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Limeburning in West Sussex, and the Newbridge Wharf Limekilns,

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PROJECT

A preliminary visit to the site at Newbridge wharf suggested a number of questions regarding lime production at the site, not the least of which was the design of the limekilns. The ground around the site at Newbridge is essentially flat, and would therefore offer no natural platform to aid construction, and easy loading of

the kilns. All of the other known large scale industrial kilns (as one would presume these kilns to have been, from both their placement on a wharf and also from their outline shape on the 1st and 2nd edition OS plans) in West Sussex, are sited on the Downs, and set into the southern (and in the case of Houghton and Washington, the south western) escarpment. Being built into the rock face allows easier loading from above the kiln, and also reduces the amount of necessary building materials needed for construction.

Documentary research having offered no conclusive evidence of the type of limekilns present at the site, it was decided that archaeological investigation might provide the necessary evidence if remains of the kilns had survived.

OBJECTIVES

The objectives of the excavation were:

- to investigate what structural remains, if any, had survived of the limekilns;
- to discover whether the kilns were continuous or flare kilns;
- to ascertain whether the overall structure depicted on the OS plan accurately represented the structure in the ground;
- to discover what kind of fuel was being used;
- to gain the maximum of knowledge with minimal intervention and destruction of the archaeological record.

GEOPHYSICS

A series of geophysical resistivity and magnetometer explorations were carried out before excavation, but the results of both proved quite inconclusive. However, a small trial trench in the area shown by the geophysics to have produced the strongest signal unearthed a number of bricks and pieces of chalk and coal.

EXCAVATION

The excavation was carried out by 'A' level archaeology students from Christ's Hospital School under the direction of the author, assisted by assistant directors, Rachel Graham, Andrew Isaac and Rowan May.

An area measuring 30m x 10m was stripped by machine to a depth of 50-100mm, with the east end of the kilns left unexcavated, as this was outside of the area considered for landscaping by the owner. The area was then shovelled and trowelled in order to define what had been uncovered.

At the eastern end of the site, an intact kiln base (kiln 1) was uncovered, with a floored working area to the south of it (used for unloading lime or loading fuel). In the middle of the site, a quarter section was removed from the pot (the actual part of the kiln in which lime was produced) of another kiln (kiln 2), to a layer of packing below the floor level. At the west end of the site, excavation concentrated on the working area at the back of kiln 3, rather than the kiln pot itself. Also excavated were sections of walls around the north, west and south sides of the site. The entire site was on a slope dipping down to the east. The difference in the heights at the beginning of the excavation between the north-west and south-east corners was 1.80m.

KILN 1 (see Figure 7, 8, 9 and 10)

The foundation cuts (66) were through natural, up to 400mm deep from the excavated ground surface and were vertical for the east and west walls of the working area, and at an angle of approximately 80° at the base of the kiln pot. The west and east walls were of a two-part construction, with bricks on the interior of the walls (62, 68), with a chalk-block and mortar packing on the outside edge (63, 69). Bricks alone were used in the construction of the kiln pot (70). These were laid in a pattern so that they appeared to be radiating from the centre of the kiln. Where only bricks were used in construction, the packing for the outside edges of the foundation trench was a light coloured silty sand (67). In the interior of the kiln the bricks were four courses high, and in the working area of the kiln they were six courses high on the east wall and seven on the west wall. The floor of the kiln and the northern most parts of the working area were brick paved with no evidence of bonding (73), while the back end of the working area was a compacted lime floor (74), produced by laying and slaking lime, then compacting it. One of the central bricks of the kiln had sunk 60mm below the level of the others. The surface of the bricks within the kiln were burnt and black in colour.

Directly above the brick floor in the kiln was a brittle encrusted layer of chalk and lime (76), covering most of the base of the kiln pot. It was up to 100mm thick by the curved north wall and thinned out to 20-30mm towards the mouth of the kiln, over a distance of about 1 metre. Above this was a 200mm thick silty deposit (71) associated with the disuse of the site, containing brick, tile, chalk, coal, metal objects, slate and animal bone. Evidence for robber activity was recovered for this kiln around the kiln pot, where following the removal of bricks from the kiln pot, a layer of mortar (72) that was once on the outside edge of these bricks, had slumped on top of the remaining bricks. The robber cut (75) was visible between the bricks (70) and the original packing (67).

