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Quern manufacturing at Wharncliffe Rocks, Sheffield

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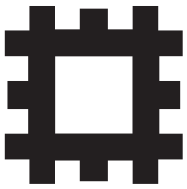

QUERN MANUFACTURING AT WHARNCLIFFE ROCKS SHEFFIELD SOUTH YORKSHIRE

Archaeological Investigation Report Series AI/20/2000

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Surveyed Oct-Nov 1999
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1. INTRODUCTION

During October and November 1999, staff of the Archaeological Investigation section of English Heritage undertook a large scale survey of a quern manufacturing site at Wharncliffe Rocks in South Yorkshire (NMR no. SK 29 NE 7). The area, which is also known by the names of Wharncliffe Crags and Long Heath, is located 8 miles north-west of Sheffield city centre at NGR SK 297 977 (Figure 1). The survey was undertaken at the request of, and partly funded by English Heritage, Forest Enterprise and Sheffield Wildlife Action Partnership primarily to assist with the management of the site.

The quern workings at Wharncliffe were discovered by a local amateur archaeologist, Leslie Butcher, in 1949 (Wright 1988, 67). He produced a detailed survey of the site, recording the existence of numerous quern roughouts of both flat-disc and beehive forms associated with working areas and trackways over an area of around 72ha. The need for the English Heritage survey arose following a fire across about 6-8ha of the north part of the site in 1996, which destroyed much of the vegetation cover thereby exposing more traces of the quern workings. It was concluded that a new survey of the fire-damaged area could record more archaeological information than was visible to Butcher and would inform management decisions affecting the long-term preservation of the site, in particular the problem of the illegal removal of querns.

The survey was undertaken to Level 2 standard (as defined in RCHME 1999, 3-4) and was confined wholly within the scheduled part of the site (Figure 2), which extends up to 300m further to the north and west (Scheduled Ancient Monument Ref. South Yorks 1253). The surveyed area also lies within a Site of Special Scientific Interest.

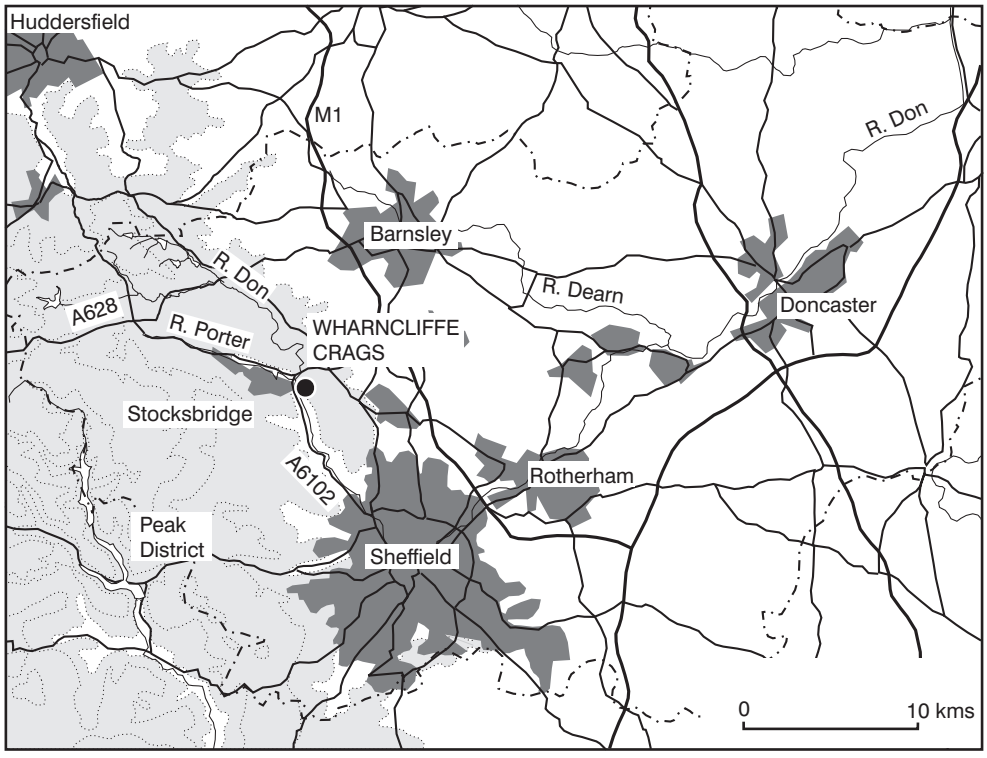


Figure 1. Site location

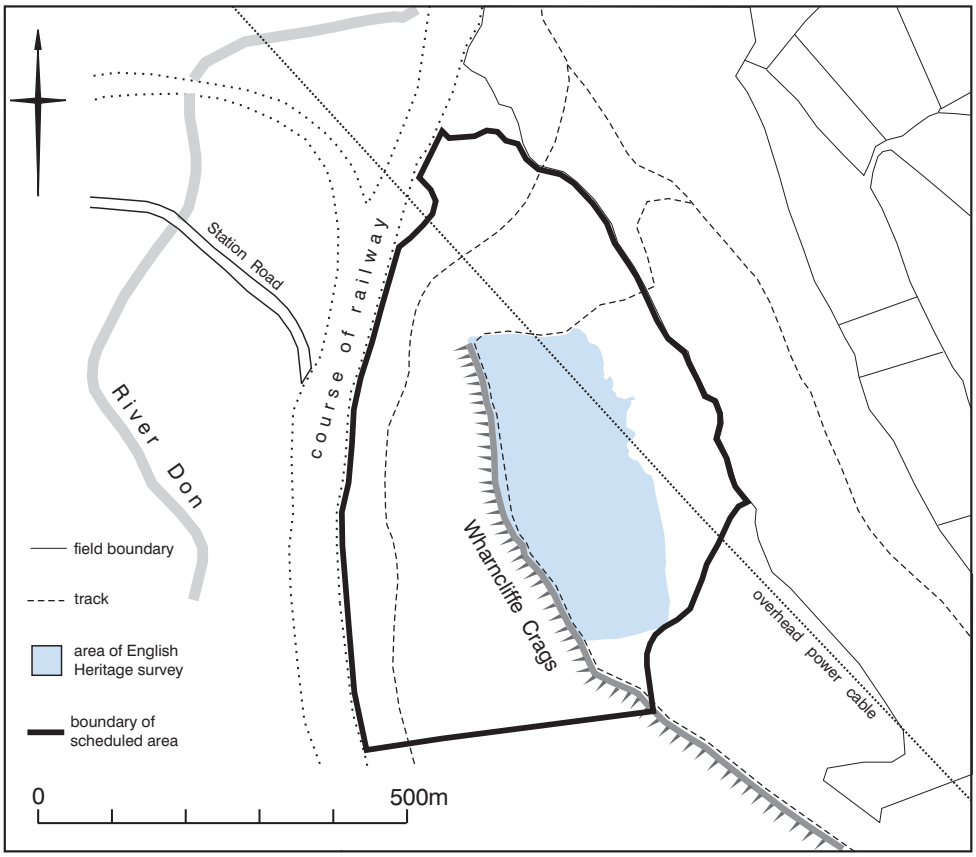


Figure 2. The environs of the site

The details of over 2,300 quern roughouts were recorded during the fieldwork along with surface traces of contemporary working floors and tracks. Each quern roughout was photographed and described and its position was recorded within Ordnance Survey National Grid using an electronic total station theodolite. The resulting digital map and database offers the facility to easily recover the location of each roughout, thereby providing a valuable tool for future management and research. As the area surveyed comprises only a part of the overall quern working site, permanent markers have been established on the site as points of reference for future survey work.

2. GEOLOGY, TOPOGRAPHY AND LAND-USE

The quern manufacturing site is located on the east side of the valley of the River Don and is focussed upon a precipitous escarpment known as Wharncliffe Crags which are a line of vertical sandstone outcrops of the lower coal measures series. Both the dip slope behind the crags and the ground in front is littered with boulders which provided the raw material for the manufacture of quern stones. The sandstone is pale grey or golden when freshly broken, weathering to dark grey, and has a fine grained texture. The survey was located at the north end of the crags on the dip slope behind the escarpment. The ground slopes at a fairly constant gradient across the survey area from a high point of nearly 250m above OD at the south-west corner, falling to around 200m above OD at the north-east edge where the terrain levels out at the bottom of the dip slope. At about the 235m contour line a belt of small outcrops and densely packed boulders crosses the site, extending uphill as far as the 240m contour. A similar zone of densely packed boulders exists at the north end of the survey area.

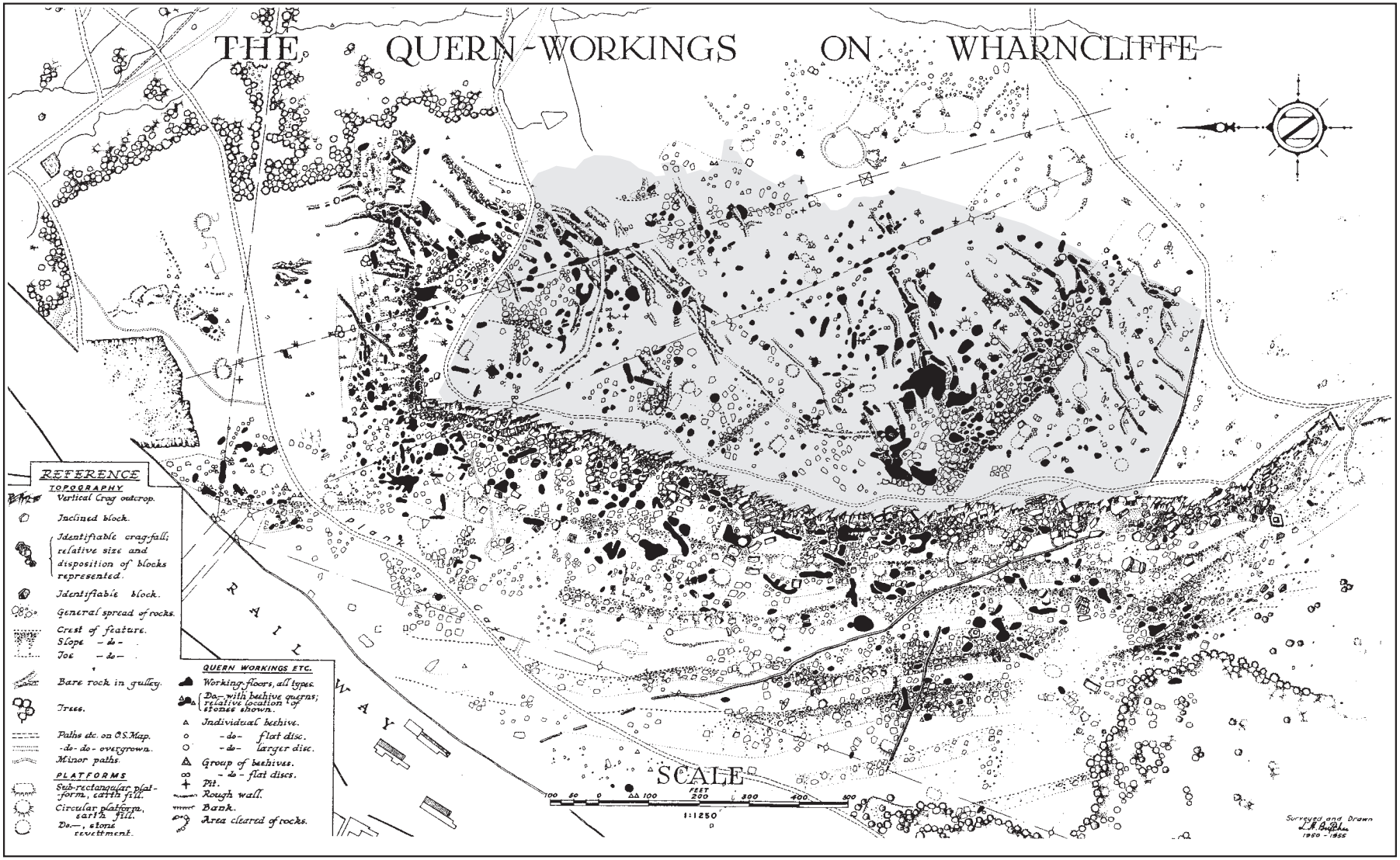
The site is an open heathland with a thin soil cover. Bracken and heather are both widespread although generally not so dense as to obscure the surface archaeology. A dense patch of heather restricted visibility at the south-west corner of the survey area as did an area of long grass at the north-east corner. A small patch of woodland also made it impossible to survey all the north margin of the site. The only other trees in the survey area were solitary oaks and birches, including the stumps of those burnt in the 1996 fire. A power line crosses the north-east corner of the site and pylons stand adjacent to the north and east sides of the survey area . All the surveyed area is accessible to the public and a board gives information to visitors interested in the ecology of the area. The sandstone crags on the west side of the site are a popular location for climbing.

In 1252 the lords of nearby Wortley created a hunting chase at Wharncliffe (Hey 1975, 115) and in 1265 Wharncliffe is referred to as *Qwerncliffe* in a document in the Wortley estate archives (Butcher 1957, 38). It has not been ascertained if the survey area fell within the medieval hunting chase although it seems likely judging by the area shown as Wharncliffe Chase on an early 18th century manuscript map from the Wortley Muniments (tracing reproduced in Latham 1994, Figure 11). The use of the chase for hunting gradually declined, so that by the 1820s it was used exclusively for pasturing sheep and for producing charcoal for the local iron foundries (Latham 1994, 9). The first edition 1:2500 scale Ordnance Survey map (Ordnance Survey 1893) indicates that woodland covered the site in the 1890s though by the time of the second edition of 1905 the area was an open heath as today (Ordnance Survey 1905).

3. HISTORY OF ARCHAEOLOGICAL RESEARCH

The archaeological significance of the site was recognised by Leslie Butcher in 1949 who then undertook a detailed survey between 1950 and 1955 under the auspices of the Hunter Archaeological Society (Figure 3). His unpublished notes are in Sheffield City Museum (Butcher 1976). He identified quern workings over an area of 72ha although his manuscript plan covers an area of around only 30ha. He estimated that the site contained some 4000 flat-disc querns of various stages of manufacture and some 400-500 beehive querns, along with about 1200-1400 'working floors' defined by stone debris from quern manufacture (Latham 1994, 11). His unpublished notes contain distribution maps of beehive and flat-disc querns (Figure 4; Butcher 1976). Other archaeological features recorded by him include a complex of sub-circular earthwork enclosures immediately to the east and outside the area of the English Heritage survey. They were not included in the survey and it is not known if these are contemporary with the quern workings. Butcher also began the task of recording evidence for Romano-British settlement in the environs of the site, and by 1994 eighteen sites of this period had been located in the Wharncliffe area (Latham 1994, 17), though how these settlements related to the quern workings, if at all, has yet to be determined.

