole have a floor (811) composed of compacted clay, with a surface layer of deep-red burnt soil and fuel residue (808) covering the floor of the external flue. This extended outside the flue as a lens spreading westwards from the flue entry point. No finds were recovered from 808 or 811.

Within the bowl the stoke-hole had been capped with a series of sandstone slabs laid flat as capstones or lintels. Three such slabs (813) remain *in situ* (Fig.8). These three were slightly offset to the east of the line of the stoke-hole, for no apparent logical reason. The three capstones had the following dimensions, slab 1 being at the back of the kiln with 2 and 3 being more to the centre of the bowl:

Stone	Length	Width	Thickness
1	570mm	-	180mm
2	740	200mm-280mm	190mm
3	660	160mm-210mm	180mm

A fourth sandstone capstone had been split in half, laterally, with the western half still *in situ*. This measured:

4	280mm	60mm-110mm	255mm
---	-------	------------	-------

Two other broken capstones, lying between numbers 3 and 4, had been displaced probably during primary backfilling of the kiln some time after abandonment and lay within the stoke-hole passage.

Between each capstone there was a narrow void running the full length of each stone but there was no such void between capstone 1 and the bowl wall. All four surviving capstones showed signs of prolonged heating to high temperatures.

Towards the south-west corner of the trench, within the cobbled surface 801, was a triangular lens (803) within which the cobbles had been packed with particles of gravel, averaging 5mm in diameter. This material did not extend across the whole of 801 so it cannot be interpreted as later inwash deposits, rather it may have been packed in to give the cobbled layer a more even and regular surface.

It was apparent from the excavation of the external flue that there had been multiple firings of the kiln: the last three firing events were recognised by alternating laminations of white limeash and red fuel residue in a section on the east wall of the flue passage (Fig.9). The entire flue and the outer part of the stoke-hole contained the residue of the ultimate firing as a deposit of white compacted limeash (807) that had not been scraped out when the kiln was last fired. These deposits were 2.20m in length, 570mm in width, and from 220mm to 280mm in depth with the thickest deposits being contained within the outer and uncapped section of the stoke-hole, suggesting that for the last firing the missing capstones were not replaced. The deposits contained much charcoal material, as well as some pottery and part of the femur of a large cow.

Similar deposits, consisting of congealed limeash and red burnt material, coated the lower courses of the bowl wall, particularly at the rear but extending round the entire circumference. This was interpreted as the residue of the last firing(s) of the kiln.

At each drawing of the kiln - or at least after the latest phase of firings - the limeash residue was scraped out of the stoke-hole and up the flue passage out of the kiln. Rather than being disposed of it was left as a cream-white spread (806) covering the south-west corner of the trench (Fig.10). It measured 1.55m in length from east to west with a north-south width varying from 280mm to 940mm; it was uniformly 150mm in thickness. The limeash here was completely solidified. This spread extended 230mm to the south-west beyond the edge of the trench, under the unexcavated turf layer. The spread was not cut into, being so hard, so no conclusion can be made concerning what may lie below it.

At some point after abandonment of the kiln the bowl was deliberately and completely filled in, almost removing all trace of the bowl. This infill (804) consisted of angular limestone cobbles of variable size, averaging 120mm in long axis length. Whether or not the smaller stone had originally been intended as material to be burned could not be ascertained. In thickness 804 was 1.45m at the maximum in the centre of the bowl and tapered out towards the upper part of the bowl wall. Large quantities of artefacts were taken out of 704 during excavation (see Section 7 and Appendix 3), including charcoal and coal, large quantities of pottery and bone, glass fragments, metal objects and burnt stone.

Possibly at the same time as the bowl was infilled the area outside the flue was also levelled off. In the south-west corner of the trench the limeash spread (806) lay immediately below topsoil 800 but in the south-east corner the ground was at a lower level: this had been levelled off with a deposit of limestone cobbles (805), averaging 140mm in long axis length. No artefacts came out of 805.

## **Discussion**

The kiln under review, though unpromising prior to excavation because of the vagueness of the earthwork, proved to be the most impressive of all the kilns investigated in the

project and is on a par, one could argue, with the initial kiln excavated as part of the Broadwood Project.

### Size

All seven kilns excavated during the project had different sizes both in diameter and depth, as shown below:

Site	Site Code	Trench Diameter at rim	Depth at Centre
1	CLD	1	2m
2	NC	2	2.50m
2	NC	3	2.50m
3	TC	4	2.80m
4	FN	5	3.80m
6	KY	8	2.60m x 2.90m
- <sup>b</sup>	BBW	-	2.20m

<sup>a</sup> depth given is to the bowl floor; full depth to the base of the stoke-hole is 1.60m.

<sup>b</sup> The Broadwood kiln excavation was a precursor to the Sow Kilns Project.

The diameter of the Kilnsey kiln (KY), rounding it off to 2.75m, is slightly greater than the average for the seven sites of 2.65m though the difference has no statistical significance. This kiln, however, stands out as it is the only one that was not constructed with a round rim. In planform it cannot be accurately described as oval but it is certainly not circular: rather it can perhaps be best described as sub-rounded. The rear wall was slightly flattened and thus a little longer than the side walls. The volume of the bowl, assuming it was levelled off at the ground surface, has been computed at 4.50m<sup>3</sup>.

The Kilnsey kiln's depth, measured at the centre point to the bowl floor rather than the bottom of the stoke-hole, conforms to the average for the data set of 1.03m.

Significant differences are apparent when flue lengths are compared. Measurements are available for four of the sample (CLD, FN, KY and BBW) and Kilnsey has the longest combined internal stoke-hole and external flue, totalling 3.75m, much greater than the average length of 2.97m. Stoke-hole depth was almost identical to that at site 1 (c600mm) but greater than in the other two kilns, while width within the stoke-hole was above average. The depth of the external flue, though, was greatest in the Kilnsey kiln and the fall from the rake-out area to the bottom of the flue stood out in terms of its acute angle: in the other excavated kilns the flue was more or less horizontal or slightly dipping down into the kiln.

### Structure

The kiln bowl was entirely lined with coursed walling, built drystone, composed largely of limestone cobbles with the occasional use of sandstone and gritstone. When excavated, the lining was found intact except around the rim where there had been some slippage and loss of stone, probably during initial backfill of the abandoned kiln. The angle of slope of the wall was 70 degrees making it considerably steeper than in either the Broadwood (BBW) or Chapel le Dale (CLD) kilns, both of which were set at 40 degrees.