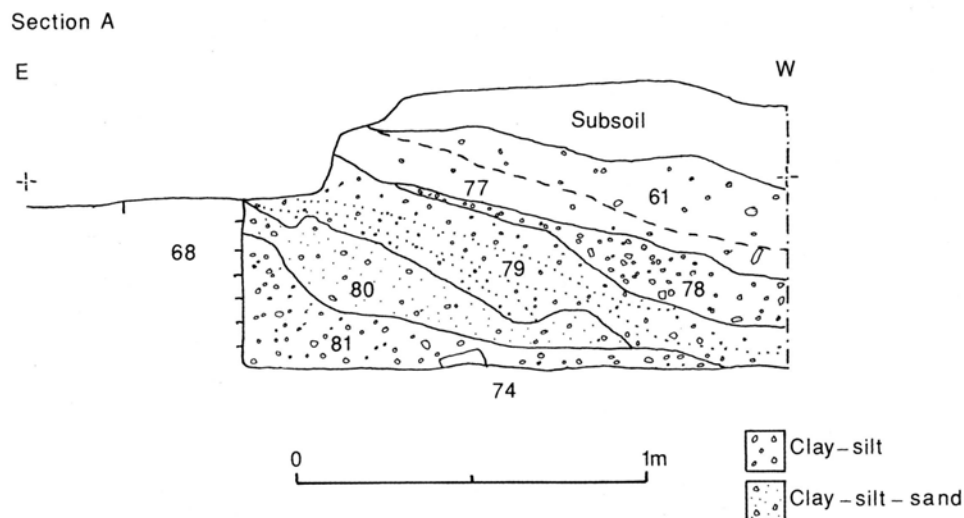


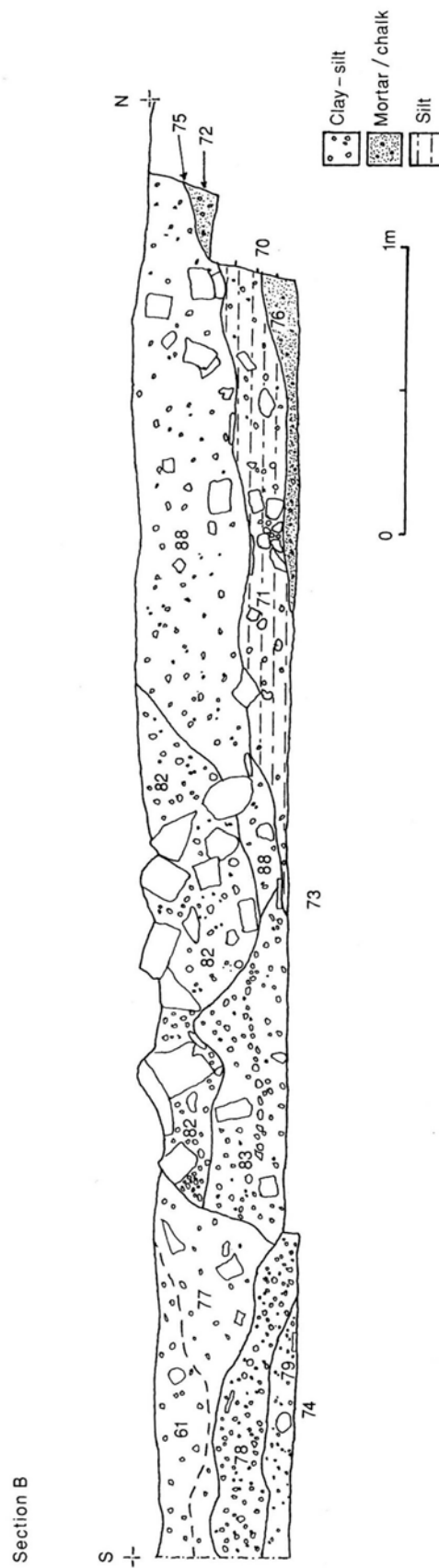
Figure 10: Section A, east-west section through kiln 1, illustration by Rowan May

