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Total excavation of a later prehistoric enclosure at Braehead, Glasgow

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ABSTRACT

Total excavation revealed a later prehistoric multi-ditched and multi-palisaded enclosure succeeded by unenclosed settlement. Despite the obvious investment of time and labour in the construction of the numerous palisades and three large concentric ditches episodic, seasonal use of the site is strongly indicated. Total artefact retrieval produced a cannel coal assemblage which has thrown light on the manufacture of the cannel coal bracelets so typical of later prehistoric sites in west-central Scotland.

INTRODUCTION

LOCATION

The Braehead multi-ditched and multi-palisaded enclosure (NGR NS 5252 6661) was situated on the eastern border of the county of Renfrewshire, but within the City of Glasgow's Administrative Area. It was located some 450m north of Junction 26 of the M8 motorway and 350m south of the River Clyde, between King George V Dock to the east and the United Distillers and Vinters plant to the west. The site occupied an area of approximately 4800m^2 or 0.48 hectares. During the course of the excavation a new IKEA store was constructed on the northern edge of the excavation area (illus 1).

DISCOVERY AND THREAT

The enclosure was originally identified as a cropmark on an aerial photograph (illus 2). Rectification of the cropmark by the Royal Commission for Historic and Ancient Monuments (RCAHMS), coupled with detailed topographic survey by AOC Archaeology, enabled the position and extent of the site to be more accurately estimated. The survival of the site amongst the industrial landscape of the former shipbuilding yards was extraordinary in itself but the more recent redevelopment of the area, which included the IKEA superstore to the north, threatened to erase it. Consequently, an invasive archaeological evaluation of the whole nine hectares was conducted by AOC Archaeology. This confirmed the extent of the enclosure but also demonstrated the fragile and truncated condition of the site with organic remains barely surviving within the ditches and palisades. Consequently, the full excavation of the site was enabled under a specific archaeological planning consent 00/01741/DC, allowing the regional curatorial agency, the West of Scotland Archaeology Service (WoSAS) to insist upon unusually stringent intensive

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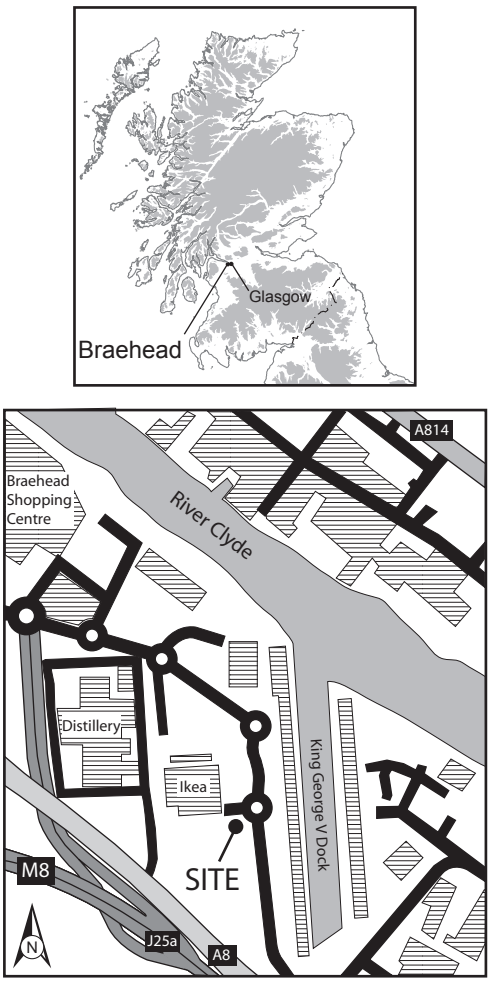


ILLUS 1 Location of Braehead

excavation methodologies and ensuring considerable public participation in the form of volunteers and daily public dissemination of information through an on-site exhibition and guided talks from an elevated viewing platform (Toolis & Ellis 2004).

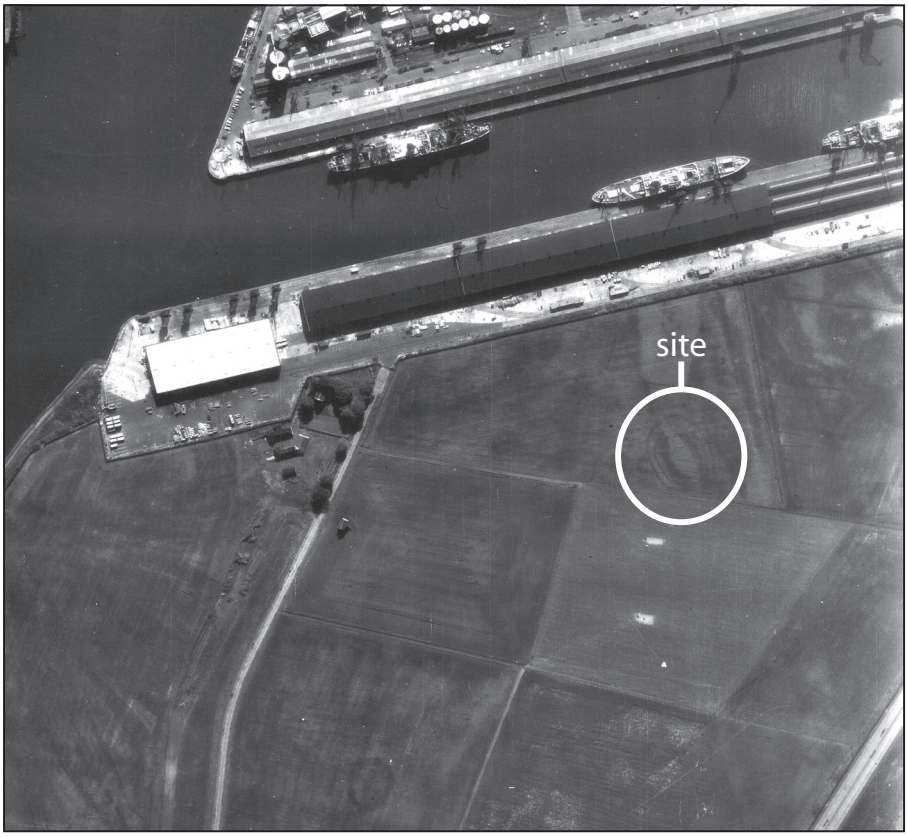
GEOLOGY/GEOMORPHOLOGY/SOILS AND LAND USE

The enclosure was situated on the Clyde floodplain on the top of a barely visible rise of alluvial sand, silt and thin layers of peat. These drift deposits are underlain by pockets of till and marine mudstones and limestones of the Dinantian succession (Carboniferous), the latter is located between 5 and 30m below the alluvium (Cameron & Stephenson 1985).

Prior to the 19th-century agricultural improvements, the River Clyde was readily fordable, exhibiting an anatomizing form with numerous well-established sand islands such as Whiteinch and King's Inch (see Pont's cartographic map of 1596). These islands were later incorporated into the mainland through a massive programme of dredging and land-reclamation. The earliest cartographic sources available note the presence of a settlement at West Scheel (Pont 1596), which was located to the immediate west of the enclosure. However, the land immediately around the enclosure comprised open fields, with a poorly drained, marshy area to the south, into the late 20th century. Recently, the northern portion of the site was used as the contractor's village for the Braehead Shopping Centre, resulting in the removal of much of the topsoil and underlying B-horizon and the laying of vast tracts of hardcore.

THE EXCAVATION

The site was excavated following the strip and map principle, whereby the thin topsoil was removed by machine and then the resultant ground surface was hand cleaned and the visible archaeological features planned. Topsoil was left up to 0.10m thick over the inner ditch to ensure the preservation of one of the bedding trenches which was only observed in section during the evaluation phase. A topographic survey of the cleaned surface was also undertaken. Bioturbation in the form of perennial weeds, grasses and worm activity was common throughout the site. Plough damage across the whole of the site was clearly evident and land drains crossed the site at regular intervals.

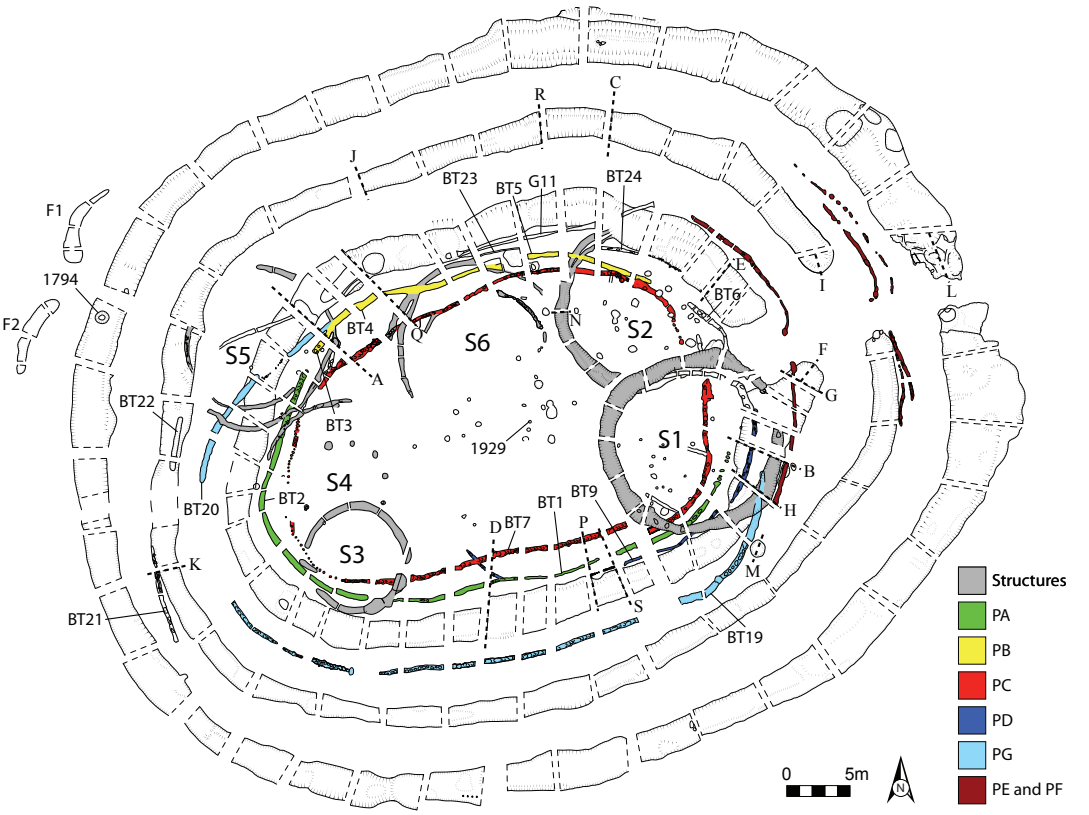


ILLUS 2 Aerial photograph of site lying just to the west of King George V Dock (58/RAF/8893) (© Crown Copyright: RCAHMS)

THE RECORDING AND SAMPLING SYSTEM

The ditches and palisades were excavated in approximately 2–5m wide areas that roughly fanned out from the centre of the enclosure (illus 3). During excavation all negative features were hand-cleaned, photographed and then fully excavated. Wherever possible, all contexts were sampled, with a 101 bulk sample being recovered as a minimum. Soil samples were also taken from every context for soil chemistry analysis and pollen assessment. In addition special samples, comprising either soil/sediment or ecofacts, were taken where appropriate. All ditch terminal fills and some 'roundhouse' structure fills were dry-sieved on site to ensure complete artefact retrieval. All bulk samples were wet sieved on site to allow for the identification of deposits rich in charred organic matter which could then be re-sampled. Volunteers helped out with the on-site wet sieving and the operation was included in the guided tour (Toolis & Ellis 2004).

Following initial cleaning and planning, the site was scanned with a metal detector. This revealed the presence of many 'magnetic' rocks (presumably erratics derived from the till) whose strong signal prevented subsequent in situ detection of metallic artefacts.



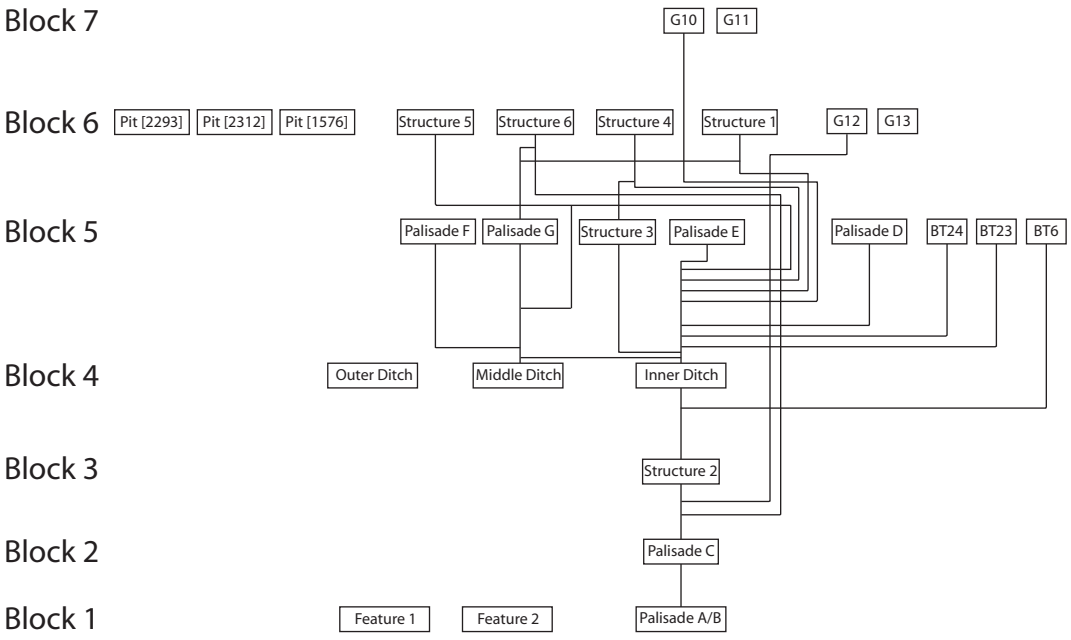
ILLUS 3 Plan of Braehead showing the location of palisades, structures, ditches and other isolated features. KEY: S = structure; P = palisade; BT = bedding trench; G = gully

THE EXCAVATED FEATURES

The main elements of the enclosure are presented below in the form of a basic structural sequence, beginning with the earliest features. Stratigraphic relationships on the site were restricted as a consequence of plough truncation, rather homogenous structural gully fills and the apparent availability of space in which new and replacement enclosure and structural elements could be built without disturbing pre-existing ditches, palisades and structures. Consequently, a healthy dose of inferred logic regarding the physical evolution of the site has been used, together with known stratigraphic relationships, in assigning the features to blocks of time of unknown duration (illus 4).

Not all excavated features could be readily related to or associated with the major structures identified on the site. For instance, a scatter of postholes located on the eastern side of S1 ([1929], [1877], [1889], [1897]) could not be assigned to a particular block and are not discussed further (illus 17 & 18).

To aid interpretation, different terms have been used to distinguish between the variety of linear features found on the site and these are defined below.



ILLUS 4 Summary of the site stratigraphy

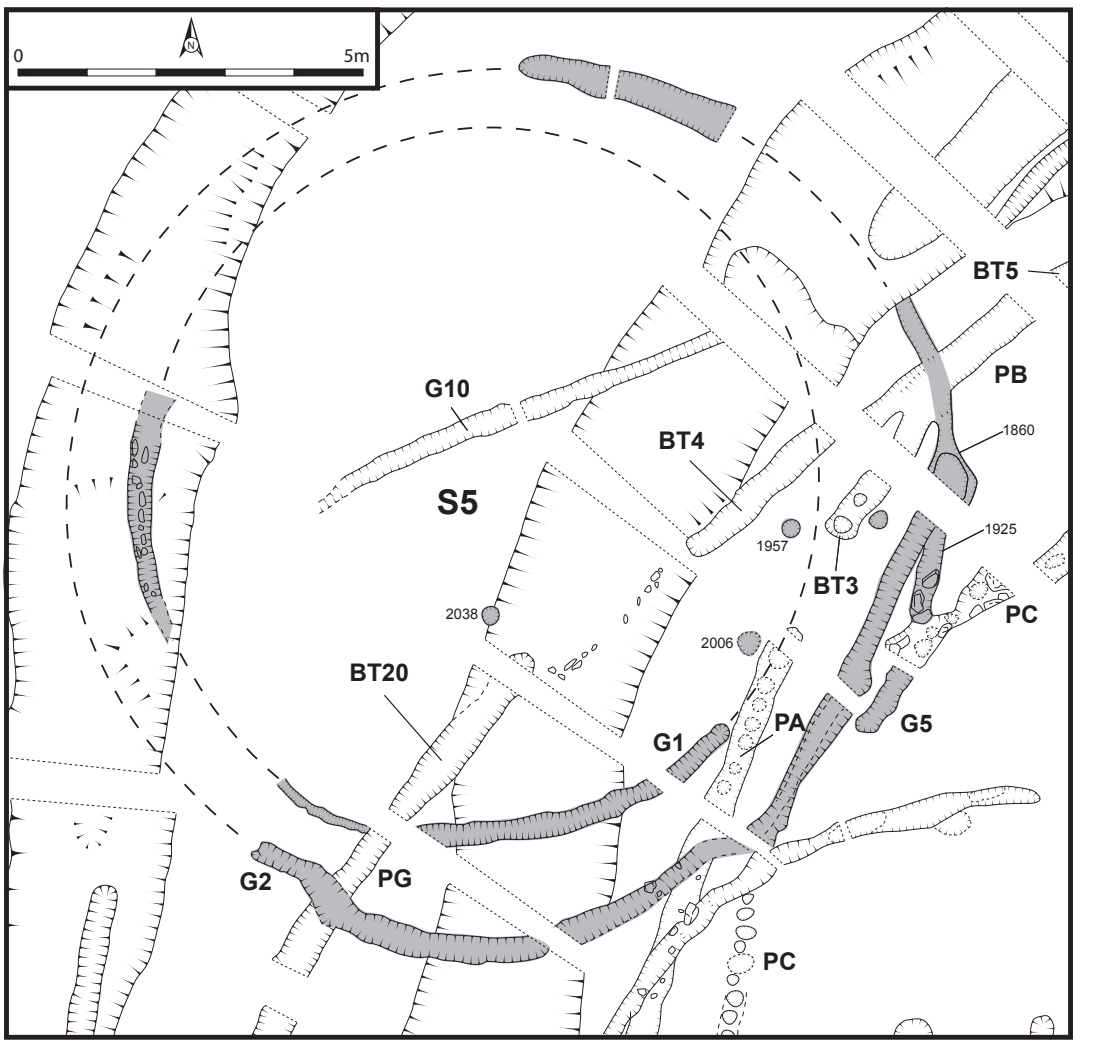
- A **bedding trench** (abbreviated here as BT) is defined as a narrow linear feature (typically around 0.40–0.50m wide) with either a broad U-shaped cross-section with a flat base, or a V-shaped cross-section into which posts have been driven or dug into and which may or may not have contained fence panels.
- A **palisade** is defined as a narrow linear feature made up of one or more contemporary linear bedding trenches.
- A **gully** is defined as a sub-circular linear feature (approximately 0.15–1.25m wide) with a U-shaped cross-section.
- A **structure** comprises a single, double or triple gully. Where more than one gully is present these are either concentric with each other or intercut.
- A **ditch** is defined as a curvilinear feature between 1.10 and 5.55m wide with a broad U-shaped cross-section.

Block 1

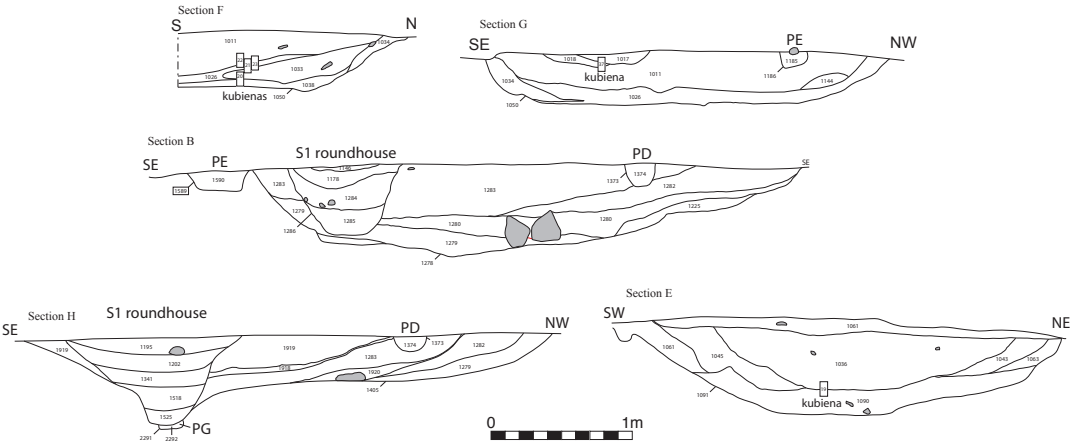
Block 1 comprises Palisade A (BT1 & BT2) and Palisade B (BT3–5), and possibly Structures F1 and F2 (illus 3 & 38).

Palisades A and B form a single-phase construction, oval in plan, which comprised a bedding trench with occasional, ill-defined postholes (illus 5 & 38). Bedding trenches 1 and 2 were clearly components of Palisade A, although the nature of the junction between the two was unclear. Bedding trench 1 was predominantly U-shaped (although in parts it was V-shaped (illus 13, Section P)), with vertical sides and a flat base and was up to 0.46m in width and 0.35m in depth; the bedding trench contained occasional posthole cuts. Bedding trench 2 was rectangular in profile with vertical sides and a flat base and up to 0.45m in width and 0.45m in depth; the bedding trench contained posthole cuts (illus 5 & illus 13 – Sections D). Palisade A/B is interpreted as a post and fence barrier. The

southern, easterly terminal was hard to define as it petered out into a series of shallow postholes (illus 18) and therefore it is unclear whether a full circuit of this palisade survives. The bedding trench of Palisade A/B exhibited a clear terminus on the western side of the site and then appeared to resume just over 1m to the north-east in the form of BT3 (illus 3). It is therefore possible that Palisade B was a continuation of Palisade A, petering out at postholes [2349] to [2327] or even with BT6 (illus 3 & 18); this would create an enclosure roughly 30m×20m. Postholes [2006] and [1957] lay immediately to the west of the western terminals of Palisades A and B and may have been the foundations for gate piers and thus part of a gate structure closing off the western entrance; this entrance would have been about 1.10m wide (illus 5). This entrance finds parallels at Leven (Atkinson 2000), Ingam Hill (Jobey 1971), Myrehead (Barclay 1983)



Illus 5 Plan of Structure 5 and the western entrances of Palisades A/B and G



ILLUS 6 Sections through the inner ditch showing Palisades D and E, and Structure 1

and Melville Nurseries (Raisen & Rees 1995). Palisade A/B was cut by Structure S2, Palisade C (BT7 and BT8) and Structures S3, S4, S5 and S1.

Structures F1 and F2 were located on the north-western exterior of the outer ditch and aligned well with the junction of Palisade A and B, although no chronological relationship was established between the two sets of features and they lay some 15m away (illus 3 & 38). They are both tear-dropped in shape and were filled with a fine to medium sand. F1 measured 7.0m × 1.6m in diameter and was up to 0.20m deep while F2 measured 7.75m × 1.2m and was up to 0.18m deep.

Block 2

Block 2 is represented by Palisade C, which consists of BT7 and BT8 which are, respectively the southern and northern limb of the same palisade circuit (illus 3 & 38).

Palisade C followed an oval circuit, some 27m × 16m, within the perimeter of the inner ditch. The southern terminal of Palisade C was located within Structure S1 and the northern

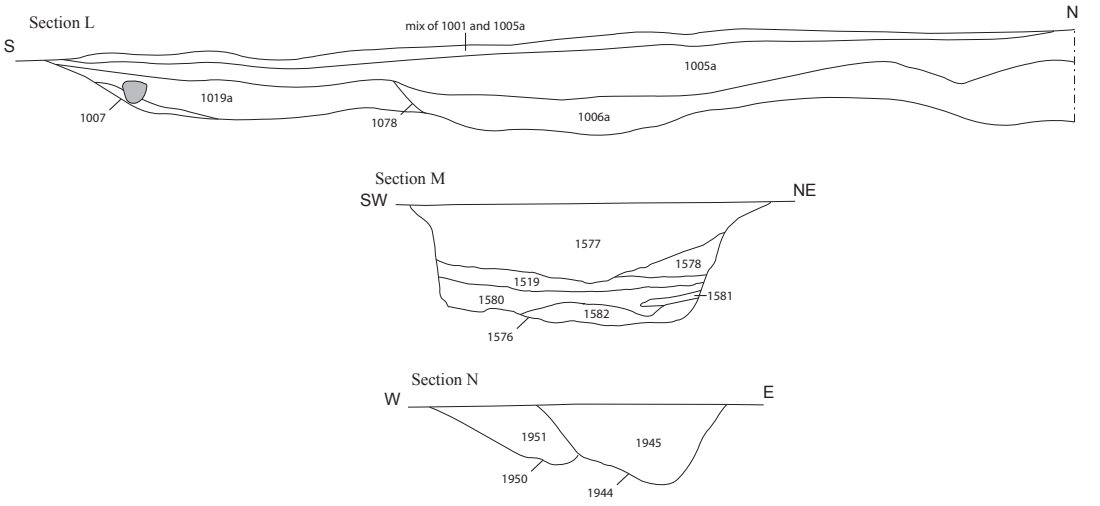
ILLUS 7 Abutting postholes within the bedding trench of Palisade C

ILLUS 8 Only the bases of the postholes in Palisade C survive along this stretch, showing the degree of plough truncation on the western side of the enclosure

terminal within Structure S2 (illus 18). Both palisade terminals were difficult to define due to plough truncation and animal burrowing but there was gap of around 2.5m which may have served as the entrance. The larger cut at the southern terminal together with the presence of stone packing is interpreted as the remnants of a substantial post and may be mirrored on the northern side by posthole [2110] which was 0.50m×0.33m diameter and 0.09m deep (illus 18). The cut of the bedding trench of Palisade C was almost vertical sided with a fairly flat base that was occasionally U or V-shaped and measured from 0.09m to 0.95m wide, averaging around 0.35m (illus 13 – Sections S, P, D, A & Q). The depth of the bedding trench was from 0.01m to 0.40m, but these depths are an artefact of plough truncation. Within the bedding trench were abutting postholes (illus 7); only the very base of these survived on the western side of the enclosure as plough truncation had entirely removed all traces of the bedding trench (illus 8). The postholes measured from around 0.09×0.09m to 0.33×0.50m in diameter and up to 0.43m in depth and were clearly driven into the bedding trench. The fill of the bedding trench generally contained rare to frequent charcoal flecks, small stones, rare larger packing stones, silt, sand and fine gravel. In the southern portion of the site the posts appear to have been burnt in situ. Palisade C was cut by Structures S1, S2, S3, S4, S5 and S 6, and Palisade D. Palisade C cut Palisade B.

Block 3

Block 3 consists of only Structure S2 (illus 3, illus 10 & illus 18). S2 is a circular structure some 10.70m diameter comprising two parallel and inter-cutting gully cuts (illus 9 – Section N). The outer U-shaped gully [1928] cut the inner U-shaped gully [1921] from the southern terminal but became separated at the northern end (illus 18), demonstrating that the gully underwent one major re-cut. The gullies measured 0.1m at their shallowest and 0.5m at their deepest and were 0.25m to 0.8m in width. The fills of the gullies were predominantly fine sands and silts with no evidence of occupation debris. The northern terminal was destroyed by the construction of the inner ditch and the southern terminal was partially destroyed by the construction of Structure S1 and BT6 (illus 10 & 18). The entrance would have faced north-east. None of the postholes or pits within the perimeter of S2 can be definitively associated with S2. However, posthole [2162] lies centrally within the structure and may represent a central supporting post. Postholes [2309], [2351], [2289], [2239], [2137] and [1460] lie in an approximate circle concentric around the central post [2162]; these



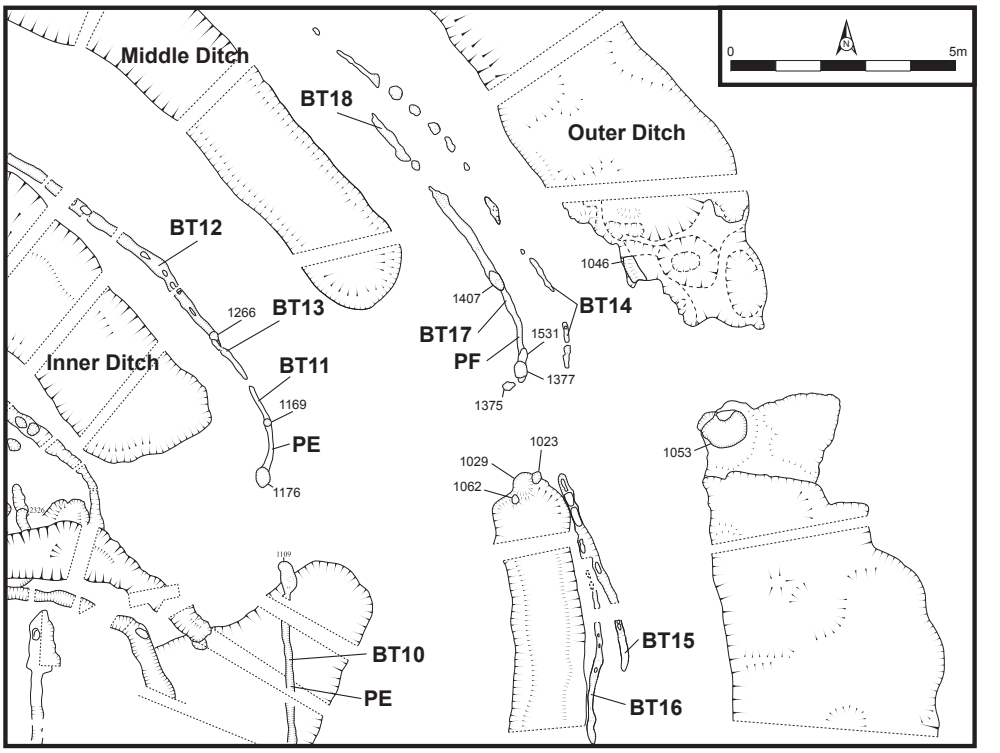
ILLUS 9 Sections through the outer ditch (L), pit [1576] (M) and Structure 2 (N)

posts may have formed the supports for an inner ring-beam for the roof while postholes [2348], [2086], [1271] and [2263] were perhaps part of the circle that formed the exterior wall.

