ART. II – *A Bronze Age burnt mound in lowland Cumbria: excavations at Garlands Hospital, Carlisle, 1997*

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THIS report presents the results of a geophysical survey and excavation undertaken by the Centre for Field Archaeology (CFA) in summer 1997 prior to development to the north of Garlands Hospital, Carlisle (NGR: NY 430 540). The site comprised 17.8 hectares (44 acres) of open field between Harraby School to the north and Garlands Hospital to the south, with the M6 motorway and London Road, Carlisle to its east and west respectively (Fig. 1).

Lancaster University Archaeological Unit (LUAU) carried out a preliminary archaeological evaluation of the site in 1996 (Leah, 1996). The sole feature of archaeological significance revealed by that evaluation was a spread of heat-affected sandstone fragments within a charcoal rich matrix, identified as a probable burnt mound that had been ploughed flat. Subsequent geophysical survey and excavation undertaken by CFA on this feature confirmed the first burnt mound to be recognised in lowland Cumbria.

Geophysical Survey

A geophysical survey was conducted over an area of *c*.1.6 hectares with the primary aim of attempting to define the full extent of the probable burnt mound (Fig. 2). A combination of resistivity and gradiometry was used; with coverage of the whole area conducted by resistivity and the northern half by gradiometry, focusing on the burnt mound, but with the intention of revealing any additional features in its vicinity.

Both resistivity and gradiometry have been used previously to great effect in the location of burnt mounds (e.g.: Hunter and Dockrill, 1990; Hodder, 1990; Dockrill and Gater, 1992; Slater, Kulessa and Barton, 1996). However, other features of archaeological interest, such as ring ditches, are often less clear from gradiometry than from resistivity (Neighbour, 1996). Consequently, application of both techniques was regarded as appropriate for this study.

Resistivity survey with the twin probe array, typically used in archaeological investigations (Clark, 1990, 44-46) will detect features such as buried walls, stone foundations, and ditched features with a normal maximum detection depth of *c*.0.5 m. Since the depth of topsoil at Garlands varied between 0.20 and 0.25 m (Leah, 1996, 7) any archaeological features present were well within the limits of penetration of the 0.5 m twin probe array. The equipment used was the Geoscan RM15 resistivity meter. A sample interval of 1 m was used: sufficient for the detection of the burnt mound and associated features.

Gradiometry is especially useful in locating features of enhanced magnetic susceptibility such as hearths and kilns. Roasted stones within burnt mounds have an enhanced magnetic susceptibility which can be observed as a characteristic magnetic signature (Hunter and Dockrill, 1990, 65). The equipment employed was