In total nine demolition layers (61, 77, 78, 79, 80, 81, 82, 83, 88.) have been identified within this kiln, (see figures 9 and 10). These could indicate a number of demolition events, or one main event from a series of different directions. However, it is clear that these events took place over a short period of time, as there was no evidence of any soil formation in between demolition layers. Layer 79 particularly, shows clear tip lines from east to west. Finds from the demolition layers similar to that of the disuse layer (71); containing brick, tile, chalk, coal, metal objects, slate and animal bone. Situated above the top layer of demolition (61) that covers much of site were two layers. A layer of chalk fragments (65) overlain by an ashy deposit (64) with some inclusions of brick and chalk. Neither of the two layers appear to have been associated with the operation or the demolition of the kiln.

KILN 2 (see Figure 11)

Unlike the foundation cut for kiln 1, which was set no more than 400mm deep, the cut for kiln 2 (41) cuts through 1.30m of natural from the top of excavation. This was the cut for the side of the kiln pot, which descended 1.05m below the ground surface at approximately 80 - 85°.

Figure 11: Section B, north-south section of kiln 1 demolition fill, illustration by Rowan May



At this point it then flattened out onto a step 150mm wide, and then dropped down vertically another 200mm to the base of the cut. Although there were no bricks still left within this kiln, it was possible to trace their original position as there remained a layer of mortar adherent to both the sides, and the step at the base of the kiln. The mortar on the sides of the kiln (42) was between 10-40mm thick, pinkish yellow in colour, of a loose consistency, and coarse, containing many small (10mm diameter) pebbles. The mortar on the top of the step (50) was 20-30mm in height, contained a much higher proportion of sand and was more consolidated.

A layer similar in consistency to context 50 was recorded at the base of the demolition deposits 0.95m below the ground surface. This was a layer of mortar (49) that would have been below the bricks at the base of this kiln, had they not been robbed out. Below this mortar was a layer of fine chalk or lime (51). This layer whilst entirely consisting of chalk, should really be split into two or three sub - units. The top 100mm of this layer (51) had been severely heated from the kiln above, and had therefore transformed from chalk to lime. Below this top 100mm was a layer of about 50mm of small chalk cobbles and below that another 250-300mm of much large chalk boulders. Between this layer and the cut (41) at the base of the kiln, was a layer of packing (52) about 20-30mm thick, packed around the large chalk blocks. There was none of the original fill from the kiln's use within the section excavated. This is because both the brick walls and the floor were removed, and therefore anything above these would also have been destroyed

Clear evidence of robber activity (53) could be seen preserved in the section wall. In order to remove all of the bricks from the kiln pot walls, after the bricks had been removed from the floor, a cut had been made through the mortar below them (49) and also through some of the chalk floor (51) below. Associated with the robber activity is a 50-150mm thick deposit of weathered brick and chalk (48), which presumably fell into the void, left by the removal of the bricks (53). The demolition layers in this kiln are similar in character to those

in kiln 1, and represent either a number of demolition events, or a single event with building debris piled into the kiln pot from various directions.

KILN 3 (elements of this structure are shown on Figure 12)