### *Airflow*

The Kilnsey kiln was unique in the sample in one respect, namely the manner in which the stoke-hole had been constructed. Five of the kilns had such a structure either in place or in a ruinous but recognisable condition (CLD, NC trenches 2 and 3, FN and BBW). In each case the stoke-hole had been seated on the floor of the kiln and stood proud of it, resembling a raised culvert. In each case the structure consisted of two lines of rough sandstone blocks with large pieces of limestone (often slabs of limestone pavement) laid on top, though with the side blocks protruding at each side of the capstones. Between the sandstone blocks and between the limestone slabs there were voids down into the stoke-hole. Such features were historically sometimes referred to as a *feather* or a *horse*. The term feather presumably derives from the resemblance between a bird feather and the stoke-hole, each having a central spine with appendages to each side; and the term horse to the resemblance with old-fashioned ridged clothes-horses. Neither of these old terms has been used in this report so far because the stoke-hole here resembled neither a feather nor a clothes-horse; it had been constructed in an entirely different style. Here the feature had been built on the floor of the hollow but the side walls were continuous and coursed like any section of drystone wall. The space between each wall and the bowl lining had been packed with fill material, not excavated therefore of unknown contents, and levelled off at the top of the side walls, leaving the stoke-hole as an incised channel. Large slabs of semi-dressed sandstone had been laid across the top of the walls, level with the bowl floor which had been finished off with compacted clay. This stoke-hole, therefore, did not sit proud of the bowl floor but was recessed within it.

The purpose of the stoke-hole was twofold: it allowed oxygen from the external flue into the heart of the bowl to maintain a regular burn with air entering the bowl through the lateral and top voids between the side and top slabs; and permitted ash and lime residues to drop down into the stoke-hole out of which they could be raked once the bowl had been emptied after each firing event. The Kilnsey kiln operated in quite a different way. Here, the only voids were between the capstone slabs and they were so narrow that they would readily have choked up with limeash thereby impeding airflow into the kiln. Such an arrangement cannot have been as efficient as the more commonly found type of stoke-hole. It would, though, have made the task of cleaning the bowl easier. Very little limeash would have fallen into the stoke-hole, as confirmed by the still-capped section of stoke-hole being empty of such material during the excavation. This kiln had a flat and level floor, unlike the other five, and all waste could easily have been scraped out of the bowl into the external flue from which it was then drawn up onto the spread (806) found outside the kiln. Thus, this kiln may have been less efficient in terms of airflow but more so in terms of labour.

### *Raw Material*

All of the kiln's last burn had been removed after the last firing though sufficient pieces of part-burnt or unburnt limestone were recovered from the post-abandonment backfill. They were variable in size but all were angular. It was concluded from examination of the stone that it had been sourced from natural scree to the north-north-west of the site below Low Ox Pasture. Scree has been recognised as the source of raw material for many putative clamp kiln sites identified by this writer across the Dales.<sup>8</sup> It was described above that a linear shallow depression - a vague open gully-like channel with an apparent low banking along its eastern edge - runs in a perpendicular manner from the

base of the scree to the foot of the hill slope in a direct line with the kiln, though the enclosure between the slope and the boundary wall adjacent to the kiln is too overgrown to permit examination of whether the channel continues through it.

If the hypothesis that the scree was the source of stone is correct, the only realistic means of moving the stone from the scree to the kiln would have been by horse-drawn sled. The angle of slope is much too steep for heavily laden packhorses or horse-drawn carts to have been used, and both distance and gradient are too great for stone to have been barrowed by hand. On a steep slope such as this there would always have been the danger of the sled slewing laterally, with possibly disastrous consequences for the horse, so low retaining banks were often thrown up alongside sledways to prevent this happening. The linear depression and adjacent low bank could conceivably be the remnants of a sledway and retaining bank to transfer stone from source to kiln.

### *Fuel*

Fragments of coal and charcoal were recovered during excavation from contexts 800 (topsoil), from all levels within 804 (post-abandonment backfill), and from 807 (lime and fuel residue within the flue channel) and 810 (the floor of the bowl). In addition pieces of carbonaceous shale from the Yoredale Group of rocks were found. These occur naturally on the high fells within the Dales where they were extracted as poor quality coal, often described in contemporary records as lime-coal. The nearest outcrops to Kilnsey are to the east of Wharfedale and on Threshfield Moor to the south.

One sample of charcoal (small finds number [sfn] 1580, Fig.11) was examined microscopically by the Group's Arthur Batty and found to be ash (*Fraxinus* sp). This had most probably been used as kindling at the start of the kiln's last firing event.

### *Dating Evidence*

As the kiln was so well preserved, and considered to be such an important site for developing a clamp kiln typology, it was decided that archaeomagnetic dating should be possible. Mark Noel of GeoQuest Associates was commissioned to carry out the exercise (he had carried out similar tests on the BBW and TC kilns) on behalf of the Group, and a date range for the last firing of the kiln was obtained between AD1620 and 1670 (Appendix 4). This technique cannot pin an event down more precisely than over a 40 to 50 year span. It is stressed that the date range obtained is for the last firing event: it does not inform the total period over which the kiln was used, or the date of its first firing.

The excavation produced an exceptional number of artefacts (see Section 7) which could help in dating the kiln, either broadly or more specifically, but a note a caution is necessary. The artefacts in themselves cannot date the period over which the kiln was used, nor can they date the last time the kiln was fired up, simply because they were all deposited within the kiln after abandonment. What they can provide is a *terminus post quem* for the last firing: any date obtained for a given artefact indicates when the kiln was already out of use. A tight date for a given artefact would pinpoint the *terminus post quem*; a broad date range, however, would be of only marginal value in fixing the time of abandonment.

Taken together, though, the archaeomagnetic date and dating of specific artefacts do provide useful information in developing a typology. Further dating evidence could have been obtained by carbon dating charcoal samples from within the kiln but it was felt that this would add nothing significantly different from the archaeomagnetic date. Had the latter been unsafe, carbon dating would have been commissioned.