Block 4

Block 4 consists of the outer ditch, the middle ditch and the inner ditch (illus 3 & 38). No direct stratigraphic relationship between the

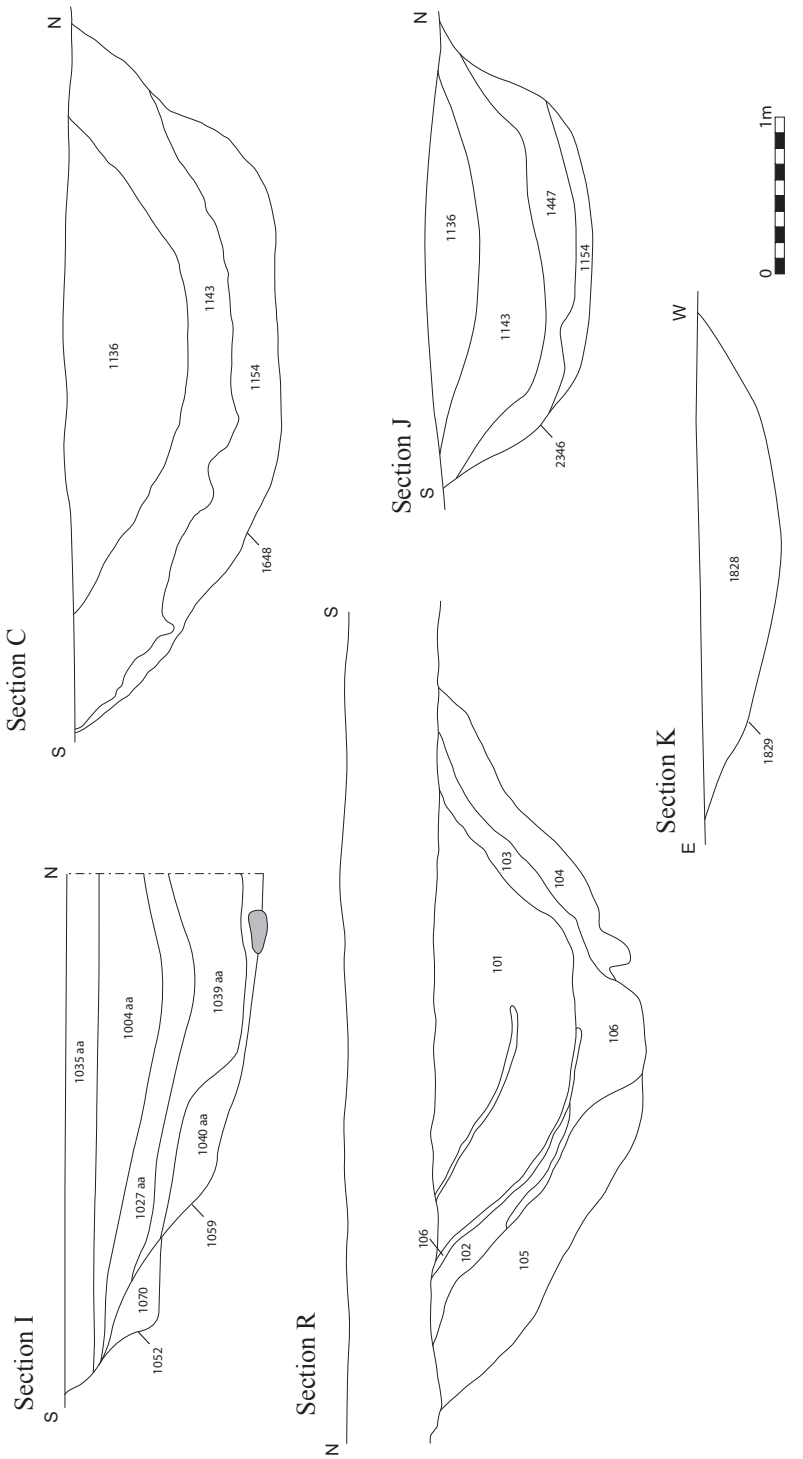
ILLUS 10 View looking east through the eastern entrance, with the junction between S1 (to the right) and S2 (to the left) in the foreground



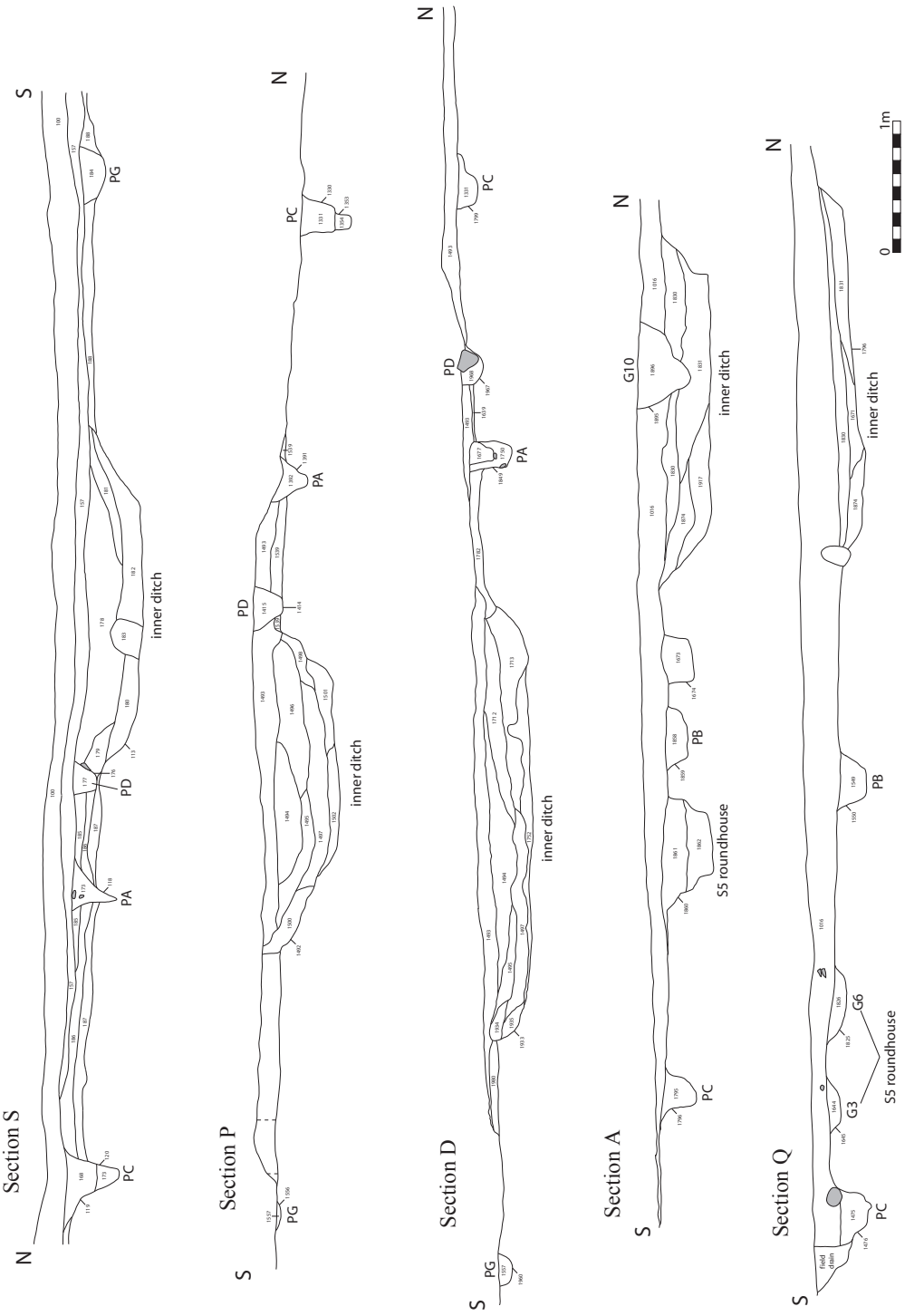
ILLUS 11 Plan of the three ditch terminals and Palisades E and F

ditches was observed. However, the lack of inter-cutting or disturbance and the degree of concentricity displayed by the ditches suggests that either all three were contemporary, or that at least one remained visible when the second and/or third were built. The surface vegetation appears to have been cleared by fire prior to ditch construction (see below) and it is probable that, given the size of the circuit of the ditches, the course of at least one must have been marked out on the ground prior to its excavation. There were no clear re-cuts of the ditch fills and although the presence of banks was inferred from the ditch fills, no bank material survived in situ.

Outer ditch: The greatest variability in form around its circuit was exhibited by the outer ditch. The southern terminal was shallow, with a flat but uneven base while the northern terminal was slightly deeper with a series of contemporaneous pits; the entrance was a maximum width of 3.75m (illus 3; 9 – Section L; 11). A pit [1794], measuring 0.77m in width and 0.16m in depth, with a stone placed at its base was located on the westernmost section of the ditch, almost opposite the entrance (illus 3). The depth of the ditch ranged from 0.16m at the southern terminal to 0.70m at the northernmost portion while the breadth of the ditch varied from 5.55m adjacent to southern terminal to 1.8m on the westernmost section of the ditch. The southern and western sections of the ditch were filled by plough soil rich in organic matter and cultivated peat while the northern section and northern terminal fills included sands, silts rich in organic matter and fine gravels. The southern ditch terminal was extended at some point in



Illus 12 Sections through the middle ditch

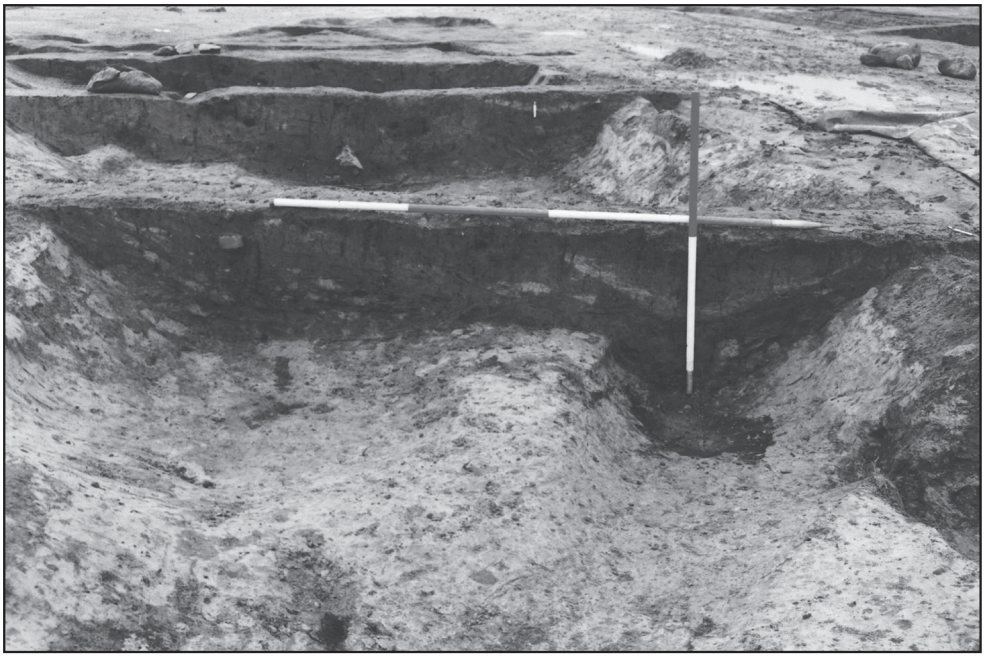


ILLUS 13 Sections through the inner ditch showing Palisades A, C, D and G, and Structures 5 and 6

its use, narrowing the outer entrance from a maximum of 3.30m to a maximum of 1.60m (no correction has been made for truncation). This smaller outer entrance may have been gated as there was a large posthole [1053], some 1m wide and 0.20m deep and a bedding trench [1046] which may have held a fence, on the inner side of the northern terminal.

Middle ditch: Although the form of the middle ditch was also uneven around its circuit it was the least distorted of the three ditches (illus 3). The two ditch terminals were broad and steep sided with flat bases and formed an entrance up to 5m wide (illus 11). The breadth of the ditch varied between 3.30m and 1.10m and the depth between 0.8m and 0.25m (illus 12). In the deeper portions of the ditch, the primary fill comprised a re-deposited peat, sand, and silt, overlain by silts rich in organic matter with some sand lens. Where the ditch was shallower the fills comprised sands and silts rich in organic matter. No recuts were observed or recorded.

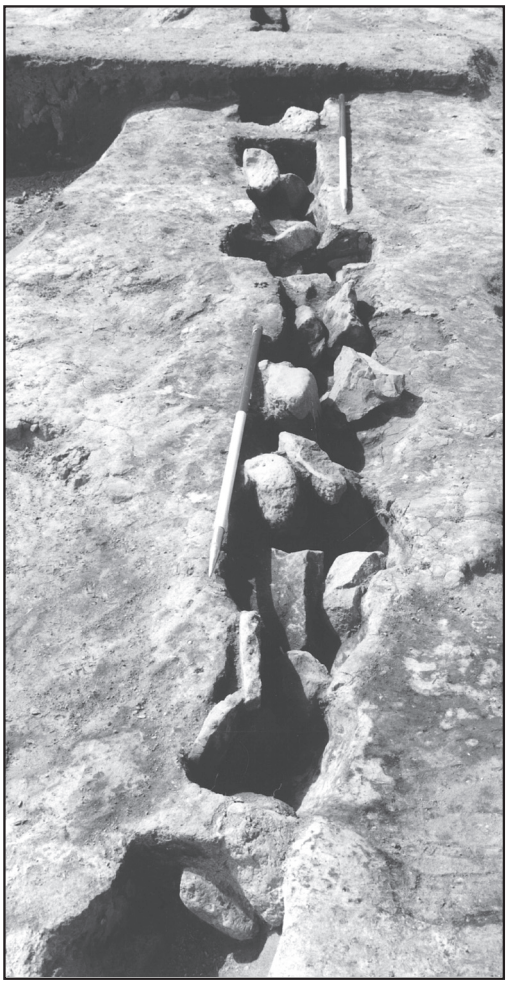
Inner ditch: The inner ditch again showed considerable variation about its circuit (illus 3; 6 – Section F, G, B, H, & E; 13 – Section S, P, D, A & Q). The breadth of the ditch varied between 1.59 and 3.12m. The southern terminal was 0.40m deep (illus 6 – Section G) and the northern terminal was 0.65m deep, while along the western section of the enclosure the ditch was only 0.12m deep. The deepest section was on the southern section between S1 and S3 where the ditch was up to 0.70m deep. At the terminals the fills included re-deposited peat, sand and silt, dumped domestic refuse (including charcoal, burnt peat clasts, ash, artefacts), silts rich in organic matter, and occasional sand lenses. Further away from the ditch terminals the sequence generally became less complex comprising predominantly a primary silt high



ILLUS 14 South-facing section through inner ditch showing lens of dumped domestic refuse

in organic matter. However, on the southern and northern sides of the circuit the fills consisted of dumped organic refuse containing artefacts (illus 14). Recovery of sherds of Vessel 10 (illus 34) from both the middle and inner ditch attests to the contemporaneous backfilling of these two ditches.

The banks: Primary upcast entered the outer, middle and inner ditches from both sides so it is assumed that the excavated ditch material was thrown up onto the side of each respective ditch to create a bank, although no obvious bank material survived in situ on the site (and see *Soil micromorphology* below). Assuming the three ditches were contemporary, it seems most likely that there were banks between the outer and middle ditch and between the middle and inner ditch. Certainly, the lower fills of the middle ditch, especially on the northern side of the enclosure, attested to the presence of unstable bounding banks. If defence were the primary concern then a bank external to the outer ditch would have been unnecessary; perhaps the upcast which fell back into the outer ditch from the exterior side was the loose remnants of ditch construction, as would almost certainly have been the case with the upcast which fell back into the inner ditch from its interior edge.



Illus 15 Packing stones in BT12

Block 5

The stratigraphic relationships of the features within this phase are unknown, but it is very probable that many of these features would not have been contemporaneous. Palisades E and F lie on either side of the ditched entrances (Block 4), forming what appear to be gated entrances (illus 11 & 38).

Pit [2293]: This pit was located on the eastern side of S1 and adjacent to the inner ditch; it was cut by BT10 (illus 18). The pit was oval with an U-shaped profile, measured 1.1×0.75m wide and was 0.2m deep. It had a single, fine sandy fill.

Palisade E: BT11, BT12 & BT13 are interpreted as separate segments of a continuous post and fence barrier, which lies roughly parallel to the line of the inner ditch (illus 11 & 18). BT11 comprised a U-shaped bedding trench 0.25m wide and 0.29m deep with two postholes, [1169] and [1176], and three slots cut 0.10m deep into the bedding trench. BT13 was physically aligned but just separated from BT11. BT13 was a U-shaped bedding trench, 1.45m long, 0.18m wide and had an undulating

base varying between 0.11m and 0.21m depth. The bedding trench of BT13 cut posthole [1266] in BT12. BT12 comprised a U-shaped bedding trench with a flat base, 8.1m long, 0.5m wide and up to 0.23m deep. It appeared to be ploughed out at its northern end. The bedding trench was cut by a series of postholes and was also packed with large stones generally oriented with their long axis parallel to that of the bedding trench; these acted as packing to the postholes and the fence panels (illus 15).

Cutting through the southern ditch terminal of the outer ditch was BT10 (illus 11) which is interpreted as being the southern extension of the post and fence barrier, Palisade E. BT10 was also U-shaped in section with a maximum width of 0.25m and depth of 0.20m. It was recorded for a length of approximately 9m, its lateral extent having been curtailed by plough truncation. A posthole [1109] marked the end of BT10. The fill of BT10 was characterized by the predominance of ash (see below); this was not the result of in situ burning but rather the result of dumping.

Palisade F (BT14–BT18): BT14 survived as a series of plough truncated postholes within a poorly preserved, curvilinear bedding trench some 0.13m wide and 0.09m deep which extended for roughly 11m (illus 11).

Parallel to BT14 was the curvilinear BT17 and BT18 (illus 11). The bedding trench of BT17 was U-shaped, 0.3m wide and 0.35m deep with a double posthole [1377]/[1531] at its southern end and a single posthole in its centre [1407]. A further posthole [1375] occurred at the southern end. The triple post arrangement [1377], [1531] and [1375] is thought to represent the remnants of a gate structure. The postholes [1023], [1029] and [1062] which cut the southern terminal of the middle ditch, are interpreted as the southern side of the gate structure. The entrance at this location would have been around 1.80m wide.

Bedding trenches 15 and 16 are all that survive of the southern circuit of the double-palisaded enclosure. The form of these was quite different to that of BT14 and BT17/BT18. BT15 was a U-shaped bedding trench with a maximum width of 0.48m and depth of 0.34m into which seven postholes had been cut. BT16, also a bedding trench some 0.24m wide and 0.10m deep, branched off BT15, but it was not clear whether BT16 was contemporary with BT15 or whether BT15 was a replacement and extension of BT16. BT15 abutted the edge of the middle ditch.

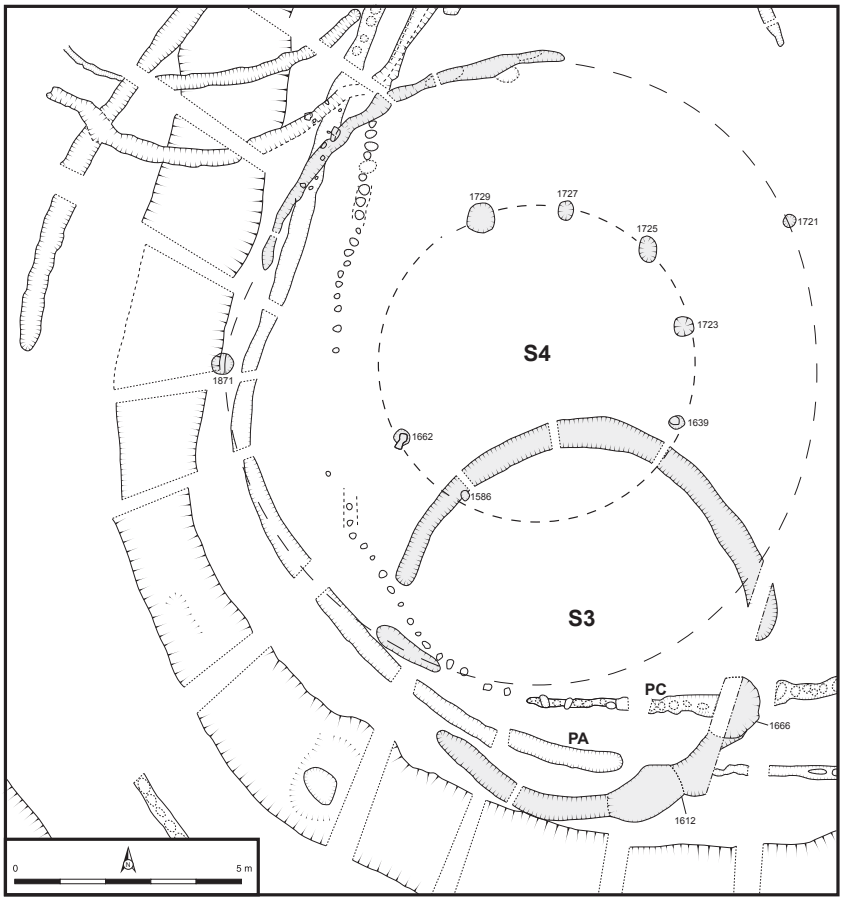
Palisade G (BT19 & BT20), BT4 and posthole [2038]: The southern terminal of BT19 was located within the inner ditch fill (southern limb), it was cut and partially destroyed by S1 (illus 6 – Section H; 18) and lay parallel to BT10, although the chronological relationship between these two palisades is unclear. BT19 curved around the southern section of the outer ditch, mimicking its circuit and extending to the western section of the enclosure where it disappeared due to plough truncation (illus 38). The bedding trench cut was U-shaped and was cut by numerous postholes located at 0.05–0.10m intervals. When the high degree of plough truncation is taken into account this indicates that the posts at the original ground surface would have been abutting. BT20, which lies along the western section of the enclosure could be a possible continuation of BT19 (illus 3 & 38), although there were no postholes evident in the U-shaped gully and the two palisades may have had very different above ground architecture. This gully extended some 8m long and 0.55m wide, with a maximum depth of 0.32m. BT20 cut the middle ditch and was cut by Gully 1 and Gully 2, both part of S5 (illus 5). Possibly associated with BT20 is posthole [2038] which lies on the exterior at the terminal of the palisade (illus 5), in a similar position to that of postholes [2006] and [1957] in relation to Palisades A & B (Block 1). It too may be the foundation for a gate pier, the northern post of which is missing. This western entrance would have been around 2m wide (illus 5), and is thought to be a continuation of this palisade circuit. A line of small stones were noted on the surface of the ditch fill between BT20 and BT4

(illus 5). However, BT4 appears to merge with Palisade B, which has been ascribed to Block 1, and because no re-cut of BT3 or BT5 was apparent it must be assumed that the circuit of BT4 and BT20 is either curtailed at this point or was not distinguishable from the earlier fills.

BT21 and BT22: BT21 was some 0.29m and 0.39m deep, and contained at least eight separate postholes (illus 3, west side). It ran for approximately 8m and cut the middle ditch. BT22 lay to the north of BT21 and was also a bedding trench cut, but shallower and wider, some 0.5m wide and 0.15m deep. It also cut the middle ditch but it is unclear whether these two bedding trenches were elements of the same palisade or represent different events.

BT6: BT6 was U-shaped, measured 0.40m wide and was 0.08m deep. It contained two postholes [2190] and [2188]. BT6 cut S2 and was cut by S1 (illus 18).

Palisade D: Palisade D lay along the southern side of the enclosure with its southern terminal being located within S1 and within the fill of the



Illus 16 Plan of Structures 3 and 4

inner ditch (illus 3, 18 & 38). The line of BT9 can be traced along the inner edge of the inner ditch before disappearing into it. A similarly constructed bedding trench was recorded just to the east of this, sweeping in a north-easterly direction; this is tentatively interpreted as a continuation of Palisade D. The bedding trench was between 0.14m and 0.37m wide and between 0.04 and 0.16m deep and was predominantly U-shaped, although in parts it was V-shaped with irregularly spaced stakeholes (illus 3; 6 – Sections B & H; 13 – Sections S, P & D). It is interpreted as a stake and fence panel barrier. An alternative explanation is that the easternmost portion of Palisade D represents the barest remnants of a roundhouse to which posthole [1929] may belong as it lies along the perimeter of a projected bedding trench 10.5m in diameter (illus 3).

BT23/BT24: These occur on the northern side of the enclosure and follow a curvilinear route roughly parallel with the course of the inner ditch (illus 3). This bedding trench sequence is again interpreted as a post and fence panel barrier. BT23 was 0.08m wide and 0.03m deep with shallow sides while BT24 was roughly V-shaped, 0.25m wide and 0.15m deep. Their fills were predominantly silt loams. Along the inner edge of the inner ditch BT24 was represented by a line of packing stones to the north of posthole [2309] (illus 18). Posthole [1142] also lies on the inner edge of the inner ditch and may be an easterly extension of BT24. The fence panels would have been embedded in a trench and packed with stone, with posts at intervals. Although there is no stratigraphic relationship between Palisade D and BT23 & BT24 they share a similar construction method and their projection eastwards would have seen them meet. BT23/BT24 disappears into Gully 3 (interpreted as part of S6), although no relationship between G3 and BT23/BT24 was determined during excavation.

Structure 3: S3 was located on the southern side of the enclosure on the inside edge of the inner ditch (illus 3). It was a circular structure some 7×7m in diameter (illus 16) comprising two U-shaped gully segments some 0.40m to 0.70m in width and up to 0.20m in depth. The western gap between the two gully cuts measured 2.5m while the eastern gap measured 0.60m; this is the only building on site with two confirmed entrances. There were no posthole or stakehole cuts within the gully cuts of S3, but this is not necessarily surprising given the high degree of truncation, although it is also possible that internal supporting posts were set on stone pads. The fills of the gullies was mixed, comprising redeposited natural sands and silts with some charcoal. The southern gully was cut by two pits, [1612] and [1666]. Pit [1612] was 1.23m in width and 0.33m in depth with steep sides and a flat base. Pit [1666] was 0.60m wide and 0.27m deep with shallow sides and a flat base. S3 was also cut by posthole [1586], which is probably part of Structure S4.

Block 6

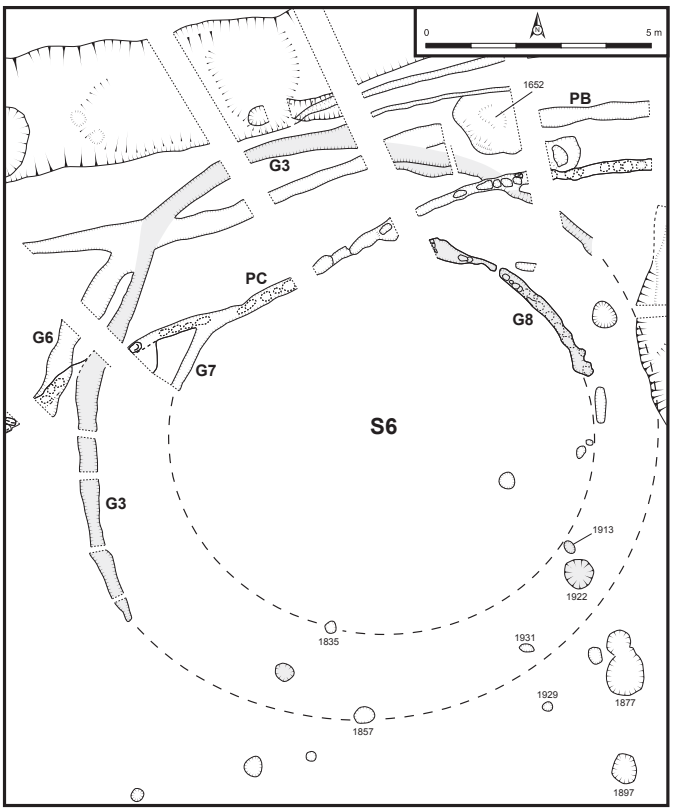
This Block includes Structures S1, S4, S5 and S6. No direct relationship between these structures was observed, but it is unlikely that S4 was contemporary with either S5 or S6, due to its close proximity to both of them. Block 6 also includes Structure S1, Gully 4, and three pits, [1652], [1576], and [2312].

Structure 4: S4 comprised a poorly preserved outer gully and an internal circle of postholes (illus 3 & 16). The structure measured approximately 10m in diameter, with an internal setting of postholes 5.5m in diameter. Only the northern stretch of the outer gully survived together with a small portion around the southwest sector. The gully had steep sides with an irregular undulating base with possible slot cuts; it measured 0.21m wide and was up to 0.22m deep. This gully presumably held some form of organic panelling which shaped the exterior of the building. Postholes [1871] and [1721] sit on the projected line of the outer

gully; it is assumed that these posts, and others like them which have not survived, held the panelling in place. The internal posthole setting comprised seven surviving postholes [1729], [1727], [1725], [1723], [1639], [1586] and [1662] which lay roughly 1m apart. These posts would have presumably supported the ring-beam of the roof structure, the outside edge of which would have rested upon the exterior wall. Poor preservation does not allow for the identification of an entrance. S4 also cut Palisades A and C.

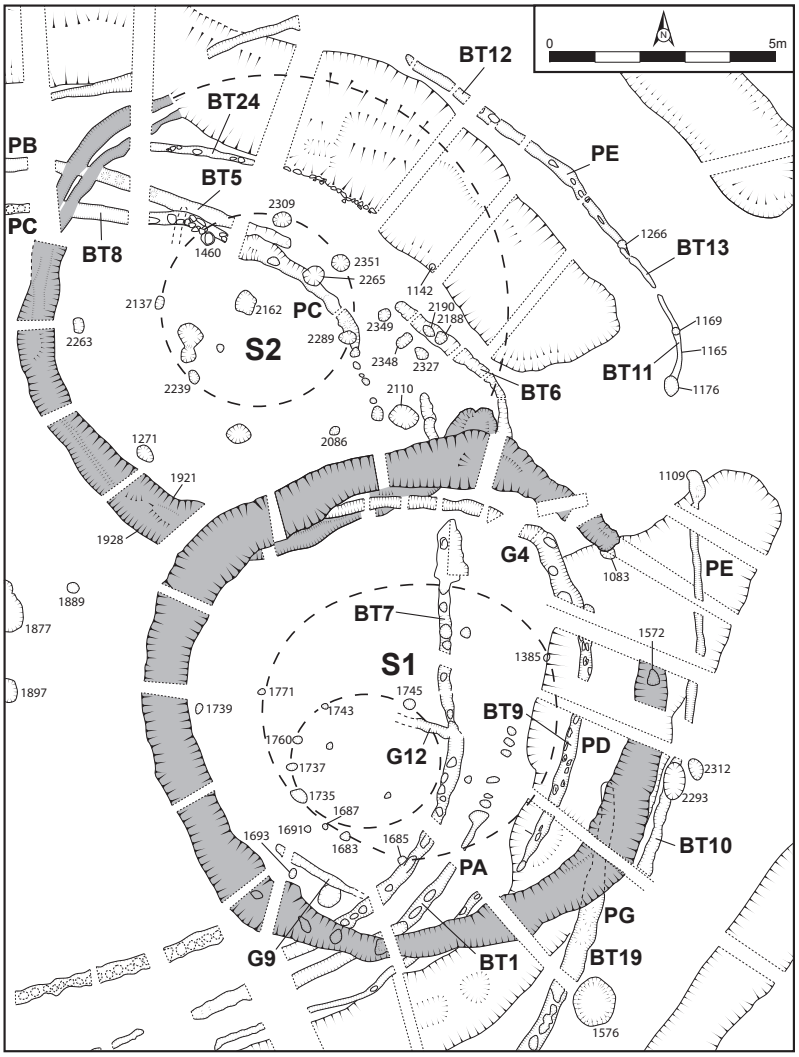
Structure 5: S5 was located on the western side of the enclosure overlying the inner and middle ditches (illus 3 & 5). The outer bedding trench measured 10.5–11m in diameter while the inner bedding trench measured between 7.5 and 8m. The gullies are not quite concentric with each other, the extrapolation of their circuits showing that they are closer around the northern perimeter of the structure. It is possible that these two gullies are not contemporary, one replacing the other in an expansion or contraction of the building. The outer, U-shaped gully deepened and widened over the ditch fill, but its full circuit was not recorded because it could not be discerned within the middle ditch fill and had been partially removed by the plough between the ditches. Gully 5 may form the easterly extension of the outer gully; if so, then its southern terminal may have defined the northern side of the entrance, although the southern side of this possible entrance is not discernible.