Following on from Butcher's work, Wright (1988, 74) has considered the evidence for quern manufacture at Wharncliffe concluding that most of the stones must have left the site as roughouts to be finished elsewhere. Her paper also poses questions concerning the distribution of querns from Wharncliffe, as she observes that they do not generally occur on local sites and suggests that the manufacture of beehive querns on the site ceased by the mid-2nd century AD (Wright 1988, 76). In 1994 an unpublished assessment of the archaeological potential of the Wharncliffe forest area summarised the evidence for documented archaeological sites in the area from prehistoric to the post-medieval periods (Latham 1994). It records that a geophysical survey and trial trenching over part of the quern working site in 1993 in advance of the laying of a gas pipeline failed to detect substantial archaeological deposits. This work took place to the north of the survey area (Latham 1994, 12).



F*igure 3. Reduced copy of Butcher's 1950-55 survey of Wharncliffe Crags. Area of English Heritage survey is shaded*

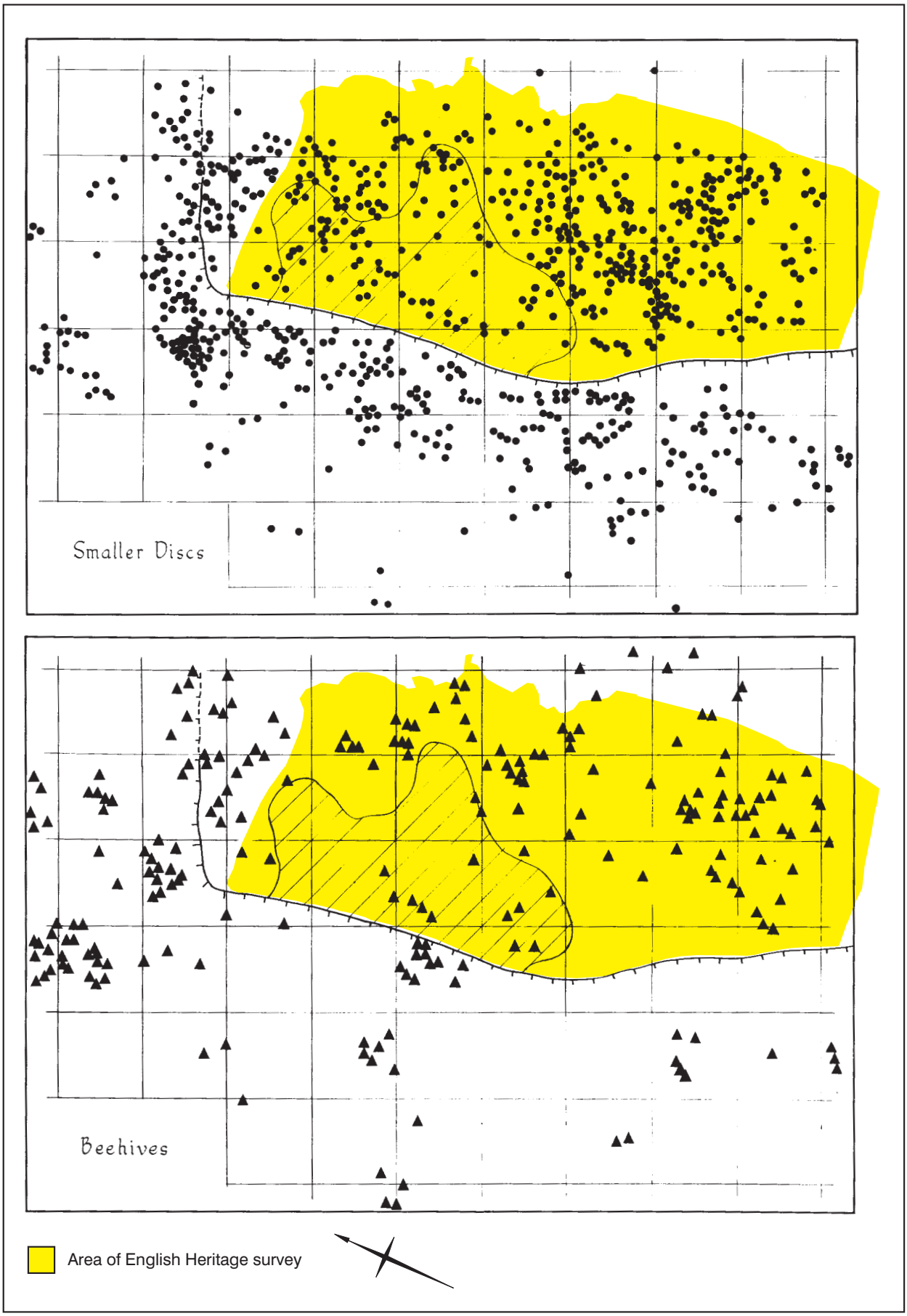


Figure 4. Undated distribution maps prepared by Butcher of flat-disc and beehive querns

4. DESCRIPTION

Wharncliffe Crags formed the west boundary of the survey which covered an area approximately 200m east-west by 400m north-south, encompassing the area that was burnt in 1996 (Figure 9). A modern track formed the north boundary of the survey and on the east the limit was defined partly by the edge of woodland and partly by a modern post and wire fence. On the south the survey was taken beyond the post and wire fence up to the line of a dilapidated drystone wall.

METHOD OF QUARRYING TO OBTAIN THE RAW MATERIAL

(Figure 10; for the location of numbered querns see Figure 16)

There is ample evidence that surface boulders were worked to produce quern roughouts. Examples were noted of roughouts partially detached from boulders (stones 1111, 1314). Stone 2406 had fractured whilst being split from a boulder and other stones lie next to the boulders from which they were split (stones 380, 536 and 930). Areas of particularly intense exploitation are suggested by parts of the site where virtually all surface boulders are either absent or have been broken up, as is the case towards the north-east corner of the site. Similarly towards the centre of the site there are few untouched boulders surviving in an area approximately 20m square (Figure 5). The only rocks in this area are small angular blocks and flakes suggesting the ground has been heavily worked for its surface stone. Several flat-disc roughouts were noted buried beneath boulders (stones 273, 315, 508, 567, 1335). This points to the fact that surface rocks and boulders have been displaced, presumably as quarrying progressed.

Figure 5. General view of the site looking south-east with heavily worked ground at the centre of the site in the foreground

The site is pitted with natural crevices and hollows but among them are pits which appear to have been dug to extract boulders. These occur chiefly on the lower slopes towards the east side of the site and range in size up to 5m across and 1.5m deep. The only example of a pit with a prominent spoil heap adjacent to it is at NGR SK 29750 97633 (Figure 10 no. 1) where a mound 1.0m high and composed of earth and stone debris stands adjacent to a rock-cut pit 0.7m deep. The mound has the appearance of being relatively recent upcast. Small mounds of spoil up to 0.3m high occur close to most of the other pits.

MANUFACTURING SITES (Figure 10)

Evidence for the manufacture and working of querns on site has been found. This has two distinct forms; working floors and concentrations of rock chippings.

Working Floors

Working floors are discrete areas with surface evidence for the working of stone and/or the dressing of quern roughouts. They are widespread across the site and display little morphological variation. They are mostly sub-circular in shape and range from 2m to 15m in diameter. Small concentrations of quern working debris less than 2m across were recorded as chipping areas rather than working floors and are described below. The most clearly defined floors are terraced into the natural slope and the surface is covered in rock spalls and flakes from stone working. In several instances the rock debitage has been pushed downslope to a maximum height of 0.5m to extend the working area, with boulders occasionally piled along the front edge to revet the resulting platform. Boulders and outcrops define the back edge of such floors (Figure 6; this floor located on Figure 10 as no. 2) and these are presumably the source of raw material for the adjacent working area. Often there is a heap of working debris towards the centre of the platform forming a mound up to

Figure 6. Working floor at NGR SK 29621 97753 viewed from the east

0.3m high. The majority of working floors are less well-developed and are defined by areas which are relatively clear of boulders but contain patches of rock flakes and spalls, sometimes mounded up towards the centre of the area as described above, or less commonly heaped up around the perimeter. Apart from one exception, there was no evidence of structures in any of the working areas though it is not unreasonable to speculate that they may have supported small, temporary shelters which would be unlikely to leave much in the way of surface traces. The one exception is at NGR SK 29716 97535, towards the south-west corner of the site (Figure 10 no. 3). A turf and stone bank up to 0.3m high defines the north and east sides of a sub-rectangular working area some 10m by 5m. The bank does not appear to be the result of casually piled up debitage from stone working and could represent the edge of a structure occupying the working area.

Concentrations of stone chippings

It has already been mentioned that heaps of stone chippings are a feature of the working floors. They also occur in isolation up to 2.0m across resting on the ground surface or on flat-topped boulders. The chips are commonly angular in shape suggesting they are flakes from dressing quern stones reinforced by the fact that there are examples of quern roughouts lying next to concentrations of rock chips (Figure 10).

THE QUERNS AND MILLSTONES

(For location of numbered querns see Figure 16**)**

The methodology used to identify and record quern and millstone roughouts in the survey area is described in Section 7. A total of 2359 roughouts were recorded, of which the overwhelming majority belonged to the flat-disc type. These amounted to 83.1% of the total (1960 stones), whilst beehive roughouts were much less numerous, accounting for just 11.5% (272 stones). The total occurrence of flat-disc quern manufacture is increased if one also takes into account the fact that a further 5% of the stones (118 examples) were drums which as roughly shaped cylinders would have been split to make flat-disc roughouts. Millstone roughouts accounted for just 0.4% of the total (9 stones).

FLAT-DISC QUERNS (Figures 7, 11 and 17)

Dimensions

The majority of the 1960 flat-disc roughouts recorded range between 40 and 60cm in diameter and have a thickness between 10 and 15cm (Figure 17). The flat-disc querns with a diameter greater than 60cm might be more properly considered as small millstones [following Spratt's 'rule of thumb' guide] (Gwilt and Heslop 1995, 43).

Stage of manufacture

As shown on Figure 17, the majority or roughouts (91.75%) belong to the earliest stages of manufacture ranging between stones which show the earliest stages of shaping (stage 1; Figure 7), to stones with rough faceting around the outside (stage 2) to stones where faceted edges show some rough smoothing (stage 3). Only 8.25 % of the stones show evidence of being taken further towards completion either with signs of rough pecking

STAGE 1 (quernstone 185)

STAGE 2 (quernstone 731)

STAGE 3 (quernstone 1131)

STAGE 4 (quernstone 296)

STAGE 5 (quernstone 101)

Figure 7. Stages in the manufacture of flat-disc querns

on the outer edge (stage 4) or with finer pecking shaping the outer edge to a smooth curve (stage 5). Traces of other constructional details were few among the stage 4 and stage 5 stones and therefore no attempt was made to distinguish between upper and lower stones during the survey. On stone 101 the exposed face of the quern was slightly dished, whilst on stones 356 and 1825 a small central hole has been chiselled through the quern. On 356 this is 2-3cm in diameter whilst that through 1825 is of equivalent dimensions and surrounded by a possible hopper represented by a circular hollow some 10-15cm across. No examples of finished querns were observed.

The majority of flat-disc roughouts appear to have been discarded either because the stone had split in two or because part of the edge had broken off as it was being worked. Around 16% of the roughouts appear to have been abandoned since there is no obvious sign of damage to the stone, however, many stones were partially buried or obscured by vegetation and it is possible that faults responsible for discard were not visible to casual inspection.

Position

Just over a half of the roughouts (56%) lie flat on the ground surface or occasionally on the tops of boulders whilst the remainder rest at an angle propped up against rocks, boulders or other roughouts, or wedged into crevices. The vast majority appear to be essentially in-situ though a range of evidence points to the fact that some roughouts have been moved in relatively recent times. Two stones leant up near the path along the top of Wharncliffe Crags (stones 286 and 288) look as though they have been moved recently to await collection. Other stones may have been moved by interested parties for examination and photography and not replaced, as in the example of the one complete roughout noted with a central hole (stone 356) which is propped up against a boulder. Stone 178 has dead bracken beneath it indicating it has been moved within the last year and stones 910 and 1060 have been moved recently as surface impressions nearby indicate their original position. Stone 2186, which is in the open and propped up on small rocks, also looks suspiciously like it has been moved to that position quite recently.

Other evidence points to flat-disc roughouts being in-situ. There are quite a few examples in close association with spreads of small spalls presumably representing working debris, which suggests these stones are probably in-situ. Such examples were noted on the tops of several boulders (stones 1306, 1344, 1380, 1441 and 1522) and on the ground where the chippings are unobscured by vegetation. The high percentage of roughouts which are at an angle could reflect the fact that stones were propped up to have their edges trimmed, in which case it might be concluded that most of these stones are in-situ. In support of this, a number of stones set at angles have an obvious working edge uppermost (stones 1900, 1902, 1934, 1954, and 1971).

Visibility and distribution

The survey found that 37% of the flat-disc roughouts are wholly visible on the surface whilst 34% are partially obscured by vegetation or rocks. The remainder (29%) are partially buried. They are found across the entire site but with a notable concentration on the north side of the boulder field in the south-west quarter of the site. Around a quarter of the total number of flat-disc querns on the site are found here in an area which is just 6% of the survey site. A second, much smaller concentration some 15m x 15m occurs at the north-west corner of the site. The

overall distribution does not show any marked clustering of roughouts around working areas, though it was observed that within working areas roughouts tend to occur most frequently around the perimeter. The numbers of flat-disc roughouts decline towards the south and east boundaries of the survey area and few were noted on the west along the top of Wharncliffe Crags. The pattern of abandoned and discarded flat-disc roughouts shows the same overall distribution across the site.

DRUMS (Figures 12 and 18)

Dimensions

Of the 118 drums recorded, the diameters mostly fall between 50 and 60cm though a few are up to 90cm across. This broadly mirrors the diameters of the flat-disc roughouts supporting the idea that the drums would have been split to provide blanks for flat-disc querns. Most drums are between 20 to 25cm thick which if split would be sufficient to provide two blanks.

Stages of manufacture

As Figure 18 demonstrates, 97% of the drums were noted as belonging to the first three stages of manufacture with the majority (63%) belonging to stage 2. Grooves cut in preparation to splitting the stone were noticed on stones 1600 and 2181 whilst drums 2356 and 2363 showed evidence of splitting. Around 26% of the drums were classed as abandoned as there is no sign of damage to them. Of the remainder, the most common cause of discard was that part of the edge had broken away. Four examples were noted where the drum had split in half (stones 1013, 1101, 1327 and 1731).