## **7. FINDS REPORT**

### **a. Bone**

All bone material was scanned for assessment by Andy Bates of Oxford Archaeology North and described by species group. Recording included the identification of elements present and interpretation of any butchery marks. This report has been written by the Site Supervisor from notes provided by Andy Bates.

A total of 258 individual bone fragments were recorded, all being animal bone. Half of them could not be identified to a specific species, hence the designations 'medium mammal' and 'small mammal', with sixteen of these being too small and degraded to identify at all. Of the fully identifiable remainder 40 per cent were from dog, 25 per cent cattle and 22 per cent sheep or goat (probably the former). Only four bone fragments from the entire sample showed any signs of butchery and it is difficult to interpret how and why the assemblage came to be in the kiln backfill (804). The smallest fragments could have been introduced by predator or scavenging animals but the larger ones can only have been thrown in, especially the larger fragments at lower levels within 804.

Two of the kilns in the sample excavated (NC trench 2 and FN) contained partial horse burials, including the skull in each case, which can only be interpreted from the perspective of ritual, closure behaviour.<sup>9</sup> It might be deemed attractive to assume that the finding of two horse mandibles complete with some teeth in the Kilnsey kiln also represented a similar behaviour pattern but this would be a premature conclusion to draw. The evidence here is just not convincing enough.

The full assemblage is listed below:

#### **Cattle**

- 1 atlas - split longitudinally but butchery for such is not obvious
- 5 mandible fragments, one identifiable from an adult animal by the wear patterns of the teeth
- 3 mandibular loose teeth
- 4 maxillary loose teeth
- 2 incisors
- 1 radius
- 1 femur
- 1 tibia
- 2 metatarsals - 1 chopped for dismemberment
- 2 metacarpals
- 1 metapodial
- 3 astragalus
- 3 carpals
- 1 3<sup>rd</sup> phalanx
- sfn 1583 - femur of smallish dog

sfn 1628 - femur of large cow, gnawed by dog, with dismemberment cut marks and filleting marks

### **Horse**

1 mandible fragment and 4 mandibular loose teeth, all probably from the same jaw  
sfn 1585 - horse mandible, no butchery marks

### **Sheep/goat**

2 mandibles, 1 aged 3-4 years and 1 aged 6-12 months by the pattern of tooth wear  
1 maxilla  
11 loose maxillary teeth  
7 loose mandibular teeth  
1 humerus  
2 tibia  
1 calcaneum  
1 metacarpal  
1 metatarsal

### **Pig**

1 atlas (1<sup>st</sup> vertebra)  
3 maxilla fragments  
3 loose maxillary teeth - including 1 canine (male)  
1 incisor  
1 radius

### **Dog - remains probably of two individuals**

1 axis (2<sup>nd</sup> vertebra)  
4 mandibles  
3 loose teeth  
1 scapula  
4 humeri  
2 radii  
2 ulnas  
6 femur fragments (probably from 4 femurs)  
4 tibias  
3 rib fragments - probably from dog  
3 rib heads - identifiably dog  
15 vertebrae  
2 sacrum pieces  
sfn 1583 - femur of smallish dog

### **Rabbit**

1 Femur

### **Gallioformes**

2 tarso-metacarpus - domestic fowl size  
1 femur - domestic fowl  
2 tiobio-tarsus - goose size.

### **Medium Mammal**

1 rib fragment  
3 vertebrae  
10 unidentified fragments

### **Large Mammal**

11 rib fragments, with only 3 rib heads  
6 vertebrae - 2 chopped longitudinally  
81 unidentified

### **Unidentified**

16 fragments  
sfn 1573 - tibia of cow, gnawed by a dog

On the advice of Andy Bates only those bone fragments with recorded small finds numbers have been retained within the excavation archive.

### **b. Non-Bone**

*See Appendix 3 for the full database.*

All non-bone artefacts were examined and identified by Chris Howard-Davis of Oxford Archaeology North. This report has been written by the site supervisor from notes and discussions arising out of that examination. The following table summarises the non-bone artefact assemblage:

<u>Artefact type</u>	<u>Number of artefacts</u>
pottery	387
glass	8
metal	34
clay pipe	16
shell	2
tile	3
<u>total</u>	<u>450</u>

In addition, samples of burnt material (limeash and clinker) and fuel (coal, charcoal and carbonaceous shale) were recovered from the kiln, as discussed on page 16.

The total assemblage can only be described as exceptional in terms of quality and variety of artefacts for a feature such as a small lime kiln and, clearly, they had no connection with the running of the kiln. All objects recovered from the structure were post-depositional and have some relevance to dating its operative years.

### **Pottery**

By far the largest number of artefacts consisted of pottery which accounted for 86 per cent of the total assemblage. This was made up of sherds from a wide variety of vessel types and fabrics with an overall date range extending from the medieval era to the 19<sup>th</sup> century, though the dominant period was late 16<sup>th</sup> to early 18<sup>th</sup>. Most of the assemblage

was derived from the primary post-abandonment backfill of the kiln bowl (804) and was consequently highly mixed with no recognisable stratification by date: medieval material occurred intermingled with early modern throughout the bowl's vertical extent. All pot finds have been dated by Chris Howard-Davis, as outlined below, and the extent to which they inform dating of the kiln is discussed in detail in Section 8.

The majority of sherds were small in size, as though the pots had been deliberately smashed by having been thrown into the abandoned kiln bowl, and in no case was it possible to reassemble any vessels from surviving sherds. As so often in archaeological excavations, one is left wondering what happened to those sherds not deposited here. Partial reconstructions were undertaken of several vessels and these are listed below:

Sf no.	No. of sherds	Description	Vessel type
1556	2 - body	Slip-decorated ware	dish
1556	2 - body	Slip-decorated ware	dish
1556, 1620	2 - body	Slip-decorated ware	dish
1611	2 - rim	Slip-decorated ware	dish
1611	2 - base	Slip-decorated ware	dish
1525, 1548	2 - rim	BGRW	dish
1566	3 - body, rim	BGRW	storage jar
1590	6 - body	BGRW	
1593	2 - body	Brown-glazed slip-decorated	teapot
1555, 1563, 1604	3 - base	BGRW	jug
1628	13- body, rim	BGRW, hard-fired	bulbous jugs
1628	8 - body, rim	Midlands purple-type	bulbous jug
1628	5 - body, rim	Midlands purple-type	jug