The inner gully comprised a U to V-shaped cut some 0.15–0.35m wide and up to 0.13m depth. A bedding trench and an irregular line of stones defined its course over the middle ditch, but much of the circuit had been destroyed by the plough or was not visible. The two postholes [2006] and [1957] may be associated with this inner gully as they occur on its extrapolated course, although an association with Palisade A has also been suggested (Block 1 above).



ILLUS 17 Plan of Structure 6

The inner and outer gullies are probably the foundation trenches for some form of organic walling. An isolated posthole [2038] may be associated with S5, although, again it seems more likely to be part of a gate structure associated with BT4/BT20 (see above). S5 cut the inner and middle ditches, Palisades A, C and G.



ILLUS 18 Plan of Structures 1 and 2 and Palisade E

Structure 6: S6 was located on the northern side of the enclosure adjacent to S2 (illus 3 & 17). It comprised parts of two roughly concentric bedding trenches, the outer approximately 10.5m in diameter and the inner approximately 7.5–8m in diameter. A further gully (G6) is also roughly concentric to G3 and G7. It is unclear whether G3 and G7 are contemporary or whether one replaced the other during a re-build. G6 and G3 are not contemporary, but no relationship between the two was ascertained. The outer gully (G6) was U-shaped and up to 0.60m wide and 0.17m deep (illus 13 – Section Q). The fill comprised silt loam with frequent charcoal flecks. The middle gully (G3) was steep sided with a flat base, measuring 0.28–0.63m wide and up to 0.28m deep. The fill comprised silt and silt loam with some charcoal flecks. The inner

gully (G7/G8) was up to 0.18m wide and 0.28m deep; on its eastern side (G8) the gully trench was disturbed by postholes and slots. The fill of the inner gully comprised silt or sand with some charcoal flecks. Postholes [1835] and [1913] sit roughly on an extrapolated circle of the inner gully and postholes [1857], [1931] and [1922] on an extrapolated circle of the outer gully of S6. As with S3 and S5 there is a distinct lack of internal postholes which would have presumably supported a roof structure. The outer gully(s) G6 and G3 probably held some form of organic exterior panelling, while the inner gully seems to have held a more substantial panelling with many more supporting uprights. No entrance is discernible, although it does not appear to have been located on the north or west side of the building. A posthole within G3 cut BT8.

Pit [1652]: Pit [1652] was located on the northern side of the site, just on the interior of the inner ditch (illus 17). It measured 1.6m wide and 0.38m deep and had a silt loam fill with numerous charcoal fragments. Pit [1652] cut Palisade B.

Gully 4 and Gully 9: G4 lay within the interior of S1 roughly concentric with its outer gully (illus 18). It measured up to 0.70m wide and up to 0.15m deep and was cut by irregularly spaced postholes. G4 cut the gully of S2 and the fills of the inner ditch but was cut by the outer gully of S1. It may be the remnants of an earlier phase of S1. On the opposite side of S1 was a linear gully G9, up to 0.20m wide and 0.10m deep, which also lay roughly concentric with the outer gully. G4 and G9 lie along the same circuit and could be part of the same structure. G9 cut BT7. G9 lay parallel to G12 and these two gullies may belong to the same feature.

Structure 1: S1 comprised a circular gully with a diameter of approximately 11.5m and an east facing entrance approximately 2.5m across (illus 18 & 19). Posthole [1745] lay at the centre of S1. The U-shaped gully measured up to 1.25m wide and was up to 0.60m deep (illus 6 – Sections B & H). The gully fill comprised a lower clay loam, overlain by a silt loam, overlain by a clay lining which was finally overlain by another silt loam; the use of the gully

Illus 19 View of S1 with the gully fully excavated

was clearly multi-phased. Rare sub-rounded to sub-angular cobbles occurred within the gully fills; these are either the collapse of an internal wall of which no other trace survives, or the remnants of post-packing. Within the upper fill of the gully a series of irregularly spaced, possible postholes were recorded. Postholes [1572] and [1083] may define the southern and northern sides of the entrance respectively. Two postholes [1739] and [1693] lie just inside the gully and could be the remnants of some form of internal barrier/fencing. Postholes [1771], [1735], [1687], [1685] and [1385] all lay along the line of a circle some 8m in diameter centred on posthole [1745]; these postholes were possibly the foundations of a ring-beam supporting the roof structure. In all 17 interior postholes were recorded. Some of these, [1683], [1687], [1735], [1737], [1760], [1743] and [1745], could form a possible internal circular structure, some 3.5m in diameter (illus 18).

Pit [1576]: Pit [1576] lay to the south of S1, between the middle and inner ditches (illus 18). It was oval in plan and measured 1.08m × 1.27m. It was 0.49m deep with vertical sides and a flat base (illus 9 – Section M). The base was lined with mixed sand and silt [1580]. This was overlain by a clay [1519] which lined the pit and rendered it watertight. This was overlain by a silt loam with charcoal flecks [1578] which was capped by a possibly dumped silt loam

TABLE 1
Radiocarbon dates. Calibration based on OxCal v3.10 (2005)

Lab code	*Feature*	*Material*	*Area/ Context*	*Yrs BP*	*δC13*	*Calibrated dates*	
						1 sigma	*2 sigma*
GU-11323		Peat		8725 ± 40	–28.2	7960–7600 BC	7920–7900 BC (2.3%) 7820–7650 BC (62.1%) 7640–7630 BC (1.7%) 7620–7610 BC (2.1%)
GU-11451	Outer ditch	*Quercus* sp	P/1299	2440 ± 40	–27.8	770–610 BC (37.3%) 600–400 BC (58.1%)	760–690 BC (20.2%) 550–400 BC (48%)
GU-11449	Middle ditch	*Quercus* sp	HH/1077	2550 ± 40	–24.0	810–520 BC	800–750 BC (30.8%) 690–600 BC (9.3%) 640–590 BC (19.8%) 580–550 BC (8.3%)
GU-11448	Inner ditch	*Quercus* sp	GGG/1090	2430 ± 40	–25.4	770–610 BC (33.8%) 760–700 BC (16.5%)	600–400 BC (61.6%) 540–400 BC (51.7%)
GU-11450	BT11	*Quercus* sp	P1/1170	2245 ± 40	–26.9	400–200 BC	360–350 BC (20.8%) 300–230 BC (41.4%) 220–200 BC (6.0%)
GU-11452	BT2	*Quercus* sp	P11/1850	2500 ± 45	–24.7	800–480 BC (88.7%) 470–410 BC (6.7%)	790–750 BC (6.8%) 720–520 BC (61.4%)

[1577]. The clay lining of this pit shares many characteristics with the clay loam fill of the gully of S1 and therefore it is surmised that these features are contemporary.

Pit [2312]: Pit [2312] lay to the east of S1, between the inner and middle ditches (illus 18). It was oval in plan and measured 0.70m × 0.40m. It was bowl-shaped in section and was 0.12m deep. The single fill of the pit [2313] was a sandy silt with occasional charcoal flecks and a single large stone (0.12m × 0.10m × 0.40m) at its base.

G12: G12 was also a short linear feature cutting and abutting BT7 (illus 18). It was U-shaped and measured up to 0.30m wide and 0.13m deep. It lay parallel to G9.

Block 7

This consists of two narrow linear features, G10 and G11 (illus 3).

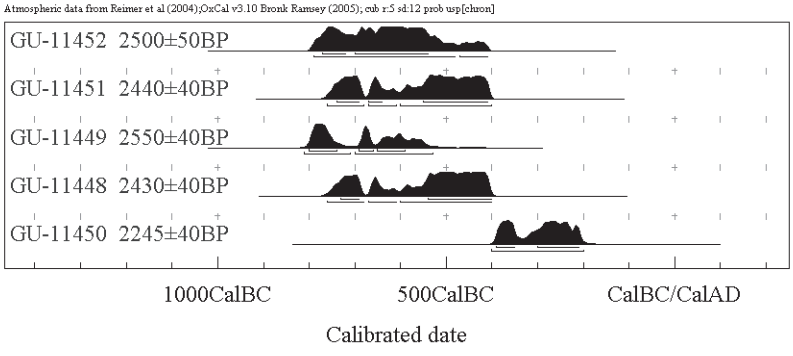
G10: G10 was a shallow, narrow linear feature, U-shaped in profile, which ran broadly east–west across the fill of the inner ditch and out into the ground between the middle and inner ditch. The fill comprised a silt loam.

G11: G11 was a shallow, U-shaped linear feature up to 0.43m wide that cut the interior of the enclosure and also the fills of the inner ditch. The fill comprised a silt loam.

POST-EXCAVATION ANALYSES

RADIOCARBON DATING

Six samples were selected for AMS dating (Table 1). Fragments of waterlogged oak (*Quercus* sp) from the outer, middle and inner ditches and from BT11 and BT2 were selected, the outermost rings of which were sampled. The two pieces of wood from the bedding trenches were in situ, while the wood recovered from the ditch fills were in a secondary location. No in situ carbonized remains were excavated at Braehead and what charcoal was recovered was largely derived from secondary ditch deposits. The majority of the charred macroplant material was derived either from the upper fills of the postholes of Palisade C or from the secondary ditch deposits; as charcoal from these contexts would not produce an unambiguous result no samples were submitted for dating. A sample of well humified peat from the base of a peat horizon located in a hollow immediately to the south of the site was also



ILLUS 20 The radiocarbon dates from the site (OxCal 3.10 (2005))

TABLE 2
Luminescence dates

	Sample	*Location*	*Description*	*Unweighted age estimate*	*Weighted age estimate*
Tube samples	1248	Inner ditch	Upper fill	280 ± 510 BC	310 ± 420 AD
	1249	Inner ditch	Lower Fill	690 ± 880 BC	140 ± 726 BC
	1250	Inner ditch	Substrate	6350 ± 920 BC	5980 ± 740 BC
	1240	Middle ditch	Mid section	2850 ± 910 BC	840 ± 334 BC
	1236	Middle ditch	Redeposited	6850 ± 1480 BC	3850 ± 707 BC
	1237	Middle ditch	Primary	6650 ± 1370 BC	4890 ± 762 BC
	1238	Middle ditch	Substrate	7070 ± 1100 BC	5400 ± 706 BC
	1241	Middle ditch	Primary	4980 ± 830 BC	3640 ± 567 BC
	1242	Middle ditch	Substrate	6040 ± 950 BC	5100 ± 745 BC
	1243	Outer ditch	Upper dark fill	1580 ± 140 AD	1610 ± 133 AD
	1244	Outer ditch	Dark fill (above redeposited)	270 ± 270 AD	710 ± 196 AD
	1245	Outer ditch	Early fill	1100 ± 450 BC	80 ± 286 AD
	1246	Outer ditch	Primary fill	11600 ± 1650 BC	9180 ± 1238 BC
	1247	Outer ditch	Primary fill	7200 ± 1350 BC	5260 ± 992 BC
Profiling samples	1248	Inner ditch	Upper fill	720 ± 460 BC	670 ± 400 BC
	1249	Inner ditch	Lower Fill	2780 ± 1350 BC	2160 ± 970 BC
	1250	Inner ditch	Substrate	6800 ± 1650 BC	4520 ± 740 BC
	1235	Middle ditch	Upper fill	890 ± 498 BC	760 ± 330 BC
	1236	Middle ditch	Redeposited	4670 ± 1090 BC	4320 ± 760 BC
	1237	Middle ditch	Primary	6650 ± 1475 BC	4950 ± 1040 BC
	1238	Middle ditch	Substrate	7980 ± 1154 BC	8300 ± 1110 BC
	1240	Middle ditch	Mid section	1530 ± 686 BC	880 ± 480 BC
	1241	Middle ditch	Primary	2600 ± 688 BC	1760 ± 520 BC
	1242	Middle ditch	Substrate	4885 ± 731 BC	4640 ± 730 BC
	1243	Outer ditch	Upper dark fill	1490 ± 349 AD	1549 ± 330 AD
	1244	Outer ditch	Dark fill (above redeposited)	160 ± 365 BC	276 ± 220 AD
	1245	Outer ditch	Early fill	2360 ± 622 BC	1870 ± 380 BC
	1246	Outer ditch	Primary fill	5040 ± 1164 BC	4300 ± 560 BC
	1247	Outer ditch	Primary fill	2330 ± 843 BC	1690 ± 550 BC
Small aliquots	1237	Middle ditch	Primary	3200 ± 675 BC	1840 ± 400 BC
	1241	Middle ditch	Primary	3700 ± 888 BC	710 ± 270 BC

TABLE 3
Quantities of different categories of material, excluding working debris, recovered from Braehead. Three blocks are excluded as their dimensions suggest they were natural

Type	*No*	*%*
?Gathered blocks	11	14
Prepared roughouts	37	48
Part-perforated roughouts	7	9
Perforated roughouts	13	17
Broken during finishing	8	10
Objects	1	1

submitted for dating to ascertain whether this deposit was contemporary with the site or represented the remnants of an earlier wetland. The samples were measured at the Scottish Universities Environmental Research Centre AMS Facility. The results are presented in Table 1.

The peat horizon clearly pre-dates the later prehistoric activity of the Braehead enclosure and so was not subject to any further study, although it does serve to demonstrate the longevity of the wetland area throughout the Holocene. The remaining radiocarbon dates reveal the later prehistoric date of the site (illus 20), although unfortunately these all fall within the plateau of the calibration curve that spans the Early Iron Age, preventing the calculation of more precise calibrated dates and the development of a detailed chronological sequence for the site. The earliest radiocarbon dates come from oak in BT2 (GU-11452) and a radial split oak plank retrieved from the base of the middle ditch (GU-11449), both of which are virtually identical. There is also no significant difference between the radiocarbon dates from a radially split plank retrieved from the outer ditch (GU-11451) and a possible oak plank from the inner ditch (GU-11448); the possibility is that these two pieces are contemporaneous and perhaps originated from the same structure. The latest date from the site is derived from the squared post of BT11 (the gated Palisade E).

LUMINESCENCE DATING

DCW Sanderson and IMC Anthony

The aim of the Optically Stimulated Luminescence (OSL) dating programme was to provide an additional set of dates which could potentially enhance the results of the radiocarbon dating programme. OSL dating operates by measuring the intensity of luminescence signals which are induced by long term exposure of minerals such as quartz to ionizing radiation in the environment. OSL signals are bleached by exposure to daylight and build up while the sample is enclosed within a sealed archaeological context. Providing the sample has been reset at time of deposition, the combination of OSL measurements of the radiation dose received and assessment of the environmental radioactivity of the sample and its context, it can be used to date depositional events. In all, 16 samples were subject to OSL dating.

Method

Small profiling samples were collected from the outer and middle ditches and used to evaluate mineralogy, luminescence sensitivities and to make preliminary stored dose measurements to identify the most appropriate luminescence approach. The profiling results identified areas of mixed deposition within each section and drawing upon this information 16 larger samples were collected in opaque tubes avoiding areas of probable re-deposition; the results of 14 of these larger samples are presented here.

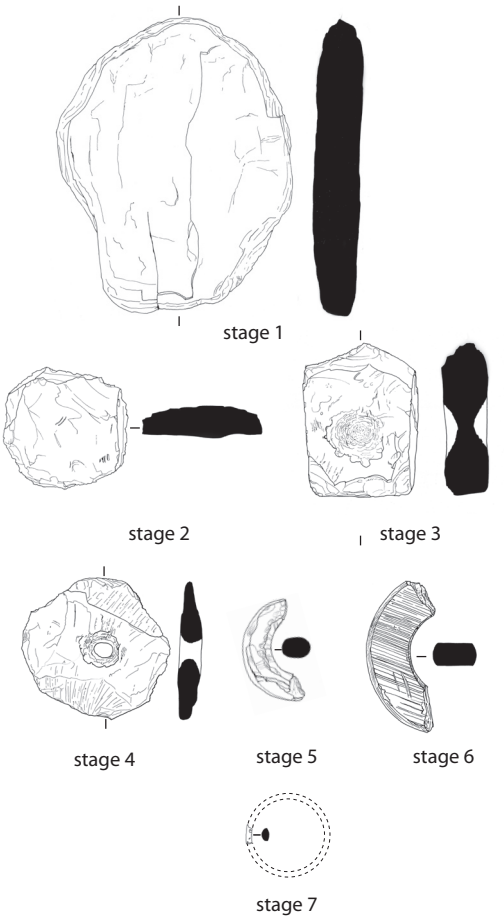
Results and discussion

In all cases it was possible to use the OSL data to determine equivalent doses for the samples. However, the dose distribution of a number of samples has indicated the presence of poorly

zeroed/re-deposited material within both bulk and profiling samples. The mixing of different aged sediment has resulted in large errors associated with the age estimates, although the OSL results do provide a progressive account of the chronology of incision, re-deposition and infilling of the ditches (Table 2). The substrate ages are close to sea level maximum (5000–6000 BC). The lower fill from the inner ditch appears to be first millennium BC (tube samples weighted data) or earlier (profiling samples in late third millennium BC), while the upper fill is either late first millennium BC/early first millennium AD. The outer ditch gives similar results to the inner ditch. The middle ditch was sampled at its edges and appears perhaps to contain older fills. However, there is evidence of re-deposition in these locations which may have biased the age estimate to the high side. Similarly, weighted and unweighted analyses give divergent results. Small aliquot data are arguably more credible, but suggest origins perhaps in the second or early first millennium BC, which are earlier than indicated by other strands of evidence, including the pottery (McSween infra) and the radiocarbon dates.

TABLE 4
Character of key cannel coal and shale assemblages in west-central Scotland of Iron Age–Early Historic date examined by the writer

Site	*County*	*Site type*	*Natural block*	*Prepared roughout*	*Part-perforated roughout*	*Perforated roughout*	*Unfinished*	*Finished*	*Range*
Auldhill	Ayr	Fort?		1	4		2	5	Bangle, bead, disc
Balloch Hill	Argyll	Fort				1	1	5	Bangle, counter
Braehead	Renfrew	Palisade	10	37	7	13	8	1	Bangle, bead, finger ring? pendant?
Carwinning	Ayr	Fort	1	7	3	1	7	16	Bangle, bead, pendant
Craigmarloch	Renfrew	Fort and palisade		2			11	9	Bangle, bead, finger ring counter
Dunagoil	Bute	Fort		3		3	34	66	Bangle, ring, bead, whorl
Dundonald	Ayr	Fort					2		Bangle, ring, pendant, gaming piece
Govan	Renfrew	Monastic		7		2	1		Finger ring, ?bangle
Sheep Hill	Dunbarton	Fort	1	12	2	4	14	11	Bangle, ring pendant, bead



ILLUS 21 Production sequence of a cannel coal bracelet

A more detailed draft report forms part of the site archive is lodged in the RCAHMS.

THE CANNEL COAL

Fraser Hunter

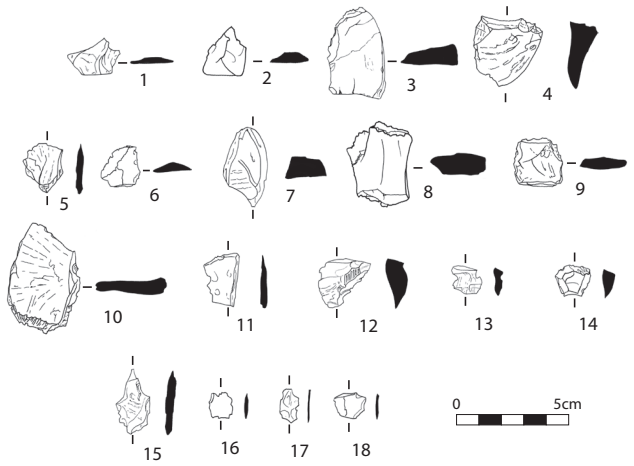
The excavation uncovered a substantial assemblage of debris from the manufacture of bangles and other items of jewellery in various forms of organic-rich black stone. Sixty-five items broken in the course of manufacture were recovered, along with 14 blocks probably gathered as raw material (Table 3) and 920g (316 fragments) of flakes and other working debris. This is the largest collection yet published from Scotland. There was also a single small fragment of a finished bangle. The raw materials were locally available cannel coal and oil shale, capable of taking a high polish when finished. However, here we see not the finished products but the stages of working (illus 21); the Braehead assemblage gives us a vivid picture of this important craft process.

The key objectives of the study were as follows:

- To reconstruct the technology involved, and any changes over time.
- To identify the likely products.
- To isolate any spatial patterns in the location of the craft activity.
- To identify and source the raw material(s) involved.
- To set the material into a regional context.

The categories of cannel coal and oil shale present on the site are as follows (Table 3):

- *Unworked blocks*: with no or minimal evidence of working, but which may have been collected for use.
- *Prepared roughouts*: a block with one or both faces thinned (normally by horizontally splitting it) and / or the edges partly rounded off (illus 28).
- *Part-perforated roughouts*: a prepared rough-out abandoned in the course of perforation, before this was completed (illus 29).
- *Perforated roughouts*: a prepared roughout in which the perforation was completed but no further finishing occurred (illus 30 & 31).
- *Perforated roughouts, finishing in progress*: this covers a wide spectrum from initial expansion of the perforation to the desired size, to making the roughout more circular, rounding off the faces, and final abrading and polishing (illus 32).
- *Finished objects* (illus 33).



ILLUS 22 Thinning flakes

Working debris

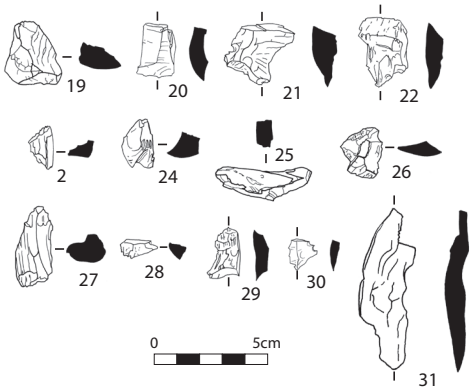
While a few fragments of working debris were recovered by hand, this was clearly no reflection of the original quantity given the number of surviving roughouts. The absence of working debris was identified at the post-excavation assessment stage. However, because of the rigorous sampling strategy, soil samples were available from across the site and some 4.4kg of 'coal' >4mm was retrieved from sieved retent samples and subdivided into likely working debris and natural fragments. The criteria used for identifying working debris were: flake scars; cut, flaked or other regular fracture on edge; sharp rather than worn edges; and angular morphology. Large block fragments which fractured accidentally or large spalls from roughouts are catalogued separately under roughouts; these are assumed to be accidental, and are more informative when considered alongside other roughouts.

There has been very little previous work done on such working debris. The classification used here was developed from observation of working traces seen on the discarded blocks and study of other assemblages of working debris, along with ideas gleaned from other lithic studies. The proforma used was detailed and records a wide range of variables. However the essence is that there are two main working axes for this material: a horizontal one, thinning the surfaces (illus 22); and a vertical one, shaping the edges and centre (illus 23).

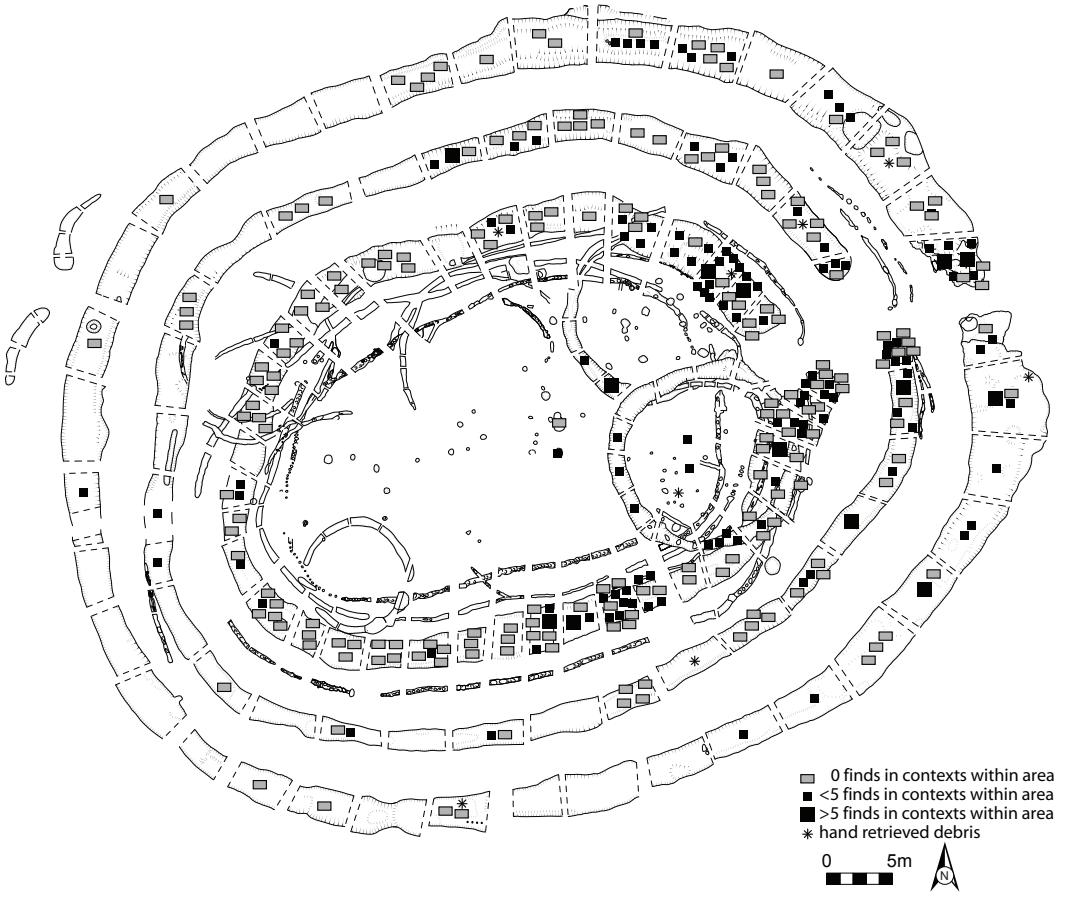
Characteristics

The recovery of material by sieving has provided a much more realistic view of the debris from shale and cannel coal working. Around 40% of the Braehead debris appears to be intact; the fragmentary material is less easy to classify, but much can still be allocated to a general type, with only approximately 8% of the material unclassifiable. Considering only identifiable debris, material from thinning outnumbers that from edge-trimming by about 4:1. Detailing the character of the assemblage beyond this is trickier (see archive report).

As illus 30 shows, the vast majority of the working debris comes from the ditch fills, and thus does not represent in situ working deposits.



ILLUS 23 Edge-trimming flakes



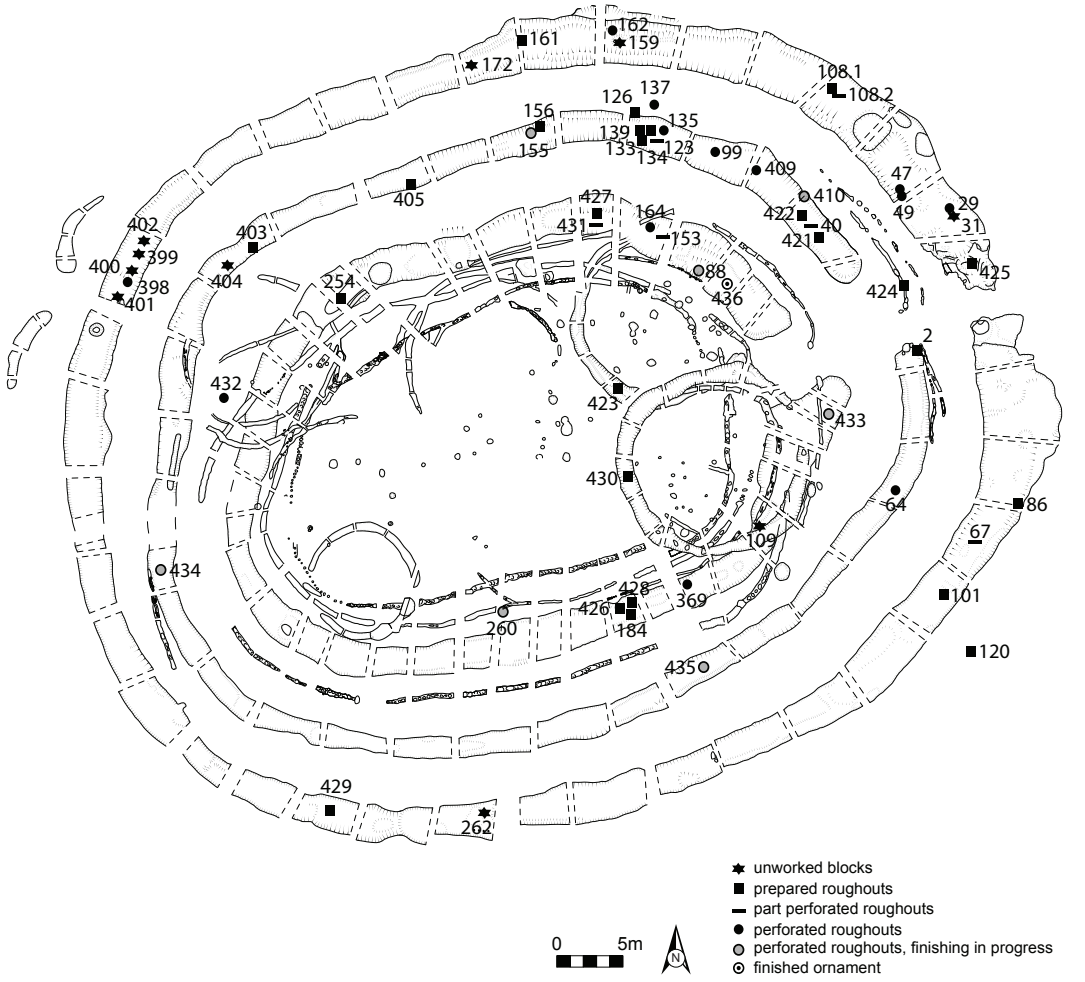
ILLUS 24 Distribution of the working debris, grey squares marked sampled contexts where no debris was recovered

This material was apparently deliberately dumped in the ditches. However, the distribution can give an idea of likely working areas. There is a marked concentration to the eastern side of the site, especially in the innermost ditch and the entrance terminals of all three ditches. There is also a notable concentration in a short stretch of the southern portion of the inner ditch: in these contexts coherent groups of small flakes were recovered which are likely to derive from a single working episode.

Curiously the distribution of working debris shows a different focus from that of roughouts (illus 31). There is an overlap, but only partial: roughouts show a more general spread, with no marked concentration in the inner ditch nor around the entrance. They are if anything more common in the middle and outer ditches, with the only notable concentration being in the north-east stretches of the three ditches. This indicates different depositional pathways: different stages of the working process (debris and roughouts) were treated differently. The debris was probably swept up from where it lay at the end of a working phase and thrown over the bank or out the entrance into the ditches. In contrast, most roughouts were not swept up along with the debris. This suggests

some curation of broken roughouts, perhaps on the off-chance they could be reused, with final deposition taking place later, perhaps when the inhabitants left the site. Alternatively broken or discarded roughouts may have been thrown away immediately rather than left to lie on the working surface. There is also a small separate cluster of gathered blocks in the north-west corner of the outer ditch, suggesting the disposal of a small stockpile.