Position

Just under half of the drums (49%) are propped up in some way, the majority leaning against rocks or boulders whilst several had been propped up on small stones (2204, 2209 and 2356). This could reflect the fact that drums were propped up to facilitate shaping and therefore they may be in-situ, although only in two cases were spreads of stone trimming debris noted immediately adjacent to drums (1587 and 2280).

Visibility and distribution

The survey found that 51% of the drums were unobscured and visible on the surface whilst 28% were obscured by vegetation or rocks. The remainder (21%) were partially buried. Although there are far fewer drums than flat-disc querns the distribution pattern shows the same two concentrations on the north side of the boulder field and at the north-west corner of the site, with no obvious clustering around working floors. The sample is too few to detect if there is also the same fall off in numbers towards the east and south boundaries of the survey, as occurs with the flat-disc roughouts.

The pattern of abandoned and discarded drums shows the same overall distribution across the site.

BEEHIVE QUERNS (Figures 8, 13, 19-21)

Dimensions

Beehive quern roughouts were recorded as either upper or lower stones; where identification in the field was uncertain they were classified as indeterminate. Of the total of 272 beehive stones recorded, 18% were identified as lower stones, 47% as upper stones and the remainder (35%) were indeterminate. The majority of the lower stones are around 30cm in height and 20-30cm in diameter (Figure 19) whilst the upper stones mostly fall between 30-40cm in height and 30-35cm in diameter (Figure 20).

Stages of manufacture

The lower stones were all identified as belonging to the first three stages of manufacture (Figure 8) with the majority (51%) being roughly faceted and therefore classed as stage 2. The majority of upper stones were also classed as stage 2 but 10 stones (7% of the total number of upper stones) had been taken close to completion with either rough pecking on the outside (stage 4) or further fine pecking to produce a well-rounded profile (stage 5). All the indeterminate stones fall within the first three stages of manufacture with the majority (57%) identified as stage 2. No upper stone recorded showed traces of either a hopper or feedpipe.

It was noted that 49% of the lower stones are abandoned, showing no evidence for damage, and 39% of the upper stones. The remainder had been discarded principally because part of the side had broken away as the stone was being worked or, less frequently, because the stone had split in half.

Position

The majority of upper and lower stones lie flat on the ground (72% and 78% respectively) with far smaller percentages noted as being propped up compared to the flat-disc roughouts. This may reflect the fact that it was easier to work the sides of the beehive stones resting on the grinding surface or with the top embedded in the ground rather than propped against boulders though, as has been discussed above, it is debatable how many of the stones are in-situ. Lower stone 2057 appears to be propped upright by small rocks (as if still left in the position it was being worked) and upper stone 339 is next to a spread of flaking spalls, suggesting it may also be in-situ. Two fragments of upper stones (1973 and 1974) appear to be part of the same block suggesting they have lain undisturbed after the block accidentally split whilst being worked.

Visibility and distribution

The survey recorded that 44% of the beehive stones (including indeterminate stones) are on the surface with a further 15% obscured by vegetation or rocks. The remainder (41%) are partly buried, a figure which goes some way to explaining the large numbers which could not be identified as upper or lower stones.

The survey clearly picked out the fact that beehive stones tend to concentrate over the east half of the site with two possible foci evident within this distribution. On the south-east there is a moderate concentration of stones 50m to the north of the boulder field extending southwards as far as the south limit of the survey. On the north-east

STAGE 1 (quernstone 12)

STAGE 2 (quernstone 843)

STAGE 3 (quernstone 1014)

STAGE 4 (quernstone 40)

STAGE 5 (quernstone 275)

Figure 8 Stages in the manufacture of beehive querns (examples depicted are beehive upper stones)

there is a moderate concentration of stones centred on NGR SK 2975 9775 around 50m in diameter. Whereas the flat-disc and drum roughouts show little sign of clustering around working floors, the majority of the beehive stones are within 10m of a working area.

There are no marked differences in the distribution of abandoned and discarded beehive roughouts across the site.

MILLSTONES (Figure 14)

Dimensions

The possible millstones identified were between 15 and 50cm thick with diameters between 75 and 120cm. However, if one follows the suggestion that flat-disc stones over 60cm in diameter could be classed as millstones (Gwilt and Heslop 1995, 43) then the total number of millstone roughouts increases from nine to sixty-two.

Stages of manufacture

Of the nine millstone roughouts identified during the survey, all were classed either as stage 2 or 3 with none showing evidence of working beyond rough trimming. Four of the millstone roughouts appear to have been abandoned since there is no obvious evidence for damage to the stone. The remaining five had been discarded because the edge had been damaged or in one instance because the stone had split in half (stone 1465).

Position

Five of the millstone roughouts are lying flat whilst stone 1699 was split in two and the two halves are embedded vertically in the ground next to each other. The other three are propped up in some way, but as with the other types of stone, it is impossible to be certain if they are in-situ and that their position reflects the fact that their edges were being trimmed when they were left.

Visibility and distribution

Four of the roughouts are clearly visible on the surface whilst two are obscured by vegetation or rocks and three are partially buried. However, with only nine examples across the site, there is little that can be meaningfully said about their distribution. Stone 2411 is immediately adjacent to the track forming the north boundary of the site perhaps to facilitate its removal from the site when completed. Similarly stone 1992 is propped against a rock next to one of the tracks which penetrate the interior of the site.

TRACKS (Figure 10)

Two tracks associated with the quern workings have been identified within the survey area (Tracks 1 and 2). A third track around the north and west perimeters of the area is more recent and was in use as a footpath at the time of the survey (Track 3).

Track 1

The track is around 2.5m wide and traceable for a distance of 80m in an east-west direction across the middle of the site. It is defined by the way in which rocks and boulders have been cleared to make the route and it is possible that a 0.4m high scarp at the east edge of the survey area (Figure 10 no. 4) marks a continuation of the track to the east.

Track 2

Track 2 enters the site at the north-east corner of the survey area where it is cut by a relatively recent drainage culvert and was also obscured by vegetation which frustrated efforts to trace it course further east. The track climbs south-westwards up the slope for 50m and then forks. One arm continues westwards for 80m forking again after 40m. Both of these branches terminate close to working areas. The second arm continues south-west for 200m terminating close to the edge of the dense boulder field which crosses the site at around the 235m contour. Mid-way along its course this arm of the track splits, the two sections joining back to each other after 30m. The east section appears to be a minor deviation off the original line of the track.

Track 2 is up to 2.0m wide and like Track 1, is chiefly defined by the cleared nature of the ground, with small boulders and rocks removed to make the route. At NGR SK 29678 97871 several large earthfast boulders straddle the line of the track, presumably because they were too difficult to dig out and being flat-topped did not present too much of an obstacle (Figure 10 no. 5). In contrast at NGR SK 29701 97887 several large boulders block the track but it is probable they result from later quarrying in the vicinity (Figure 10 no. 6). In addition to clearing the ground to make the trackway, two sets of flat slabs have been laid side by side to span shallow natural gullies towards the south end of the track (NGR SK 29669 97658 and SK 29671 97655; Figure 10 no. 7). Similarly, along the length of the track, angular rock fragments, presumably the debitage from quarrying and dressing quern stones have been packed into the ground to consolidate the surface. At NGR SK 29644 97736 there is a heap of rock fragments up to 0.3m high suggesting that some dressing may have taken place on the track itself (Figure 10 no. 8).

Track 3

Track 3 skirts the north and west edges of the survey area. The route almost certainly dates back to the 1820s at the very least since carved on a rock cleared to the north side of the track at NGR SK 29629 97925 is the name Holly Birch Ride and the date of 1824 below the initials WL (Figure 10 no. 9). It is much more prominent than the other two tracks, partly because it is in use and partly because it has been cleared of rock and boulder obstructions in a much more regular and concentrated way than

with the tracks described above. At NGR SK 29572 97880 a large boulder has been cut through to widen the trackway (Figure 10 no 10).

MISCELLANEOUS FEATURES (Figure 10)

At the north-west corner of the survey area, a bank up to 0.2m high and 1.5m wide runs north-south up the slope for a distance of 25m (Figure 10 no. 11). It is composed of earth and rock debris and at NGR SK 29593 97903 three flat-disc querns are propped up on the west side of the bank (stones 163-5; Figure 10 no. 12). There is no firm evidence as to the date or function of this feature though it could be an element of land division pre-dating quern manufacture. There is a 2m line of rocks at NGR SK 29687 97635 which has been laid out in a straight line among boulders immediately to the south of a working area. It has no association with the working area and has no obvious purpose (Figure 10 no. 13).

At NGR SK 29736 97795 there is a rectangular earthwork platform measuring 10m x 7m by up to 0.7m high on the downslope side. The feature is some 10m south of the line of the overhead power line and is sufficiently large to have accommodated a pylon if the cable was formerly aligned further to the south (Figure 10 no. 14).

The partly ruined drystone wall marking the south limit of the survey is a maximum of 2m high and 1m wide and is constructed with small rocks and boulders from the surface, including fragments of quern stones. At the west it terminates just before the track along the top of Wharncliffe Crags and from here it runs for just over 100m eastwards before disappearing as a standing structure. However the foundations can be traced further eastwards as far as a track descending the slope (Figure 10 no. 15). It seems unlikely that this stretch of the wall has been robbed down to its foundations when the rest of the wall still stands to 2m high. This suggests that the wall was never completed and that the line of foundations marks where work ceased.

5. DISCUSSION

There is extensive evidence for large scale quarrying and working of rock for the manufacture of rotary querns within the area surveyed. The fieldwork defined what may be the eastern extent of the site by the decline in the numbers of beehive and flat-disc roughouts towards the bottom of the slope along the east edge of the survey area. The survey found no compelling evidence that the rock was worked for anything other than quern stones, nor were there any traces of settlement contemporary with the quarrying activity. The rectilinear bank recorded at the south-west corner of the site may be evidence of a structure but it does not suggest settlement of any duration or extent.

Chronology

The only feature observed which might pre-date quern manufacture is the slight bank at the north-west corner of the site. It may be part of the enclosure complex noted by Butcher near the edge of the north-facing crag (Butcher 1976).

The beehive and flat-disc roughouts have different patterns of distribution within the survey area. The beehive roughouts mainly occur along the east margin of the site towards the bottom of the rise up to Wharncliffe Crags, whereas the flat-disc roughouts are ubiquitous across the site. This same pattern is evident on the unpublished distribution maps prepared by Butcher (Figure 4) although he does not appear to have commented on it in his unpublished notes (Butcher 1976). It is thought that beehive querns were in use in the north of England from the Middle Iron Age, with flat-disc querns appearing after the Roman conquest. Both types were in use during the Roman period (Gwilt and Heslop 1995, 42) and therefore the existence of beehive roughouts on the Wharncliffe site does not necessarily mean that manufacture began before the Roman conquest.

There is no obvious reason for the difference between the distribution of beehive and flat-disc roughouts. It may simply be the case that the production of beehives was at a level which did not necessitate the exploitation of the more exposed parts of the site along the summit of the crags. Alternatively, later quarrying for flat-disc querns may have destroyed most of the beehive roughouts on the upper slope but this seems unlikely as the beehive roughouts would have been no use for the manufacture of flat-disc querns and would have been disregarded. Other possibilities are that quarrying was excluded from the upper slope of the hill by other activities taking place which have left no surface evidence, or there were fewer boulders of the right size and shape for beehive roughouts towards the summit of the crags. The observation that beehive roughouts appear to cluster in the vicinity of working floors on the lower slopes of the hills suggests these sites may be connected with the manufacture of beehive querns.

No evidence was found to explain why or when the quarrying operations ceased and there is little sign of any later activity in the surveyed area. The derivation of the name Wharncliffe from *Quernclif fe* (Butcher 1957, 38) implies that people at least recognised this as a former quern working site and may have continued to work other parts of the site in the post-Roman period. The inclusion of the site in part of the medieval Wharncliffe Chase must have been an effective barrier to any further exploitation of the area. The small number of millstones identified may indicate small scale quarrying has taken place since the Roman period although they are just as likely to be contemporary with the manufacture of the flat-disc querns. The

unfinished stone wall on the south part of the site probably belongs to this period of the site's history. Butcher referred to it as the deer park wall (Butcher 1976) and its height is exceptional for a field wall.

Exploitation of the site

The survey found that the majority of roughouts on the site belong to the earliest stages of manufacture (stages 1-3) and only a relatively small number of examples are more advanced than stage 3. The reason that there are so few roughouts in the survey area in the later stages of manufacture supports the theory they were taken elsewhere for finishing as has been previously suggested (Wright 1988, 74). An alternative explanation for the paucity of roughouts in the later stages of manufacture might be that they were less prone to break as they neared completion and therefore fewer were discarded. However, this is not likely as the chiselling or drilling of central holes in flat-disc querns and the shaping of hoppers and feedpipes in the beehive querns would have caused stones to break but no examples of stones with these features were noted on the site, apart from several flat-disc querns with central holes. The number of nearly complete querns in the surveyed area might have been slightly depleted in recent years through the theft of stones by collectors or for use in garden rockeries.

The field evidence demonstrates that the site was exploited in several different ways with the most concentrated effort associated with Tracks 1 and 2. The south branch of Track 2 terminates at the foot of the boulder field and focussed around this point is the most dense cluster of flat-disc roughouts and drums on the site. The adjacent boulder field was presumably exploited for raw material as was the ground immediately to the north where surface boulders and rocks have been heavily worked. Track 1 may also have originally continued to this area from the east side of the site. Similarly, the west branch of the Track 2 also leads towards an area at the north-west corner of the site where the ground has been intensively worked and where there is a notable concentration of flat-disc roughouts and drums. Effort also seems to have been expended on improving the surface of Track 2 by packing it with rock chips or laying flat slabs at several places. Despite this the tracks would still have been unsuitable for carts and were probably only used by people on foot or by pack-animals. The evidence of the tracks points to a sustained and organised approach to working parts of the site and the association between the tracks and concentrations of flat-disc roughouts indicates they date to the period when flat-disc rather than beehive querns were being produced.

The evidence suggests that working floors developed on an ad-hoc basis immediately adjacent to suitable rock outcrops and boulders, their lifespan and size dictated by the length of time it took to exhaust supplies of suitable stone in the immediate surroundings. The fairly even distribution of working floors across the site is unlikely to mean that they were all in contemporary use as this would have involved hundreds of people working on the site at the same time. More likely is that the pattern points to a gradual shift in working across the site as the supplies of easily worked stone were depleted in a particular area. The existence of dumps of working debris on Track 2 suggests the track itself was used as a working surface which may also explain why there is a marked absence of working floors on its east side.