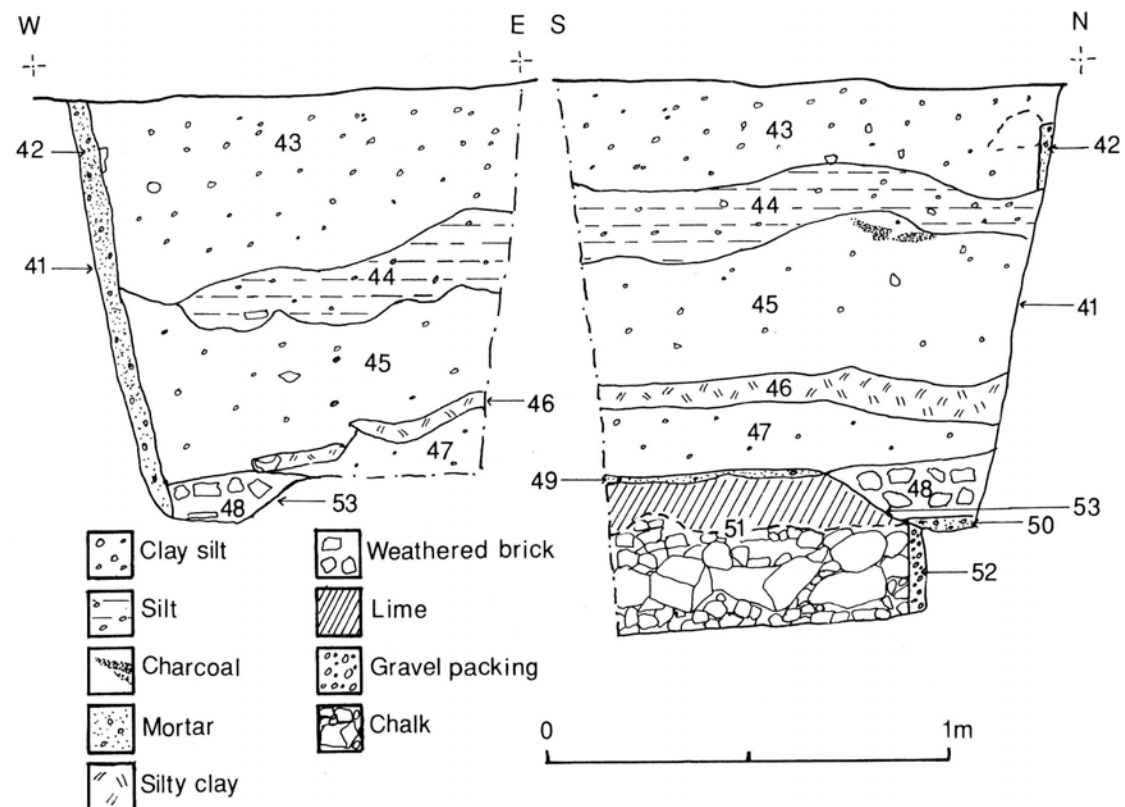


Figure 12: East-west, and north south sections through kiln 2, illustration by Rowan May

The foundation cut (30) was identified in the working area of the kiln, the only part to be excavated. The floor (32, 33) above this cut was 1.10m below the ground level. The walls for the cut were vertical, cut into the natural. The walls (34) in this part of the kiln were at the very base of the excavations and only two courses or 140mm high, 230mm wide and 0.95m long (the width of the excavation). It was only uncovered at the east end of the trench. The floors in the working area of kiln 3 were similar to those encountered in kiln 1. Half of the excavated area was brick-paved (32), whilst the second half was constructed of compacted chalk or lime (33). The total width of this working area was 2.95m. This compacted surface

was lost under the section edge, but reappears approximately 1m away to the north of wall 60 (see section on retaining walls).

Directly above the floor of the working area was a layer 30-50mm thick of lime and or ash. This covered the entire excavated surface. Within and on top of this deposit a large number of roof tiles had accumulated, and other finds also included a metal object and animal bone. It is probable that this layer represents left over lime from firing, on to which roof tiles have fallen after the kiln fell into disuse. Although the demolition layers in this kiln are similar to the other two kilns, because of time constraints they were only assigned one context number (37) and both sections photographed with full scale, rather than drawn. As with the other kilns it was possible to see many different layers of demolition fill, that appear to have been deposited from a number of different directions.

RETAINING WALLS

Around the outside of the kilns there was a retaining wall, that would have held together the internal structures, and these were identified on the south, west and north sides (see Figures 12 and 13). The south wall was a foundation (87), which ran east - west from the south end of the east wall (68 and 69), for a length of approximately 0.50m before disappearing under the west-facing site section edge. It was 250mm wide, constructed from chalk blocks, and presumably robbed out to the same depth as the floor of the kiln working area.

Set further to the south, and at the west of the site, another south wall (60) was uncovered at the same depth as the working area of kiln 3 (Figure 12). The bricks were three courses high, and a breadth of 350mm. A total of 3.4 metres of the wall was uncovered. The cut (58) of this wall had been packed with some unbonded chalk blocks on the south side of the wall. This wall almost certainly joined the west wall (59) under the section edge and this wall section was given the same cut number. Judging by the height of the cut into the natural,

visible in the east-facing section edge, the south wall here must have been at least 0.70m high (200mm high wall + 500mm visible height of cut).