It is worth comparing this to the deposition of other materials. Coarse stone shows a broadly similar pattern to roughouts, although with a near-total absence from the middle ditch (illus 36). This supports the idea that roughouts were treated in the same way as other discarded artefacts. Pottery is markedly different, focusing much more strongly in the west (and especially south-west) of the site (illus 34). This is likely to indicate different activity areas;



ILLUS 25 Distribution of the cannel coal finds, excluding working debris

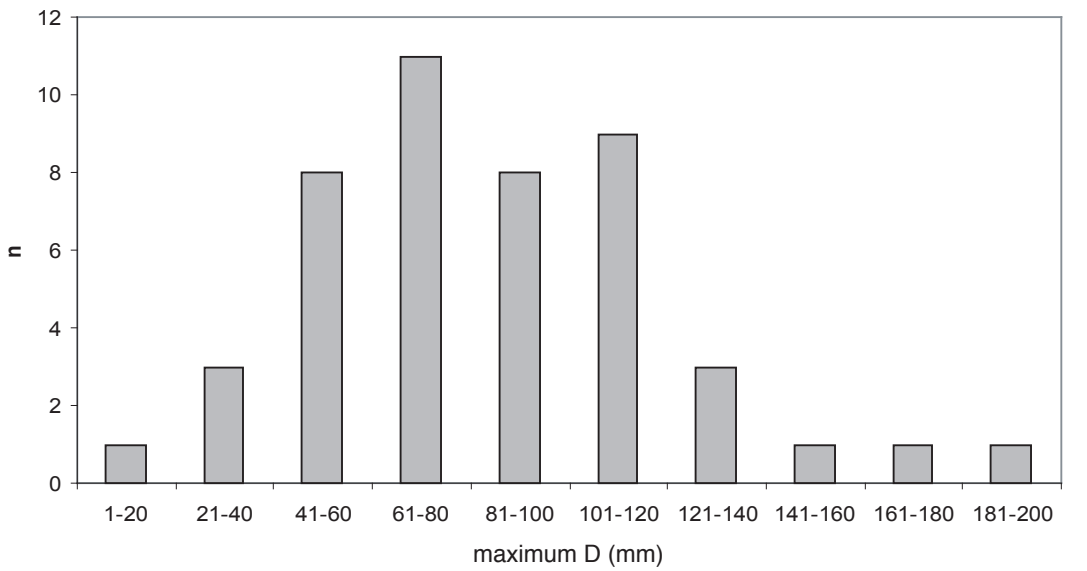
there are no strong suggestions of structured deposition.

Discussion

Although jewellery-making debris of cannel coal, shale and similar materials has regularly been recovered from Scottish later prehistoric and Early Historic sites, it has never received the attention it deserves. This is surprising, because its importance was recognized long ago by Callander in a seminal study of jet and related items in Scottish prehistory (Callander 1916). It certainly merits more attention, as it is one of the few craft processes we can reconstruct in detail, and one which is abundant in areas near the raw materials, especially central and western Scotland and coastal Sutherland. Elsewhere the subject has seen more study: the Kimmeridge shale industry of Dorset, while there are valuable site-specific studies from Bronze Age sites in Derbyshire (Calkin 1955; Beswick 1979; Radley 1969; Cox & Mills 1991). Further afield, the working of similar black organic stone materials is known across large parts of continental Europe throughout the Iron Age (Rochna 1962, 1974; Chevillot 1976; Venclová 1992, 1998; Vuaillat 1992; Pouenat & Vernet 2002). Broadly similar production processes involving the removal of solid disc cores are attested in most areas; this contrasts to normal Scottish techniques, which focus instead on perforation and expansion of the hole.

While publication of some smaller assemblages provides initial approaches to the material (eg Auldhill, Ayrshire; Hunter 1998) and work on others is in progress, Braehead represents the most substantial published assemblage to date, and allows a detailed assessment of the technology involved for the first time since Callander's work.

Dating: The vast bulk of the material derives from ditch fills, dated to broadly 600–400 BC, which puts the main production phase into the early Iron Age. The individual fragments of



ILLUS 26 Range of the maximum diameters of the cannel coal finds

working debris from other structures (S5, S6 & BT2) are not securely stratified. However, there is a small quantity of more securely-stratified material from S1, which clearly post-dates the infilling of the ditches; three unworked blocks, five prepared roughouts, a broken roughout and 12 fragments of working debris. This indicates some limited cannel coal and shale working in the later use of the site, but on a very different scale from the early Iron Age peak.

Raw material: A combination of visual identification and XRF allowed the vast bulk of the material to be identified to three coherent groups of cannel coal, canneloid shale and oil shale (see archive report for full discussion). The similarities shared between these groups suggested they came from a related series of sources, with very limited use of other material. Given the site's position, and the presence of natural cannel and shale fragments in the sediments, a local source is likely; the site lies on the edge of the Central Coalfield (Gibson 1922, 10–3; Cameron & Stephenson 1985, 61, 64, 66–91). There is always a problem in directly relating geological mapping to past utility, since useable sources were only accessible at exposures, for example in rivers or at the coast, while many archaeologically significant exposures are likely to have been worked out long ago.

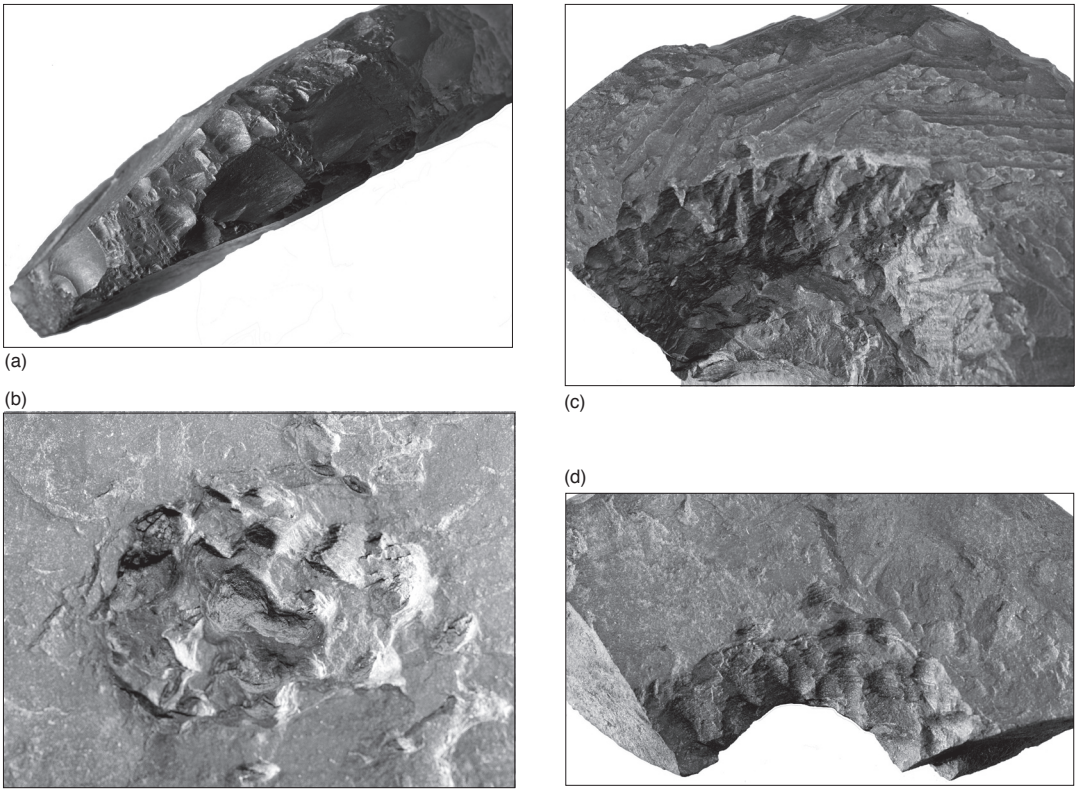
Technology: The main products at Braehead appear to have been bangles. Some of the near-finished items indicate bead and probably finger ring manufacture, while the size of some roughouts indicates that annular items smaller than bangles (rings, ring-pendants or perhaps whorls) were also being manufactured. While a roughout gives only an indicator of maximum possible diameter (the final product being rather smaller), illus 26 indicates the range of external diameters represented. This shows a range of small diameter material (beads, rings etc) and a cluster around bangle-dimensioned blocks; the few larger items are bangles which had seen minimal edge-trimming.

The material shows a broadly consistent production sequence (with minor variations), as illustrated in illus 21:

- gathering of appropriate blocks of raw material (generally naturally flat, and often naturally near-square)
- preparing the block (typically by squaring or crudely rounding it off and thinning one face; sometimes a rough centre point was marked)
- creating a biconical pecked and/or gouged perforation
- finishing by:
  expanding the perforation to the required size, rounding the exterior edge to size and shape, and/or rounding off the flat surfaces.

Table 3 shows the numbers in each of the different categories. This indicates when discard occurred, and thus the most hazardous stages of the operation. If the likely reasons for discard are considered, in most cases (55%) this was due to breakage; in 15% of cases the blank was over-thinned or other mistakes in working were made, while in 9% of cases it seems the raw material proved too laminar. However with 20% of the pieces, there is no obvious reason why they were abandoned. It may be there were subtle differences in working properties which we cannot readily discern but were enough to warn a skilled craftworker that the piece was unsuitable, or they may simply have been abandoned when other priorities arose.

A noteworthy feature is how few near-finished pieces are present: on other sites, as noted below, fragments of virtually-finished bangles are a frequent find (and must have been a source of extreme frustration to the craftworker). Their rarity here suggests that the workers concentrated on basic shaping of the raw material, getting the blanks past the hazardous stage of perforation but leaving final finishing for another occasion. This in turn supports the notion of mobility as an essential feature of activity at this site: the blanks were being prepared to be taken elsewhere. A



ILLUS 27 (a) Toolmarks from a gouge on edge of SF 123; (b) Partial perforation of SF 123 showing toolmarks, probably from a gouge; (c) Initial stages of perforation on SF 153, showing toolmarks from a fine point or gouge; (d) Perforation on SF 162, showing toolmarks, probably from a gouge

concentration on the early stages explains why there are so many prepared but unperforated blanks. These were presumably either left before work could proceed, or abandoned because initial shaping indicated they were unfavourable. This difference is shown starkly in Table 4, which summarizes other assemblages from the area: the dominance elsewhere of near-complete and finished items is striking. Braehead provides our first evidence of a more complex system of manufacture. While some sites show evidence of the entire process, from shaping the blank to finishing the bangle, it seems that others, such as Braehead, were more specialist, providing the blanks for further working elsewhere. The presence of such large flat unfinished rings should be sought on other sites.

The Braehead assemblage also gives valuable indicators of the tools involved in production from the traces left on the debris; experimental work to replicate the marks would be a valuable area for future work. Photographs of the best traces are provided in illus 27a–d. Much of the shaping involved crude flaking or chipping, sometimes unifacial, sometimes bifacial. In concept this is a similar process to the shaping of chipped stone tools (such as the pot lids found at the site). It could have been carried out with stone pounders (although no clearly associated finds were noted). Shaping

was also carried out by crude snapping and more subtle gouging and knife-trimming. The thinning was carried out by splitting the surface along laminations, by flaking and more rarely by fine gouge-work. Perforation, always biconical, seems to have taken place by pecking with fine (?iron) points or carving with fine gouges. Scratching on many pieces indicates abrasion with sandstone grinding-stones or perhaps iron files. The tools and techniques used would have to be tailored to the material; the shale had rather different properties to the more compact cannel with its conchoidal fracture, and would need rather different working.

Some specific details of the working can also be gleaned. Generally one natural face was retained until the perforation was complete, with only one face being thinned, although there are exceptions (SFs 39.2, 123, 133, 416.2). This presumably was to avoid excessive work on a piece that was going to break; the thinning and edge-shaping would also give a good idea of the block's properties. A number of roughouts have crude marks in the approximate centre of one face, and these are likely to be guide marks for the perforation; they were noted on SF 39.1 and SF 86. All perforations were straightforward biconical ones except SF 123, which had a broader hollow with a central disc which was being outlined for removal intact. This is a variant on a method attested intermittently elsewhere, where the centre of the bangle was removed in one single piece to the intended diameter; does this indicate the presence of a craftworker trained in a different tradition? Sadly the details of regional working traditions are as yet poorly known, although variants of this disc removal technique are attested at a number of widely spread sites (Callander 1916, 236–7). Find 260 shows a variant method of shaping the outer edge. In most cases (although poorly attested here because finishing took place elsewhere) this involved gradual reduction (by filing, flaking, etc) of the edge to the desired shape; in this case it involved cutting a groove at the required diameter to detach the extraneous portions. This does not appear to have caught on as a general technique.

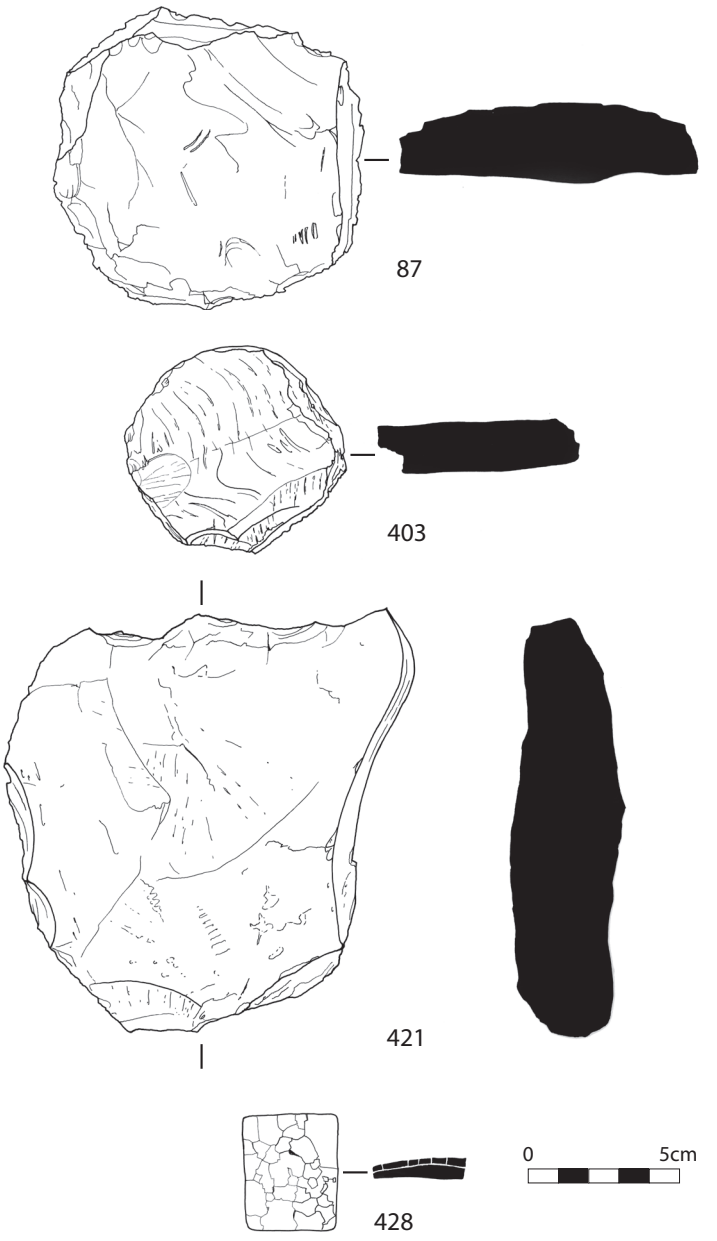
Another point worth noting, although not related to the technology per se, is the reuse of SF 126; here, after breakage, one broken end was reshaped into an expedient blade.

Working debris: The study of working debris is made awkward by the lack of experimental work on this material, the lack of an agreed typology (arising from both lack of study and the material's irregular working characteristics compared to traditional lithic study areas such as flint), and the presence of natural fragments and natural spalls.

This study has allowed the first systematic picture of such material, and has demonstrated that hand-collected samples show a systematic bias compared to material recovered from sieving. The assemblage may be split broadly into two types, those reducing the thickness of the roughout (thinning) and those defining its shape (edge-trimming). The former outnumber the latter by about 4:1. The characteristics of the assemblage have been defined above, but it is only as other comparable assemblages are analysed from other sites that any comparisons can be made.

The distribution of the working debris concentrates markedly in the eastern half of the enclosure, notably in the inner ditch and entrance terminals. This all represents secondary movement of the material from its working location, but suggests the bulk of the working took place in this part of the site. Discarded roughouts were disposed of differently; rather than being swept up with the rubbish, they appear to have been collected and disposed of later.

Regional context: Barely an excavated site in the west-central Scotland lacks this material, and most sites have evidence of working. It seems that, in this region where the raw materials were locally prevalent, every site had fairly ready access. Of course this does not mean that access was direct; the Braehead evidence suggests



ILLUS 28 Prepared roughouts

the initial shaping and final working may have taken place at different spots, and thus that the raw materials may have been gathered at some distance from the site where the products ended up. The Auldhill assemblage also produced evidence for differences within the range of black shiny jewellery, as artefacts made in a slightly different (presumably non-local) material were the only ones on site to be repaired; even in an area of abundant raw materials, a different source (albeit visually near-identical) could be valued differently, whether as exotica, memento or some other interpretation (Hunter 1998).

However, it is clear that the craft in black jewellery was much more widespread in west-central Scotland than in other areas. In Galloway, for instance, although the products are common, working evidence is rarer (Hunter 1995), while further afield (eg in north-east Scotland or in the Northern and Western Isles) such jewellery is markedly rarer, and presumably had more of a value as an exotic, perhaps status item.

Conclusions

Braehead has provided a valuable case study of this understudied material. For the first time it has allowed full publication of a substantial assemblage, enabling much greater insights into the technologies involved and hopefully raising awareness of this important category of evidence. The assemblage is dominated by unfinished items and debris, giving a remarkably clear picture of

the process. Yet it lacks stages which would be expected, notably the final finishing which must have been carried out elsewhere. This adds to the other strands of evidence (see below) which suggest that this was not a year-round occupation site but one where people visited and carried out a range of activities, including the roughing-out of jewellery in black, shiny stones.

(A full version of this report is lodged with the site archive in the RCAHMS)

CATALOGUE OF ILLUSTRATED CANNEL COAL FINDS

(All measurements in mm)

Prepared roughouts

87 Rounded block, one surface natural with limited flaking, the other covered in flake scars. One edge is naturally square, the others rounded by flaking; the regular scars (W 16–25) are all struck from one surface except in a small area at one end. 100×95×24. [1000], outer ditch

134 Broken square block, with two curving natural edges (with a little unifacial flaking) and one gouged; fourth edge broken. One surface natural, other flaked. 128×92×33. [1136], middle ditch

403 Rounded roughout, one face natural with limited abrasion, the other split; edges rounded by unifacial and bifacial flaking. Its size suggests a very small bangle or, more likely, a ring or pendant. On other sites (eg Portpatrick; Callander 1916, 236–7) such circlets are reused cores removed from larger bangles, but in the absence of such a core-removal technology at Braehead this was presumably always intended as a small blank. 66.5×66×16.5. [1143], middle ditch

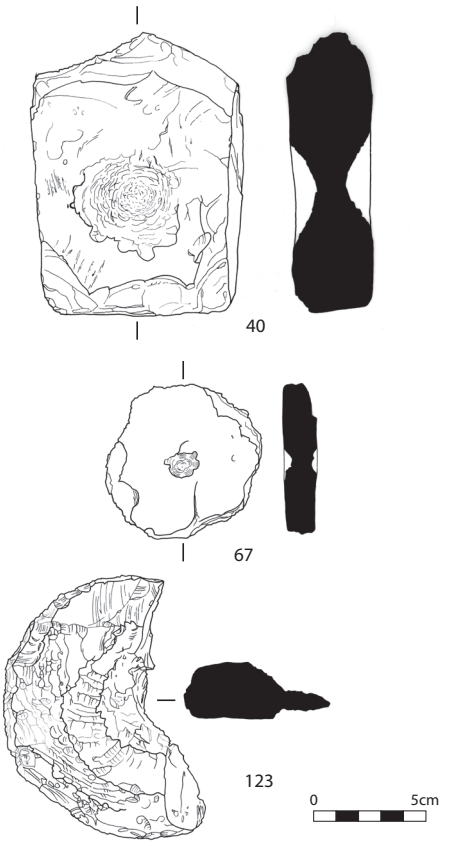
421 Crudely squared and part-rounded block, probably abandoned because edge-flaking caused a large spall to detach from one face. Edges trimmed by horizontal gouging and bifacial flaking; faces thinned by flaking (with some fine gouging on one), although parts of the natural surface survive on both. 164×139×25. [1027], middle ditch

428 Very regular small squared block, the edges cut square and both faces flaked smooth. 39×32×5. [1502], inner ditch

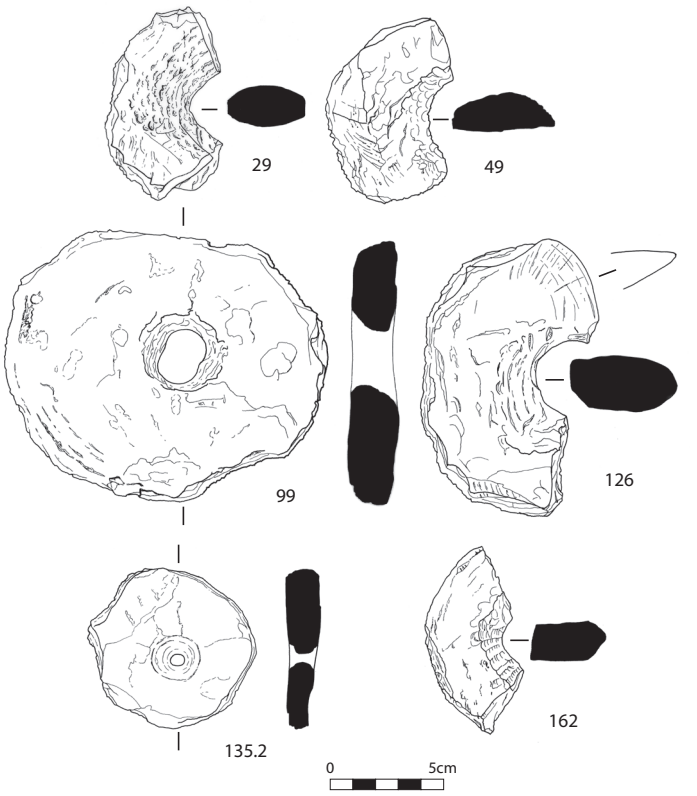
Part-perforated roughouts

40 Pentagonal block with four very square (?cut) vertical edges and the other edge bifacially flaked. One face is natural, with some flaking to smooth edges and some scattered blade marks from ?rough flattening; the other has been flaked to flatten it and the corners have been thinned. Opposed central hollows, pecked with a point or fine gouge, D 41–49, depth 13. 125×93×41. [1004], middle ditch

67 Roughly rounded block, the edges crudely unifacially flaked, from alternating sides. One natural face, the other flaked. Incipient gouged biconical perforation (D 12–13, 2.5–4 deep)



ILLUS 29 Part-perforated roughouts



ILLUS 30 Perforated roughouts

with 8.5mm thickness remaining to remove. The size suggests it was intended as a ring or pendant. 69×65×15. [1000], outer ditch

123 Rounded block, the near vertical edge gouged to shape. Both faces shaped by flaking, with channelling on one suggesting a chisel or gouge. Broad biconical partial perforation (W 56–70), preserving marks of a thin gouge (W 4); a thin plate of material (T *c* 7) is still in situ with a groove cut round the margin suggesting it was to be removed in one. D 117, T 29. [1143], middle ditch

153 Block with two naturally square edges, the others shaped (mainly by crude ?unifacial flaking, with some cutting) to form a rough hexagon; one face natural, other split. The natural face shows the beginnings of a perforation, with individual toolmarks clearly visible from a narrow gouge some 6mm wide. One spit of material has been removed over an area *c* 30×35, with the central area rather deeper and a few scattered toolmarks elsewhere. 120×119×30. [1252], inner ditch

416.1 Crudely-rounded (near-octagonal) roughout with unfinished biconical perforation, snapped in half in process of perforation with 10mm thickness still to go. The hollows (D 19–25, 3–5 deep) are finely pecked, perhaps with a point. One surface is natural, the other flaked, and the edges appear crudely flaked. D 98, T 19. Unstrat (close to entrance, N side, from middle ditch)

431 Small part-perforated roughout, badly broken: one possible original edge, cut square. Natural faces. Fractured across an incomplete unifacially-pecked perforation (D max 8).

The ?original edge gives a maximum D 20mm, suggesting it was a bead or ring. T 3.5. [1955], inner ditch

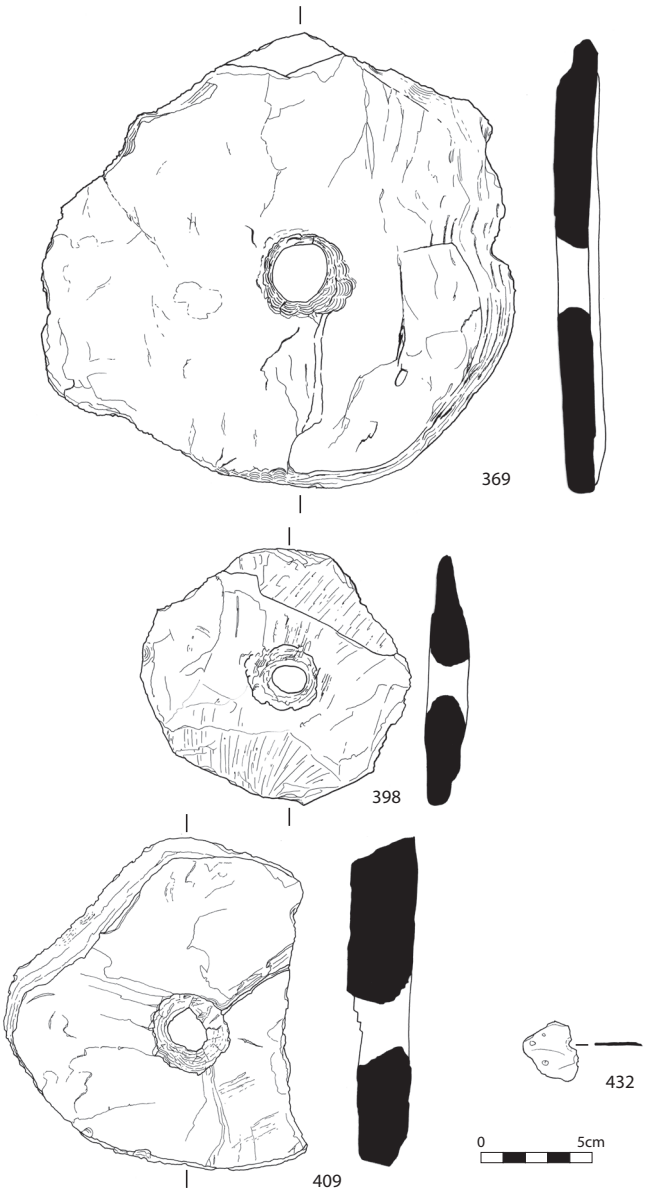
Perforated roughouts

49 Accidental flake from a rounded and perforated roughout, the edge partly natural, partly shaped (?by gouging and flaking); surface natural with some flaked edge-thinning and filemarks. Perforation ?biconical, with traces of small gouge and abrasion. L 84, W 45, H 15.5, exterior D *c* 100. [1005], outer ditch

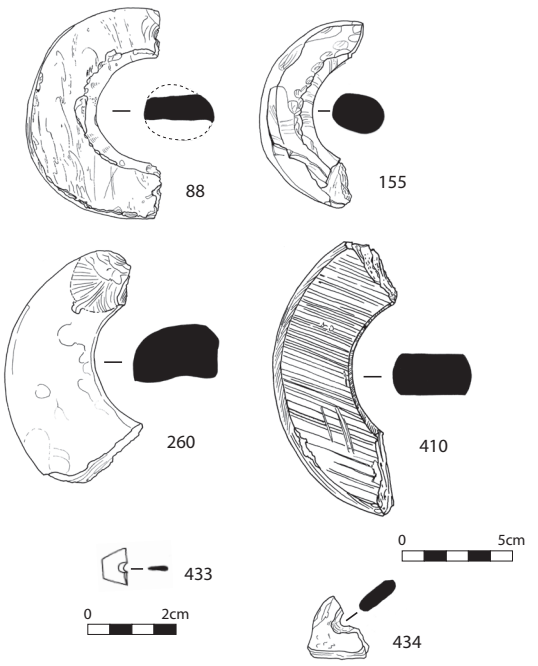
99 Sub-circular roughout, one face unmodified bar a few filemarks, the other flaked to shape. Around half the perimeter is the natural edge; elsewhere it is shaped by snapping, unifacial flaking and gouging. Sub-circular biconical perforation (D 17×22, hollow 35–40), irregular because enlargement has begun. Unclear why it was abandoned. 140×116×20. [1104], middle ditch

126 Broken rounded and perforated roughout, fairly circular in plan, the edges still rough from crude bifacial flaking; both faces are natural and little modified bar limited fine abrasion on one. Biconical perforation with no enlargement; the piece broke before any finishing was possible. The perforation (D 33 in a hollow of D 53) preserves fine peckmarks from a point or punch. After fracture one edge has been smoothed and tapered; its function is unclear, but it may have been an expedient blade. External D 120, W 45–50, T 25.5–27.5. [1136], middle ditch

135.2 Crudely rounded by ?cutting, snapping and unifacial flaking; still quite angular, with octagonal shape. Natural tabular surfaces with part of one face flaked ?accidentally, perhaps leading to its abandonment. Central biconical perforation (D min 6, max 14); on both faces is an incised marking-out line, D 19–20. 77×61×10–15.5. [1137], middle ditch



ILLUS 31 Perforated roughouts



ILLUS 32 Perforated roughouts – finishing in progress

162 Rounded and perforated roughout; broken, with about a third surviving. Sharply biconical perforation (hollow D *c* 50, perforation D *c* 23). One face with flake scars, other barely modified; edges gouged. Toolmarks are very clear in the perforation; the fine curved facets appear to be from a gouge of width *c* 6mm. L 82, W 32, T 16. [1258], outer ditch

369 Roughout, half the edge naturally rounded, the remainder unifacially and bifacially flaked to shape. One area is only partly thinned, with part of the natural surface remaining. Biconical perforation, deeper on one side (D 26, hollow 33–43) with gouge marks visible (W 10). It seems that a large flake was accidentally detached for one side, thinning it too much and leading to abandonment. 230×200×24. [1494], inner ditch

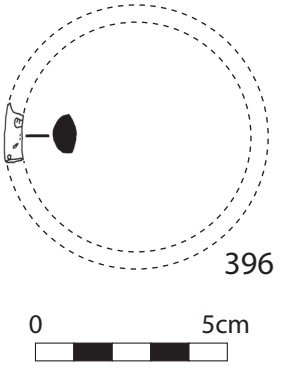
398 Roughout crudely rounded by bifacial flaking, both faces flaked (although one retains a central raised area), one with abrasion scars. Biconical perforation, slightly misaligned and slightly expanded (D 13, hollow *c* 23×32); fine gouge marks are visible in places. Probably abandoned because accidental flaking on one face meant it was too thin. 119×111, T 18 (but only 6 in thin area). [2282], outer ditch

409 Very irregularly rounded block, with about a third lost and part of one face over-thinned. The near-vertical edges are scalloped, suggesting use of a gouge. One face is flaked flat while the other is natural; the section preserves an interface between two layers, the flaked side being much more organic. On the natural side the perforation is wide and shallow (35×42, 9 deep); on the other side it is much steeper, the toolmarks suggesting a gouge some 4mm wide. Perforation D 14×16.5. Dimensions: 153×148×33. [1046], middle ditch

432 Surface spall from a small perforated roughout for a bead or ring. Squared block, one edge natural, one flaked; broken across biconical perforation (D 3.5). 26.5×min 22.5×1.5. [2245], BT20