The majority of the working floors are remote from the system of tracks and it is difficult to see how the more isolated floors related to the routes. A number on the lower slopes probably pre-date the tracks since, as was noted above, they seem to be

connected with the manufacture of beehive querns. Roughouts may have been carried from working floors to collection points on the tracks but no evidence was found for these along the tracks and it is possible that the tracks and the majority of working floors belong to different episodes in the production of flat-disc querns.

Many beehive and flat-disc roughouts and small areas of rock chippings occur at some distance from working floors suggesting a far less systematic level of exploitation than that which gave rise to the working floors. The evidence suggests individual boulders were selected for working rather than an area of rocks or an outcrop, the roughouts being fashioned on the spot from the parent boulder leaving behind the isolated areas of rock chippings and discarded querns.

The field evidence points to a remarkable degree of standardisation both in the size and the technique of manufacture, suggesting continuity in the production of both beehive and flat-disc querns. The higher proportion of beehive upper stones recorded which are in an advanced stage of preparation (stages 4 and 5) compared to the flat-disc querns suggests they were taken closer to completion on the site than the flat-discs. The shape of beehive querns may have meant they were less prone to break in transit than the flat-disc querns and therefore could be safely taken further towards finishing before they left the site.

Preservation and vulnerability

In addition to the large numbers of quern roughouts lying on the surface, the site is notable for the clarity with which minor features from stone working and quarrying survive. These features range from dumps of spoil and stone chips in the working areas to concentrations of angular stone spalls on boulders and next to roughouts. Generally their survival points to the fact that the site has been largely undisturbed since quern production ceased, possibly because for most of the time it was woodland and part of Wharncliffe Chase in the medieval period. Woodland is shown across the site as late as the first edition 1:2500 scale Ordnance Survey map of 1893 (Ordnance Survey 1893). Another factor could be that the site has experienced periodic burning explaining why so many roughouts and areas of stone debris are clearly exposed on the surface. The fire of 1996 was reportedly only the latest in a succession of fires caused in the past by sparks from steam engines passing at the bottom of Wharncliffe Crags on the now disused line between Sheffield and Manchester (Wright, pers. comm). In the period since 1996, some roughouts and areas of stone spalls are starting to disappear under a carpet of moss as the vegetation regenerates.

The fact that the remains are so clearly exposed and visible means that they are very vulnerable to unintentional disturbance or deliberate damage. The most vulnerable areas of chipping waste are the small areas of stone spalls on the tops of boulders. Quern roughouts are susceptible to being moved out of context for examination and photography, evidence for which was noted during the survey. More seriously, the fact that the survey did not find the nearly-complete flat-disc querns photographed on the site by Butcher in the 1950s testifies to the fact that stones have been removed from the site. The sparsity of roughouts along the top of Wharncliffe Crags also suggests quernstones may have been pitched over the edge, as Butcher noticed with one of the stones he recorded in the 1950s (Butcher 1976). The most vulnerable quernstones are the more nearly complete examples which are lying unobscured on the surface. These are mapped on Figure 15.

6. ACKNOWLEDGEMENTS

Jerry Ready and Elizabeth Wright from Sheffield and Roy Sykes of the South Yorkshire Sites and Monuments Record rendered valuable assistance with the fieldwork. Jane Haigh of Sheffield Wildlife Action Partnership, Paul Barwick of Forest Enterprise and Keith Miller of English Heritage are thanked for help in setting up the survey and Elizabeth Wright supplied background information and discussed the results of her own research into the site. Gill Woolrich organised access to Leslie Butcher's archive in Sheffield City Museum.

7. METHODOLOGY

English Heritage staff involved in the field investigation were Trevor Pearson, Alastair Oswald, Antonia Kershaw, and Marcus Jecock, with the assistance of Stewart Ainsworth and Bernard Thomason. The survey was undertaken using a Leica TC1610 total station theodolite with integral Electronic Distance Measurement (EDM) on a closed traverse of 11 stations. The sites of four of the stations (one, two five and six) were permanently marked with brass rivets and their positions related to the National Grid (OSGB36) using a Trimble 4800 dual frequency Global Positioning Satellite (GPS) system. A transformation programme was used to compute their positions relative to Ordnance Survey trigonometrical pillar SK39/T10 at Hill Top Farm (NGR SK 276 991), 2.5kms north-west of the site. For the location of the permanent stations see Figure 22 and for witness measurements and values see Appendix 1.

All archaeological features encountered during the field investigation were surveyed using the total station, their positions having previously been located by systematic searching of the ground. The ground was divided into discrete blocks and each block was searched for quern roughouts and any other archaeological remains which were then surveyed before the next block was searched.

Each quern roughout was given a unique number; the sequence starting with quern number 100 whilst numbers below 100 were reserved for querns encountered in the area between the post and wire fence and stone wall at the south end of the survey area. Numbers 1-47 were allocated to this area.

A standard set of details for each quern were recorded into a notebook. These were:- (1) the type of quern; (2) the maximum diameter and thickness of the quern; (3) the stage reached in the manufacture of the quern; (4) whether the quern appeared to be abandoned or discarded; (5) the angle at which the quern rested; (6) the visibility of the quern on the surface (see Appendix 2). A digital photograph was taken of each quern using a Fujica MX-700 camera.

The survey was processed using Key Terrafirma and AutoCad software and plotted out for checking in the field at 1:500 scale. The details of each quern was entered into a computer database compiled in Excel 97 (see Appendix 2) and this was subsequently linked digitally with the plot of the querns held in AutoCad using AutoCad Map software. The linkage enabled the results of database queries to be displayed graphically. The digital photographs were checked using Corel Photo-Paint 8 software. The report and illustrations were prepared by Trevor Pearson using CorelDraw 8 and Corel Ventura 8 software. The report was edited by Stewart Ainsworth.

The site archive has been deposited in English Heritage's National Monuments Record, Great Western Village, Kemble Drive, Swindon SN2 2GZ, to where applications for copyright should be made (reference number: SK 29 NE 7).

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Wright, E, 1988. 'Beehive Quern Manufacture in the South-East Pennines' *Scottish Archaeological Review* Vol 5, parts 1 and 2, 65-77