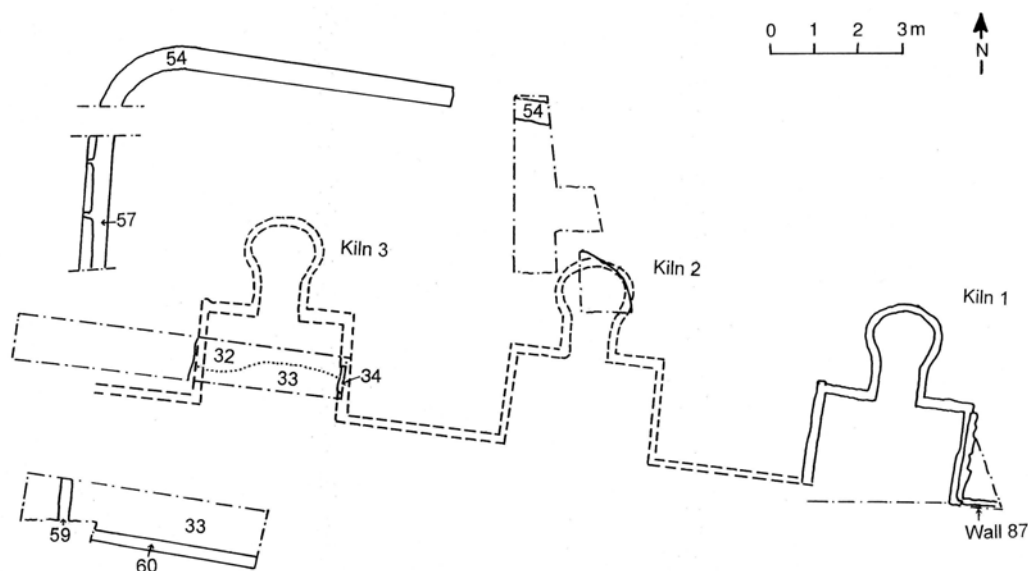


Figure 13: The retaining walls, including the location of kiln 1 & 2, illustration by Rowan May

The west wall (59) and its foundation cut (58) were associated with a working surface, at the same level as the one in kiln 3 (Figure 12). The excavated section comprises only the chalk packing or foundation material and was 0.90m long, 300mm wide and 250mm high. 2.50m to the north, a wall (40) was picked up in section in the west end of the excavation trench of kiln 3. The base of the cut was approximately 0.50m higher than the top of the first section of the west wall (59). The cut (31) for this wall was 350mm deep and 350mm wide. It was 2.70m west of the east-facing wall of the kiln 3 working area. At the base of the cut was a thin layer of mortar (38) that would have formed the base of the wall, and above that 0.50m of rubble from the demolition and / or robbing out of the wall. It was not bonded or well consolidated. Further north was another section of the west wall (57), which linked round to the north wall, and had a foundation cut (56). The exposed section of wall was 3m long and

0.50m wide. It was not possible to discern the depth of the wall. The east-facing section of the wall was brick faced and in some places up to three courses high, while the rest of the wall was constructed from chalk blocks bonded with mortar. To the west of the west wall (40) section, adjacent to kiln 3, were two deposits. The first, a 20mm thick layer (35) of small fragments of chalk and brick rubble lay directly above the clay natural, abutting up to the edge of the wall cut (31). This was possibly a thin layer of debris built up against the wall during the use of the kiln. Above this layer was a thicker layer (39) of soil that may also have been deposited during usage or before demolition of the kilns.

The north wall (54) was a continuation of the west wall (57), (Figure 12). It was 0.50m wide, between 300 and 450mm deep and survived for a distance of 7 metres. The east end had either been robbed out or demolished to ground level. It was constructed from chalk blocks with a few bricks used without recourse to any pattern, and may have been part of the foundations rather than any part of an upstanding structure. At the west end of this wall, where the large blocks of chalk have been robbed out, a faint line of chalk remained visible at what would have been the base of the foundation cut.

FINDS

No objects useful for dating specific contexts, such as coins, clay pipes and porcelain were found. A small number of undatable metal objects were recovered, including one teapot spout, and all finds, which included brick, tile, chalk, coal and animal bones were recorded for each context.