Perforated roughouts, finishing in progress

88 Large fragment flaked from a perforated and rounded bangle roughout; this would cause manufacture to be abandoned. The outer edge is well-abraded (although still flat, not rounded off); surviving face flaked, biconical perforation smoothed by transverse abrasions. D 94, T 11, RW 27–34. [1036], inner ditch

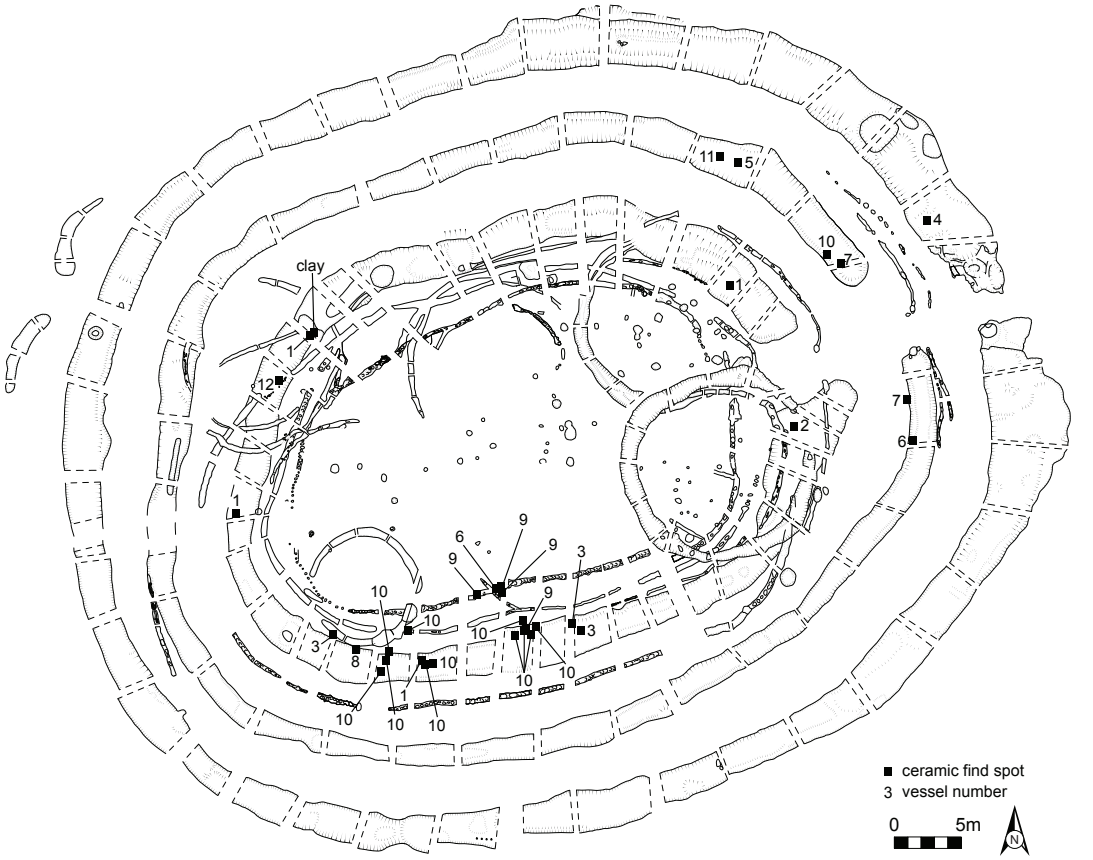


ILLUS 33 Finished ornament

TABLE 5
List of pottery vessels, with contextual information

Vessel	*No of sherds*	*Find number*	*Context*	*Context description*
1	11	245	1874	Inner ditch fill
1	1	394	2166	Inner ditch fill (upper fill)
1	1+3 frags	379	1497	Inner ditch fill
1	1+8 frags	96	1090	Inner ditch fill
2	3 frags	Rt	1211	Inner ditch fill near terminal
3	2	Rt	1588	S3
3	1+1 frag	418	1504	Inner ditch fill
3	1 frag	257	1713	Inner ditch fill
4	2	43	1073	Outer ditch fill (pit cut)
5	thumb pot	80	1104	Middle ditch fill
6	1	251	1713	Outer ditch fill
6	5+5 frags	42	1002	Middle ditch fill
7	8+5 frags	411	1040	Middle ditch fill terminal
7	3	11	1002	Middle ditch fill
8	1	366	1712	Inner ditch fill
9	frag	255	1331	BT7 bedding trench fill
9	frag	259	1331	BT7 bedding trench fill
9	frag	248	1331	BT7 bedding trench fill
9	frag	250	1331	BT7 bedding trench fill
10	5+2 frags	247	1713	Inner ditch fill
10	1	249	1713	Inner ditch fill
10	1	15	1004	Middle ditch fill
10	frag	370	1712	Inner ditch fill
10	frag	371	1712	Inner ditch fill
10	frag	365		Inner ditch fill
10	4+2 frags	252	1713	Inner ditch fill
10	1	261	1782	layer, turf bank between BT7, BT2, BT10
10	1	367	1493	Inner ditch fill
10	1	258	1712	Inner ditch fill
10	1	264	1493	Inner ditch fill
10	1	373	2108	Inner ditch fill
11	1	91	1104	Middle ditch fill
12	2	374	2114	Inner ditch basal fill
clay		256	1874	Inner ditch fill

155 Bangle roughout, near-finished with edges and section rounded when it broke; one face naturally flat, the other rounded. Some trimming facets and abrasion scars (predominantly circumferential, some transverse in perforation and one face). 83.5×23.5×19. [1143], middle ditch



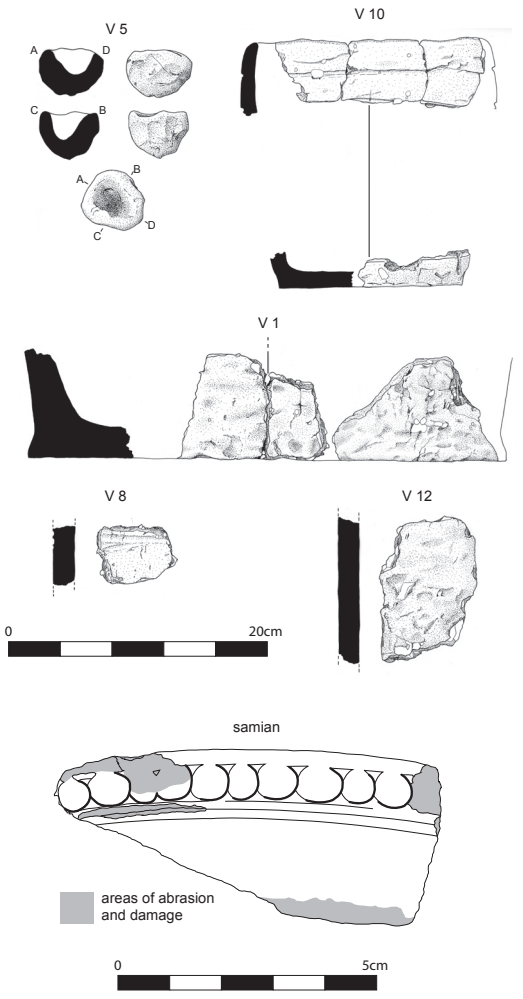
ILLUS 34 Distribution of later prehistoric ceramics

260 Broken bangle roughout representing a variant method of manufacture. One face and the surviving edge are natural; the other face is split and abraded flat. The perforation has been expanded to the desired size, with a smooth flat edge. To create the circular form, rather than flaking and cutting from the outer edge, a groove was being cut at the desired circumference to remove the excess; the roughout snapped during this process. L 106, W 44, T 23; intended internal D *c* 60–65, intended W *c* 18.5, external D *c* 80–85. [1677], BT2

410 Rounded and perforated bangle, broken in the finishing process. Circular, the outer edge rounded with circumferential abrasion scars; flat faces with crisscrossing diagonal abrasion scars; inner edge with transverse scratches. The effort going into flattening rather than rounding of the faces suggests this was near the intended final section; perhaps it was to be a large flat ring (an armlet?) rather than a bangle. As it survives, exterior D 70, interior D 35, W 36, H 18–19. [1027], middle ditch

433 Spall from surface of bead roughout, broken across the biconical perforation (D min 1.5, max 2). Suitable for a disc bead of 8mm D. One natural edge, others broken; natural surface. 8.5×6×1. [1095], inner ditch

434 Perforated roughout for a ring or bead. Very worn and apparently burnt; broken across the perforation. Squared flat roughout with the edges slightly tapered (no visible toolmarks). Central biconical perforation (D 5.5); a ring of gougemarks on one side shows expansion



ILLUS 35 Later prehistoric ceramics and Roman pottery sherd

was in progress to a diameter of 9mm. Natural surfaces. 31×min 23×6. [1828], middle ditch

435 Finger ring roughout? Spall from surface of a perforated disc; natural surface, angular edge but well-finished perforation, vertical and polished (interior D *c* 20mm, 14% survives). This suggests it was intended as a finger ring: a pendant would not have such a vertical edge. L 11, RW 8, T 2.5. [1389], middle ditch

Ornament

436 Bangle fragment: thin D-section with slightly rounded interior. Exterior well-finished, while interior retains circumferential abrasion scars. The latter are typical on finished objects, and there is no reason to doubt this was a finished item broken in use rather than a near-complete one broken during manufacture. It is the only example of the products manufactured on the site. Internal D *c* 55–60, 7% survives. L 16, W 4.5, H 8.5. [1036], inner ditch

THE LATER PREHISTORIC POTTERY

Ann MacSween

Approximately 90 sherds and fragments of coarse coil-built pottery were recovered during the excavations at Braehead (Table 5). Most of the pottery was recovered from the fills of the inner ditch (illus 34). After detailed examination and matching these were grouped according to vessel. Twelve vessels are thought to be represented (Table 5).

Description of main characteristics

Apart from a complete thumb pot (V5) (illus 35), only two of the vessels, V7 and V10 (illus 35), are represented by rims, both having an inverted profile. Three vessels – V1 and V10 (illus 35), and V11 – are represented by basal fragments. In all cases flat-based vessels are represented. Where it is possible to determine vessel shape, large bucket-shaped vessels with thick walls are indicated. It was not possible to reconstruct a vessel profile for any of the vessels but the rim diameter of V1 is estimated at 400mm while that of V10 is estimated at 180mm.

In all cases a fine clay has been used, in three cases (V2, V4 and V10) with no added rock fragments, but most commonly with 20–30% of large mixed rock fragments added (V1, V6, V7, V8 (illus 35), V9, V11, V12 (illus 35). The fabric of V3 is fine clay with *c* 20% of black rock fragments while V5, the thumb pot, is of fine

clay with occasional small inclusions. A lump of unfired clay, weighing 382g was recovered from the fill of the inner ditch. It is very similar in composition to the most common fabrics on the site and indicates pottery production on the site.

The vessels seem to have had no more than minimal wet hand smoothing of the surface – no instances of burnishing were noted. Four of the vessels (V3, V8, V10 & V12) have traces of probable incised decoration – single or double lines which appear to have been incised using a small twig. V10 also has a finger impression on the exterior which may be decoration.

Only four of the vessels (V1, V7, V10 & V11) showed traces of residue or sooting which might suggest a storage function for at least some of the vessels.

Discussion

Typologically, the assemblage from Braehead can be compared with those from a number of sites in lowland Scotland dating to the later prehistoric period. A comprehensive survey of later prehistoric assemblages from the south of Scotland is provided by Cowie (2000, 31–3) and will not be repeated here. Recently excavated assemblages include those from Broxmouth (Cool 1982), St Germains, East Lothian (Alexander & Watkins 1998), and Abie Hill, Dumfriesshire (Strachan 1999).

In general, most of the vessels from these sites are undecorated, bucket-shaped vessels with simple rim forms, usually plain, flat, or slightly inturned. The choice of rim type may simply reflect the potter's personal preference as to the look of the final vessel, but is more likely to have a functional association, for example, an inturned rim may lessen the risk of chipping if being used with a lid. While an inturned rim is not the best design for a vessel being used for pouring, it would be fine if a scoop or ladle was used to remove the contents and it may also be effective in lessening the chance of overheated liquids boiling over. It would seem likely that the subtle differences noted between assemblages are due to such factors as differences in locally available materials, the preferences of different potters for certain rim angles, and the intended use.

A recurring theme of pottery reports dealing with assemblages of this period is the small size of the total assemblage even where substantial proportions of relatively large enclosures have been excavated and Braehead is no exception. At Fishers Road East, for example, extensive excavations over two enclosures produced only 12 sherds from six vessels (Gwilt 2000) and at Fishers Road West, it was noted that the combined weight of the Iron Age sherds amounts to less than a third of the estimated weight of a single complete vessel (Cowie 2000, 33). It is probable that this is partly due to the use of other types of container, for example wood, leather or metal, but it may also be due to the offsite disposal of rubbish from the site, perhaps through middening.

(A full version of this report is lodged with the site archive in the RCAHMS)

Catalogue of illustrated pottery

Vessel	*No of sherds*	*Find no*	*Location*
1	1+3 frags	379	Outer ditch fill
5	thumb pot	80	Middle ditch fill
8	1	366	Outer ditch fill
10	4+2 frags	252	Outer ditch fill
12	2	374	Outer ditch fill

THE ROMAN POTTERY

John Dore

Description

A single sherd was recovered from the upper-most fill of the outer ditch (illus 35). It has a fine orange-brown fabric with a slightly paler

smoothed and burnished surface. The rim is moulded and decorated with a horizontal band of small spheres in low relief. Inclusions: moderate rounded quartz up to 0.2mm; some red iron-rich grains 0.2–0.3mm, clay pellets up to 0.5mm and a scatter of fine silver mica, <=0.1mm.

Discussion

Bowls such as this are common on sites of late first century AD date in northern England and Scotland. The form is regarded as deriving, ultimately, from Samian form 29. The band of decoration might be seen as a faint echo of the ovolo decorating Samian form 37. A close parallel which has the moulding but not the band of decoration, occurs at the Red House Fort at Corbridge (Hanson et al 1979, fig. 17, no 62). Pottery production in Scotland in the first century AD is known to have taken place (eg at Inchtuthil – see Darling 1985) so it is entirely possible that this vessel originated in Scotland.

THE COARSE STONE

Dawn McLaren and Fraser Hunter

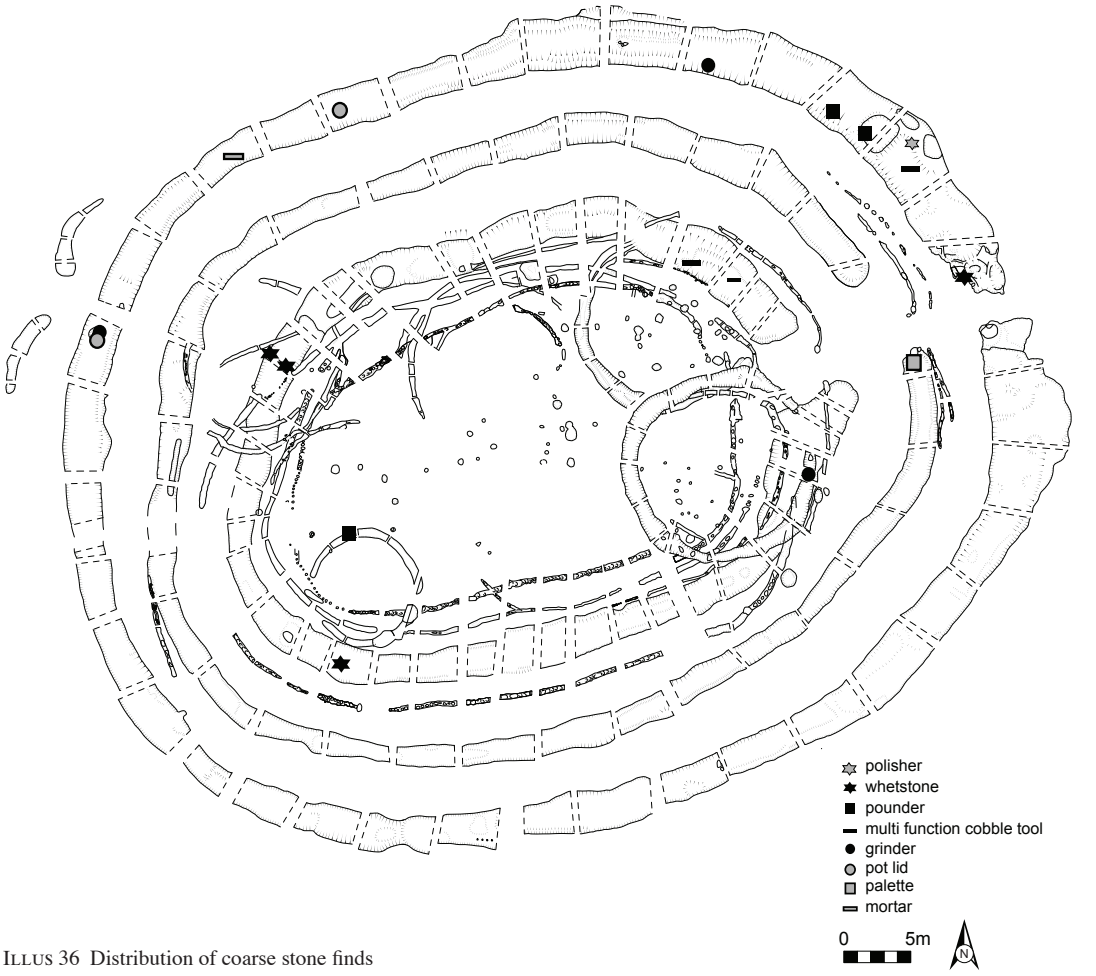
Functional analysis

Despite the large scale of excavation, this assemblage is both small (21 items) and rather limited in range, with notable absences such as quern stones and spindle whorls (Table 6 & illus 36). This suggests that it may have been an occasional (perhaps seasonal) settlement, with activities including the initial processing of local shale and cannel coal resources (see Hunter above).

The assemblage is summarized in Table 6. The majority of tools were manufactured from local river cobbles with little or no preparation or modification prior to use. Most exhibit signs of considerable utilization in the form of well-defined, often multiple wear facets. The cobble tools have been classed by wear type, using the system proposed in the Howe report (Ballin-Smith 1994, 196–201). These tools could have had a range of functions. The grinders and perhaps the pounders may have been used to process cereals and other foodstuffs but equally could have been used in preparing clay or pigments, among other possible functions. The damage sustained by the hammerstones and some pounders implies they were used with some force; it has been suggested that they were used for dressing or shaping large stone objects such as querns (Close-Brooks 1986, 175) but these are absent at Braehead. However, they may have been used in the manufacture of the shale and cannel coal items. The polisher has some dark staining on its worn surface; a similar phenomenon at Dunadd was interpreted as the result of hide processing (Lane & Campbell 2000, 178–9). The stone tools from Braehead are generally consistent with other Iron Age sites in western Scotland, as discussed below.

TABLE 6
Tool types in the Braehead coarse stone tool assemblage. Entries in the format '+2' are combination tools with more than one wear type

Type	*Quantity*	*Notes*
Grinders	4 + 2	
Pounders	4 + 3	
Anvil/working surfaces	0 + 1	
Polishers	1 + 1	
Combination cobble tools	3	
Whetstones	3	1 deliberately shaped
Palette	1	
Pot lids	2	
Querns	0	
Mortars	2	
Cannel coal bangle	1	



ILLUS 36 Distribution of coarse stone finds

Stone sources

Most items have been manufactured from local materials, especially quartzite cobbles. A number of non-local stones were also used (greywacke from the Southern Uplands and Dalradian chlorite schists from the southern Highlands), but the evidence suggests these were glacially transported and would have been locally available in drift deposits. One whetstone was made from a fossil, and this may have been deliberately selected because it was unusual.

Interpreting the assemblage

A number of features of the assemblage give hints about the nature of activities at the Braehead site. The absence of quern stones is interesting, and likely to be significant given the scale of excavation; this, along with the restricted size and range of this assemblage (despite near-total excavation) point towards the site being temporarily occupied, perhaps on a seasonal basis, rather than representing a permanent settlement. The pot lids perhaps hints that the occupants may have brought with them a certain

amount of food stuffs; perhaps flour or bread were brought in storage containers, negating the need for quern stones.

Regional comparisons

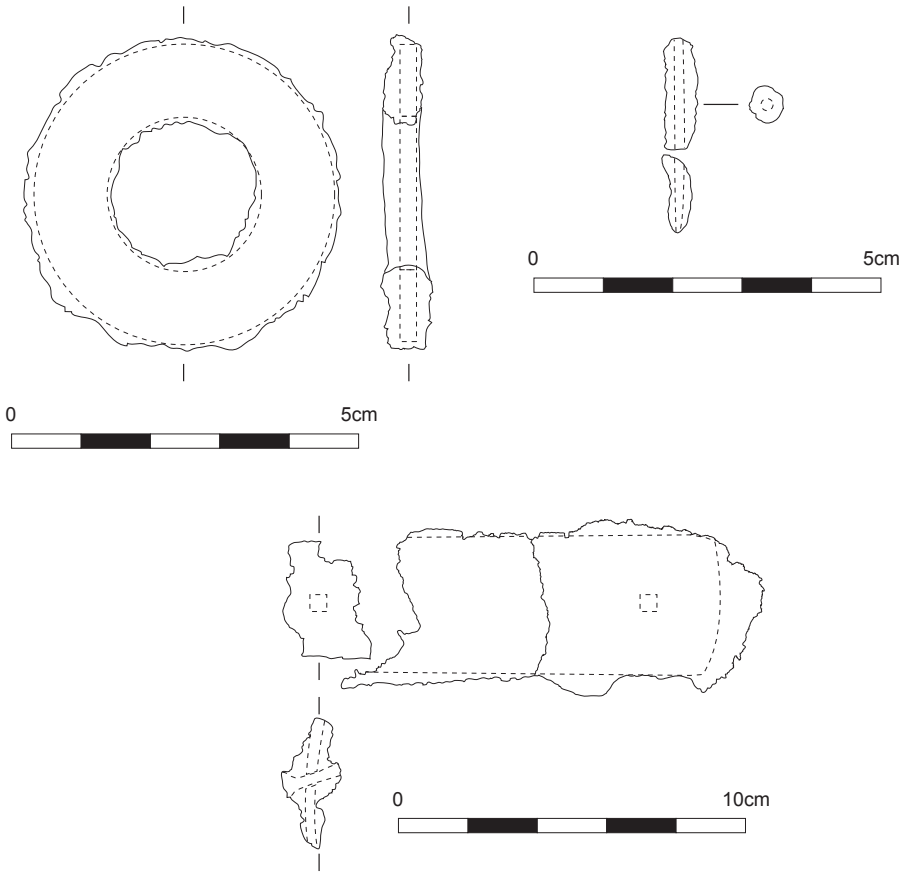
To place Braehead in its regional context the coarse stone assemblage has been compared to excavated Iron Age sites (including those, such as crannog sites, which also saw Early Historic activity) within the former counties of Renfrewshire, Ayrshire and Dumbartonshire. A key limiting factor has been the scale of excavation, the range of stone tools from a site unrepresentative on small-scale excavations and as such they have been disregarded within this current analysis. By contrast, medium- and large-scale excavations show a wide spectrum of artefact types. There are no large collections from the area: assemblage sizes vary from 2–24 objects, but this disguises considerable variation: Braehead, with 21 finds from the total excavation of a large enclosure, is much less find-rich than Craigmarloch (Nisbet 1996) or Sheep Hill (Smith 1895), where the finds came from quite limited trenching. None of the assemblages are large, and there will always be a degree of variation between sites for taphonomic reasons. However, it is clear that a broadly similar range of coarse stone tools was in use across a wide range of sites (as Clarke (2004, 102–4) has noted with south-east Scottish material). Cobble tools and whetstones were ubiquitous, as was shale-working (see Hunter infra for further discussion); as a result of the latter, ornamental material (primarily shale and cannel coal bangles) is also a common find (see Table 7).

The significance of the presence or absence of other material is more difficult to gauge. Perhaps of most interest are the querns, absent at Braehead and on five other sites. In two cases (Sheep Hill (MacKie 1976) & Auldhill (Caldwell et al 1998)) this may be due to the relatively limited investigations, while in the case of a single house like the Ashgrove crannog (Smith 1895) there is less chance of finding the quern(s). Closer parallels come from the absence of querns at the Leven (Atkinson 2000) and Shiels (Scott 1996), both of which saw extensive investigation but have an even smaller and more restricted range of finds than Braehead. A caveat is that in both cases relatively little of the ditch fills was removed, as these produced the bulk of the finds at Braehead. However, this suggests that there is a group of enclosure sites which saw relatively limited use, with a restricted range of activities which did not involve such typical domestic activities as the grinding of grain.

A focal point of the current investigation was the examination of cobble tool wear patterns in an attempt to determine whether the cobble tools were consistent with others in the area, or if they showed any differences arising from the possibly intermittent occupation of the site that has been suggested by other strands of evidence (see below) or its role in craft production. In general,

TABLE 7
Artefact types ranked according to the number of sites in the sample which produced them. Sixteen sites were analysed. Other infrequent finds were ingot moulds, haematite, a ball, a strike-a-light, a grooved stone, a decorated stone, a chipped tool and a rubbing stone

Type	*No of sites*
Cobble tool	15
Whetstone	13
Shale-working	12
Ornament	11
Quern	10
Polisher	9
Disc	7
Hollowed stone	5
Sharpening stone	5
Spindle whorl	5
Anvil/working surface	4
Perforated stone	3



ILLUS 37 Metal work, the disc, pin and bar

grinders are the dominant cobble tool in the area. The Braehead grinders are consistent with the dimensions and wear patterns from other sites in the area (eg Dunbuie (Millar 1896), Craigmarloch (Nisbet 1996), Sheep Hill (MacKie 1976) and Coalhill (Smith 1919)) and the majority are single function tools but examples with multiple wear types occur regularly (at Braehead, Dunbuie, Craigmarloch, Sheep Hill, Coalhill and Seamill (Munro 1882)). Most commonly pounding facets co-occur with grinding wear but use as hammerstones and whetstones are also present at Sheep Hill and Coalhill. Examples with more than two wear types are very rare.

Pounders tend to be more variable in size, but are generally larger and heavier than grinders, reflecting functional differences. They are typically oval in shape, generally with areas of wear restricted to one end. The pounders from Braehead are consistent with those from Dunbuie, Sheep Hill and Seamill. Hammerstones cannot be compared as few have been retained within the older collections.

In general, the Braehead cobble tools are typical of those from other Iron Age sites in the area. No anomalous types or wear patterns were identified which would mark the site out as different on the cobble tools alone. Despite its

TABLE 8
(a) Charred cereal remains

CEREALS		*1022*	*1036*	*1038*	*1081*	*1089*	*1207*	*1331*	*1331*	*1339*	*1364*	*1370*	*1392*
Taxa	English Name	*ditch*	*ditch*	*ditch*	*BT*	*ph*	*BT*	*pal*	*pal*	*ph*	*ph*	*ph*	*gully*
Hordeum sp	Straight Barley							7		2			3
	cf Straight barley							4	18		1		5
	cf Twisted Barley												1
	Hulled Barley	36	32	37	36	9	5	2	344	29	29	28	51
	cf Hulled Barley						2	65	98	12	10	9	17
	Naked Barley												3
	cf Naked Barley								6				
	Barley		6		10	2	1	149	367	41	28	33	45
	cf Barley							27	63	10	4	2	6
Triticum dicoccum	Emmer Wheat	1		2	2	1		1			2		2
	cf Emmer Wheat		2		1	1	1	3	12		2		3
Triticum dicoccum/spelta	Emmer/Spelt Wheat		5		2			2					
Triticum sp	Wheat indet						1	10	44				3
Cereal indet	Cereal indet	2	6	4	6	3	2	119	14	14	7	15	10
cf *Avena* sp	cf Oat		3										
CHAFF													
Hordeum sp	Barley internodes				3			1					1
Triticum sp	Emmer Wheat glumes												
Poaceae indet	Chaff indet				2								

KEY
ph = posthole; pal = palisade; BT= bedding trench

TABLE 8 (*cont*)
(a) Charred cereal remains

CEREALS		*1409*	*1494*	*1494*	*1497*	*1584*	*1604*	*1617*	*1619*	*1663*	*1713*	*1736*	*1882*
Taxa	English Name	*pal*	*ditch*	*ditch*	*ditch*	*pal*	*pal*	*ph*	*ph*	*ph*	*ditch*	*ph*	*ditch*
Hordeum sp	Straight Barley	1	2		3			4					
	cf Straight barley	4	6	2				3					
	cf Twisted Barley												
	Hulled Barley	58	30	9	20	40	28	31	51	1	22	3	158
	cf Hulled Barley	29	14	10	21	5		12	32	3			
	Naked Barley								2				
	cf Naked Barley							3	6				
	Barley	48	40	12	46	15	4	26	71	3	2	3	28
	cf Barley	18	10	4					16				
Triticum dicoccum	Emmer Wheat	1	1							1	1	1	1
	cf Emmer Wheat	2	8	3		2	1	1					1
Triticum dicoccum/spelta	Emmer/Spelt Wheat					12	3						
Triticum sp.	Wheat indet			3		3		2	1				2
Cereal indet	Cereal indet	21	15	13		10	11	16	117		3	2	26
cf *Avena* sp	cf Oat						3						
CHAFF													
Hordeum sp	Barley internodes												
Triticum sp	Emmer Wheat glumes					2							
Poaceae indet	Chaff indet												

KEY
ph = posthole; pal = palisade; BT= bedding trench

TABLE 8 (*cont*)
(b) Charred cereal remains

WEEDS Taxa	English Name	*1022* *ditch*	*1036* *ditch*	*1038* *ditch*	*1081* *BTr*	*1089* *ph*	*1207* *BTr*	*1331* *pal*	*1331* *pal*	*1339* *ph*	*1364* *ph*	*1370* *ph*	*1392* *gully*
Ranunculus sp	Buttercup				2	2							
Chenopodium sp	Goosefoot			1			1						1
Chenopodium cf glaucum	Oak-leaved Goosefoot			1									
cf *Chenopodium* sp	Goosefoot												
Atriplex cf *hortensis*	Garden Orache												
Chenopodiaceae sp	Goosefoot family	1			1	1		3					
Spergula arvensis	Corn Spurrey	1											
Silene spp	Campions		3		1								
Polygonum cf *amphibia*	Amphibious Bistort		3	2					7			2	
Polygonum persicaria	Redshank		27			3		2	1	1		1	
Polygonum cf *persicaria*	Redshank		1		2								
Polygonum lapathifolia	Pale Persicaria				2								
Polygonum sp	Knotgrass		4			2							
Rumex cf *acetosa*	Common Sorrel			1	3								
Viola tricolor/arvensis	Wild/ Field Pansy												
Viola sp	Violet					1							
cf *Viola* sp	Violet								1				
Brassica sp	Cabbage			1			1						
Umbilicus sp	Navelwort		1	1	1								
Coronilla sp	Scorpion Vetches												
Lens sp	Lentil								1				
Trifolium sp	Clover												

TABLE 8 (*cont*)
(b) Charred cereal remains

WEEDS		*1409*	*1494*	*1494*	*1497*	*1584*	*1604*	*1617*	*1619*	*1663*	*1713*	*1736*	*1882*
Taxa	English Name	*pal*	*ditch*	*ditch*	*ditch*	*pal*	*pal*	*ph*	*ph*	*ph*	*ditch*	*ph*	*ditch*
Fabaceae sp	Pea Family												
Linum sp	Flax												
Solanum dulcamara	Bittersweet												
Galeopsis sp	Hemp-Nettle			1									
Lamiaceae sp	Dead-Nettle Family												
Plantago lanceolata/maritima	Ribwort/ Sea Plantain								1				
Galium sp	Bedstraw						1						
cf *Sambucus* sp	Elder					1							
Centaurea sp	Knapweed												
Anthemis cf *cotula*	Stinking Chamomile	1			1								
Asteraceae sp	Daisy Family					5							
cf *Juncus* sp	Rushes												
Schoenus cf *nigricans*	Black Bogrush		1										
Carex sp	Sedge				1								
Cyperaceae sp	Sedge Family				1								
Poaceae sp	Grass Family	3	24	1	58	30		5	5	3	4	3	1
Indet.	Seed pods/ cluster		5		1	3	1						
Indet.	Weed indet	2	12	5	14	10	3		5				
	Nutlet												
	Seed pod												
	Root	1											

suggested temporary and specialized occupation, the cobble tools do not provide any distinctive signature.