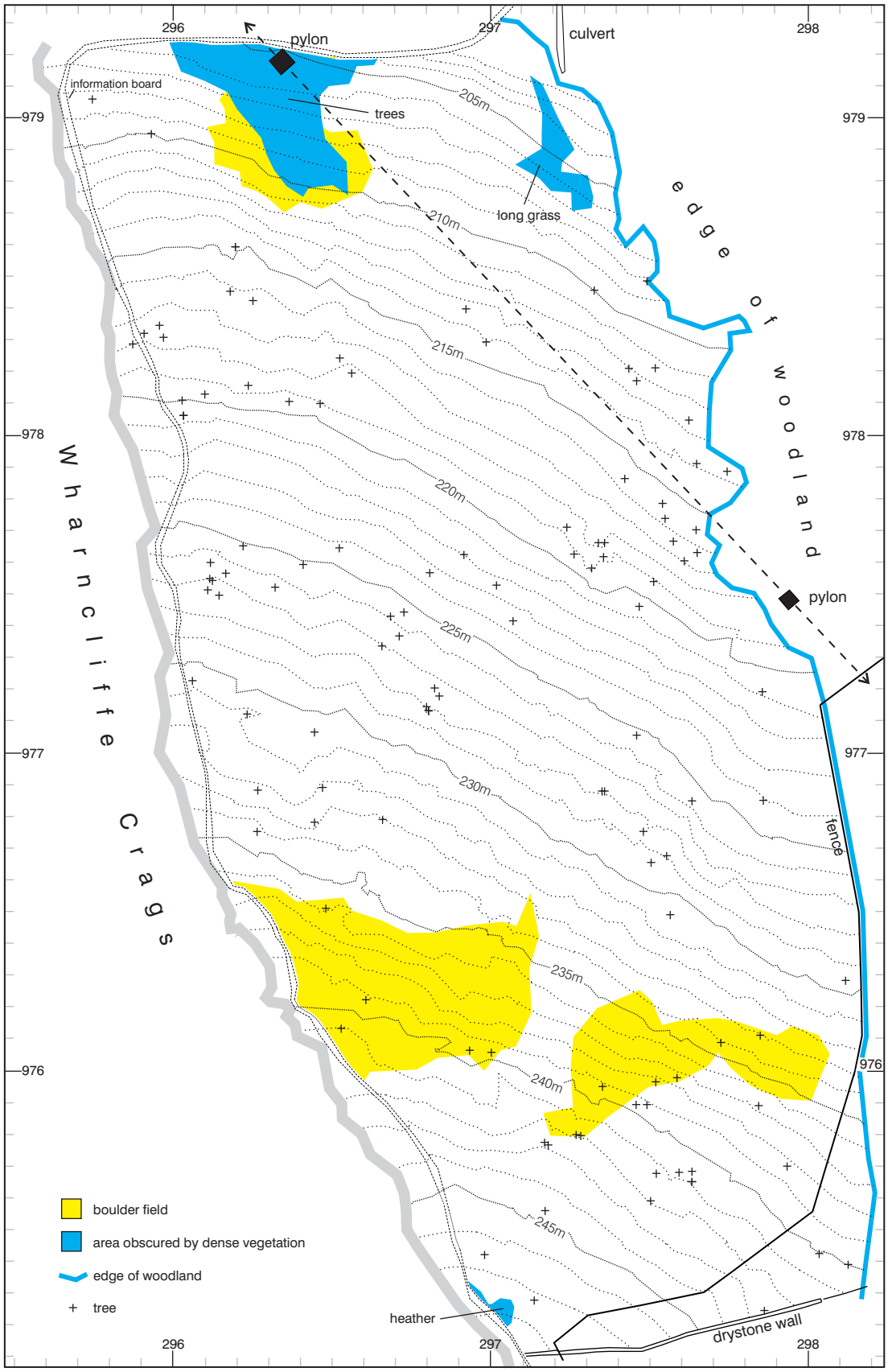


Figure 9. The natural topography and modern features

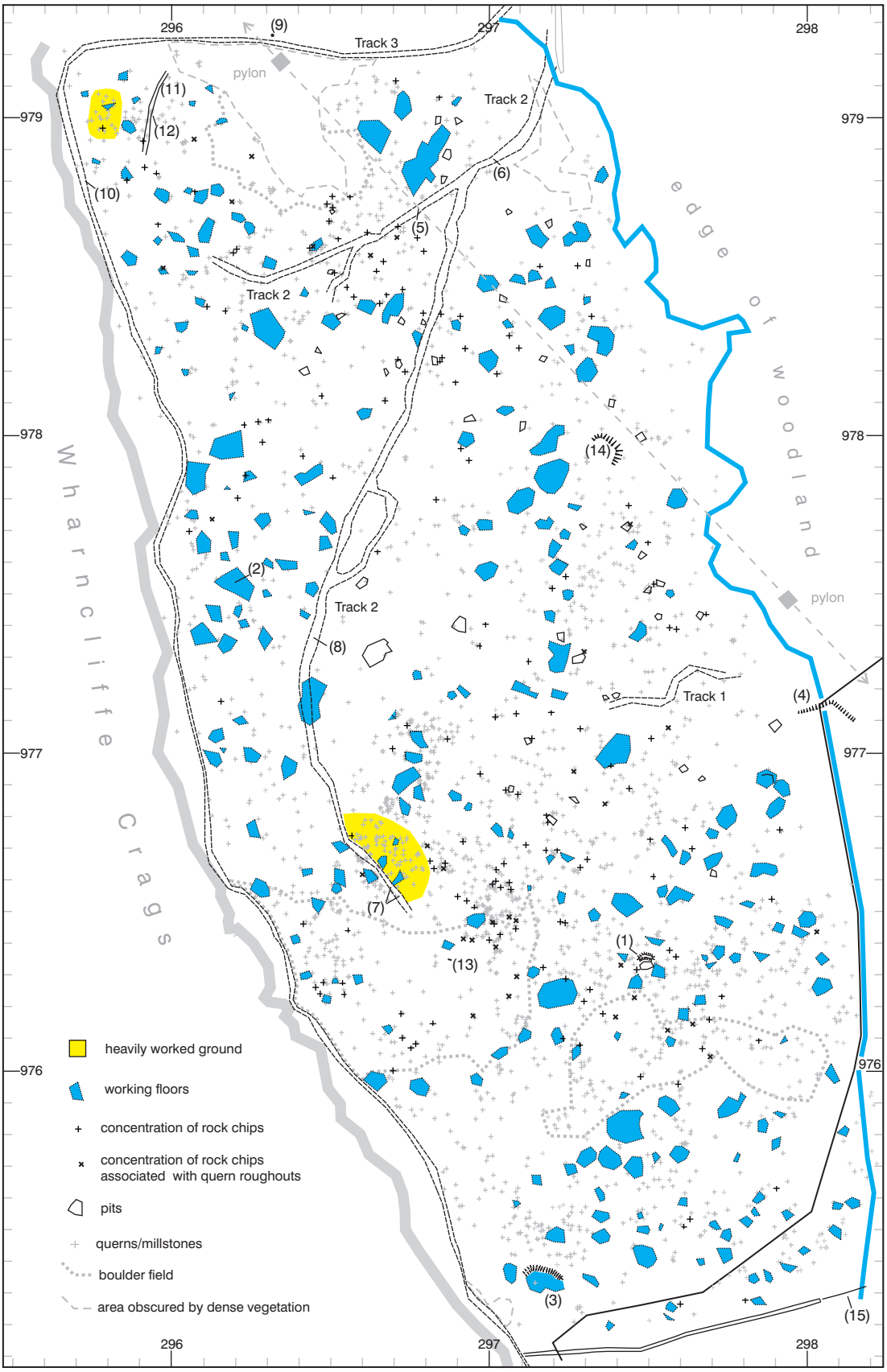


Figure 10. Surface workings, tracks, working floors and miscellaneous earthworks

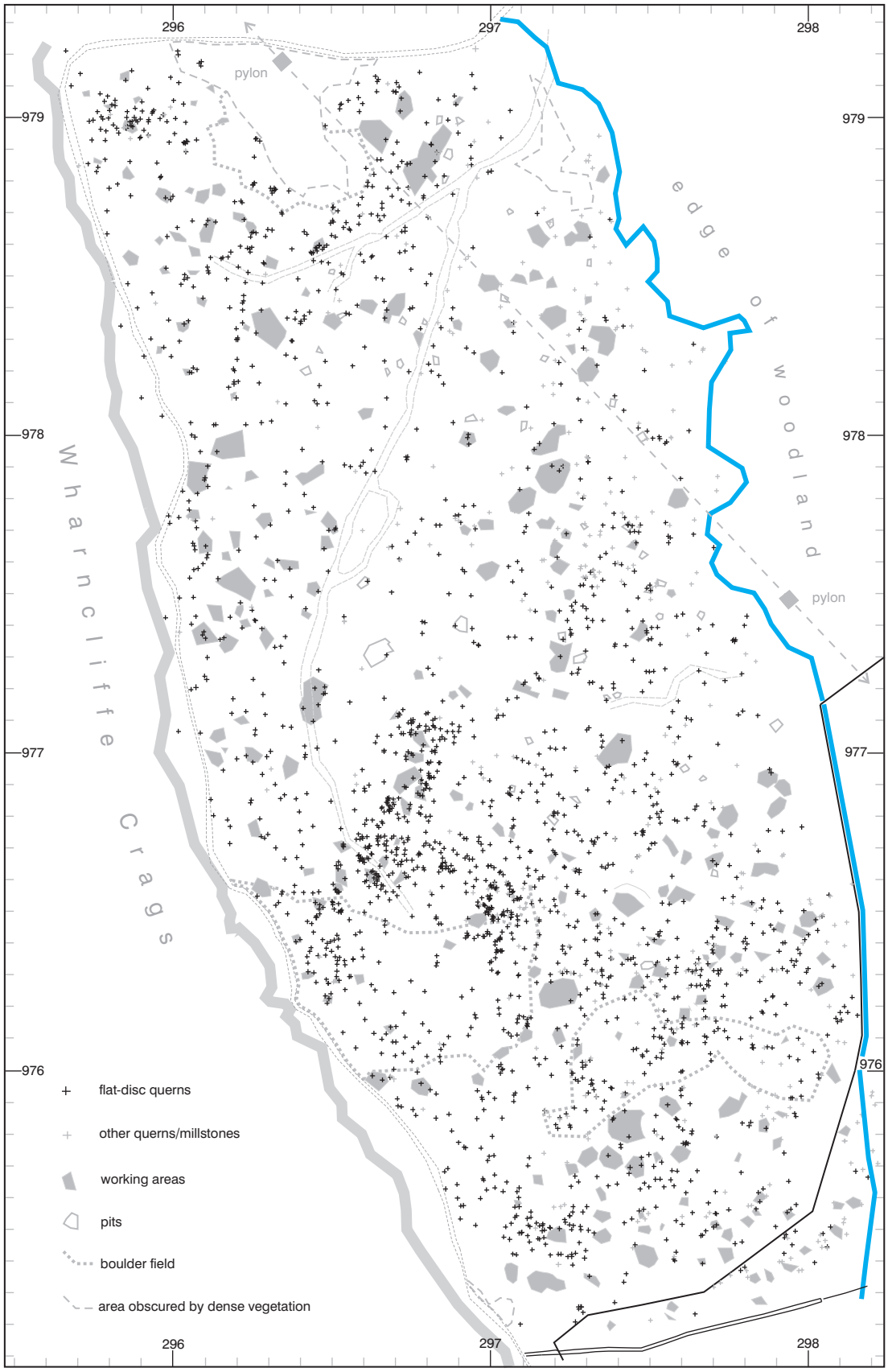


Figure 11. The distribution of flat-disc querns

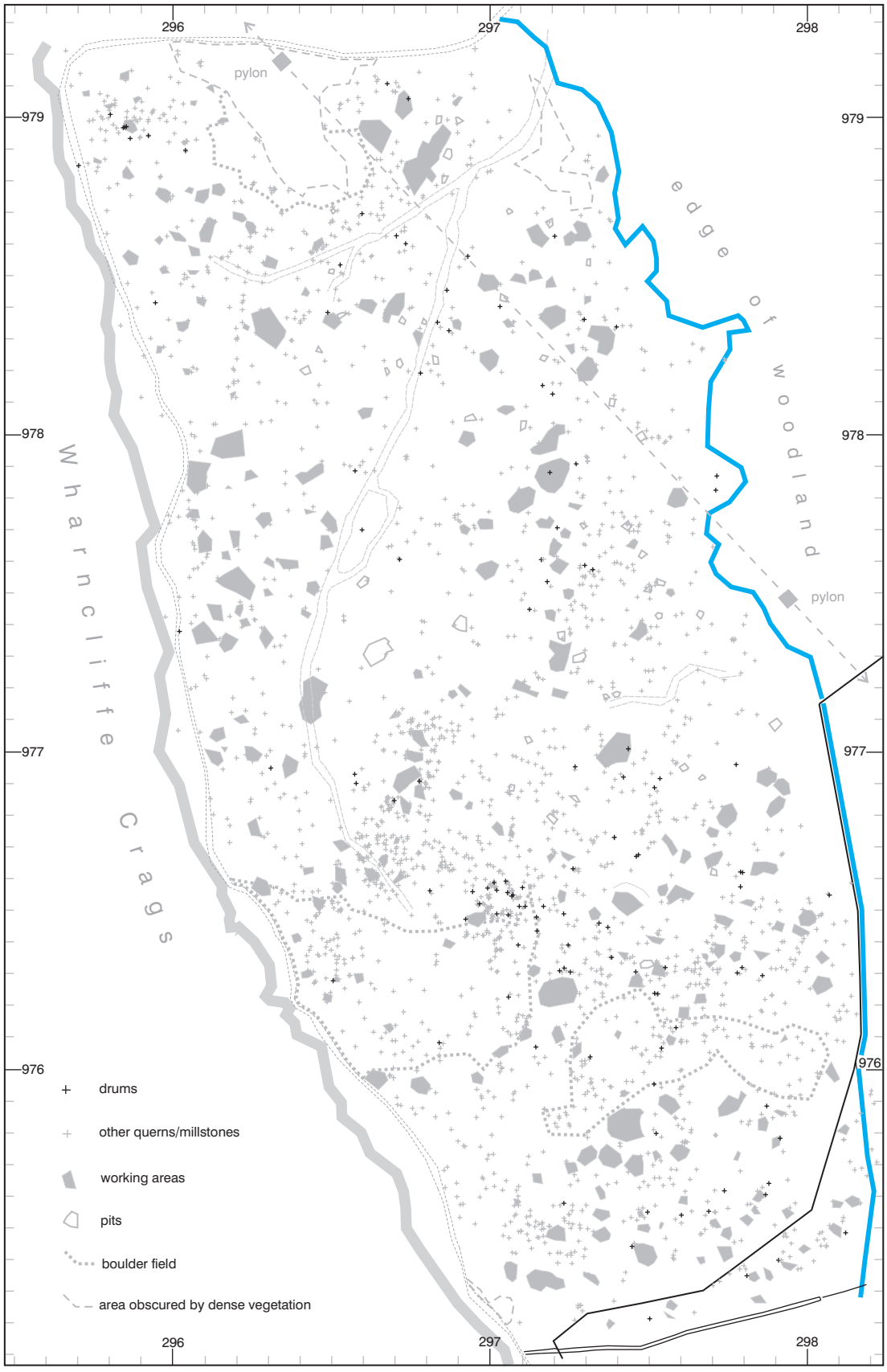


Figure 12. The distribution of drums

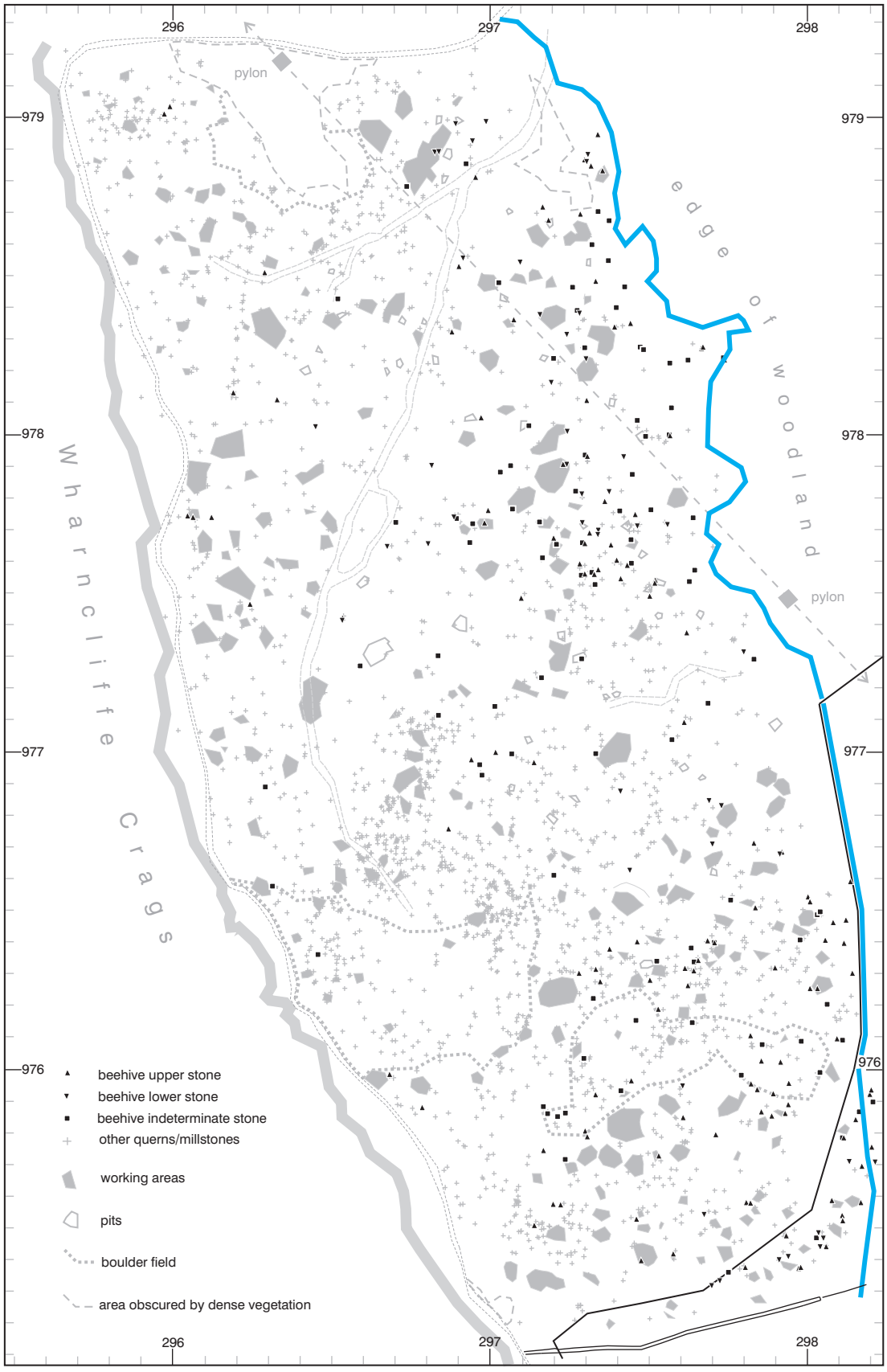


Figure 13. The distribution of beehive querns

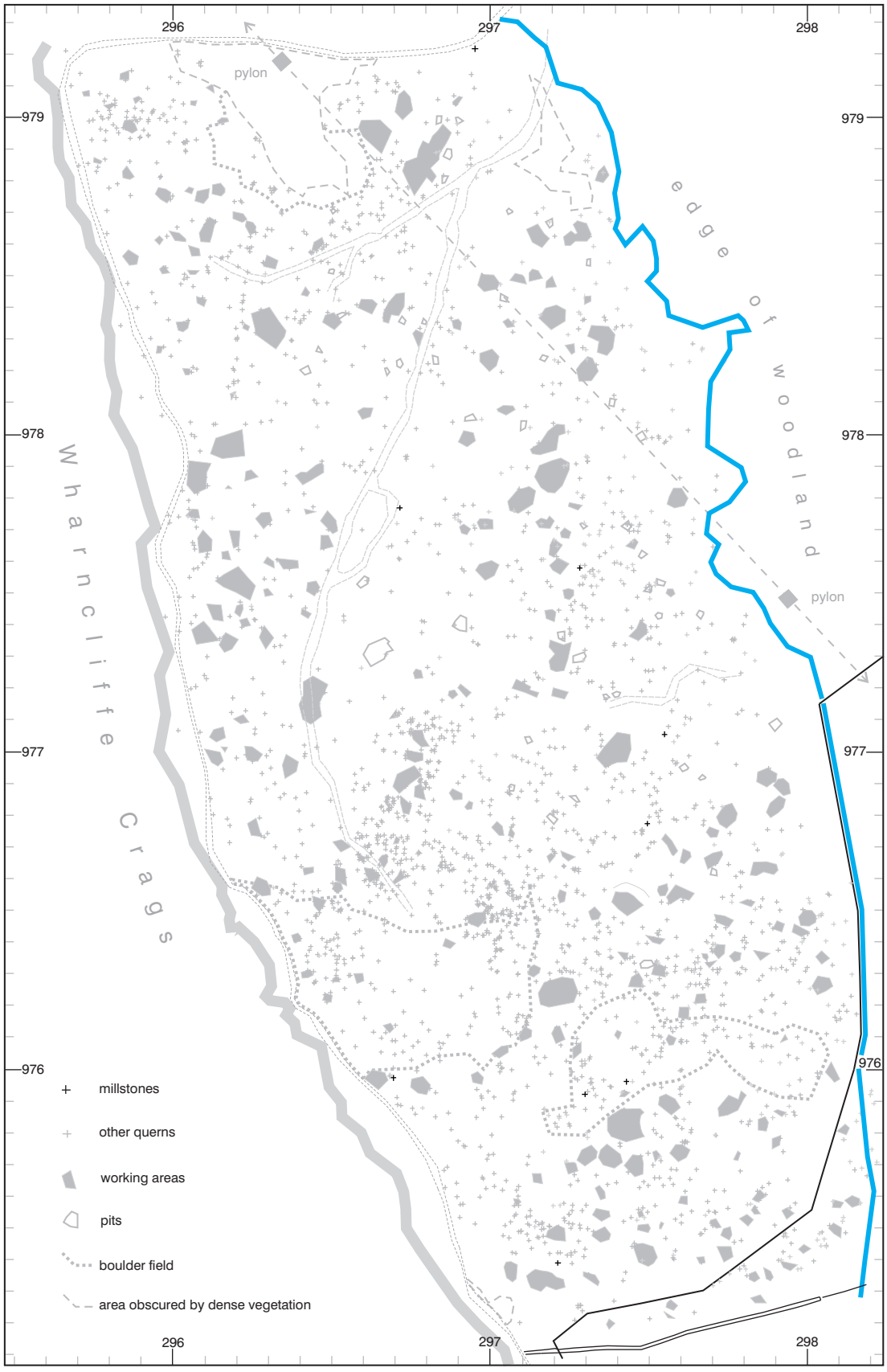


Figure 14. The distribution of millstones

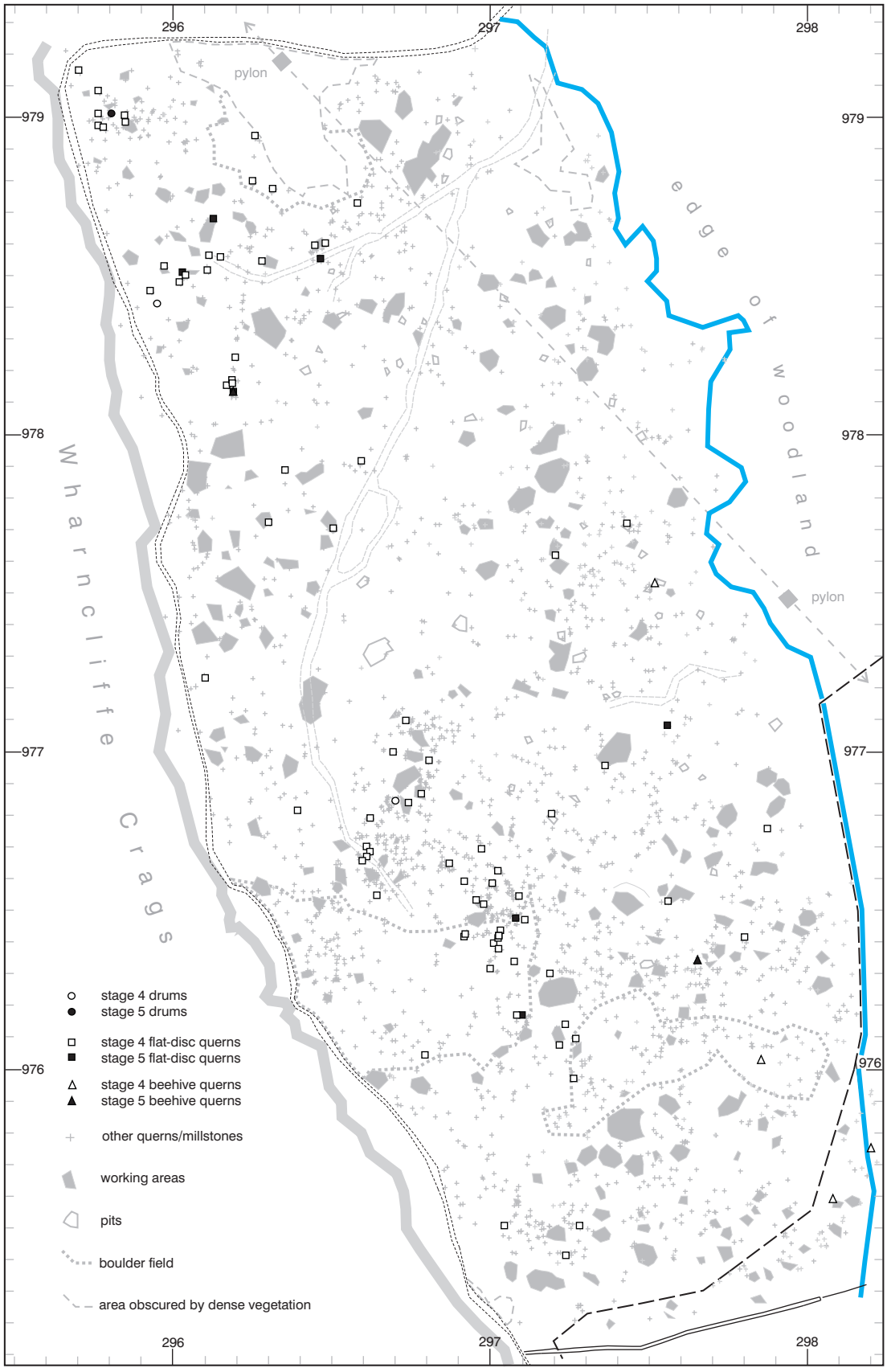