All pot artefacts are itemised in the database (see Appendix 3) and this narrative concentrates on the more significant types within the total assemblage. More than half of all sherds were Black Glazed Redware (BGRW) though many different vessels were represented within the collection (Fig.12). The size and form of individual sherds suggested they were mainly from jugs or storage vessels with some dishes, but thickness, diameter and detailed shape varied markedly, and the quality of the vessels ranged from the common utilitarian to the well-to-do domestic. The BGRW tradition developed in the latter stages of the 16<sup>th</sup> century though most of the sherds in this assemblage have been ascribed to the 17<sup>th</sup> or early 18<sup>th</sup> with the notable exception of sfn 1531 which is part of an 18<sup>th</sup> or early 19<sup>th</sup> century pancheon, probably brought in from the Buckley production centre in Flintshire, and sfn 1590 which was part of a very hard-fired late 16<sup>th</sup> century vessel. Some sherds had orange fabric while others were purple, reflecting variations in firing procedure and the degree of oxidisation and, quite possibly, hinting at differing production centres.

The second largest collection consisted of Metropolitan-type ware sherds, probably fairly locally-produced imitations of pottery originally manufactured in the Harlow area, though with the possibility that they may be early examples of Staffordshire ware. Twenty-one sherds made up this part of the assemblage but four different designs were represented within it, all having a relatively fine oxidised fabric with slip-trailing and colourless glaze

applied (Fig.13). Obviously these sherds represent several individual pots, mainly shallow dishes. All, though, are considered to be of high status.

Manganese-mottled ware was represented by 18 sherds from more than one storage jar, sfn 1562 consisting of 16 non-joining sherds from the same vessel (almost certainly a cup), dating from the late 17<sup>th</sup> or early 18<sup>th</sup> century.

A further pottery type was well represented in the assemblage with 14 Midlands purple-type ware sherds being identified, many of which were joining and thus re-assembled in the post-excavation period (Fig.14). The original vessel was probably a tall jug, possibly a baluster. This tradition grew out of the latter stages of the 16<sup>th</sup> century, having its origins in late medieval Cistercian wares and the vessel(s) represented here could date from the mid to late 15<sup>th</sup> or early 16<sup>th</sup> century. All these sherds bore signs of superficial iridescence as well as the metallic sheen of very hard-fired clay. Some, but by no means all, also had superficial calcareous deposits on the inside face, probably resulting from post-depositional chemical processes owing to direct physical contact between pot and limeash within the abandoned kiln.

Other sherds worthy of emphasis include ten from more than one late 17<sup>th</sup> to early 18<sup>th</sup> century brown salt-glazed stoneware tankards, including one (sfn 1529) which was very similar to that recovered during excavation of the Broadwood kiln in 2003.<sup>10</sup> Three joining sherds of late 17<sup>th</sup> century, externally glazed Staffordshire Yellow ware (sfn 1624) represented the base of an item of high-status tableware, possibly a (CH-D?). Sfn 1602 contained one sherd of a 'Bellarmine' jug which had been imported from the major production centre at Frechen near Cologne in Germany. These vessels were imported in bulk from the 16<sup>th</sup> to early 18<sup>th</sup> centuries as general purpose containers.

Very few of the sherds showed any signs of having been used as cooking pots though four non-joining pieces within sfn 1539 were well-sooted indicating repeated use on an open fire. They came from a very common type of mid to late 18<sup>th</sup> century vessel, some sort of plate in this case, slip-trailed and press-moulded during the manufacturing process.

Among the dominantly 17<sup>th</sup> and 18<sup>th</sup> century sherds were a number of earlier pieces, some with a coarse fabric and unglazed, others green-glazed in the well-known medieval tradition. Sfn 1558 bore the hallmark of having been incompletely reduced with surviving faint traces of a painted decoration; sfn 1623 and 1628 contained sherds from 13<sup>th</sup> or 14<sup>th</sup> century incompletely-reduced ware from two vessels (jugs or cisterns) that may have been brought in from a known manufactory at Scarborough; while sfn 1527 represents imported, fully-reduced late green glazed ware, possible copper-rich, from the base of a large vessel (a cistern?) that could date from the 14<sup>th</sup> century but could equally well be from the 16<sup>th</sup> or even 17<sup>th</sup>. This was glazed on both sides of the vessel. Sfn 1592 contains two base sherds from a large and heavy vessel (jug or cistern), green-glazed on the inner surface only and with a distinctly orange fabric: this has been dated to the late medieval period.

## **Glass**

There were three fragments of dark opaque glass (sfn 1579 and 1581), all of which had an iridescent surface veneer that probably resulted from natural post-depositional chemical processes within the kiln fill. The two pieces from sfn 1581 were joining

fragments from the same vessel with one piece having the hint of a curving edge on one side. These fragments were thin in section (2mm) while sfn 1579 was half as thick again with a clear curving profile. Two further fragments (sfn 1502) were clear glass with a bluish tinge but from different vessels. One was 4.50mm in thickness while the second was less than half that. Neither displayed any signs of iridescence. None of these pieces was large enough to inform its original form, size or function, other than to conclude they were not window glass.

The remaining pieces of glass (sfn 1616 and 1625) were window glass though their detail confirms they were not from the same period (Fig.15). Sfn 1625 consists of one piece of clear window glass barely 1mm in thickness with five edges apparent though three of these are fracture edges. The central part of the fragment has been affected by post-depositional hydration which has left a blackish surface deposit on the glass. This fragment can be ascribed to the 17<sup>th</sup> century.

Sfn 1616 consists of two sections of leaded window glass with one (cracked) triangular pane, approximately 40mm long by 25mm at the widest, intact; a further diamond-shaped pane, with sides 34mm long, partially *in situ*; and a third diamond-shaped pane, with sides 25mm long, with no accompanying leaded surround. In addition, there were three other fragments of leaded surround within sfn 1616 and a fourth fragment forming sfn 1587. The lead and glass within sfn 1616 bear the clear characteristics of the late 16<sup>th</sup> century. The lead is milled, rather than cast, a technique first introduced in this country towards the end of that century, and it is described as having a “long-H kame”. The panes - or “diamond quarries” - were made of pale green “forest glass, all of which have become heavily mineralised post-deposition. The edges to the quarries are crinkly in profile owing to their having been subjected to “grozing” during the manufacturing process: in other words the edges were re-touched to shape and smooth them.