Summary

In conclusion, while the individual artefacts from Braehead are commonplace, the overall composition of the assemblage raises interesting questions. The unusually large scale of excavations allows us to be reasonably sure that a representative sample has been recovered, permitting the data to be pushed more than is normal. It suggests in particular that this was not a permanently occupied domestic site, and it may be appropriate to think of it as one part of a wider settlement pattern which involved seasonal or intermittent use of different resources.

(A full version of this report is lodged with the site archive in the RCAHMS)

THE CHIPPED STONE

Robert Engl

A total of 20 pieces of chipped stone were retrieved. The assemblage comprised 11 pieces of flint and nine of quartz. Six of the flints were burnt and showed a high degree of calcination. Where present the cortex appeared smooth and water rolled indicating a coastal or riverine pebble source. The quartz was mostly a fine-grained, smoky grey variety with good flaking properties.

Only two cores were recovered, one from the surface (unstratified) and the other from the fill of a posthole [1889] within the interior of the enclosure. Both were classified as amorphous and were made of quartz. When taken together with the rest of the material the assemblage appears to represent an expedient flake industry with a high degree of indeterminate débitage.

Two flint scrapers were recovered. A coarse convex scraper came from a lower fill near the northern terminal of the inner ditch and a finely worked, burnt thumbnail type came from the upper fill of the southern terminal of the inner ditch.

The small size of the assemblage and the dearth of diagnostic artefacts largely prevents any cultural and chronological inferences. Overall, it is typically later prehistoric in nature although the thumbnail scraper would generally be considered Bronze Age in date. The industry, such as it is, appears to be based on the expedient reduction and use of locally available raw materials.

(A full version of this report is lodged with the site archive in the RCAHMS)

THE METALWORK

Fraser Hunter

Three items of metal work were recovered, a broken pin, a disc and a fragment of iron bar (illus 37). The broken pin was derived from the basal fill of the inner ditch northern terminal, its context indicating an Early–Middle Iron Age date. Pins of this date are very rare, and it is unfortunate that nothing of the head survives to indicate its type. More surprising in a way are the other two items, a disc derived from the gully of S1 and a fragment of strengthening bar derived from the single fill outer ditch. Both are quite prosaic items, which is rather at odds with our predominant view of iron as a relatively rare and prized material at this time. It does emphasize how much our view of early iron use is conditioned by biases of recovery. Given that it was recyclable and that it corrodes so readily, it is no surprise that so little survives. It is perhaps to proxy indicators, such as tool marks on bone (where they survive), that we should turn for a better picture of the extent of iron use.

(A full version of this report is lodged with the site archive in the RCAHMS)

CARBONIZED PLANT MACROFOSSILS

Alys Vaughan-Williams

Two hundred and thirty-three bulk samples were processed on site by flotation using 1mm and 300 micron mesh sieves. The residues were scanned by eye to retrieve artefactual material. The flots were scanned and sorted using a low power stereo-zoom microscope. Identifications were made with reference to the modern seed reference collection at University College London, and using Berggren (1981) and Anderberg (1994). Twenty-four samples were chosen for further analysis on the basis of the diversity, concentration and standard of preservation of the charred remains. Plant nomenclature follows Stace (1997).

Results

Summary results are presented below and in Tables 8a and 8b (a full report forms part of the archive lodged at RCAHMS).

Eight ditch fills were analysed, producing charred assemblages dominated by grains of hulled barley (*Hordeum* sp) with occasional grains of glume wheats (*Triticum dicoccum/spelta*). Weed seeds were an occasional presence dominated by grassland plants such as redshank (*Polygonum persicaria*), pale persicaria (*Polygonum lapathifolia*) and grasses (*Poaceae* sp); ditch fill [1036] had moderate quantities of weed seeds. Chaff was absent.

The palisade and palisade-posthole assemblages were dominated by hulled barley with occasional grains of wheat. Palisade C produced the richest assemblages, although a large proportion of the grains were unidentifiable (*Triticum/Hordeum* sp). Occasional seeds from the grass family and knotgrasses were also present.

The bedding trench assemblages of Structure S1 comprised grains of hulled barley and weed seeds of grassland such as grasses and redshank. Occasional typical arable weed seeds such as stinking chamomile (*Anthemis cotula*) and bedstraw (*Galium* sp) were also present.

Discussion and interpretation

The density of charred material, in particular hulled barley, is greatest in the samples derived from BT7 and similar assemblages are represented in those from BT1, BT2, BT10 and the inner ditch. These assemblages lack any significant chaff, although the barley grains were still encased in their hull. This suggests that they had been semi-cleaned before reaching the enclosure, but left in their hulls as protection against infestation by insects, damp and other environmental damage during storage (Hillman 1981). Prior to use, the grain would typically have been separated from the chaff encasing it through the process of parching (drying) the grain over a fire, ie a hearth or oven; or by rolling with hot stones (Fenton 1978). All three methods are naturally associated with the risk of fire.

The predominance of barley in the grain assemblage is typical of Iron Age sites in Scotland. Naked and six-row hulled barley occurs frequently on contemporary Scottish sites such as Sheils, Glasgow (Robinson 1983); Camelon Native Site, Falkirk (Dimbleby & Sheldon 1980); Crosskirk Broch (Dickson & Dickson 1984); and burnt mounds sampled in Crawford (Banks 1999). The occurrence of some wheat is of interest. Wheat is more sensitive to variations in climate and soil. On sites elsewhere where both barley and wheat were cultivated, the barley has been interpreted as representing a risk management strategy (Van der Veen 1992). In the case of a good harvest, the barley could be fed as fodder or used in various concoctions such as soups and pottages (Wilson 1973). However, in the case of Braehead, it is perhaps more likely that barley was the main crop exploited, and that wheat was of secondary importance.

The mixed assemblages of separate wheat grains, enclosed barley grains, very rare chaff

TABLE 9
Soil micromorphology – summary descriptions

								Matrix			*Organic composition*									*Pedofeatures*						
Sample	*Context/band*	*Microstructure*	*Porosity %*	*Sorting*	*Grainsize*	*Preferred orientation*	*Boundary*	*Matrix colours*	*Fabric*	*Related distribution*	*Woody organics*	*Amorphous organic matter*	*Charred amorphous organic matter and or /disseminated charcoal*	*Charcoal (cellular)*	*Biogenic silica*	*Burnt bone*	*Roots (not charred)*	*Sclerotial/mycorrhizal sheaths*	*organic and/or phosphatic coatings/infillings*	*Silt coatings/infillings*	*Clay coatings/Infillings*	*Microaggregates/faecal pellets*	*Fabric pedofeatures and/or clasts*	*Papules*			
47	1233	G	10–50	P	MIXED		S	RB	ISO-SS	OP			D		F				R			VA				
K5	187	M	<2	W	SS	YES	S	DB	WA	OP		A	R		O		R			O			O			
K5	186	CR	2–10			YES	S	DB	WA		A		D		A							F	F			
K5	185	C	<2	W	SLT	YES		GY	SA	OP		O	F				R					F	O			
K4	106 A	C	10–30	W	FS	YES	S	YB	ISO	GF	R	D		R						R	O	O	O			
K4	106 B	V	2–5	W	SLT	YES	S	YB	WA	OP		D	F				R	R			R					
K4	106 C	C	10–15	W	FS	YES		DRB	ISO	GF			D				R						O			
K3	106	C	2	W	FS/M/SLT	YES	D	YRB	WA	OP		D	O	R	VA		R	VR			VR	R				
K3	107	M	<2	W	SLT	YES	S	RB	ISO	OP	F	D	F	D	A		R				VR	R				
K3	101	V	2	W	FS	YES		YB	WA	OP		D		R	F		R	R		F			R			
K2	101 A	C	10–20	W	SS	YES	S	YB	WA	OP		D	F	O	F		R	R								
K2	101 B	SG	15–20	W	SLT	YES	S	YB	WA	EN	D		R								R		F			
K2	101 C	CS	15–20			YES	S	DB	ISO	OP			D	D							F					
K2	101 D	B	15–20	W	FS	YES		DB	ISO	CH	D		R							F	R					
33	1040	C	2–5	P	MIXED	YES		YB	ISO-SS	OP	O		D	O	VF		O	R			R	R				
51	1136	C	2–5	P	MIXED	YES	S	DRB	ISO-SS	GF-OP			D	R	A			R	F		R	O	F	R		
51	1143	C	2–5	M	FS			DRB	ISO-SS	GF			D	R	A			R				O	F			
19	1090	C	2–5	P	SLT - FS	NO	S	RB	ISO	OP			D	O	A		R	R				R				

TABLE 9 (*cont*)

Soil micromorphology – summary descriptions

								Matrix			*Organic composition*									*Pedofeatures*					
Sample	*Context/band*	*Microstructure*	*Porosity %*	*Sorting*	*Grainsize*	*Preferred orientation*	*Boundary*	*Matrix colours*	*Fabric*	*Related distribution*	*Woody organics*	*Amorphous organic matter*	*Charred amorphous organic matter and or /disseminated charcoal*	*Charcoal (cellular)*	*Biogenic silica*	*Burnt bone*	*Roots (not charred)*	*Sclerotial/mycorrhizal sheaths*	*organic and/or phosphatic coatings/infillings*	*Silt coatings/infillings*	*Clay coatings/Infillings*	*Microaggregates/faecal pellets*	*Fabric pedofeatures and/or clasts*	*Papules*
19	1036	C	2–20	M	SLT-FS	YES		YB	SS	OP			D	F	O		R	VR			R	R		
20	1033	C		P	SLT	YES	S	BYB-DB	ISO-SS	NA			D	F	O			O						
20	1038	C		P	FS	YES		YB-BB	SS	NA			D	O	F			O			R	R		
22	1011	C	3–50	M	SLT	YES		B	SS	DOP			D	O	O			R				R	R	VR
23	1033	V	2	W	SLT		S	BY	SS	OP		D		O				O				F		
23	1026	V	5–10	M	SLT-FS	YES		RB	ISO-SS	DOP			A	O	VF			F		R	R		R	VR
37	1011/ 1018/ 1017	G	10–30	P	SLT			GBB	SS	NA			VA	VA	A	VR		VR	R			A		
57	1917	M	1–20		FS	YES		DRB	ISO-SS	OP			D	O	A	VR		R	A	R		R		
55	1874	C	1–5	P		YES		DRB-YB	SS	OP			VA	A	VF			VF	R			A		
60	1713	C	2–3	M	SLT	YES	S	YB-RB	SS	OP			D	VR	VA		R	O	F				O	
62	1712	C	<1–10	P	SLT-FS			GB-RB	SS	OP			D	VR	F		R	VR	R		R	O		
50	1285	M	5–15	M	SLT-FS	YES	S	YB	ISO	NA	O		D	F	A	VR		VR	R	VR	R			
49	1284	M	5		SLT-FS	YES	S	DGB	SS	OP			D	F	A	VR		VR	F					
49	1178	M	<1	W	C			DG	SS	OP			F			R							R	
66	1283	C	5–10	P	SLT-FS		S	B	SS	SP			D	F	F			VR	R		R	O		
66	1604	CS	10	P	SLT			GB	SS	OP			A	VA	A	R			A					

and paucity of even the larger, more hardy weed seeds suggests that these cereals were not derived from field crops (mixed planting) but are a product of separate off-site semi-cleaning, prior to presumably accidental charring and subsequent deliberate discarding about the enclosure. Furthermore, the rarity of chaff and other crop-cleaning by-products may be due to this material being used as kindling for domestic hearths and hence much more likely to being burnt and destroyed than grain (Boardman & Jones 1990; Gustaffson 2000).

The weed seeds from Braehead were essentially grasses and grassland plants with occasional wet habitat taxa such as sedges (*Carex* sp). This is in contrast to those recovered from the nearby site of Sheils. At this site moorland plants were represented in abundance with seeds of taxa such as heather (*Calluna vulgaris*) and the bogland hare's tail cottongrass (*Eriophorum vaginatum*) (Robinson 1983). The reason for this contrast lies varying conditions of preservation at each site. Although ditches were sampled from both sites, those at Sheils were waterlogged and therefore reflect the surrounding environment to a greater degree whereas the charred assemblages at Braehead represent economic (agricultural) activities.

SOIL MICROMORPHOLOGY

Clare Ellis

Eighteen kubiena samples were taken from a variety of representative features including outer, middle and inner ditch fills and dump deposits within gullies and palisade trenches. All the samples were assessed for their quality and potential to elucidate specific research questions. The assessment and subsequent discussion resulted in 18 samples being chosen for full analysis. Summary descriptions are given in Table 9 (a full report including details of the methodology used forms part of the archive lodged at RCAHMS).

The utilized fuel resource

Micromorphological analysis of ditch, gully and palisade deposits has demonstrated that the main fuel constituents utilized for functions such as heating, lighting and cooking were peat, silty peat and wood. Many of the deposits were well mixed and it was evident that many of these fuel residues were observed in secondary depositional contexts having been subject to bioturbation, fungal and bacteria attack elsewhere. Furthermore, many of the deposits showed evidence of aeolian transportation and deposition and/or deposition under the influence of running or still water. It is postulated that hearth cleanings and a small quantity of other domestic refuse was initially dumped to form midden stacks/mounds. These stacks seem to have been subject to wind erosion, with clasts of midden (mostly ash, amorphous organic matter and rare, minute burnt bone fragments) being regularly blown from the stacks into the relative calm of the ditches and gullies where the carrying capacity of the wind reduced dramatically. The midden derived material of the ditch fills were often interrupted by thin, discontinuous layers of fine sand and silt; interpreted as originating in the exposed sand substrate of banks or eroding surfaces within the enclosure and blown into the ditches. Other deposits are thought to have been deliberately dumped at the side of a ditch or perhaps upon the bank and subsequently slumped and/or were washed into the ditch by rain water.

The predominance of charred amorphous organic matter, comminuted charcoal and larger clasts of charcoal within the fuel residues is indicative of low temperature fires (around 400°C) typical of domestic hearths, as opposed to higher temperatures typical of fires used for industrial purposes in which all organic matter is combusted in temperatures of 800°C (Courty et al 1989; Simpson et al 2003).

It is presumed that the silty peat and peat utilized in the domestic fires was obtained locally, as the natural substrate contained thin

bands of peat and a substantial layer of peat was located in a hollow to the south of the site. A basal sample from this deposit has been dated to 7950–7600 BC (Table 2) so peat certainly was available locally during the occupation of the enclosure. The wood was probably also obtained locally, either from scrubby woodland growing upon the floodplain or even perhaps collected as flotsam along the banks of the River Clyde.

Old ground surface

A probable old ground surface and ditch upcast, comprising charred, extremely well humified silty peat with dark greyish brown clay and white silt was recorded along the northern and southern interior edges of the inner ditch (illus 13, Section S). In thin section (Sample 47) the sediment was dominated by clasts of charred silty peat and silty peat ash with a minority of brown to yellow silt clasts and fine sand. It has experienced extensive bioturbation and a granular microstructure dominates. The lower peat is reddish brown while many of the granules above this are dark reddish brown and contain slightly less silt. This change in colour could be due to a reduction in the intensification of heat towards the surface and the presence of more available oxygen. These deposits have been burnt and are interpreted as a physically disturbed, but basically in situ old ground surface. Similarly Sample K5, which was taken from the interior of the inner ditch in between BT9 and BT1, has what is interpreted as a burnt in situ peat with silty peat horizons [186] (this is underlain by a natural undisturbed silt) (illus 13, Section S). This burnt peat also exhibits a darker colour towards the top. The innermost Palisade A was burnt down at this location and it is possible that the peat horizon was affected by this fire. Alternatively the peat horizon may have been affected by a surface fire designed to clear the virgin site of vegetation prior to any construction taking place. The overlying silt [185] is interpreted as redeposited up-cast from the excavation of BT1. There is no evidence that this deposit has been subject to direct fire or indirect heat.

Middle ditch fills

Samples K4, K3 and K2 were taken from a vertical section through a middle ditch section; K4 sampled the lower fill of the ditch and K2 the upper fill of the ditch (illus 12 – Section R).

K4 comprised a single basal context [106], although at least three separate depositional episodes were observed in thin section, the lowermost referred to as Band A and the uppermost as Band C. The sediment of Band B was primarily deposited from suspension and through a body of water, while the well sorted nature of much of Band A and Band C indicates that the silt and fine sand were principally introduced into the ditch through aeolian processes, probably aided by gravity. The rounded nature of the primarily wood ash clasts is also indicative of aeolian erosion and rolling. The microlaminations of silt and fine silt caps within Band B are interpreted as successive phases of deposition within evaporating puddles or pools; suggestive perhaps of episodic rainfall and rain-splash run off and the production of slaking crusts (Courty et al 1989). The anthropic derived material (charcoal and other ash remnants presumed to be derived from domestic fires within the enclosure) is integral to the deposits. Rare, rounded clasts of silty peat exhibit fecal pellets, while the silt of Band B does not, confirmation that this bioturbation took place prior to sediment deposition. In addition the presence of sclerotia, produced by the soil fungus *Cenococcum geophilum* (FitzPatrick 1993), indicates that the source of the ditch sediment was a deposit rich in organic matter such as a topsoil or more likely a well-established midden. The likely scenario is that much of the sediment and refuse was blown in and/or washed in to the ditch from midden heaps located on the edge of the ditch or from dumps upon a ditch bank. At least 14 separate depositional events were evident within K4. Furthermore, the relative

intactness of Band B is interpreted as evidence of relatively rapid continuous deposition, ie probably within a single season. There was no evidence within the thin section for the cleaning out of the ditch or its re-cutting. Limited post-depositional bioturbation also attests that the deposits were not permanently waterlogged.

Similar sedimentary processes to those observed in K4 were observed within the overlying units (Samples K2, K3, K33 & K51) with waterborne and aeolian sedimentation taking place in a damp, rather stagnant environment, interrupted by rapid and short lived influxes of sand and charcoal. The accumulation of ditch vegetation in anaerobic conditions (ie Sample K3, [106]) was interrupted by a rapid and short-lived influx of fine sand and charcoal. K33 was taken from the basal fill of the northern, middle ditch terminal. The very mixed nature of the deposits (largely derived from wood and silty peat/turf ash) and the general lack of preferred orientation is thought to be due to the rolling, carrying, and dropping of mineral grains, organic fragments and ashy clasts in eddying wind currents across and around the enclosure, the sudden reduction of velocity at the ditch edge causing the rapid deposition of this load into a damp and probably semi-waterlogged environment. K51 was taken from the middle deposits of the middle ditch. Deposition of some of the banded sediments was episodic and may represent individual hearth cleanings.

Inner ditch fills

K19 was derived from the basal fills of the inner ditch. The in-field interpretation of [1090] (illus 6 – Section E) was that it comprised redeposited substrate, silt clasts, peat clasts and sand clasts. However, micromorphological analysis revealed that it largely comprised re-deposited midden material (charred organic matter, charcoal, rare sclerotia and ash) coupled with a windblown sand content; there were rare, small fragments of silt and peat substrate. It is envisaged the mode and environment of deposition was similar to that described above for K33, with material being blown in from dumps of midden, eroding exposures of natural sand and occasional up-cast collapsing from the bank back into the ditch. There was a sudden change in the environment of deposition with a sharp boundary into silt, rich in charred organic matter and comminuted and disseminated charcoal. This silt [1036] was deposited under the action of low velocity water such as a combination of ditch water and run-off. As with the middle ditch deposits one of the major sources of the sediment appears to be domestic hearth ash and refuse and it is likely that this material was largely blown or washed in from a midden. The coarsening of [1036] would indicate that the base of this unit contained at least two separate episodes of deposition.

K20, K22 and K23 were taken up through the sediment profile of the southern terminal of the inner ditch (illus 6 – Section F). The ditch cut is represented by a sharp boundary between clasts of natural silts and silty peat (with fragmentary charcoal) and the overlying mixed silts, fine sands and burnt organics [1038]. The sharp nature of the boundary would suggest rapid deposition of the mixed unit very soon after the ditch was excavated. There are 30-plus depositional events represented within [1038]. Probably every time it rained silt-sized material (largely derived from low temperature fires) appears to have been loosened and transported (from a dump of hearth ash) into the ditch where puddles and shallow pools formed. The coarser material settled out first, with the final dusty clay capping representing the final stage of deposition of a muddied surface. This process was intermittently repeated, occasional reversed and often interrupted by a short-lived influx of windblown sand and larger charcoal fragments. The accumulation of this sequence could have occurred over a short time-scale, even a single season. Quite suddenly the rate of deposition increased with the accumulation and juxtaposition of clasts of burnt silty peat, wood ash and lens of fine sand. This material appears to have entered the ditch through a combination

of aeolian forces and slumping down the ditch edges. The mixed nature of the anthropic derived material indicates that its source was some form of refuse dump. Above this was a well sorted silt that is interpreted as a re-deposited clast of the silt substrate occurring within the larger unit of [1026]. There was a sharp boundary into a laminated, well sorted silt with fine sand [1011]; this unit appears to be a combination of windblown sand and midden derived clasts of wood ash and silty peat ash and windblown and inwashed silt (also with midden derived inclusions). The vughy microstructure (irregular shaped cavities) of this unit is indicative of the compaction of a water-saturated deposit. The unit contained rare re-deposited clasts of natural silt; these were perhaps derived from an eroding bank. The same context was sampled in K22. Post-depositional bioturbation was evident in the upper portion of [1011] demonstrating that the ditch sediments became drier and more aerated towards the current ground surface.

Within the uppermost inner ditch fill of the southern terminal two additional contexts were noted during excavation; [1018] a silt with charcoal and probable burnt peat fragments and [1017] a silt with unidentified burnt fragments (illus 6 – Section G). K37 sampled these contexts but unfortunately they were not readily identifiable in thin section. However, the sediment did comprise charcoal and mixed ashes of wood and peat, with partially burnt peat dominant towards the base of the slide. The high mineral content of much of the sediment (ie where clasts are not readily identifiable) coupled with the presence of abundant phytoliths and comminuted and disseminated charcoal may indicate that silty peat was being used as a source of fuel.

K57 and K55 were taken from deposits that had accumulated on the inner edge of the inner ditch (illus 13 – Section A). K57 comprised a single context [1917] and is interpreted as fuel residue, mainly peat and silt peat ash with occasional wood ash. The deposit appears to comprise a series of dumps with the material falling down the side of the ditch and coming to settle at its base. K55 comprised a single context [1874] and is also interpreted as being largely derived from domestic fuel residue. The presence of burnt fungaus sheaths indicates that rotting wood, presumably naturally fallen timber gathered from the forest floor, was a source of fuel. The unit exhibited a true juxtaposition of clasts of different materials including rounded clasts of pure phytoliths which are indicative of well combusted peat, partially combusted peat clasts, dirty silt rich in charcoal and silty peat ash. Rare clasts of the latter exhibited a fine layer of clean silt which is interpreted as the underlying natural substrate. The fuel residues would have been tipped into the ditch and been poorly sorted by a mixture of run-off and gravity.

K60 was derived from a lower inner ditch fill [1713] (illus 13 – Section D). The sediment comprised silt and midden material (mainly wood and peat ash) which appeared to have been blown, rolled and dumped from the interior of the enclosure. It is likely that one of the sources were dumps of midden and the other the dusty occupation surface of the interior of the enclosure. The presence of sclerotia indicates that the material had been subject to decomposition by soil fungae and the most plausible explanation is active midden heaps upon which hearth waste and other domestic refuse was stored. Towards the top of the sample was a clast of organic matter which had been burnt. This clast had no internal stratigraphy but contained fragments of charcoal; it is unclear whether this clast is burnt peat or a composite clast such as herbivore dung.

K62 was taken from the overlying context [1712] (illus 13 – Section D). The silt occurred in two forms, one is interpreted as clasts of largely undisturbed substrate and the other as clasts of ash with abundant charcoal and charred amorphous organic matter. The deposit is a mixture of re-deposited substrate and ashy residue (wood and silty peat). One explanation of this deposit is that it was derived from the admixture of ditch up-cast and domestic refuse dumped on the interior bank as it was shoveled back into the ditch.

Structure S1 gully

K49 and K50 were taken from the same section through the gully of S1, K50 from the lower deposits and K49 from the upper.

K50 comprises at least five episodes of deposition, with additional fragmented episodes clearly visible within any one of the main five depositional zones. The lower 'dirty' silt and fine sand is a horizontal deposit comprising numerous clasts of juxtaposed silt, wood ash, peat ash, charred silty peat and charcoal which has been dumped into the gully presumably from a well established midden. A similar scenario is envisaged for the upper dirty fine sand, although much of this material appears to have been washed and/or blown into the gully and does not contain the large (5mm) clasts of burnt peat seen in the lower dirty silt and fine sand. A zone within the latter deposit, comprising dirty clay infillings and silt, appears to be in situ and probably reflects very localized conditions; where windblown sand entered the gully, it rained and silt and clay were washed in, the ground surface dried and further dirty sand was blown in. The very well sorted dirty fine sand lamination may well have been windblown as many of the elongated minerals and occasional organic fragments are oriented parallel to the horizontal. All this material was deposited prior to the emplacement of possible shallow posts within the gully.

K49 comprised two contexts, the lower [1284] a mixed silt and fine sand and the upper [1178] a clay. [1284] is interpreted as a re-deposited midden comprising mostly the residue of low temperature domestic fires where wood and silty peat were the main fuel constituents. Some of the material may have been deliberately dumped into the gully although the presence of dipping bedding indicates that much of the material was washed and/or windblown. The boundary between the two contexts is extremely sharp and it would appear that the clay of [1178] was deliberately laid upon the surface of [1284] and smeared up the sides of the gully, effectively sealing it. The clay, with about a 10% fine sand content, had been mixed with comminuted charcoal and other charred organic matter; this was perhaps to a give it more elasticity and enable the clay to hold a higher moisture content making it more malleable. The function of this clay lining remains unclear; perhaps it was to stop the smell of the underlying midden, although given that the main constituent of the midden was ash it is unlikely to have emitted much perfume. Perhaps the clay-lined shallow gully was used as a drinking trough for stock housed within the interior of the gully?

BT10

K66 comprised two contexts, the lower [1283] interpreted as an upper inner ditch fill and the upper [1604] the fill of BT10 (not illustrated). The ditch fill comprised reworked and re-deposited domestic refuse, mainly peat ash but with a wood ash component. The ashes had been subject to significant bioturbation prior to the incorporation of the deposits into the ditch and it is thought that this material was stored within a midden before finding its way into the ditch. The cut of the palisade trench is extremely sharp, indicating that it was rapidly infilled after its construction and also that post-depositional bioturbation was limited in its extent. The overlying context is dominated by large clasts of peat ash, mixed with fragments of burnt bone. It seems apparent that, whatever structure was held within BT10, domestic refuse, comprising mainly the remnants of low temperature fires, was used as packing.

Summary conclusions

K4, K2, K33, K51 (middle ditch fills), K19, K20, K22, K23, K57, K55, K60 (inner ditch fills), K50, K49 (the gully of S1) and K66 (the fill of BT10) all partially comprised re-deposited domestic refuse, dominated by the remnants of low temperature fires where peat and silty peat

TABLE 10
Phytolith assemblage – summary of features

Sample phytolith typology	*1011/1026 /1033*	*1011/a*	*1011/b*	*1026*	*1874*	*1917*	*1920*	*1504*	
rondel	23	63	0	30	30	17	32	45	
trapezoid – pyramidal	46	39	56	9	5	36	32	28	
trapedzoid – polytlobate	18	13	19	6	15	18	25	18	grass short cells
saddle	1	2	0	0	5	0	9	2	
dumbbell	13	19	9	30	45	31	52	80	
cross	0	1	0	6	0	0	4	0	
elongate smooth	86	83	71	91	59	43	34	40	
elongate sinuous	18	21	15	15	5	16	14	10	grass long cells
elongate spiny/dendritic	7	12	3	42	28	32	21	5	
bulliform	9	16	2	12	22	21	6	8	
trichome	8	15	1	20	15	15	8	8	grass cells
papillae	2	0	4	0	0	0	4	0	
hair base	1	2	0	2	0	0	0	0	
sphericals	5	0	17	0	5	0	0	1	
irregular A	26	20	51	4	15	0	0	16	
irregular B	0	0	18	0	0	0	0	0	
perforated plate	0	0	9	0	0	0	4	0	various typologies
schlereid	0	1	0	0	0	0	0	0	
type 1	0	0	4	0	0	0	0	0	
dicot silica skeleton	1	1	0	0	1	0	0	0	
clum silica skeleton	1	2	0	0	0	0	0	0	silica skeletons
not determined	9	5	0	14	14	24	10	9	
total	274	315	279	281	259	253	255	270	2186
counted rows	1	1	2	2	5	3	2	1	
diatom (comb)	5	0	6	4	10	3	10	7	
sponge spicule	23	19	18	18	25	18	7	6	other silica bodies

were the dominant fuel type with wood forming a less significant component. These fuel types were available within the immediate vicinity of the site.

There was no direct evidence for middens within the enclosure at Braehead. However, micromorphological analysis has revealed that much of the ditch, gully and certainly one palisade fill comprised predominantly midden material that had been subject to the actions of soil biota and fungi elsewhere and thus, it is postulated that the source of this material could have been individual middens associated with the 'lost' house structures.

A significant proportion of the ditch fills were blown in from middens and/or eroding banks and/or eroding occupation surfaces within the interior of the enclosure.

Episodic sediment deposition within the ditches occurred through settlement-out-of-suspension, eg in pools or puddles or through rain water run-off, in K4, K3, K2, K51 (middle ditch fills), K19, K20, K22, K23, K55 (inner ditch), K50 and K49 (Structure 1).

A proportion of the ditch, gully and palisade fills were deliberately dumped or placed, eg K51 (middle ditch), K57, K55, K60, K62 (inner ditch), K50 (S1) and K66 (BT10).

In situ sediment accumulation within the ditches was rare (eg K4 and K3).

The deposits in K47 and K5 are tentatively interpreted as bioturbated remnants of the lower portion of a burnt old ground surface (OGS). It is postulated that this OGS may have been deliberately burnt to remove the floodplain vegetation prior to the construction of the enclosure. This deposit was thin and occurred only where it had been protected from surface erosion (ploughing etc) by plough spread ditch deposits.

There is no micromorphological evidence for the re-cutting or cleaning of the ditches once sedimentation begins. The implication is that the ditch fills started to accumulate soon after the relatively rapid abandonment of the ditches.

There is no direct micromorphological evidence for banks associated with any of the ditches, although it is very probable that much of the windblown silt and sand was derived from eroding banks as were rounded clasts of natural substrate (eg K19, K33 (middle ditch fills), K20, K22, K60 (inner ditch)).