Figure 15. The distribution of querns belonging to stages 4 and 5 which are visible on the surface

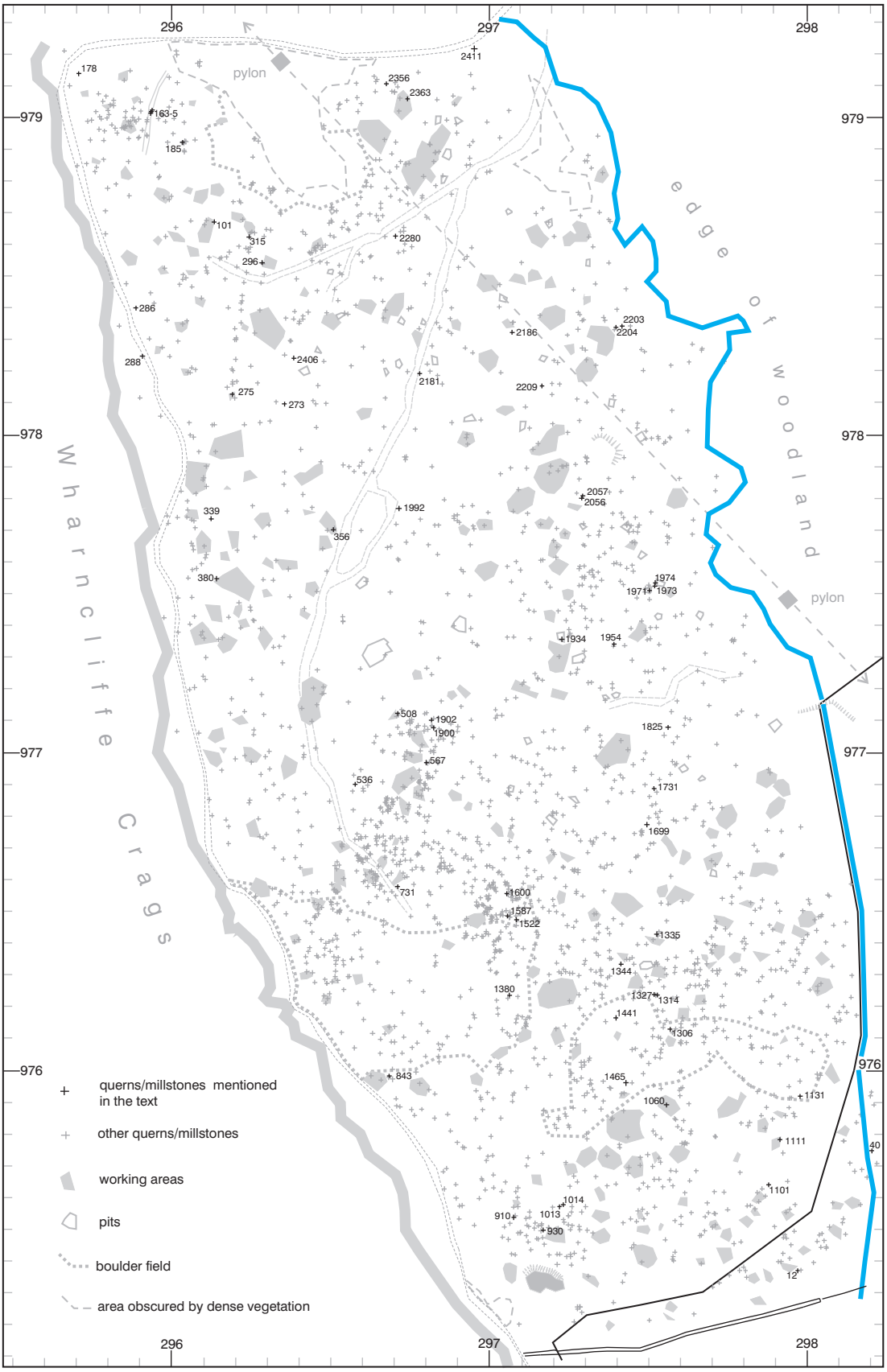
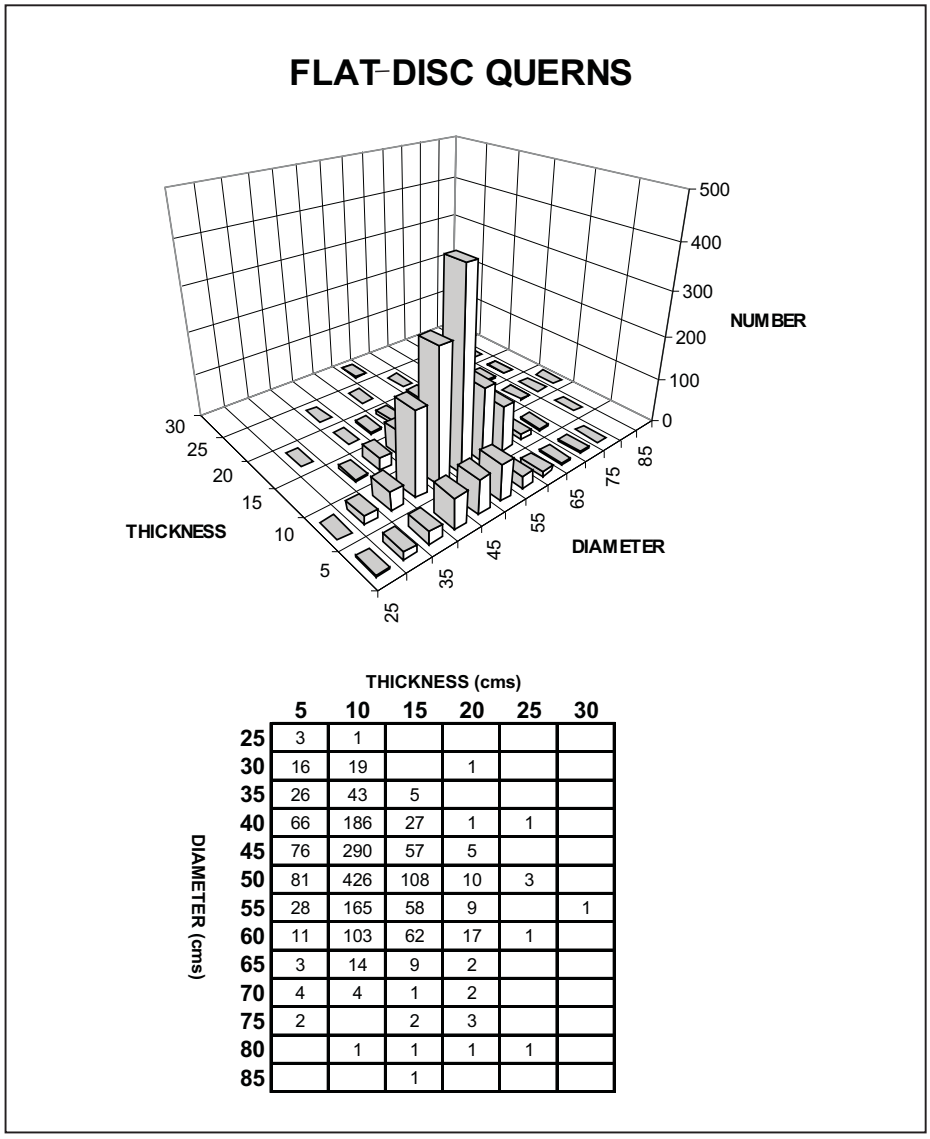


Figure 16. The location of querns mentioned by number in the text



THICKNESS (cms)

DIAMETER (cms)	5	10	15	20	25	30
25	3	1				
30	16	19		1		
35	26	43	5			
40	66	186	27	1	1	
45	76	290	57	5		
50	81	426	108	10	3	
55	28	165	58	9		1
60	11	103	62	17	1	
65	3	14	9	2		
70	4	4	1	2		
75	2		2	3		
80		1	1	1	1	
85			1			

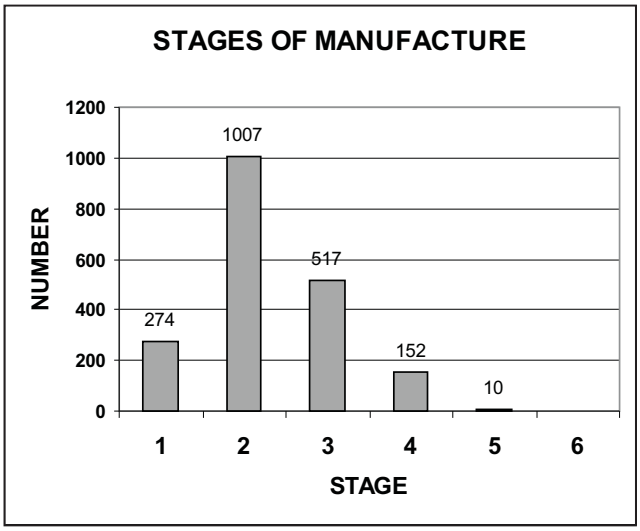
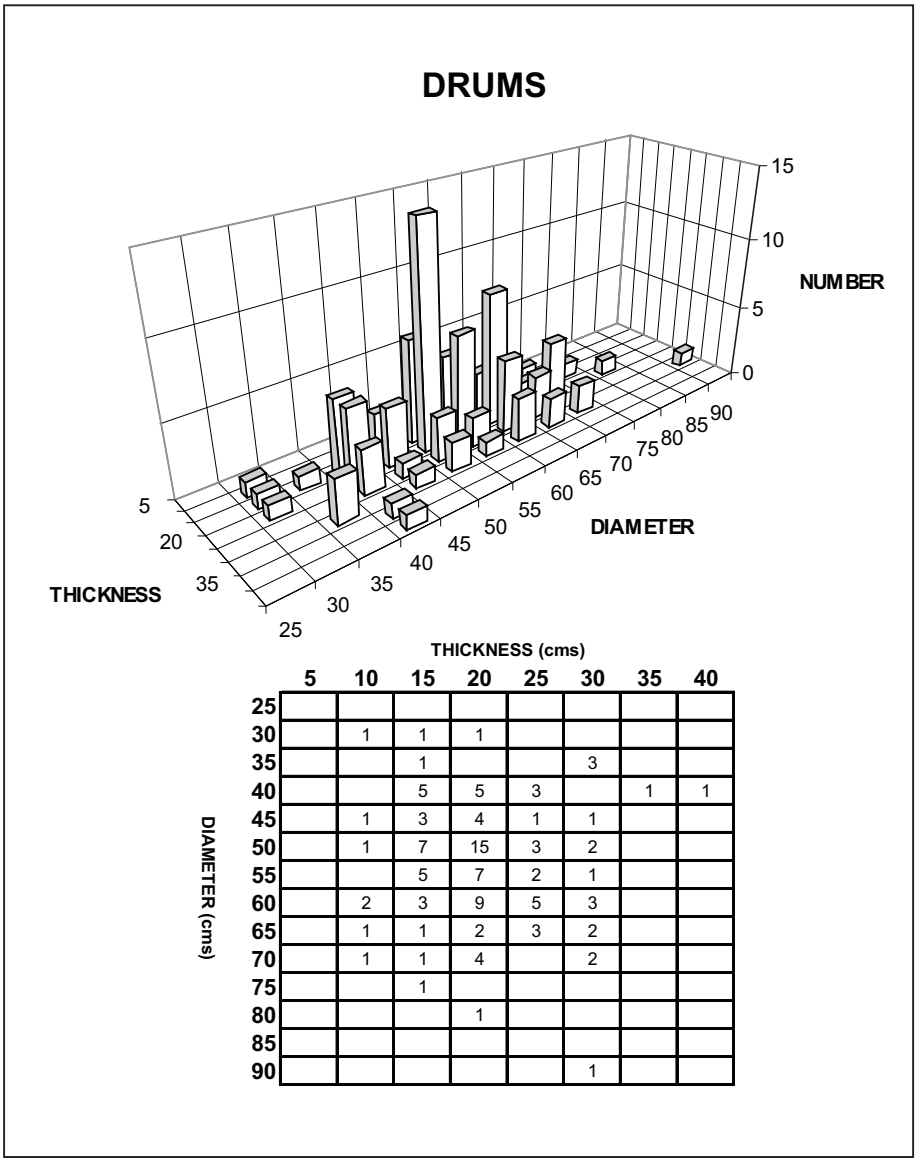