Detailed examination of the quarries and lead kames suggests that it all came out of an undecorated window (or windows) from a high status building. This may have been in the private chapel for a hall giving it a secular religious rather than armorial context. The lead with sfn 1587 appeared to be later than that within sfn 1616: it may have been associated with the glass with sfn 1625.

## **Metal**

Various highly corroded nails, some forged, and fragments of sheet metal were logged though it was not possible to identify what these fragments had once been part of. A complete metal rolled rim (sfn 1633) from a bucket or similar vessel was recovered as well as various highly corroded body pieces from the same object, along with a further piece of rolled rim (sfn 1536) from a different vessel. Five short sections of 45mm-wide metal cooping (sfn 1605) from a wooden bucket or barrel were also logged but all that can be said about the size of the original vessel is that it had a very large diameter.

Several of the metal artefacts are of significance. Two large, corroded mortice lock keys were found (see Fig.16): one was 135mm in length (sf 1607), the other 140mm (sf 1608). The bit end of the shanks was different in form, the shorter key ending in a point whilst the other has a blunt end. Bothy keys, though, have similar bows for applying torque being oval. Both keys have been dated to the 17<sup>th</sup> century and both clearly operated sturdy locks on presumably sturdy doors.

Three metal buckles were recovered from within the kiln. One (sfn 1614) had a smoothed central stay with a double-oval rolled rim frame and was 42mm long by 31mm wide: this was a 17<sup>th</sup> century shoe buckle. Sfn 1603 contains two metal buckles, one with the clasp intact. The horse harness can be dated with a degree of certainty to the years 1630-50 though its original use cannot be determined.

Further equine links consisted of a largely complete roll spur (sfn 1619) that is missing one end piece and has been dated to the years 1620 to 1660; and part of a horseshoe (sfn 1621) ascribed to the late medieval period by its characteristic very broad web. It is highly corroded (Fig.17).

A highly corroded and mainly complete clog iron (sfn 1631), with intact end upturned, and a piece from the snaffle bit of a horse harness (sfn 1632) complete the metal objects assemblage. The latter is well-preserved and only lightly corroded: it is 110mm in length with a central ring of 25mm internal diameter.

Two shell fragments (sfn 1627) were logged but only one was sufficiently intact to enable identification as most of one half of a bivalve: no significance can be drawn from it.

### **Clay Tobacco Pipe**

Sixteen fragments of clay pipe were logged, dominantly snapped-off stems. All were broad-bore and hand-drilled and date from the 17<sup>th</sup> century with the one intact bowl (sfn 1609) having been narrowed down to the period 1640 to 1660 by its raked profile, broad bore and milled rim. Stem diameters varied in size, the largest being 8mm in external diameter, while internal diameters were mainly 3mm.

### **Tile**

Three sections of roofing tile (sfn 1572), or “thackstone”, were recovered from the primary kiln backfill (Fig.18). One small piece was even in surface and uniformly 18mm thick, but the two larger, but non-joining, pieces were much rougher on their surfaces and varied in thickness from 25mm to 28mm. One of these had a fixing hole 7mm in diameter at the narrower top end of the tile. It was not possible to provide any dating of the tiles.

## **8. DISCUSSION AND INTERPRETATION**

### **Kiln structure**

The kiln fits into the norm of clamp kilns as recognised during the Sow Kilns Project in terms of size, in all dimensions, and form though its stoke-hole arrangement was significantly different from others in the sample. The design found in other excavated kilns had the stoke-hole structure standing proud of the bowl floor with lateral voids between each foot-stone and vertical voids between capstones. This would have permitted air from outside the kiln to flow through the flue passage into the stoke-hole and then into the bowl to feed the fire. Constructing a kiln in such a manner also enabled the cross-sectional area of the flue/stoke-hole to be relatively small and meant that the external flue could run at the same level as the internal stoke-hole, thus making the task of cleaning out the passage after each burn a simple task: it was all raked out on the level.

In the Kilnsey kiln the stoke-hole was set into the base of the bowl and the bowl floor was at the same level as the top of the capstones. The space between the bowl wall and the stoke-hole side walls had been infilled to level it off. As a result there were no lateral voids within the stoke-hole and the vertical voids between surviving capstones were so narrow that they must soon have choked up with burning limestone or limeash. These two observations, in turn, suggest that airflow into the bowl must have been impeded at the best of times. In addition, the depth of the stoke-hole meant that the external flue had to drop down at a steep angle which can only have made the raking out process a tiresome occupation. Indeed, it is difficult to imagine how the rear portion of the stoke-hole was cleaned out though, when excavated, it was found mostly empty and clean.

The matter of clamp kiln chronology is raised here. It has been concluded from the Sow Kilns Project as a whole that the full stone-built stoke-hole arrangement was the latest form in the sequence of bowl designs. Such designs have been dated either by archaeomagnetic techniques or by carbon dating of artefacts to the second half of the 17<sup>th</sup> century. The Kilnsey kiln was dated to the period 1620 to 1670 with artefacts confirming this range but its stoke-hole arrangement must have made it a less efficient kiln than those with a free-standing structure. The question arises whether the Kilnsey variety slightly predates the other form or was contemporary with it. If the latter is accepted, a further issue is raised as to why that should have pertained. The free-standing form has been widely found in the Project area so - allowing for the size of the sample - why should just one kiln have a very different build?

### **Bowl lining**

It might appear illogical that the bowl was lined almost exclusively with limestone cobbles, given that its function was to burn the same into quicklime, but another kiln excavated during the Project (at Cracoe), dated by association to before the mid 17<sup>th</sup> century, also had a limestone lining. In reality the greatest heat must always have been concentrated in the heart of the kiln charge with lower ambient temperatures around the bowl wall, which assumption would suggest that this kiln did not - and could not - achieve the very high temperatures needed to produce a high quality firing. In turn, this could bring the argument back to the details of the stoke-hole as discussed above. Perhaps this kiln was not totally efficient

An alternative hypothesis is that a limestone lining would need replacing on a regular basis as individual cobbles fractured owing to thermal stress. None was mortared into the wall so replacement would have been relatively easy and there was no shortage of loose stone on the scree slopes just to the north of the kiln site. This hypothesis is given credence by the large quantity of partially burnt and cracked limestone cobbles that had been used as primary infill whenever the kiln was levelled off. In fact approximately 80 per cent of the stone infill material was of this nature.