The clay infilling of the gully of S1 (K49) was deliberate; the clay had been mixed with a small amount of charcoal and organic matter presumably to make it more malleable; the function of this lining remains unknown.

Midden material was deliberately used as a packing material in BT10 (K66).

PHYTOLITHS

Marco Madella

Phytoliths, the silica bodies deposited in intracellular and intercellular locations in plants tissues, were analysed to aid the understanding of the vegetal material exploitation on site and the nature of the fuels being utilized. In all eight samples derived from the inner ditch fills were analysed**.** Phytoliths of different plant origin, both herbaceous and woody, have been identified (Table 10). Many of these have been affected by taphonomic processes; specifically there are signs of dissolution in the form of surface pitting and erosion.

Discussion

The phytolith assemblages show that most of the phytolith input is due to culm or leaves of grasses (typologies: smooth rods, wavy rods, polylobate trapezoids, bulliforms). Grass crops, both in the form of single typologies (spiny rods & dendritics) and of silica skeletons, comprise a small proportion of the assemblages. The limited evidence for cultivated grasses (eg cereals) suggests that the phytoliths originated mainly from wild grasses and not from crop by-products. However, even if the deposits have a general paucity of crop phytoliths, they divide

into two groups, one with higher frequencies of dendritic/elongate spiny (indicative of cultivated cereal by-products (Samples 1026, 184, 1917 & 1920) and one with lower frequencies of dendritic/elongate spiny.

The Panicoid type silica skeleton is to be attributed to the epidermal tissue of a reed (possibly *Phragmites australis* L) and most of the dumbbell phytoliths (C4 grasses) also probably share the same origin. The consistent and continuous presence of wild grasses in all the samples suggests that an important part of the contribution of phytoliths originated from the surrounding wild vegetation. As the contexts are likely to derive from burning activities that took place within the settlement, it could be suggested that the original fuel was mainly constituted of grasses and probably some wood. One possible source of wild grasses is animal dung, which may have been utilized as a fuel. Dung could have been used on its own or mixed with wood. However, the frequencies of wood phytoliths are low and it is difficult to evaluate if this is due to low input, taphonomic processes or to the comparatively small quantities of phytoliths in wood compared to grasses (Albert et al 1999; Albert & Weiner 2001). Nevertheless, the phytolith contribution is clearly due to anthropic action, as the frequency of phytoliths in the deposits is distinctively high.

The phytolith evidence from the southern terminal of the inner ditch ([1011], [1026] & [1033]) also points to the use of a mixed fuel (grasses and wood) with a possible contribution from dung. The very low presence of crop by-product phytoliths in these samples seems to suggest that the influx of phytoliths was due to non-domestic activities. These deposits differ from all the other contexts in that they contain minimal dendritic/elongate spiny types. This pattern suggests different inputs and it possibly highlights the different origins of the deposits: non-domestic (higher in wild grasses) *versus* domestic (higher in crop phytolith) refuse. The presence of non-epidermal silicified tissues (irregular B, tracheid) in one of the samples also implies good water availability to the plants growing in/around the ditch. The remains of soil sponges and diatoms also support this evidence.

(A full report, including details of the methodology used, forms part of the archive lodged at RCAHMS)

DIATOMS

Ann Breen

Ten samples were prepared for diatom analysis.

Results; the middle ditch

Four samples were taken in a vertical sequence through a section on the northern stretch of the middle ditch (not illustrated); these are described from the base upwards. The in-field interpretation of the basal middle ditch fill was the in situ accumulation of decayed vegetation, windblown silt and fine sand. The diatoms were mainly broken and exhibited a low content suggesting low water levels. The dominant species *Cocconeis placentula* var. *euglypta* is epiphytic, suggesting the presence of vegetation and plenty of wood or stone substrate to attach to. This species prefers flowing water with a medium-low mineral content and medium-high pH. *Gomphonema parvulum,* the second most dominant species, is indicative of an environment with low conductivity, low mineral content, neutral pH and periphytic (rich in plants). Overlying the basal silt was a sandy silt loam with a low concentration of diatoms. The diatom species indicate flowing acidic water with a low mineral content. The overlying sediment, a silt loam exhibited low species diversity, suggesting that the environmental conditions had become less acidic and less suitable for a broad range of diatom species. The key characteristic of all the species present is that they are all common in flowing or moving water. The uppermost sample, another silt loam with lenses of sand and silt and occasional gravel-sized material, contained lots of broken

diatom fragments suggesting that the water was shallow. In general terms the diatom species suggests that the water was slightly acidic with a low mineral and nutrient content.

The diatom species of the ditch terminals paint a similar picture, with low concentrations of *Gomphonema parvulum* and *Pinnularia subcapitata* suggesting a similar, if less favourable environment in the base of the middle ditch terminal) to that described on the northern section. The base of the southern terminal of the middle ditch, contained high species diversity and the diatoms were in a good condition. Again the two dominant species are *Gomphonema parvulum* and *Pinnularia subcapitata* and the diversity of the diatoms indicates very similar basal environmental conditions to those described above. Both ditch terminals exhibited high levels of conductivity and therefore both may have been affected by sea water. Similarly, the middle ditch environment just away from the north terminal has high species diversity but low concentration, with the main species being *Gomphonema parvulum*. *Pinnularia subrostrata*, the second dominant species, thrives in dystrophic waters indicative of a very high humic content, suggesting lots of decomposed plant material. Furthermore, *Eunotia paludosa* is found in very deep water with lots of plant matter. On the southern section the presence of broken diatoms, *Gomphonema parvulum* and *Eunotia minor* is indicative of shallow water with a low conductivity, low mineral content and circumneutral pH.

Results; the inner ditch

The inner ditch terminal area exhibited a low concentration of diatoms which were often in very poor condition. However, the environment of the inner ditch appears to have been markedly different to that of the middle ditch. Typically *Navicula cincta* is found in areas of high conductivity in brackish conditions. *Achnanthes minutissima*, *Nitzschia commutata* and *Nitzschia frustulum* also prefer high levels of conductivity and are therefore able to flourish in a brackish environment. *Pinnularia subrostrata* thrives in dystrophic waters suggesting that the water had a very high humic content. *Pinnularia microstauron* is found in shallow bogs, lakes and rivers and can tolerate acidity. Similarly, *Eunotia bilunaris* is also a species that is found in acidic standing or flowing water and can tolerate a range of conductivities. It also is common in eutrophic conditions (environments rich in nutrients with excessive plant growth leading to a lack of oxygen) suggesting that the water had a high nutrient content.

Results; the outer ditch

The single sample derived from the basal fill of the outer ditch contained a rich and diverse diatom flora dominated by *Fragilaria capucina* and *Eunotia subarcuatoides* which is found in flowing oligo-mesotrophic waters (poor to moderate nutrient conditions), which are acid to circumneutral, and have low to medium conductivities. *Pinnularia subrostrata* thrives in dystrophic waters suggesting that the water has a high humic content due to the presence of decomposed plant material.

Summary

Prior to sedimentation the environment of the middle ditch was neutral to slightly acidic, with high levels of vegetation in shallow but flowing water. Further up the profile conditions became less acidic and there was more vegetation. Nutrients levels then fell, resulting in less vegetation under shallow water.

Prior to sedimentation the inner ditch had a high decomposing vegetation content, and coupled with probable influxes of sea water, this resulted in an acidic and brackish environment rich in nutrients. Similar, but less acidic and brackish conditions prevailed in the outer ditch.

(A full report including details of the methodology used forms part of the archive lodged at RCAHMS)

TABLE 11
Waterlogged and partially waterlogged wood

Context no	*Sample no*	*Species*	*Dimensions (mm) L × W × T*	*Growth rate (rings per cm)*	*Comments*	*Location*
1090	24	*Quercus* sp	230 × 84 × 25	9	eroded plank-like piece of wood Surfaces eroded but regular rect cross-section Unusual conversion (E1) for plank. Could be rotted remains of larger timber but very regular cross-section	Inner ditch
1077	25	*Quercus* sp	32 × 6 × 15	4–5	long sliver, surfaces eroded – radially-split	Middle ditch
1077	26	*Quercus* sp	340 × 130 × 11	4	radially-split planking surviving mostly as dark fibrous stain < 2 mm thick in places	Middle ditch
1077	27	*Quercus* sp	380 × 165 × 10	–	radially-split planking surviving mainly as fibrous stained sand. Too degraded to establish ring-count	Middle ditch
1144	29	*Quercus* sp	20–25 diam		partially carbonised lengths of roundwood	Inner ditch
1155	31	*Quercus* sp	–	6	very small fragment of carbonised wood	Inner ditch
1138	32	*Quercus* sp	20–25 diam		partially carbonised lengths of roundwood	
1170	38	*Quercus* sp	175 × 70 × 60	9	Squared post made from radially-split timber displays classic post decay in centre	BT11
1252	41	*Quercus* sp	80 × 50 × 46	6	large piece of radially fragmented carbonised wood	Inner ditch
1299	42	*Quercus* sp	250 × 60	9	Very degraded lump supported mainly by sediment possibly a roundwood post	Outer ditch
1299	43	*Quercus* sp	370 × 55 × 20	4–5	Very degraded lump supported mainly by sediment E conversion like S24	Outer ditch
1299	44	*Quercus* sp	370 × 80 × 13	6	Radially-split plank. Very degraded supported mainly by sediment.	Outer ditch
1850	58	*Quercus* sp	290 × 200 × 60	7	radially-split plank - both top and bottom edged decayed Estimated 140 rings present	BT2
1850	59	*Quercus* sp	95 × 40 × 24	6	small irregular fragment from either radially-split plank or whole trunk	BT2

THE WOOD ASSEMBLAGE

Anne Crone

The assemblage contained a mixture of waterlogged wood, waterlogged wood which was partially carbonized and fully carbonized wood. Some samples consisted of single, discrete fragments of wood (Table 11) while others consisted of bulk samples of charcoal (Table 12).

The waterlogged and partially carbonized wood

All of the samples of waterlogged and partially carbonized wood, 14 in total from nine contexts, were examined (Table 11). Most of these samples came from the ditches, the exceptions being Sample 38 which came from BT11 and Samples 58 and 59 which came from BT2.

The waterlogged wood was in a highly degraded, fragile condition, the surfaces eroded and the wood spongy. A number of samples survived only as fibres in dark stained sand. However, it was still possible to identify the species of wood used; all of the samples were identified as oak (*Quercus* sp). Despite their condition it is clear that, with the exception of two samples of small roundwood, the majority of the samples represent the remnants of more substantial structural timbers. At least half the samples are radially fragmented and, particularly in the case of the larger pieces, it is unlikely that this was the result of decay. It is more likely that these are fragments of deliberately fashioned radially-split planking. Sample 58 was the largest surviving fragment of radially-split planking, with a cross-section at least 200mm wide and 60mm thick. Samples 24 and 43 are also plank-like but they appear to have been fashioned from chords, cleft off the trunk. Sample 38 is the remains of a small squared post, 70mm × 60mm in cross-section, again fashioned from a radially-split baulk. It displays the classic decay pattern of an oak post, the wood towards the centre of the original tree having decayed away leaving a vacuity (Barber 1997, 137–8).

The oak displays growth rates varying from four to five rings per cm to nine rings per cm, medium- to relatively fast-grown timber. Sizable trees were used; Sample 58 has been split from a tree at least 400mm in diameter and at least 140 years old.

The bulk samples of charcoal

Charcoal from 27 contexts was examined (Table 12). These were chosen to be representative of the various types of context excavated at Braehead, the ditches, palisades and structures.

Seven species are represented in the charcoal assemblage; alder (*Alnus glutinosa*), oak (*Quercus* sp), hazel (*Corylus avellana*), birch (*Betula* sp), willow (*Salix* sp), Pomoideae (cf *Pirus malus* – this family can include hawthorn, quince, apple and pear) and cherry (*Prunus avium*). Alder is the dominant species, accounting for 48% of the charcoal assemblage while oak accounts for 26%.

Discussion

The waterlogged wood assemblage suggests that oak was the species used in the construction of the main defensive perimeters of the site. It was used to make squared oak posts for BT11 (Sample 38) and planking in BT2 (Samples 58 & 59), suggesting that the palisades consisted of post-and-plank fencing. The bulk of the samples recovered from the ditches were also planking; this may represent some form of revetment facade for the banks or it could represent collapsed post-and-plank palisades.

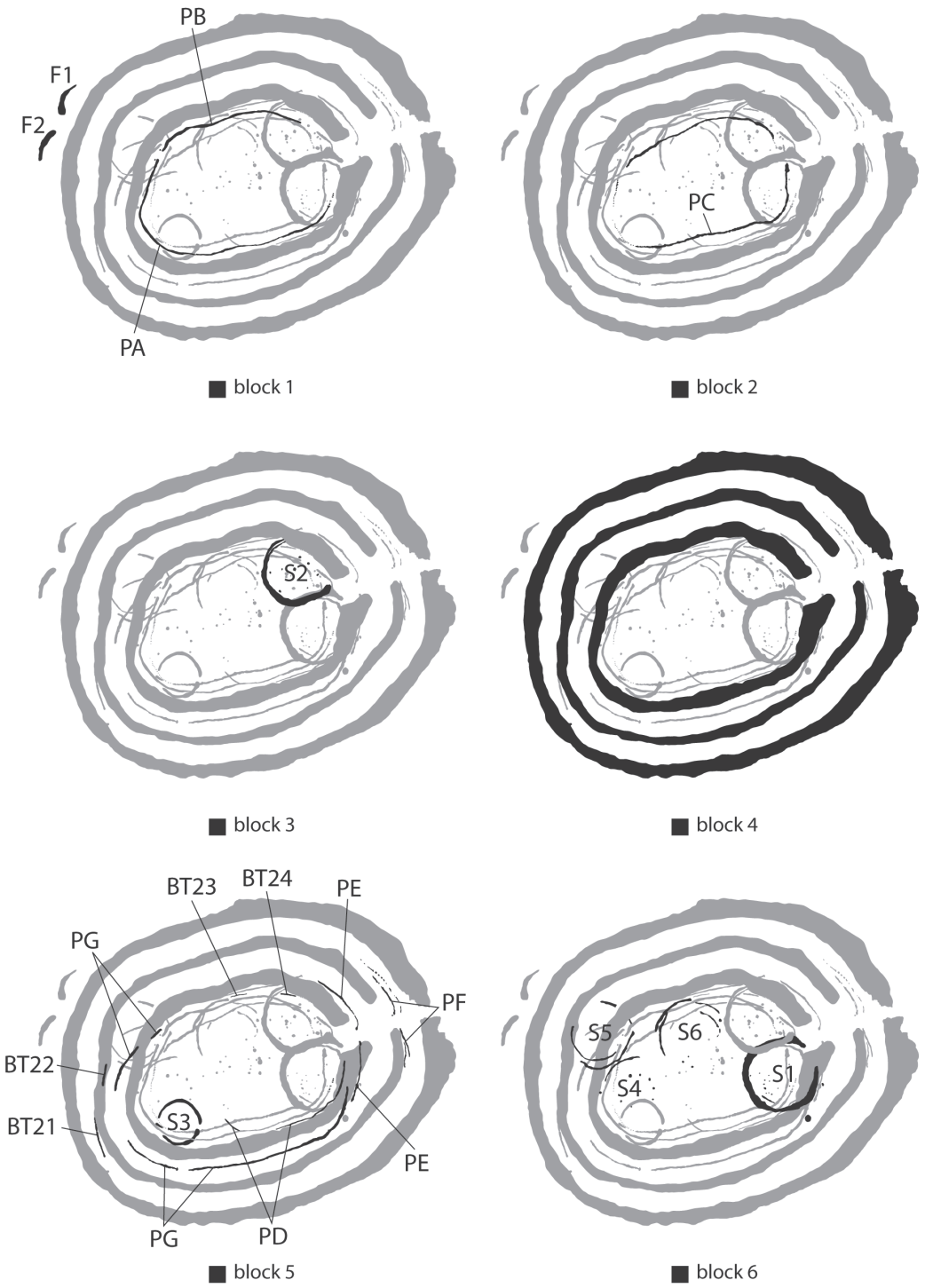
The contrast between the waterlogged and charcoal assemblages highlights the dangers inherent in trying to reconstruct wood use on the basis of the scant charcoal assemblages usually available on plough-truncated Scottish sites. The charcoal assemblage does not reflect at all the exclusive use of oak for major structural timbers. Instead it suggests that alder was the main species used throughout the site, with oak of secondary importance. Alder would probably

TABLE 12
Wood charcoal

Context no	*Sample no*	*Species*	*Total weight*	*Quantity*	*Comments*
1018		*Alnus glutinos*a	1.4	3	
		Quercus sp		3	
		Corylus avellana		2	small round wood
		Betula sp		2	
1027	2	*Corylus avellana*	2.19	100%	small angular fragments – only one fragment of roundwood
1028		*Alnus glutinosa*	3.84	9	
		Quercus sp		1	
1040	8	*Alnus glutinosa*	12.77	100%	small angular fragments – no roundwood
1055		*Alnus glutinosa*	3.5	4	
		Quercus sp		4	
		Corylus avellana		2	
1205		*Alnus glutinosa*	0.89	5	
		Quercus sp		4	
		Corylus avellana		1	
1221		*Alnus glutinosa*	0.44	1	
		Quercus sp		1	
		Corylus avellana		1	
		Salix sp		2	
1225	39	*Alnus glutinosa*	31.36	100%	*c* 75% small roundwood
1227		*Alnus glutinosa*	0.19	1	
		Quercus sp		1	
		Corylus avellana		1	
		cf *Salix* sp		1	small round wood
1234	40	*Quercus* sp	17.42	100%	small angular fragments – no roundwood
1331		*Alnus glutinosa*	24.1	7	
		Quercus sp		3	
1374		*Alnus glutinosa*	4.74	4	
		Corylus avellana		4	
		cf *Salix* sp		1	small round wood
		Pomoideae		1	
		cf *Pirus malus*			
1392		*Alnus glutinosa*	1.37	8	
		Quercus sp		2	
1459		*Alnus glutinosa*	10.59	6	
		Quercus sp		4	
		Betula sp		1	

TABLE 12 (*cont*)
Wood charcoal

Context no	*Sample no*	*Species*	*Total weight*	*Quantity*	*Comments*
1497		*Alnus glutinosa*	0.74	3	
		Quercus sp		5	very slow growing
		Prunus avium		1	
1542		*Alnus glutinosa*	4.82	1	
		Quercus sp		3	
		Corylus avellana		2	
		Betula sp		4	
1549		*Alnus glutinosa*	1.58	4	
		Quercus sp		6	slow growing
1575		*Alnus glutinosa*	0.41	4	
1644		*Alnus glutinosa*	1.16	6	
		Quercus sp		1	
		Pomoideae		1	
		cf *Pirus malus*			
1713		*Alnus glutinosa*	5.85	4	
		Quercus sp		5	very narrow rings
		Salix sp		1	
1730		*Alnus glutinosa*	1.25	5	
		Corylus avellana		1	
		Salix sp		2	
1917	63	*Pomoideae*	7.11	100%	small angular fragments – no roundwood
1998		*Alnus glutinosa*	1.71	5	
		Quercus sp		4	slow growing
		Corylus avellana		1	
2157		*Betula* sp	0.39	1	
		Salix sp		1	
2183	65	*Quercus* sp	18.19	100%	small angular fragments – no roundwood
2199		*Alnus glutinosa*	4.07	5	
		Corylus avellana		4	small round wood
		Pomoideae		1	
		cf *Pirus malus*			
2245		*Alnus glutinosa*	0.38	2	
		Salix sp		1	



ILLUS 38 Likely sequence of structural development at Braehead. KEY: S = structure; P = palisade; BT = bedding trench; G = gully

have been the most readily available species around the site, given the high water table experienced there even today, and was probably used for a multitude of smaller scale construction purposes, eg in the roundhouses, for fencing and for fuel.

What the contrast between the waterlogged and charcoal assemblages suggests is that there was a clear distinction between the type of wood used for defensive, or display purposes and that used for ordinary day-to-day purposes. Oak appears to have been reserved for the perimeter fences/facades; no other species would do. Oak is not only strong and durable but it also splits easily and would have provided planking of a width that no other locally available species could produce. It may well have been selected for these practical features but there may also have been an aesthetic reason, the oak producing a smooth, regular façade. Oak was used exclusively in the revetment of Neolithic ritual structures, such as the mortuary enclosure at Inchtuthil, Perthshire (Mills 1991) and the large ditched enclosure at Forest Road, Kintore (Crone 2008), probably for the same, aesthetic reasons. Other species could have provided an equally impenetrable defensive perimeter so display of social status and prestige may have been a factor in the use of oak.

DISCUSSION

TRUNCATION

The site has been subject to plough truncation, witnessed by the cross-hatched pattern of plough marks across the entire site. In addition the site has suffered from aeolian erosion, both in the past and during excavation. Truncation was the most severe in the western portion of the enclosure and was clearly illustrated by the severely truncated postholes, in Palisade C for example, some of which had virtually disappeared (illus 8). Palisade postholes varied in depth from 0.04–0.43m (Palisade B and Palisade C), while those in S1 varied between 0.04–0.27m, those in S2 from 0.06–0.40m and in S4 from 0.18–0.25m. Working on the premise that one-third of the height of a post is buried for stability (Mercer 1981), then a post-palisade of 1.5m height above the ground would have had a buried portion of 0.75m. It is therefore clear that although preservation in plan was generally good at Braehead, what was being observed was in many cases the very last remnants of survival.

THE STRUCTURAL SEQUENCE OF BRAEHEAD

The broad structural evolution of Braehead has been unravelled largely through interpretation of the limited site stratigraphy (illus 4). The development of the site is discussed below, with all elements, where possible, placed within quantifiable blocks of time. It will become clear to the reader that many of the structural elements within these blocks could not have co-existed, but clearly pre- or post-date the structural elements of the preceding or proceeding blocks.

Block 1 (illus 38)

The earliest structure on the site appears to be Palisade A/B. The outer rings of an oak plank from BT2 (which was hewn from a tree at least 140 years old) yielded a radiocarbon date of 800–480 BC (Table 1). A similar date was derived from the palisade at Craigmarloch, located about 16 km to the west of Braehead (Nisbit 1996, 56; Atkinson 2000, 64) and the Late Bronze Age palisaded homestead of Knapps, near Kilmacolm (Newall 1965). The Early to Middle Iron Age palisaded enclosure of Braehead exhibits a gated western entrance, very similar in design to the northeast entrance at Dryburn Bridge, East Lothian (Dunwell 2007). There was no defined eastern entrance although there is a break in the palisade which could just as easily be the result of truncation. Aligned with the western entrance were two tear-drop shaped, shallow, earthen ditches, F1 and F2, which are interpreted, for want of another function, as entrance markers.

The enclosed space is of similar proportions to the late Bronze Age palisaded homestead of Knapps, Kilmacolm (Alexander 1996, 16) and although no coherent trace of internal structures are evident, the internal space would have only been able to comfortably accommodate two approximately 10–12m diameter roundhouses at any one time. There is a significant overlap between the radiocarbon date derived from the in situ radial split plank from BT2 (Palisade A) (GU-11452) and the radial split plank derived from the middle ditch (GU-11449) (illus 20). There is also some overlap with the radial split plank recovered from the outer ditch (GU-11451) and the eroded plank found within the inner ditch fills (GU-11448). Rather than interpreting the planks retrieved from the ditch as some form of ditch revetment for which we have no structural evidence, it seems more reasonable to propose that the original source of these planks may have been Palisade A/B. Many of the surviving planks may have been deliberately removed from the palisade prior to the construction of Palisade C, which closely followed the route of the earlier one and would have been structurally compromised had the planks remained in situ. These planks may have been stored or re-used, possibly some within Palisade C and perhaps elsewhere, before eventually becoming too degraded to be of use, some being discarded amongst the accumulating dross in the ditches.

Block 2 (illus 38)

This phase has not been absolutely dated. However, Palisade C mirrors the route of Palisade A/B and appears to have been a direct replacement as in the northern portion of the site BT5 is cut by BT8; indeed the implication is that the remains of BT8 were discernible, if not upstanding, when Palisade C was built. It is not possible to determine whether there was a period of abandonment between the deterioration of Palisade A/B and the construction of Palisade C. However, a different construction method was employed in each of the palisades, Palisade C being built of abutting posts as opposed to the slightly more spaced post-and-plank construction of Palisade A/B, although this may signify no more than the use of different builders. Most interestingly, Palisade C had no western entrance (the missing postholes on the western side are the result of truncation (illus 8) signifying a deliberate change to an eastern point of access and egress. A portion of the palisade along its southern circuit, just to the west of S1, was destroyed by fire and within the fill of the bedding trench a small assemblage of charred cereal grains was recovered. It is assumed that these grains were burnt at the same time as the palisade, perhaps within a stack stored up against or suspended from the palisade, and were subsequently incorporated by post-depositional processes and buried under the bank of the inner ditch.

Block 3 (illus 38)

Sometime after the destruction of Palisade C, S2 was constructed in the north-eastern corner of the interior space. Although there are no absolute dates for this structure it is clearly later than Blocks 1 and 2 as the two ring-grooves of S2 cut Palisades A, B and C. The northern portion of S2 was destroyed as a result of the construction of the inner ditch but it is not clear whether the structure was enclosed by the middle and/or the outer ditches. It has been previously noted that the form and possible construction method of the middle ditch is slightly different to that of the inner and outer ditches and there is always the possibility that this ditch was the first to be built. The middle ditch may therefore have enclosed S2 and any other structures, now obliterated, which may have existed within the interior. S2 differs from the other circular 'house' structures on the site, in that it appears to be isolated in both time and place and this suggests a clear distinction in social attitudes and/or status of the people who built it from those responsible for the palisades. It is conceivable that another structure or structures were located towards the centre of the site, but

here plough truncation has obliterated all but the faintest remnants of any negative features. S2 appears to have been completely rebuilt, or at the very least it underwent considerable modification with the replacement of the perimeter roughly along the same line of the pre-existing one; an example of direct superimposition (Halliday 1999). The proximity of the two ring-grooves would indicate that structural elements of the first 'house' were either visible to the architects of the new one or were removed by them during its refurbishment.

Block 4 (illus 38)

Ritchie (1970, 54) notes that 10 palisaded sites in northern England/southern Scotland were succeeded by earthwork phases, the classic example being Hownam Rings, Roxburghshire (Piggott 1948). Craigmarloch (Nisbet 1996) is the nearest example to Braehead, and Braehead itself appears to emulate this pattern. The designer(s) of the three enclosing ditches undoubtedly had a very different attitude towards settlement, space and the meaning of enclosure than those who went before them, as well as having access to a relatively large labour force (Haselgrove & McCullagh 2000, 175). Consequently it seems logical to presume, given the apparent differences in the 'cultural' attitude towards the architecture of the site and the truncation of S2, that a period of abandonment separated Block 3 and Block 4. No sequence of construction and/or use is discernible between the three ditches, although the middle ditch is physically different from the other two and could conceivably be earlier or later in date, as many similar multivallate sites may be multi-phased (Broxmouth – Hill 1982, 141; Fishers Road East – Haselgrove & McCullagh 2000, 186). Samples of waterlogged oak, from the base of the inner ditch and the base of the outer ditch, date their construction to some time after 770–400 BC and oak derived from the middle ditch dates its construction to some time after 810–520 BC (Table 2). The ditches may have been kept clean during their use, although the limited evidence for re-cutting, which consists of the extension of the ditches to narrow the entrance, seems to represent a deliberate alteration to the entrance architecture of the inner and outer ditches, rather than cleaning which tends to result in the removal of all silting and the widening of ditches (Chadwick 1997) rather than extension to their length.

Sherds of Vessel 10 recovered from both the middle and inner ditches demonstrate that these were backfilled concurrently (illus 34). None of the excavated 'house' structures are contemporary with the use of the ditches and similarly none are present from the following period of abandonment, silting up and deliberate backfilling of the ditches, although plough truncation of the interior may have removed the evidence. During this period, typified by craft production (Hunter supra), the site appears to have been unenclosed, in that the ditches would not have provided an effective physical deterrent or barrier to access to the interior. Micromorphological evidence (Ellis supra) suggests that the natural infilling of the ditches was a fairly rapid affair, occurring over tens, as opposed to hundreds of years and similarly the infilling of the terminals and portions of the inner ditch by dumping would have occurred relatively rapidly. Hingley (1990) suggested that a change from enclosed to unenclosed settlement was due to an increased population and expansion of the social group which resulted in the sharing of territory and resources with the broader group. Thus, perhaps the abandonment of the ditches and the 'mass production' of tradable craft items are symbolic of the integration of a local group into the broader community.

Block 5 (illus 38)

The unenclosed period of episodic and/or seasonal activity (see below) at the end of Block 4 was at some point superseded by a third, post-defined, oval palisaded enclosure, Palisade G, and/or a series of gated entrances represented

by Palisade E and F. The re-establishment of an enclosed (partially or fully?) inner space marks another shift in cultural attitude towards the utilization of the site and also the cultural meaning(s) imparted by it; but whether this modification was instigated by a change in the occupants, possibly by a different family unit and/or a reaction to turbulent local politics is a matter for conjecture.

The radiocarbon date obtained from the squared oak post recovered from the gated eastern entrance and associated Palisade E demonstrates that this palisade was constructed some time after 400–200 BC (Table 2). The large postholes at the terminals of the palisades are interpreted as the foundations for gate piers of an entrance some 1.70m wide. However, as BT10 was cut into the backfilled inner ditch sediments, the fence and gate structure of Palisade E and the inner ditch could not have acted as a coherent barrier. Furthermore, the recovery of pieces of the same pottery vessel (Vessel 10) from the fill of both the inner and the middle ditches reveals that two ditches were infilled around the same time and so the gated structure of Palisade E was unlikely to have functioned as a weaker secondary entrance to that of the middle ditch (Palisade F). It is possible that the gate and fence may have formed a secondary entrance to the outer ditch which could have been extended at this time to narrow the access but this seems most unlikely. The most plausible explanation is that Palisade E was part of a larger palisade circuit which has been truncated beyond recognition. Alternatively, this fencing may have been part of an isolated, undefendable wooden gated entrance serving solely as a visual statement, guiding access into the interior.

Palisade F appears to form a gated entrance structure aligned on the same entrance created by Palisade E. There is no stratigraphic relationship between the post and fence structures, BT14 and BT17/BT18. They may not be contemporary as they are physically very close; one may have replaced the other. Alternatively, if conjoined, a double width palisade would be much stronger and harder to penetrate that a single skinned entrance. For instance, these parallel fence and posts could have supported a narrow, raised timber rampart. A local parallel to this potential double entrance palisade can be found at Craigmarloch (Nisbet 1996, 57) and further afield parallels include Hayhope Knowe in Roxburghshire (Piggott 1949) and Loudoun Hill, Ayrshire (Atkinson 2000). The last phase of the adjacent site of Shiels may have had a similar double stockade which overlay the ditch but enclosed the site with an entrance defined by a two parallel wooden barriers which were probably gated. Although Scott (1996, 69) suggests this was a later medieval addition as its form does not 'fit easily into an Iron age context' a similar gateway has been excavated at the double ditched Iron Age/Romano-British enclosure at Carronbridge (Johnston 1994, 243).

The possibly converging palisades of BT15/BT16, which would have formed the southern element of this entrance structure, are paralleled at Loudoun Hill, Hogbridge, Hownam and Craigmarloch (Atkinson 2000, 62). This gate and palisade structure is associated with, but not contemporary with the middle ditch; although BT15/BT16 appears to respect the outer edge of the middle ditch it would clearly have been constructed within the ditch, once plough truncation is taken into account. However, the palisading was clearly constructed around the form of the ditch and serves to narrow the entrance defined by it. This gated palisade may have functioned independently of that of the inner ditch, Palisade E, or they may have formed a double entrance. These double-gated palisades find a clear parallel at Loudoun Hill (Atkinson 2000, 63).