Figure 17. Diagrams showing the numbers of flat-disc querns ranged by dimensions (above) and stages of manufacture (below)



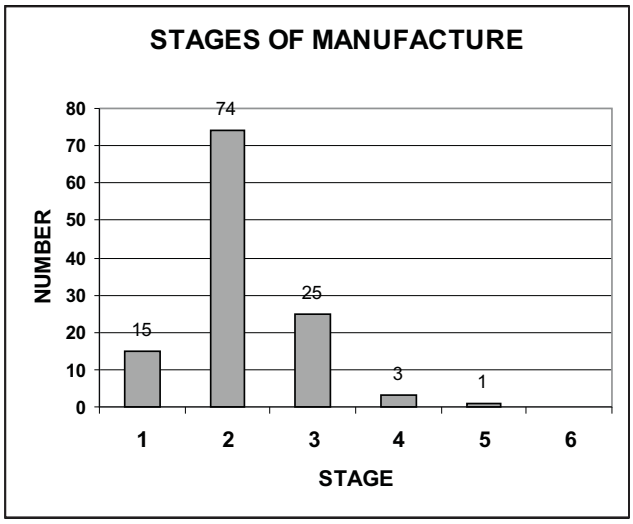
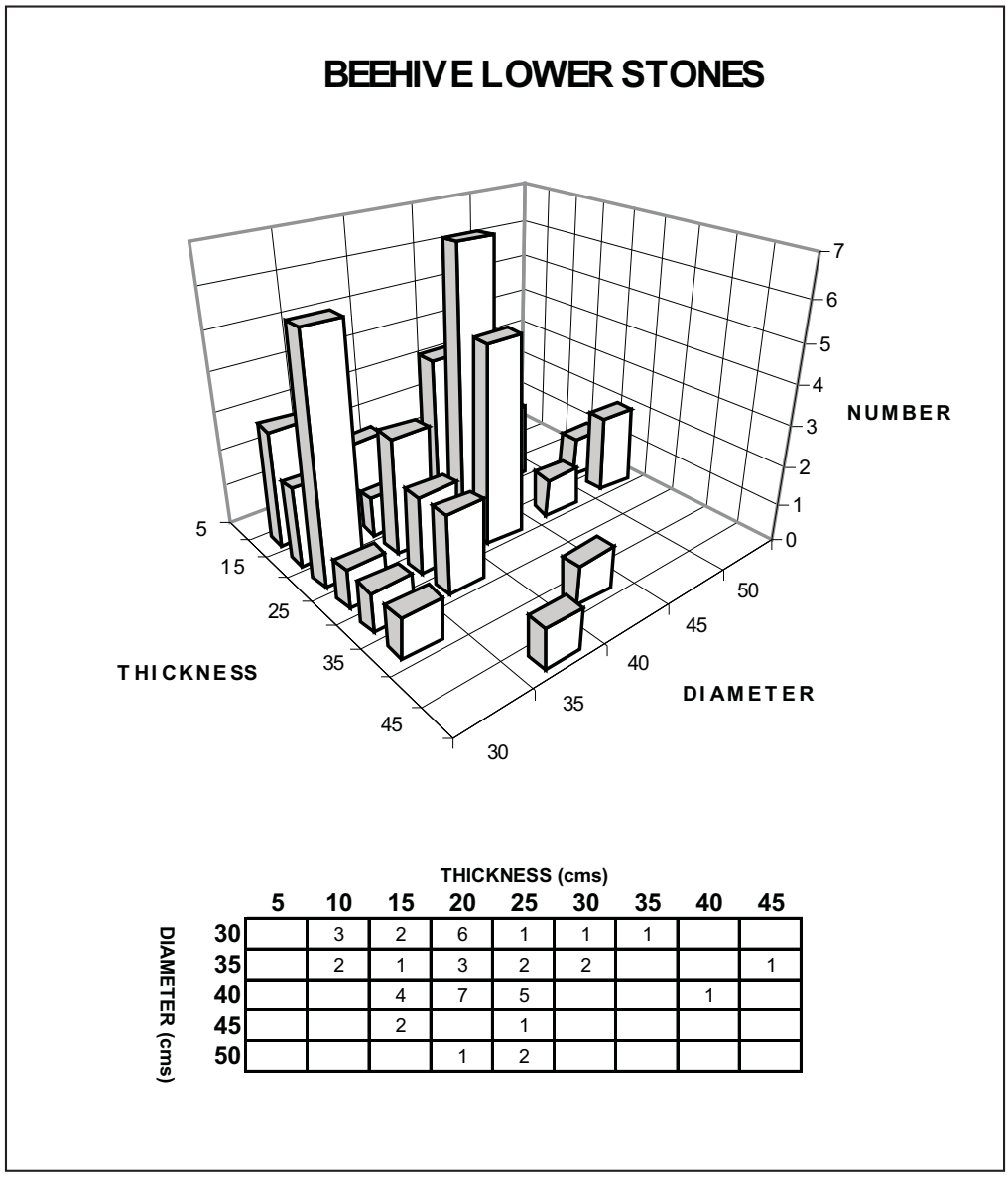


Figure 18. Diagrams showing the numbers of drums ranged by dimensions (above) and stages of manufacture (below)



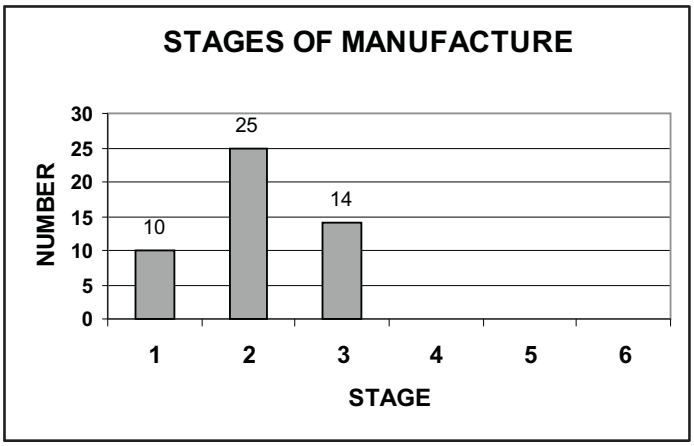
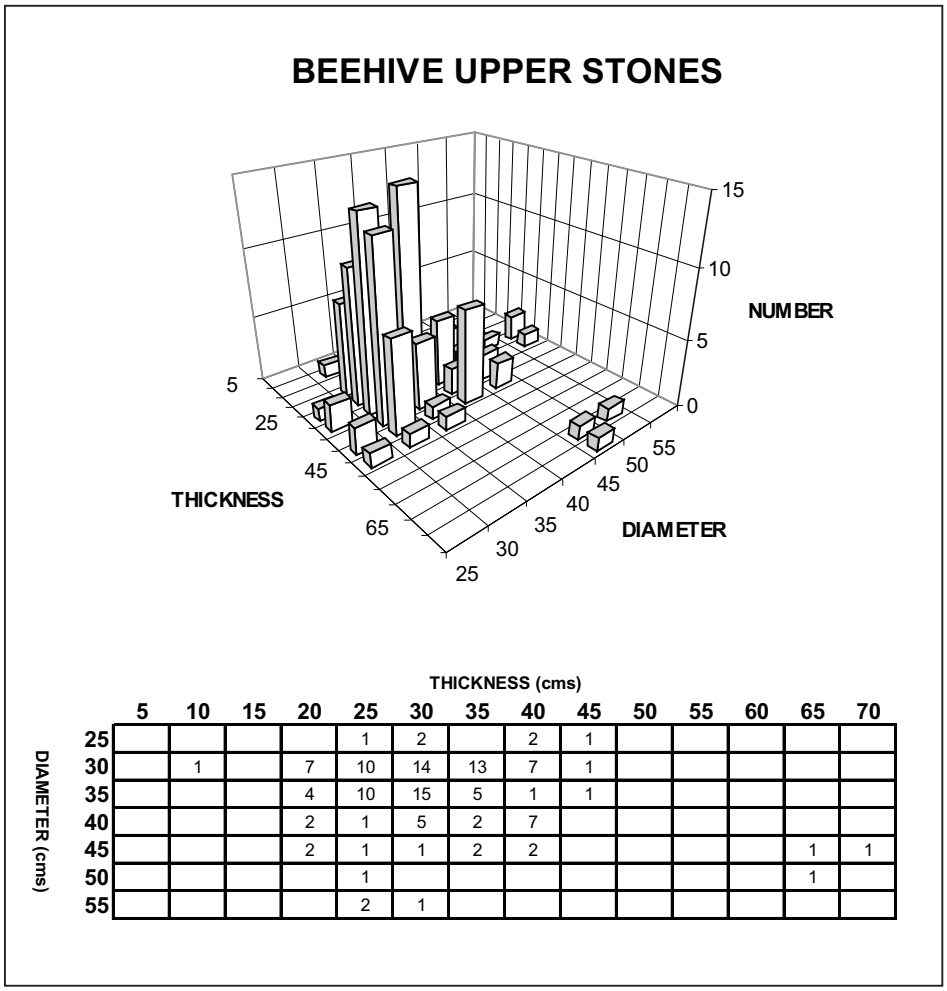


Figure 19. Diagrams showing the numbers of beehive lower stones ranged by dimensions (above) and stages of manufacture (below)



THICKNESS (cms)

DIAMETER (cms)	5	10	15	20	25	30	35	40	45	50	55	60	65	70
25					1	2		2	1					
30		1		7	10	14	13	7	1					
35				4	10	15	5	1	1					
40				2	1	5	2	7						
45				2	1	1	2	2					1	1
50					1								1	
55					2	1								

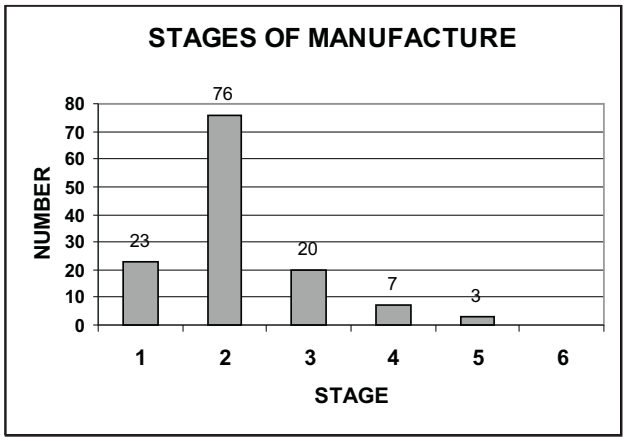
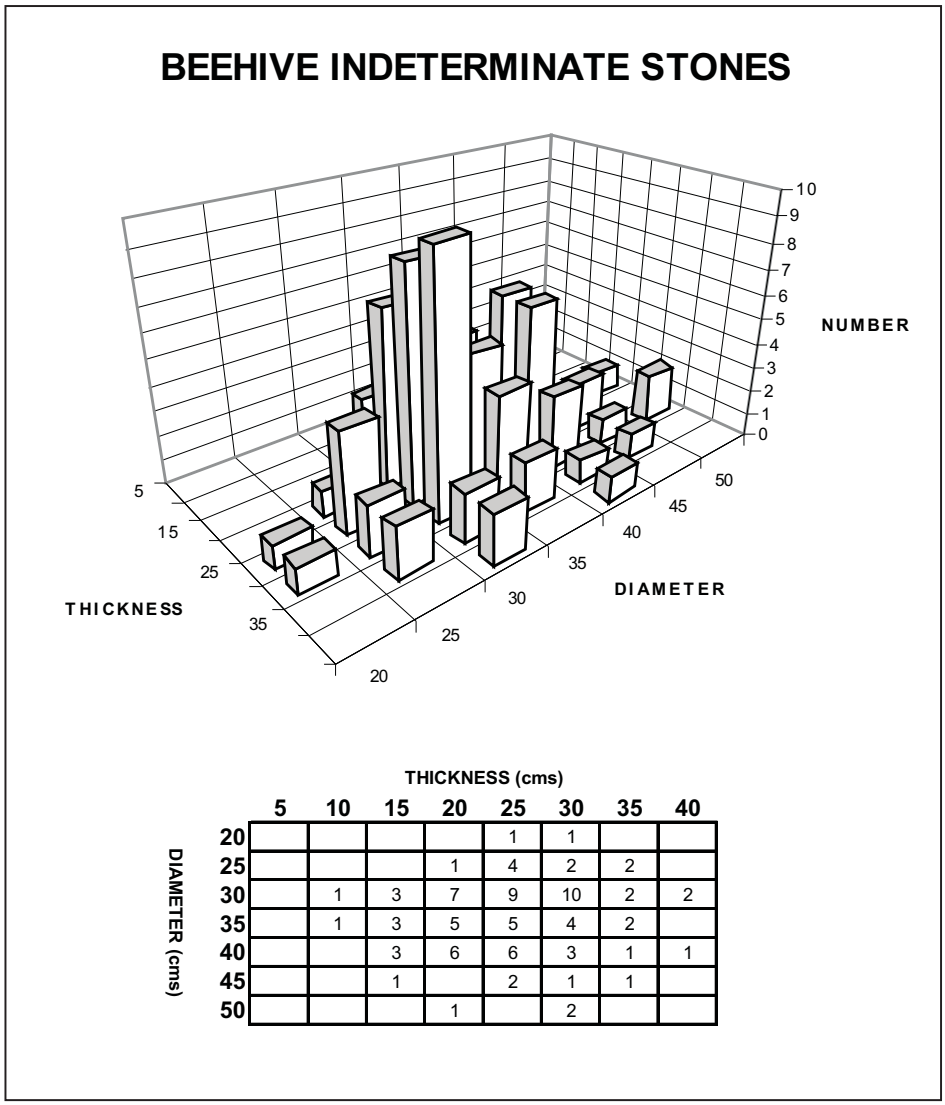