### **Working floor**

The area surrounding the kiln, except on the downhill, flue entry side, had been levelled off with a surface of regular-sized cobbles which excavation showed extended under the boundary wall north of the kiln. This is consistent with similar features found at other sow kiln and free-standing field kiln sites in the Dales. Otherwise, in times of wet weather the area round the kiln would have been churned up by the limeburners themselves not to

mention the ponies which were probably used to bring stone and fuel in. If sleds were used to bring stone down from the scree, they would have needed a firm stable surface for safety, if for no other reason. If coal was brought in by horse and cart, or even by pack animals, the same would apply. The fact that there was no cobbling outside the flue on the south side of the kiln may suggest that loading of quicklime was not performed there but to the sides of the kiln.

### **Kiln Function**

Assigning a specific function to a 350 year-old kiln is fraught with difficulty unless the context the kiln appears within is sufficiently strong. A remote kiln in the middle of a pasture may be assumed to have had an agricultural purpose; conversely one within a dated building complex may be assumed to be contemporary with that. In the case of the Kilnsey kiln it is perhaps not so clear cut: it does sit on the bounds of a building complex but is (now, at least) in an open area.

Documentary sources provide indisputable evidence of lime burning at Kilnsey in the mid 15<sup>th</sup> century and the settlement was an important grange and latterly vill within Fountains Abbey's extensive estates in this part of the Dales, but this long predates the known use of this particular kiln.<sup>12</sup> This kiln may hint at the continuation of a long tradition here.

The date range for the kiln is 1620 to 1670 and many of the artefacts found within its primary infill back up that range. Rebuilding of Kilnsey Old Hall was completed in 1648; it is not known if any of the other associated buildings (such as the bakery, brewhouse and assumed chapel) were also rebuilt or renovated at the same time, but it is not beyond the bounds of reason to assume that this kiln was utilised in the rebuilding of the hall, if for nothing else.

### **Artefacts**

As discussed in Section 7 the kiln revealed a large and varied assemblage of artefacts, pottery being dominant. Most of the metal objects have been dated to the 17<sup>th</sup> century, the pottery ranges from the medieval to the early 19<sup>th</sup>, and the leaded window glass is from the early post-monastic period. None of the finds was stratified within the primary infill as material from different periods was found at all levels within the fill. The only indisputable fact arising from interpretation of this distribution is that they were all deposited in the bowl after abandonment of the kiln. It is not possible to determine the time span between abandonment and deposition.

Many of the artefacts are considered high status so they did not come from a 'peasant' holding. It is quite likely that they originated in Kilnsey (Old) Hall when it was in the process of being rebuilt. The issue is the rationale behind their being deposited in the kiln: was it used as a midden, or was there some ulterior motive?

Various arguments can be proffered in support of the midden hypothesis. The material had clearly been thrown in rather than having been carefully placed, and almost all the finds were recovered from the eastern part of the bowl, *ie* that part closest to the hall and other buildings. All the pottery was smashed. On the other hand there are also strong arguments against the midden concept. If the disused kiln had been used as a dump, one would expect to find other types of material including kitchen waste but there was absolutely no trace of such. Furthermore, if this had happened, the pottery sherds would

surely be stained and contaminated by organic midden matter: there was none. All the pottery sherds had clean fractures and surfaces; the only staining was from post-depositional chemical processes.

The suggestion could be put forward that the material had originally been deposited elsewhere and to be later transferred into the kiln, as a secondary midden deposit. The contamination counter-argument can also be invoked here but, even more convincingly perhaps, the pottery would show abrasion scars and scratches, however none was identified. The very notion of the kiln having been used as a regular midden must be discounted.

Perhaps the material had all been deposited at one time along with the large quantity of burnt limestone used to infill and level off the kiln. If it all went in at one time, that would account for the lack of stratification and as most of the stone was essentially clean this would explain the clean pottery surfaces. This, however, would bring us back to the question of when it was all dumped. Was it all thrown in at the end of the date range, *ie* in the early 19<sup>th</sup> century, or are the later pieces residual items that happened to find their way in, with the majority being deposited at the end of the 17<sup>th</sup> or in the early 18<sup>th</sup> century? If the former has any credence, why did such items not appear in the upper layers? If it has no credence, the circle of discussion returns to the contamination issue. In short, there can be no resolution to the matter.

## **Bones**

A total of 258 pieces of bone were found within the bowl, from a range of domestic animal species. Dog accounted for 40 per cent of the total but these were from only two individuals. Most of the remainder were cattle, sheep or goat and pig. It would be easy to conclude that the kiln had indeed been used as a domestic midden, given the quantity of bone, but this would be premature. Only four fragments of bone showed any signs of butchery which would be inexplicably small for such a midden.

One bone (sfn 1630) was the femur of a large cow and this was found at the very base of the bowl; a cow tibia (sfn 1573) came out of the compacted limeash that filled the kiln flue (context 807). Neither showed signs of butchery. No meaningful conclusion can be drawn from these two finds.

The presence of horse bones - two mandibular pieces and four teeth - raises an interesting if controversial question. It has been discussed above (page 18) that two other kilns within the Project sample contained what can only be termed ritual horse inhumations. Each had more or less the same bones, disarticulated and not butchered, carefully placed within the stoke-hole, and the conclusion drawn is that they were the material evidence of a closure ritual, 'replacing' the stoke-hole which historically was sometimes known as a horse with remains of an actual horse, to appease the limeburners' superstitions about evil spirits. It would be attractive, perhaps, to draw the same conclusion at Kilnsey as each of the other burials contained the skull, as did Kilnsey in part. This would definitely be premature, though, as just part of a skull in isolation is not an inhumation. It must remain a tantalising and unresolved matter.

## 9. CONCLUSION

The initial aims of the Kilnsey excavation were to identify if the vague earthwork was a kiln at all and, if so, if it was a lime kiln; and to try and establish a firm dating for the kiln. Both aims were achieved, as discussed in this report. More broadly this excavation was designed to bring the excavation phase of the Sow Kilns Project to an end with the hope that whatever form it might have would inform the clamp kiln typology being developed within the Project. This is discussed more fully elsewhere (see Note 8) and only the briefest summary is appropriate here. Various forms of clamp kiln have been identified, some having an unlined bowl with no stoke-hole, others having a bowl wall with stones revetted into the clay, and the Broadwood kiln having a fully stone-lined bowl, stone-built stoke-hole and stone-built external flue. It is postulated here that the unlined kilns are the earliest form in Craven with the Broadwood variant being the latest and most developed. The Kilnsey site fits in to the latter stages of this chronology.