The surviving portions of both eastern gated entrances and palisades are of limited extent, but it is very possible that these once formed full circuits and operated independently of the ditches and banks. For example, BT21 and BT22 might be continuations of this circuit (but

see below). Alternatively, Palisades E and F may have been specifically designed to update the previous existing ditched entrances and lead up onto the denuded but pre-existing banks of the outer and middle ditches.

The circuit of Palisade G (possibly continued by Palisade B) is offset from those of Palisades A/B and C, lying further to the west and south. This circuit, Palisade G, sees a return to the gated western entrance; it is unclear whether there would have been an eastern entrance. This western entrance is set at an angle to that of the Palisade A/B, but intriguingly close to it (illus 5). Perhaps its location was triggered by an ancestral memory, or perhaps more pragmatically, the entrance was roughly aligned with something in the landscape such as an important route-way or a distant hill. Running very roughly parallel to Palisade G along its western circuit are the very fragmentary bedding trenches BT21 and BT22. They lie between 1.5 and 4m outside of BT19 and BT20 and it is possible that these are contemporary and formed a double palisade such as that at Craigmarloch (Ritchie 1970, 50; Nisbet 1996, 46) (but see above for alternative interpretation). No stratigraphic relationship exists between Palisade G/B and that of Palisade E but it is unlikely that they are contemporary, as their southern portions lie only 1m apart (illus 3).

Structure 3 would have lain within the circuit of Palisade G/B and could therefore feasibly belong to this phase of occupation.

Another, rather ephemeral palisade complex is Palisade D and its tentative partners BT23 and BT24. A projected curvilinear course of the stake and panel palisade BT9 would join BT23/BT24, but conversely so would that of BT19/BT20. The chronological relationship of these architectural elements is open to interpretation and conjecture.

Block 6 (illus 38)

The final phase(s) of settlement would have been unenclosed, as the structures in this Block, S1, S4, S5 and S6, are later than all the enclosing palisades and the inner and middle ditch. The outer ditch may have existed as a semi-functioning barrier at this time, although given the early date and probable source of the waterlogged wood (probably Block 1 or 2) retrieved from the base of the ditch, this scenario seems fairly unlikely. No stratigraphic relationship exists between the circular structures of S1, S4, S5, and S6. It is very unlikely that S4 and S5 are contemporary as they lie so close to each other and appear to be quite different in their design. Conversely, the architectural similarities between S5 and S6 are indicative of a shared design and if not contemporary one may have been built to replace the other. Posthole [1385] occurs near the south-eastern end of Palisade A and cut the inner ditch. During excavation this posthole was tentatively interpreted as part of Palisade A, but based upon the radiocarbon dates and other stratigraphic relationships (for example Palisade B is cut by S2, the latter is cut by the inner ditch) it appears that this posthole is more likely to be associated with S1.

Summary

Six blocks (each comprising a series of stratigraphically indiscernible features) of activity and likely at least six episodes of abandonment are evident from the excavated remains at Braehead. There is evidence of a seventh phase of activity, comprising two linear gullies running east–west across the site but the evidence is too slight to warrant further comment. The basic structural sequence discernible at Braehead appears to conform to the premise that palisaded sites often evolve into larger or more substantial forms, as for example at Hownam Rings (Piggott 1948) and Craigmarloch (Nisbet 1996). However, at Braehead this trend is reversed when the large ditched enclosure is then superseded by smaller palisade enclosures and finally unenclosed settlement. The later replacement of palisade with unenclosed settlement is mirrored at Dryburn Bridge in the middle half of the first century BC

(Dunwell 2007) and similarly the final phase of St Germains is an unenclosed settlement which followed after an enclosing ditch phase (Alexander & Watkins 1998, 247).

The palisade of Block 1 represents a single construction event. The duration of use of this enclosed space is unknown, although the radiocarbon dates (Palisade A/B was constructed after 800–480 BC and Palisade E after 400–200 BC) would indicate 280 years or more separating Block 1 and Block 6 and therefore, the duration of each structural phase could be tens of years as opposed to hundreds. Between Block 1 and Block 2 a relatively short period of abandonment is assumed as this would help to explain how a reversal in orientation of the palisade entrance came about. Palisade C also appears to have been constructed as a single entity and there was no archaeological evidence for structural repair. The life expectancy of a timber post can be calculated at 15 years for every 50mm of post diameter (Wainwright & Longworth 1971, 225), allowing around 30–45 years of potential use of the palisade if it was not destroyed prematurely by fire. Block 3 is represented by single structure, S2 which was re-built on the same stance at least once and which overlay and cut the foundation trenches of the earlier palisades. This period of unenclosed settlement was replaced by a major phase of enclosure (Block 4), the inner ditch partially destroying the remnants of S2. However, the ditches were not open for any great length of time with natural silting starting almost immediately. It is not clear if the site was then abandoned or whether occupation continued relatively uninterrupted into a period (Block 5) in which the site was enclosed and/or semi-enclosed by a further series of palisades, two sets with eastern gates and one set with a western entrance. The final phase of use of the site comprised unenclosed settlement of one or more, presumably domestic, dwellings. It is possible that the late first century AD sherd of Roman pottery recovered from the uppermost fill of the outer ditch is associated with this final phase of occupation. This single piece of Roman pottery hints at activity on the site during the Flavian period; certainly other forts in the area were occupied at this time (Maxwell 1989, 93).

CHARACTER, FUNCTION AND CULTURE

Palisades

The structural evidence from the palisade bedding trenches, coupled with the survival of waterlogged wood possibly originally derived from the palisades suggests that a variety of construction methods were employed at different times. Palisade A was certainly constructed from oak planks (although larger roundwood timber may have also been employed) set vertically into the bedding trench, possibly with horizontal oak panels between the uprights. One of the Block 5 palisades, Palisade E appears to have been constructed from squared posts and wooden fencing secured in a bedding trench and packed with large stones (illus 15), while the Block 2 Palisade C and Block 5 Palisade G appear to have been constructed from abutting posts. Whatever the design of the above-ground element, a narrow bedding trench into which posts were set or driven was the construction method employed in all the palisades to secure the palisade in the ground. This is typical of all palisaded enclosures (Ritchie 1970, 49).

Atkinson (2000) has recently reviewed Scottish and northern English palisade enclosures. Palisaded enclosures of the mid-first millennium BC were traditionally seen as the earliest enclosure phase of the Hownam sequence, with their distribution concentrated in the Cheviot Hills with a scatter to the north, west and south (Ritchie 1970). Sites with up to three houses were termed homesteads and those with more than three were termed settlements; the term enclosure was used for sites at which evidence of occupation was either absent or unknown (Ritchie 1970, 49). The implication from this classification is that the primary function of palisaded enclosures was as places of domestic occupation and settlement (Atkinson 2000).

However, Topping (1989) has suggested that palisaded sites may have been used as temporary stock enclosures while Hingley (1990) and Hill (1989) place great emphasis upon the symbolic function of enclosure. There is no evidence for the enclosure of stock or for the domestic use of the interior during the earliest phases of enclosure at Braehead and the evidence from the later phases (Block 5) is ambiguous. However, all the palisades clearly functioned as a physical barrier, and were presumably designed to prevent uncontrolled access or egress by people and/or animals. They may have also served to define, protect and perhaps exclude from view the space and activities within. The palisades appear to have been primarily constructed from oak and Crone (supra) suggests that, while oak would certainly have provided a strong effective barrier, it may have been chosen because the aesthetic appearance of the barrier was also important.

Ditches

The Braehead enclosure formed by the concentric ditches and/or banks resembles many other sites in Britain and Ireland, close parallels being found at Woodend Farm in Annandale (Banks 2000), Barochan Cross in Renfrewshire (Alexander 1996) and Lisnavaragh and Ruthturret in Co Down in Ireland (Limbert 1996).

The bases of all three ditches were extremely irregular along their entire circuits, especially the inner and outer ditches, with seemingly randomly located pits or depressions, although there was a concentration of pits within the terminals of the outer ditch. The irregularity of the base is interpreted as an unintentional by-product of hand excavation and where attainment of an approximate depth and width would readily suffice. The resultant variation in the width of the ditches, their pit construction and the local irregularity in their course is thought to reflect the work of loosely organized gangs, each working on a discrete stretch of ditch at any one time (Haselgrove & McCullagh 2000, 81). The excavation of the ditches would have required an enormous commitment from the local populace, although it may have involved the use of slaves and/or captives. Without allowing for the obvious denudation through plough truncation, the outer ditch may well have taken well over 60 person days to dig out, the middle ditch 36 and the inner ditch 39. This is based upon a single person being able to hand excavate $2m^3$ per day (a figure taken from modern day hand excavation of ditch fills by archaeologists using modern tools).

The broad and shallow terminals of the outer ditch and to a lesser extent the inner ditch, coupled with the considerable localized variability in depth and form is a strong indication that the primary function of the ditches and associated banks was unlikely to have been a defensive one. The relatively large width of the original outer ditch entrance (3.30m) and that of the middle (5m) and inner ditches (3.75m) coupled with their relative shallowness provides support for this premise. Furthermore, the upcast from the shallow ditches would not have made for a substantial barrier without revetment (a similar premise is proposed at Fisher Road West (Haselgrove & McCullagh 2000; 76)) but none of the internal palisades at Braehead are contemporary with the ditches. Bowden & McOmish (1987, 77) argue that multivallate hillforts may have looked strong and impregnable but could not have been successfully defended. Rather, they suggest that the ditches and ramparts related to prestige; the more ditches and ramparts the greater the status of the settlement and its inhabitants. They further suggest that, given the numbers of people needed to excavate the ditches, the act of construction itself may also have been intended to enhance the prestige and status of the inhabitants.

Thus, the multivallate ditches at Braehead may have primarily served to symbolize the importance of the site within the surrounding low-lying landscape, as Bowden & McOmish (1987, 78) have suggested in relation to the Chesters, at Drem in East Lothian. Various authors (Bowden & McOmish 1987, 77; Chadwick 1997; Hingley 1990) suggest that such multiple bank and ditches would have

ILLUS 39 Flooding in the ditches after a recent downpour of rain

been imbued with social concepts such as land-tenure and ownership of wild resources, and would also have served to emphasize the social (perhaps splendid) isolation of the inhabitants. However, beyond any symbolic meaning, the sheer presence of concentric enclosing ditches and banks would have served as a physical and visible barrier to the movement of both people and stock, both internally and externally. There had been no re-excavation of the ditch circuits apart from possible minor re-excavation of the ditch terminals, suggesting that either cleaning had resulted in the removal of all former fills (Chadwick 1999) or more likely that the ditches were not maintained because they were not required to function as such for a prolonged period. Similarly the ditch at Woodend was allowed to silt up with no evidence for re-cuts (Banks 2001, 248). Differential upkeep of the ditches was also evident at Fisher Road West, where the ditch terminals at the Phase 4 eastern entrance were repeatedly cleaned whereas the north and south sides of the circuit were allowed to infill after being excavated (Haselgrove & McCullagh 2000, 77). Indeed Bowden & McOmish (1987) suggest that some of the rapidly backfilled ditches of Late Bronze and Iron Age enclosures are an indication that once the area of the settlement is defined and a deliberate deposit put into the ditch or ditches they no longer serve any purpose and so are allowed to silt up.

All three ditch terminals were isolated from the adjoining ditch section by slight rises in the base of the ditch. The impression is that the ditch terminals and adjoining ditch section were designed to channel and pond water for a greater part of the year (Evans 1997). The higher parts of the ditch sections, especially those on the western side may have had shallower stands of water in times of extended rain or overbank flooding but probably lay semi-dry at certain times of the year (Breen supra). The accumulation of water

at the ditch terminals might have been the result of a deliberate ploy to maintain a relatively 'dry' interior but it could also have been intended to heighten the visual impressiveness of the entrance façade by making the ditches appear deeper (Alexander & Watkins 1998, 247; Haselgrove & Lowther 2000, 175). Perhaps, as suggested for the smaller inner ditch circuit at Wardy Hill (Evans 1997, 222) the inner and middle ditches also acted as traps to bank run-off preventing the flooding of the interior (illus 39).

No 'house-structures' have been positively identified as contemporary with the ditches when they were opened or being backfilled, although a combination of plough truncation and lightweight construction may explain this absence. One possibility is that the outer ditch remained open after the backfilling of the inner and middle ditches and enclosed the various 'round-house' structures in Block 6. It is clear from examination of the ditch fills that the environment within the ditches was not static; rather it oscillated between the accumulation of windblown sand and midden material, waterborne sands and silts, the in situ accumulation of vegetation and the rapid accumulation by dumping of domestic rubbish and craft production waste. The midden material is concentrated at the terminals of the inner, middle and outer ditches, with pockets on the northern and southern sides of the inner ditch. It seems unlikely that the ditch terminal deposits signify structured deposition as this is most commonly associated with the deposition of human remains and/or specific artefacts (Hingley 1990; Chadwick 1997; Parker Pearson 1996). Rather it seems more likely that the terminals received more rubbish simply because they were on a transit route in and out of the enclosure and therefore more readily accessible than those ditched areas obscured by the banks (Haselgrove & McCullagh 2000, 79).

Circular structures

The circular structures comprise one gully-defined structure (S1), one gully and posthole-defined structure (S2), the latter comprising two ring-grooves one of which was a near direct replacement for the other; two double ring-groove-defined structures (S5 & S6), one single shallow ring-groove structure (S3), and one ring-groove and posthole structure (S4). None of these structures can be clearly associated with any of the phases of enclosure. Few finds were recovered from these structures and these do not readily elucidate their form or function.

Structures 1 and 2: In common with many later prehistoric roundhouses the entrance of S2 is roughly oriented to the east to benefit from the morning sun (Oswald 1997, 93–4) and to protect against the vicious northwest wind (illus 3). Within the interior of S2 is a possible circle of postholes, some 5.5m in diameter, which may have supported the ring-beam on which the roof structure lay, with the lower portion of the pitch being supported by a ring of presumably shorter posts internal to one or both of the gullies. Some of the fills of these gullies returned medium to high levels of easy available phosphate (see site archive), indicating animal or human waste, although it is unclear whether the fills are contemporary with the use of S2 or are post-abandonment in origin. Pope's (2003, 73) extensive analysis of drainage gullies associated with roundhouses indicates that the gullies of S2 would conform in size and character to typical 'drainage' gullies as opposed to typical wall slots.

As with S2, the entrance of S1 is also orientated to the east (illus 18). S1 does not readily conform to the 'classic' ring-ditch house (eg Feachem 1965; Rees 1998); the gully of S1 is relatively deep and steep sided, whereas the classic ring-ditch is shallow and broad and forms an internal feature between a ring of posts and an outer wall. In addition the internal postholes of S1 were irregularly spaced and small, making it difficult to envisage how these could have held posts to support a large roof structure.

The clay lining of the gully of S1, which appears to have been spread at least some

way into the interior, may provide a clue to at least one of its later uses. The natural sand is extremely permeable, alleviating the need for a drain but perhaps necessitating a requirement for a fresh water trough along the base of which was possibly placed a fence. Interestingly, the large pit [1576] located immediately outside the gully on the south-east side (illus 18) was lined with the same type of clay. A similar ditch structure at Carronbridge set on free draining gravel is thought either to be a deliberately deep ring-groove to aid in the support of a large span roof, or perhaps an enclosure ditch associated with an internal revetted bank (Johnston 1994). However, the large U-shaped ditches of two similar structures, one at Burradon in Northumberland where the ditch was approximately 2m wide and 1m deep and infilled with blue grey clay silt (Jobey 1970), and one at Thorpe Thewles, in Cleveland (Heslop 1983) have been interpreted as drains. The use of clay lining in ditches and gullies is not an isolated phenomenon; the northern ditch terminal of the late Iron Age enclosure at nearby Shiels was thought to have been deliberately lined with clay in an effort to prevent the collapse of the ditch sides (Scott 1996).

Within the interior of S1, but off-set from the centre, is what appears to be a small circle of postholes, some 3.5m in diameter. Given the size and location of these they are unlikely to have functioned as substantial roof supports, linked by a ring-beam. It seems more likely that they formed a small isolated structure or stock enclosure; the charred assemblage of predominantly weed seeds derived from one of the postholes could have been fodder (Vaughan-Williams supra). Given all the evidence it is tempting to interpret S1 as an elaborate stock yard rather than a domestic dwelling. Artefacts included an iron ring and a few cannel coal roughouts and unworked blocks recovered from the fills of the gully.

Structure 4: Despite considerable plough truncation S4 conforms to the classic round-house design with an internal ring of load bearing posts (illus 16), presumably connected by a ring-beam and an external post and fence/ wattle wall which would have born a relatively minor load (Guilbert 1981, 299 & Hill 1984). An alternative explanation, and in this author's opinion given the concentricity of the two structural elements a less likely one, is that the internal postholes supported an outer wall while the gully formed an encircling hurdle fence (Pope 2003, 94–5).

Structure 3: The two entrances of S3 (illus 16) sets it apart from the standard roundhouse layout. This, together with the absence of any internal postholes suggests a roofless, self-supporting wattle-fence enclosure, the function of which remain elusive; one plausible use would be the controlled handling and separation of stock for shearing and milking, etc, herding them in through one entrance and out through another. Larger Iron Age structures with double entrances have been excavated at Carronbridge, Dumfries and Galloway (Johnston 1994), Rispain Camp, Whithorn (Haggarty & Haggarty 1983), St Germains, East Lothian (Alexander & Watkins 1998), and Broxmouth, East Lothian (Hill 1982), as well as a Bronze Age example from West Acres, Newton Mearns (Toolis 2005). The latter is interpreted as a domestic dwelling with an attached tapering fence construction designed to funnel and control stock. One fragment of pottery (Vessel 3) was recovered from the fill of S3, but a few other fragments of the same vessel were recovered from the backfill of the inner ditch (illus 34). The pottery evidence does not demonstrate that the backfilling of the inner ditch and the construction of S3 were contemporaneous (this is not possible as, prior to plough truncation, S3 would have overlain the inner ditch); rather, it indicates either the haphazard and liberal dumping of rubbish in the general area of the ditch with some of this being incorporated into the backfill of the structural elements of S3, or (though less likely) the post-depositional disturbance of the upper ditch fill by ploughing which dragged the pottery sherd

from the ditch to become incorporated within the gully fill.

Structures 5 & 6: S5 and S6 are both severely plough truncated but where architectural features survive these are very similar, comprising roughly concentric circular gullies that presumably held wattle fencing/walls (illus 5 & 17). These structures could be described, depending upon the stratigraphic relationship between the gullies, as simple or double-ring structures (Pope 2003, 97). Similar ephemeral 'house' structures were recorded at Shiels (Scott 1996). It is unclear whether these structures were roofed. The inner ring-groove of S6 may have housed supporting stakes, but there are no obvious means of support in the remaining grooves other than that afforded by the groove, the fence itself or possibly by means of a sleeper beam (Guilbert 1981, 299). Pope (2003, 99) suggests that rather than being a structural feature an outer ring-gully could either have held a fence designed to protect thatch from being grazed by livestock (Type 2) or, where close to the internal post or stakehole ring, could have provided a space for storage or livestock beneath the eaves (Type 1). A possible entrance occurs on the eastern side of S5, although none is discernible for S6.

ECONOMY, OCCUPANCY AND SOCIAL CONTEXT

There is little material evidence to indicate what the function and economy of the enclosure was, or whether it changed over time. The available data is largely limited to the period when the ditches were being infilled (Block 4) and it is clear that familiar domestic tasks were being carried out that involved fires on which wood and silty peat turves were burnt, the use of stone tools and the local production of pottery. The semi-industrial production of cannel coal jewellery roughouts was also carried out. Surprisingly there is no evidence from the site for the exploitation of marine or estuarine resources; although activities such as fishing are unlikely to leave much evidence in the archaeological record we might expect shell to have survived.

There are features of the ecofact and artefact assemblage from the Braehead enclosure which suggest that it may have been occupied only intermittently, perhaps seasonally. Certainly its location, on the tidal floodplain of the River Clyde would make occupation at certain times of the year very difficult. The rapid accumulation of, and the semi-permanency of ditch water, is attested by the recorded microlaminated ditch silts (Ellis supra) and the survival of waterlogged wood; indeed, the rapidity of flooding was witnessed during sudden downpours throughout the excavation (illus 39). Although now canalized the River Clyde in its natural form would have been prone to localized overbank flows as channels became blocked by uprooted trees and vegetation during storm events; indeed the presence of brackish water in the ditch terminals is confirmed by the diatom analysis (Breen supra). It therefore seems likely that for much of the winter and early spring the site was periodically flooded and waterlogged, and consequently treacherous to approach, at least on foot; in all, not a very pleasant place to inhabit.

The lack of artefacts and ecofacts could be either a consequence of poor survival due to soil conditions and plough truncation, or it could reflect a real absence. At Fisher Road West, McCullagh & Mills (2000, 78) suggested that a similar absence of material evidence coupled with the disproportionate size of the enclosure for purely domestic purposes was because it primarily functioned as a place for a select portion of society to meet, produce and exchange and that this only took place at certain times of the year. The paucity and nature of the material recovered from Braehead could similarly be interpreted as reflecting episodic, and probably seasonal use rather than chance survival, especially as the pottery and macroplant material which does survive is in a moderate condition and there is no indication of loss due to physico-chemical weathering.

The lack of evidence for the processing of cereals on site, together with the dearth of quern stones, supports the thesis that the site was used for relatively short durations, implying that pre-prepared or semi-prepared food stuffs were perhaps used. A very similar assemblage, with few or no quernstones and no evidence for cereal processing, was found at Fishers Road West (although interestingly the neighbouring and largely contemporary enclosure of Fishers Road East yielded solely processing debris (Hazelgrove & McCullagh 2000, 183)), and from Carronbridge (Johnston 1994, 281). There is also an absence of pits at Braehead, which is unusual on Iron Age domestic sites, and is perhaps a further indication of short and specific periods of use, although their absence could be also be explained by seasonal fluctuations in the groundwater levels. Hunter (supra) suggests that the predominance of unfinished cannel coal artefacts is an indicator of the deliberate episodic use of the site. It is conceivable that the natural cannel coal which occurs as isolated clasts within the alluvial sands was preferentially collected at relatively low water and/or following periods of flood and erosion. The presence of miniscule pieces of burnt animal bone within the hearth cleanings and the absence of large animal bones at Braehead may also be a function of its seasonal and temporary occupation. The implication is that meat was brought to site already prepared and that animals such as cattle and sheep were not slaughtered or larger meat joints prepared and consumed on site because the young stock was being grazed and fattened on the lush spring and summer meadows of the floodplain, being slaughtered and over-wintered elsewhere.

The archaeological evidence for the repair or rebuilding of structures is limited to a replacement of the ring-groove of S2, the multi-phased nature of the gully of S1 and the possible replacement of a portion of the outer wall of S6. The uncut survival of the foundations of many of the structures would indicate that these were largely left to rot in situ with the new structures being built elsewhere on site (which also suggests the availability of clear space on which to re-build). Interestingly, it has been demonstrated that repairs to roundhouses are relatively uncommon (Halliday 1999). It would seem likely that at Braehead every day damage and structural deterioration would have been amplified if the houses were unoccupied during the worst of the winter months. Barber and Crone (2001, 71) have demonstrated that timber structures tend to be short-lived, occupied for a few decades at most; we can presume that, where maintenance was sporadic due to episodic occupation, then their duration of use was likely to be far less. The possibly annual return to the site would have necessitated cleaning and repairing, and perhaps the designing of new architectural forms, be they ditches, palisades or shelters, and such acts may have served as a means to strengthen and reiterate social ties and obligations between people or groups (Chadwick 1997).

The entrance of the ditched enclosure(s), various palisades such as PC, PE and PF, and structures S1 and S2 are oriented approximately east/north-east. Pope (2003, 173; 2007, 213) suggests that the choice of orientation of entrances may have been governed by prevailing wind as well as orientation to maximize morning sunlight with an east/north-east orientation focused on the spring and summer sunrise. Pope (ibid) goes on to suggest that variations in orientation may reflect seasonal patterns of occupation. This would imply that the Braehead structures largely reflect spring and summer use. However, the western entrance of S3 and the northwestern entrances of palisades PA and PG demonstrate that factors other than environmental concerns, presumably social and practical, governed the locating of these entrances.

The episodic and probable seasonal exploitation of the floodplain appears to have continued into the Late Iron Age as attested by the enclosure at Shiels located just to the west of Braehead (Jack 1996, 69). This site was similarly affected by its low-lying position with well preserved organics surviving within the ditch fills. Shiels also lacked quern stones, although

Scott suggested dark stains near the entrance were quern stances rather than postholes (Scott 1996, 68). Similarly, there appears to have been no evidence for the processing of grain on site.

There are numerous sites in the areas which could be contemporary, and which may have formed elements of an integrated settlement pattern, some of them being occupied/used during periods of temporary abandonment at Braehead. Larger sites include the univallate fort of Craigmarloch, which had its inception in the Bronze Age and continued in use into the Iron Age (Nisbet 1996); charcoal from the later wall core yielding a radiocarbon date of 1985 ± 40 BP (Alexander 1996, 17). A series of nearby hillforts are also attributed to the Iron Age, for example Walls Hill near Howwood (described by Feacham (1965) as being large enough to constitute an *oppidium* of the Damnonii), Dunwan near Eaglesham, Marshal Moor and Castle Hill both near Bridge of Weir, and Duncarnock near Newton Mearns (Newall 1964; Alexander 1996; Alexander 2000). Sheep Hill, a multi-phased vitrified fort, with occupation extending into the first century AD lies to the north-east and across the River Clyde. Other 'fortified' lowland settlements that may have been occupied at the same time as the later phases of Braehead includes its nearest neighbour, Shiels, dating to around 1930 ± 140 BP (SRR–576) and 1640 ± 80 BP (SRR-577) (Scott 1996) and the cropmark site of Barochan Cross (Alexander 1996; 2000), located on a low hill some 10km to the west of Braehead. The latter bears an uncanny resemblance to Braehead as it also exhibits three concentric ditches with internal structures but it remains unexcavated and undated. In addition numerous unenclosed hut-circles, groups of hut-circles and homesteads are recorded on the higher ground to the south of the Clyde basin (eg Newall 1964; Alexander 1996; Alexander 2000).

To the west of Braehead and along the southern bank of the River Clyde are at least four crannogs, Erskine Bridge, Langbank East, Langbank West and Dumbuck (Sands & Hale 2001). Radiocarbon dates from Dumbuck, which is located on the northern side of the River Clyde, date the site from the second century BC to the second century AD, although the authors argue for a single phase of construction (Sands & Hale 2001, 48). Similarly, the radiocarbon dates from the Erskine Bridge crannog date the site from the third century BC to the second–third century AD (Sands & Hale 2001, 48). Langbank yielded a mid-first century AD penannular brooch and a second century AD comb (MacGregor 1976, 275), and although the security of the contexts from which these artefacts were derived is open to question (Sands & Hale 2001, 49) they nonetheless indicate activity on the crannog during the same period that the other nearby crannogs were being used. Sands and Hale (2001, 48) note the relatively high number of log boats recovered from along the River Clyde and its clear exploitation for resources, transportation and communication. Furthermore, they suggest that shallow stretches of river (prior to its canalization) such as that near Dumbuck and that at Kilpatrick sands could have been used in the summer as fordable crossing points both for people and animals, with the crannogs acting as location markers or even control points. The Braehead enclosure may have lain on a route leading to and from one such river crossing and in its later phases functioned not only as a base for controlling access to rich grazing land but also as some form of exchange and bartering point for material goods. It remains a matter of speculation as to whether the final abandonment of the Braehead site was due to the presence of the Romans, or occurred prior to the arrival of Roman forces in the late first century AD.

SUMMARY

The enclosure at Braehead represented the rare survival of a large cropmark site within an expanding industrial landscape which was clearly threatened by future commercial development. Excavation revealed that it had been severely damaged by plough truncation which had resulted in the loss of all floor levels,

hearths and most occupation deposits. However, the total excavation of the site has demonstrated that such plough truncated later prehistoric Scottish sites are not necessarily completely impoverished in terms of artefacts and ecofacts, as is often indicated by smaller scale, sample excavation; indeed, given the right conditions these can survive in significant quantities, especially within ditch fills.

The inception of Braehead appears to have begun with the burning off of the floodplain vegetation and the construction of an oval palisaded enclosure probably sometime around the mid first millennium BC. This was gated in its northwestern sector and was aligned with two tear-drop shaped features. Interestingly, the site never expanded beyond these two features. A subsequent period of abandonment ended with the construction of a second oval palisaded enclosure which roughly followed the route of the first but had an eastern entrance. Again there seems to have been a period of abandonment before the erection of an apparently unenclosed substantial roundhouse which seems to have undergone one major repair or re-build. This was followed by a massive ditch and bank building phase, although it remains unclear whether the three concentric ditches and banks with their aligned eastern entrances were contemporary. These began to infill with sediment soon after their construction and were later used as dumps for midden and domestic waste from an otherwise unrecorded phase of site use. Subsequently, around 200 BC the inner and middle ditch entrances were gated and possibly the circuit of the enclosure was surrounded by palisading. Finally the settlement expanded out over the inner and middle ditch, but appears to have been confined within the outline of the infilled outer ditch. Use of the site probably continued into the first century AD.

In common with Fisher Road West (McCullagh & Mills 2000) and Carronbridge (Johnston 1994) there is little evidence for the economy or economies of the site throughout its complex history. This may well be partially due to the plough truncated nature of the site and the consequent reliance upon the largely midden derived ditch fills for material evidence, but it may also be a reflection of the temporary and episodic nature of the use of the site for much of its existence.

For example, the lack of chaff, the small quantities of grain and the lack of quern stones could be seen in terms of a temporary stay, in that only processed cereal and flour was brought onto the site because 'other' tasks took precedence during its occupation. The absence of spindle whorls suggests that woven fabrics were not made on site, which would be unusual if the site were occupied all year round. There is no evidence for metalworking on site; all the fuel residue was produced in low temperature domestic fires which were fed with a wide variety of fuel types including mixed wood, peat, silty peat and perhaps even dried dung. Pottery, for every day domestic use, was made on the site, but appears to have been a relatively rare commodity with perhaps organic containers being used in preference. The full excavation of the site has allowed us to more fully understand the hitherto understudied cannel coal bracelet manufacturing process and the apparent specialization of Braehead as a roughout manufacturing site. However, it seems very unlikely that the production of cannel coal bracelet roughouts was a primary function of the site as there is too little material; rather their production should be viewed as just one of the many tasks undertaken on the site, most of which did not leave archaeological evidence.

All in all, it seems unlikely, given the evidence for the seasonal flooding of the site and consequent difficulties of access, together with the small amount of ecofactual evidence gathered from the site, that Braehead was permanently occupied. Rather, it is suggested that the low lying palisaded site was the focus of activity during the late spring, summer and early autumn, perhaps for the grazing, breeding and later in the season the milking of cattle, with associated cheese production. Braehead is

not unique in its episodic and/or seasonal use; Buiston crannog (Crone 2000, 110), Fisher Road West (McCullagh & Mills 2000, 78), Carronbridge (Johnston 1994) and Dumbuck crannog (Sands & Hale 2001) have all yielded evidence which has been interpreted in terms of intermittent occupation. These sites are part of a growing corpus with evidence of intermittent occupation which is challenging previous widely held assumptions of continuous and long term occupation of prehistoric and later sites.

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