Figure 20. Diagrams showing the numbers of beehive upper stones ranged by dimensions (above) and stages of manufacture (below)



THICKNESS (cms)

DIAMETER (cms)	5	10	15	20	25	30	35	40
20					1	1		
25				1	4	2	2	
30		1	3	7	9	10	2	2
35		1	3	5	5	4	2	
40			3	6	6	3	1	1
45			1		2	1	1	
50				1		2		

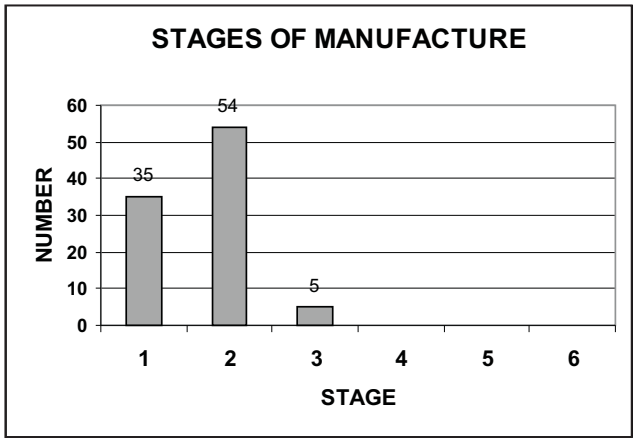


Figure 21. Diagrams showing the numbers of indeterminate beehive querns ranged by dimensions (above) and stages of manufacture (below)

APPENDIX 1: Survey traverse diagram and location of permanent survey stations

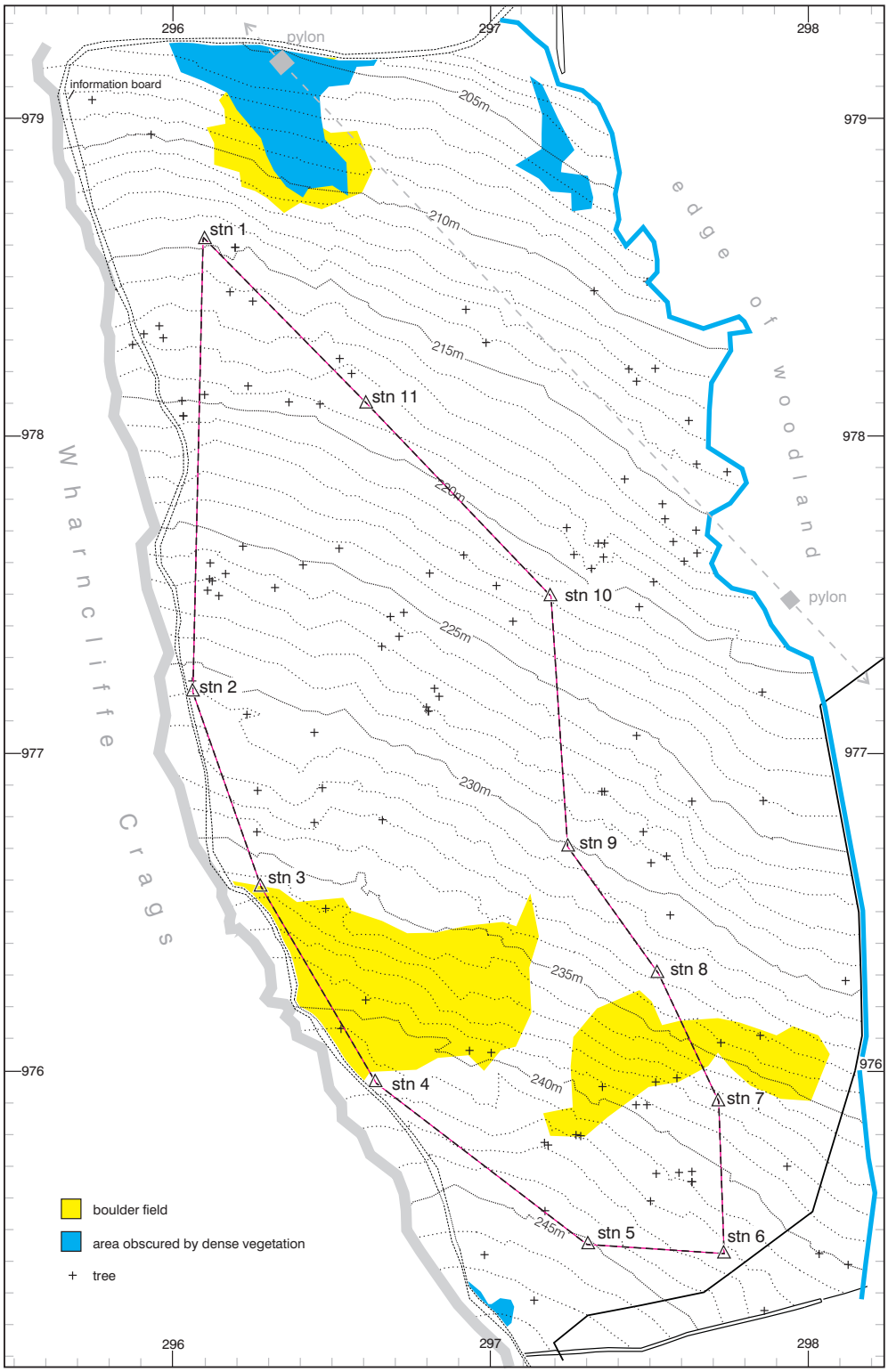


Figure 22. Survey traverse showing location of survey stations (stn 1-11)

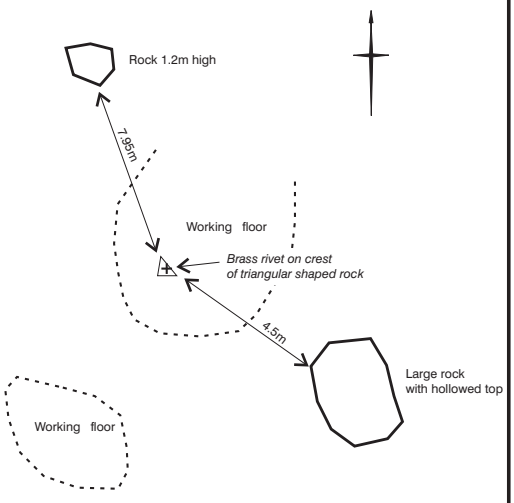
ENGLISH HERITAGE

SURVEY STATION INFORMATION

SITE NAME	Wharncliffe Rocks, Sheffield		
Station number	Station Number 1	**Status**	Permanent
Type of Mark	Brass Rivet	**NMR number**	SK 29 NE 7
Date of Survey	Oct-Nov 1999	**Sam number**	S YORKS 253
Office of origin	York	**RSM number**	—
Surveyor(s)	TP, AO, AK, MJ, SA, BT	**Neg number**	—

Co-ordinate Scheme	Eastings	Northings	Height
OS National Grid	429609.540	397862.386	214.641
Divorced Site Grid	—	—	—

View looking south-east



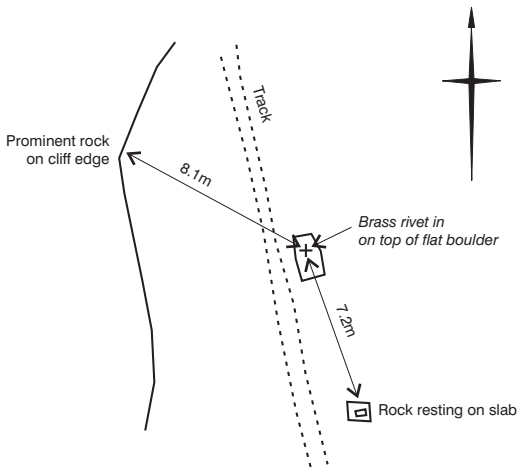
ENGLISH HERITAGE

SURVEY STATION INFORMATION

SITE NAME	Whandiffe Rocks, Sheffield		
Station number	Station Number 2	**Status**	Permanent
Type of Mark	Metal bolt	**NMR number**	SK 29 NE 7
Date of Survey	Oct-Nov 1999	**Sam number**	S YORKS 253
Office of origin	York	**RSM number**	—
Surveyor(s)	TP, AO, AK, MJ, SA, BT	**Neg number**	—

Co-ordinate Scheme	**Eastings**	**Northings**	**Height**
OS National Grid	429606.310	397719.129	230.938
Divorced Site Grid	—	—	—

View looking north-west



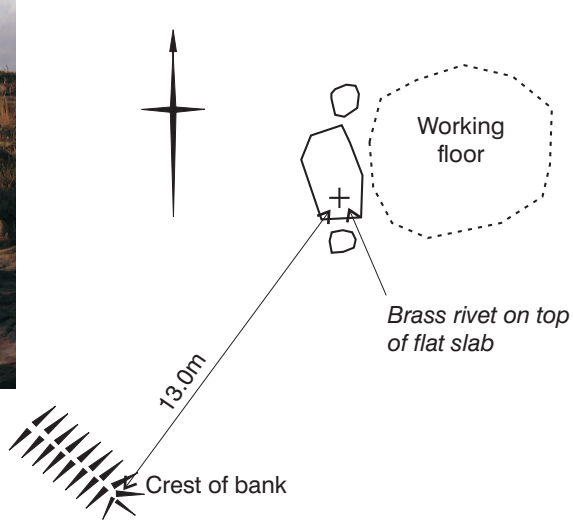
ENGLISH HERITAGE

SURVEY STATION INFORMATION

SITE NAME	Whandiffe Rocks, Sheffield		
Station number	Station Number 5	**Status**	Permanent
Type of Mark	Metal bolt	**NMR number**	SK 29 NE 7
Date of Survey	Oct-Nov 1999	**Sam number**	S YORKS 253
Office of origin	York	**RSM number**	—
Surveyor(s)	TP, AO, AK, MJ, SA, BT	**Neg number**	—

Co-ordinate Scheme	Eastings	Northings	Height
OS National Grid	429730.351	397545.457	245.226
Divorced Site Grid	—	—	—

View looking south-west



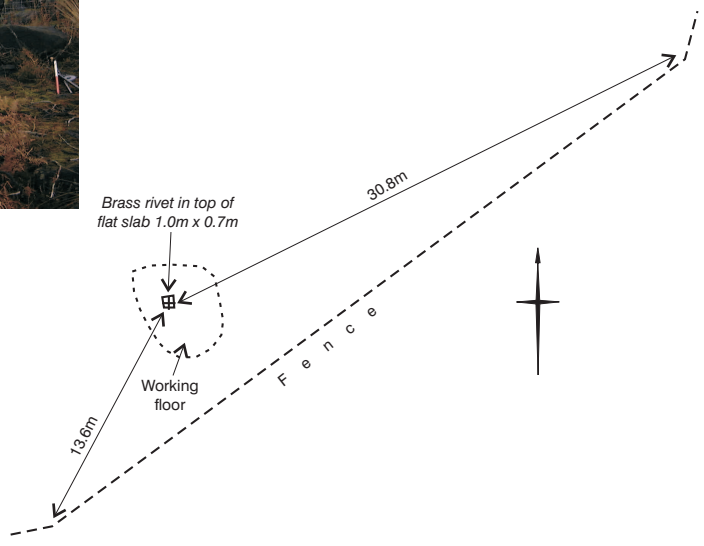
ENGLISH HERITAGE

SURVEY STATION INFORMATION

SITE NAME	Whandiffe Rocks, Sheffield		
Station number	Station Number 6	**Status**	Permanent
Type of Mark	Metal bolt	**NMR number**	SK 29 NE 7
Date of Survey	Oct-Nov 1999	**Sam number**	S YORKS 253
Office of origin	York	**RSM number**	—
Surveyor(s)	TP, AO, AK, MJ, SA, BT	**Neg number**	—

Co-ordinate Scheme	**Eastings**	**Northings**	**Height**
OS National Grid	429773.476	397542.516	242.413
Divorced Site Grid	—	—	—

View looking south



APPENDIX 2: Database of querns recorded during the survey

Key to Appendix 2

TYPE
bi = indeterminate beehive stone
bl = beehive lower stone
bu = beehive upper stone
d = drum
f = flat-disc
m = millstone

DIMENSIONS (all mesurements are in centimetres)
DIM-1
The diameter of the quern
DIM-2
The thickness of flat-disc querns, drums and millstones; the height of beehive querns

STAGE (stage of manufacture)
1 = outline of quern defined by rough shaping
2 = outline of quern defined by a roughly faceted edge
3 = quern with faceted edges smoothed
4 = fully shaped quern with rough pecking on outside edge
5 = fully shaped quern with fine peacking on the outside edge
6 = completed quern showing signs of use

DISCARD?
d = a discarded quern where the stone has evidentally broken during manufacture.
a = an abandoned quern where there is no sign of physical damage to explain why the stone was left uncompleted

ANGLE
0 = flat-disc quern, drum or millstone lying horizontally; beehive quern resting on its grinding surface
45 = quern resting at an angle of around 45 degrees
90 = flat-disc quern resting on its edge; beehive quern resting on its side

VISIBILITY
ob = quern almost totally obscured by vegetation or overlying rocks/soil cover
pb = quern partially buried by rocks/soil or partially obscured by vegetation
os = quern on the surface and clearly visible

EASTING AND NORTHING
National Grid references given to the nearest metre (although recorded to the nearest centimetre in the field).