## 10. NOTES

- 1 Johnson D. 2006. *The Sow Kiln Project. Excavation of Clamp Kilns in the Yorkshire Dales*. Ingleton: Ingleborough Archaeology Group.
- 2 Johnson D. 2004. *Excavation of Broadwood Enclosure, Thornton in Lonsdale, North Yorkshire*. Ingleton: Ingleborough Archaeology Group.
- 3 See for example 'Excavations of Early Lime Kiln Sites in North Craven' *Dales Heritage*, 3, 2005, p.3; 'Excavations of Early Limekilns' *Industrial Archaeology News*, 135, 2005, p.12-13; 'Excavations of Early Lime Kiln Sites in Craven – Update' *Dales Heritage*, 6, 2007, p.6-7.
- 4 I am indebted to Sonia Wilkinson for historical information on Kilnsey.
- 5 Note 1, p.11-15.
- 6 *Memorandum Book of Thomas Swynton 1446 to 1458*, folio 71: "...et debetur eidem pro labore suo ad kylnsay cum calce, iijd." ("... and there is owed to him for his labour at Kilnsey with lime, 3d.") Yorkshire Archaeological Society.
- 7 Note 1, p.40-44.
- 8 Johnson D. forthcoming. 'The Archaeology and Technology of Early-Modern Lime Burning in the Yorkshire Dales: Developing a Typology' *Industrial Archaeology Review*.
- 9 Note 1, p.49-51.
- 10 Note 1, p.44 and Fig.25.
- 11 Note 8.
- 12 *Memorandum Book of Thomas Swynton 1446 to 1458* in Fowler J.T. 1918. *Memorials of the Abbey of St Mary at Fountains*, vol.3, folio 71. Surtees Society CXXX.

## 11. PERSONNEL

Site supervisor	David Johnson
Photography	Chris Bonsall
Geophysics	Arthur Batty
	Roger Martlew
Surveying	Pat Carroll
	Phil Carroll

Jane Lunnon  
Ruth Spencer  
Alan Williams

Excavation team                      John Asher                      (IAG)  
   Arthur Batty  
   Chris Bonsall  
   Rodney Hooper  
   Helen Sergeant

Janis Heward (UWHG)  
Jane Lunnon  
Ruth Spencer  
Sonia Wilkinson

## 12. APPENDICES

- 1        Photographic Database
- 2        Context Descriptions
- 3        Bones database
- 4        Finds Database
- 5        Archaeomagnetic Dating Report

### APPENDIX 1      Photographic Database

See project archive

### APPENDIX 2      Context Descriptions

#### Key

- 1        description of material
- 2        approximate thickness
- 3        above Context
- 4        below Context
- 5        finds

#### Context 800

- 1        friable sandy silt with 95% silt, very dark brown. Topsoil.
- 2        24mm to 155mm
- 3        801 to 806
- 5        pot, bone, glass, metal, charcoal, coal, burnt stone, burnt lime.

#### Context 801

- 1        cobbled layer, consisting of small limestone cobbles, 100mm average long axis, sub-angular.
- 3        natural
- 4        800
- 5        none

#### Context 802

- 1 wall of the kiln bowl composed of coursed limestone blocks and cobbles varying from 50mm to 250mm in long axis length.
- 2 kiln depth: 1m at centre. Angle of slope of wall: 70 degrees.
- 4 800
- 5 none

#### Context 803

- 1 small lens of limestone pea-sized sub-angular gravel within 701.
- 5 none

#### Context 804

- 1 post-abandonment infill consisting of variable angular limestone cobbles in a soil matrix.
- 2 1.45m maximum
- 3 806 to 813
- 4 800
- 5 pot, animal bone, glass, metal, charcoal, coal, burnt stone.

#### Context 805

- 1 angular limestone cobbles, average long axis measurement 140mm; post-abandonment fill outside the kiln and on part of the bowl wall in south-east quadrant.
- 2 200mm maximum
- 3 802
- 4 800
- 5 none

#### Context 806

- 1 solidified cream-white limeash and residue from last kiln firing(s) forming a spread outside the kiln entrance.
- 2 150mm
- 3 808
- 4 800
- 5 metal objects

#### Context 807

- 1 layer of unconsolidated limeash within the external flue, laminated showing 3 firing episodes.
- 2 220 to 280mm
- 3 808
- 4 804
- 5 pot, animal bone, charcoal.

#### Context 808

- 1 highly burnt red material (soil and fuel residue)
- 3 natural?
- 4 807
- 5 none

#### Context 809

- 1 wall of external flue and internal stoke-hole formed of coursed limestone and some sandstone blocks of variable size, built drystone.
- 2 height: 550mm to 600mm
- 4 804
- 5 none

#### Context 810

- 1 floor of the kiln bowl, built up on primary deposits not excavated and thus not known, composed of compacted clay with limeash residue especially on east side of kiln.
- 4 804
- 5 pot, bone, charcoal, burnt lime.

#### Context 811

- 1 compacted clay beneath the limeash residue within the external flue and internal stoke-hole, forming the floor of these features.
- 4 808
- 5 none

#### Context 812

- 1 a plastering of burnt lime and fuel residue over the lower courses of the bowl wall.
- 3 802
- 4 804
- 5 none

#### Context 813

- 1 three large horizontal sandstone slabs acting as capstones to the internal stoke-hole.
- 2 180mm to 190mm
- 3 807
- 4 804
- 5 none

### **APPENDIX 3 Finds Database**

See project archive

## APPENDIX 4 Archaeomagnetic Dating Report

See project archive

### 13. ILLUSTRATIONS

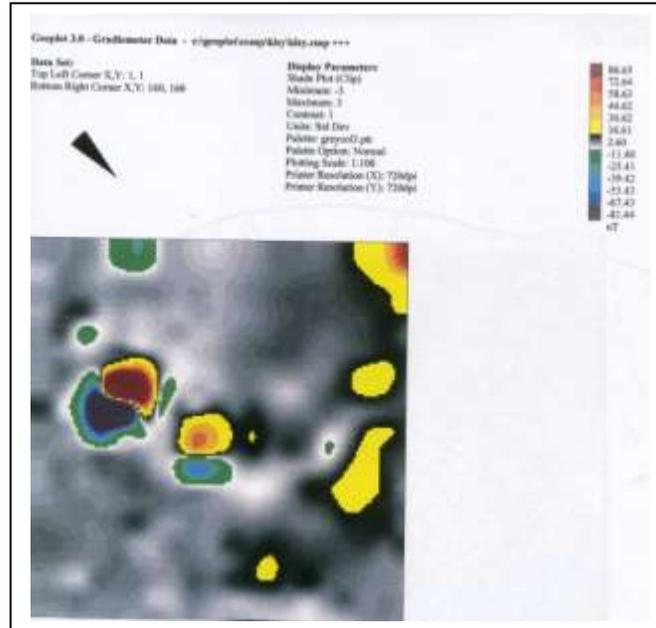


Fig. 1 Magnetometer plot

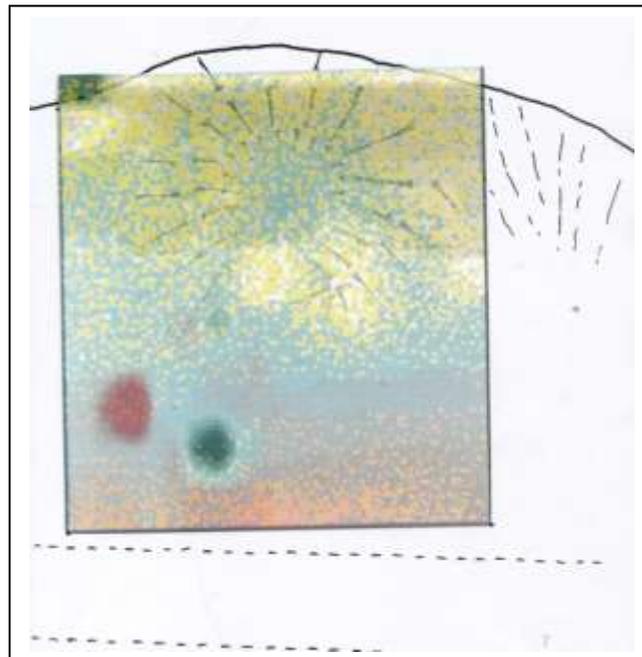


Fig. 2 Resistivity plot

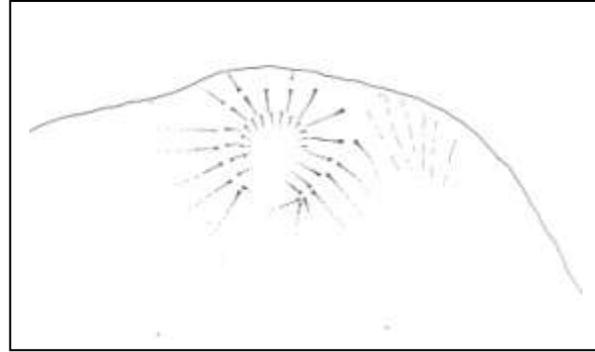


Fig. 3 Topographic survey plot

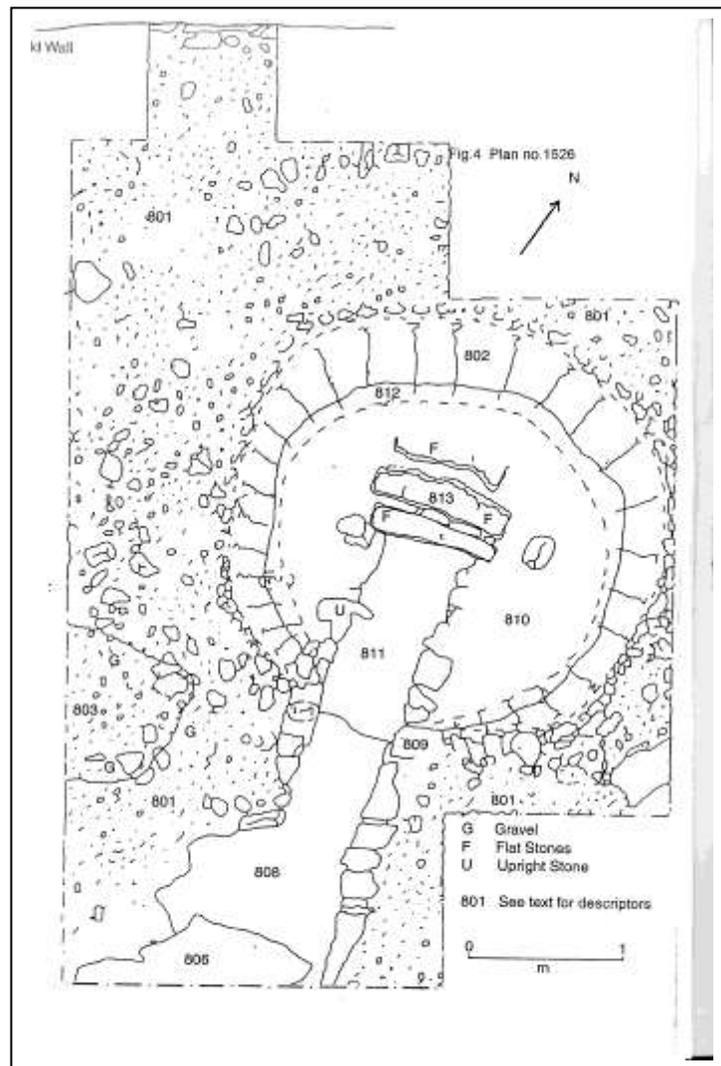


Fig. 4 Final excavation plan



*Fig. 5 Pre-excavation earthwork*



*Fig. 6 Bowl wall (802) and bowl floor (810)*



*Fig. 7 Stoke-hole (808) and flue (813)*



*Fig. 8 Capstones to stoke-hole (813)*



*Fig. 9 Limeash laminations (807)*



*Fig. 10 Limeash spread (806)*



*Fig. 11 Selected small finds*



*Fig. 12 Selected small finds*