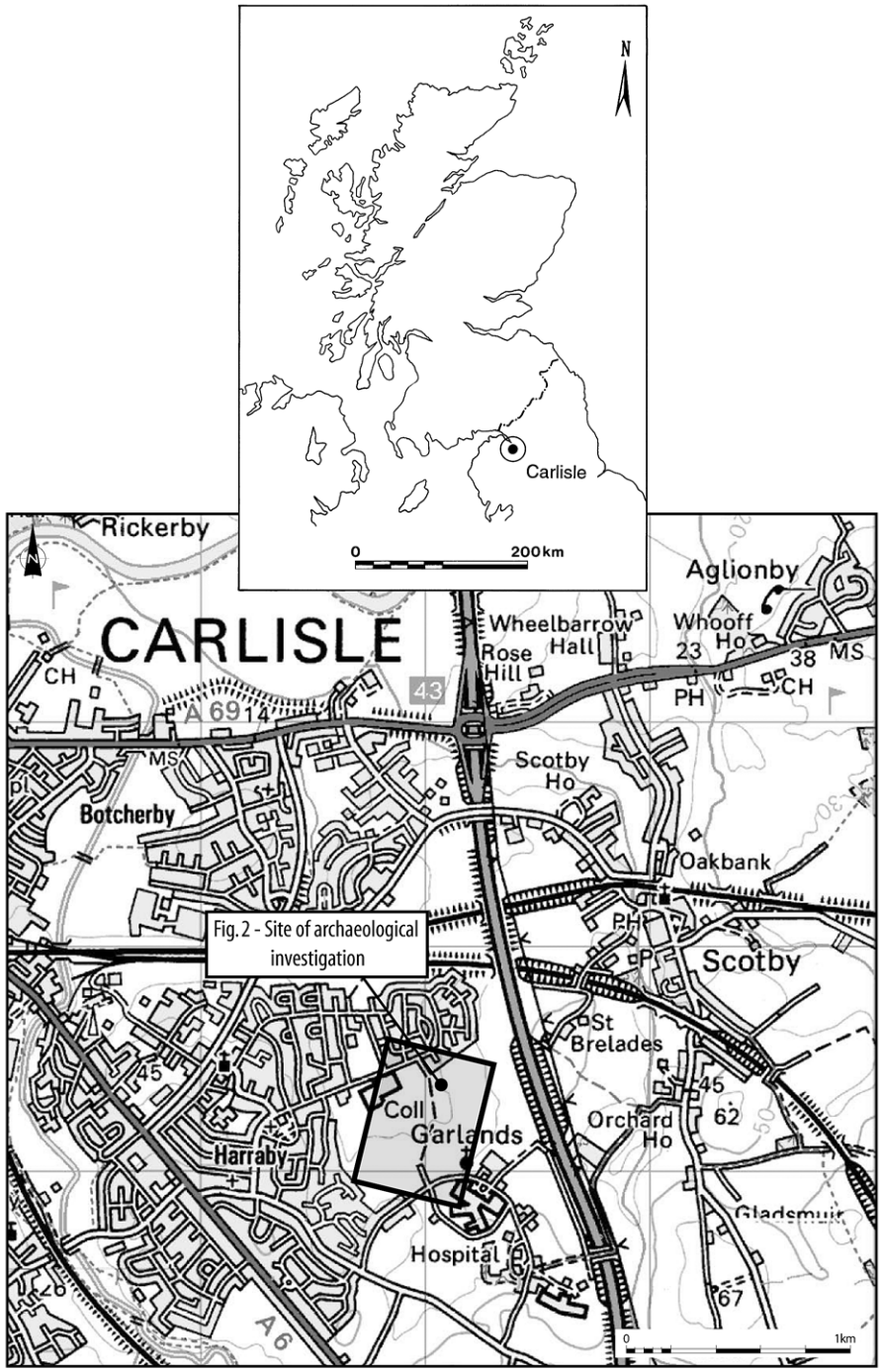

FIG. 1. Location maps

the Geoscan FM18 gradiometer. A traverse interval of 1 m was used with a sample interval of 0.25 m along each traverse.

Data from both instruments was processed and displayed using Geoplot 2.02 (Geoscan Research). The data from the survey area has been displayed as grey scale plots (Figs 3a and 3b). Grey scale plots clip the data set at extreme magnitudes but are generally best at revealing fine structure. An interpretative plot of the geophysical survey results is presented as Fig. 3c. A trace plot of the gradiometer data from the vicinity of the burnt mound (Fig. 3d) shows the full data range, highlighting the changes in magnitude within the data.

The extent and shape of the putative burnt mound were demonstrated by both the resistivity and gradiometer survey (Figs 3a and 3b). The latter technique confirmed that the feature was a burnt mound, as it demonstrated the characteristic magnetic signature of an aggregation of roasted stones, visible on the gradiometer plots as an area of enhanced magnetic susceptibility (Figs 3b and 3d). The mound had evidently been spread by ploughing, as it did not have the horseshoe shape typical of this class of monument. Rather, it appeared as an oval measuring *c.*30 m NS by *c.*20 m east-west that had clearly been cut by the concrete track at the western side of the survey area (Fig. 3c).

The other features on the survey plots are linear or curvilinear. The high magnetic susceptibility of most of these indicated that they were field drains or culverts. Resistivity survey produced a single anomaly, in addition to the burnt mound, which was thought might be of archaeological significance. Subsequent excavation, however, demonstrated that this was not the case (Neighbour, 1997).

The burnt mound

The burnt mound was located in the extreme northern corner of the development area. A trench (Fig. 2, Trench 1) was excavated in order to uncover its full extent as revealed by the geophysical survey. A combination of machine and hand excavation was used. All machine excavation was conducted using a flat-bladed ditching bucket under constant archaeological supervision. Initially, the trenches excavated by LUAU were re-excavated, then topsoil and turf were removed from the whole of the mound by machine, leaving a single, L-shaped baulk. Once the burnt mound had been exposed, cleaned by hand and planned, the burnt stones were removed by machine, leaving a number of baulks (Fig. 4). The features identified below the mound were excavated by hand, as were the baulks, where appropriate. Bulk samples were taken from all deposits and pit fills.

The mound (102) consisted of heat-affected and shattered sandstone and metamorphic stone within an organic-rich matrix up to 0.5 m thick and was spread across an area measuring *c.*20 m north to south by at least 15 m east to west (Figs. 4 and 5). The western extent of the mound was not exposed, as it ran under a modern concrete track that was still in use at the time of the excavation.

Five pits (104-108), all filled with burnt mound material, were sealed beneath the mound and one further pit (103) was cut through the burnt mound (Fig. 4).

Thin wooden boards were discovered on the flat base of each of two, sub-circular pits of over 1 m diameter (106 and 108; Figs. 4 and 6). It is possible that this wood was the remains of a pit lining. However, no trace was found of a wooden lining on

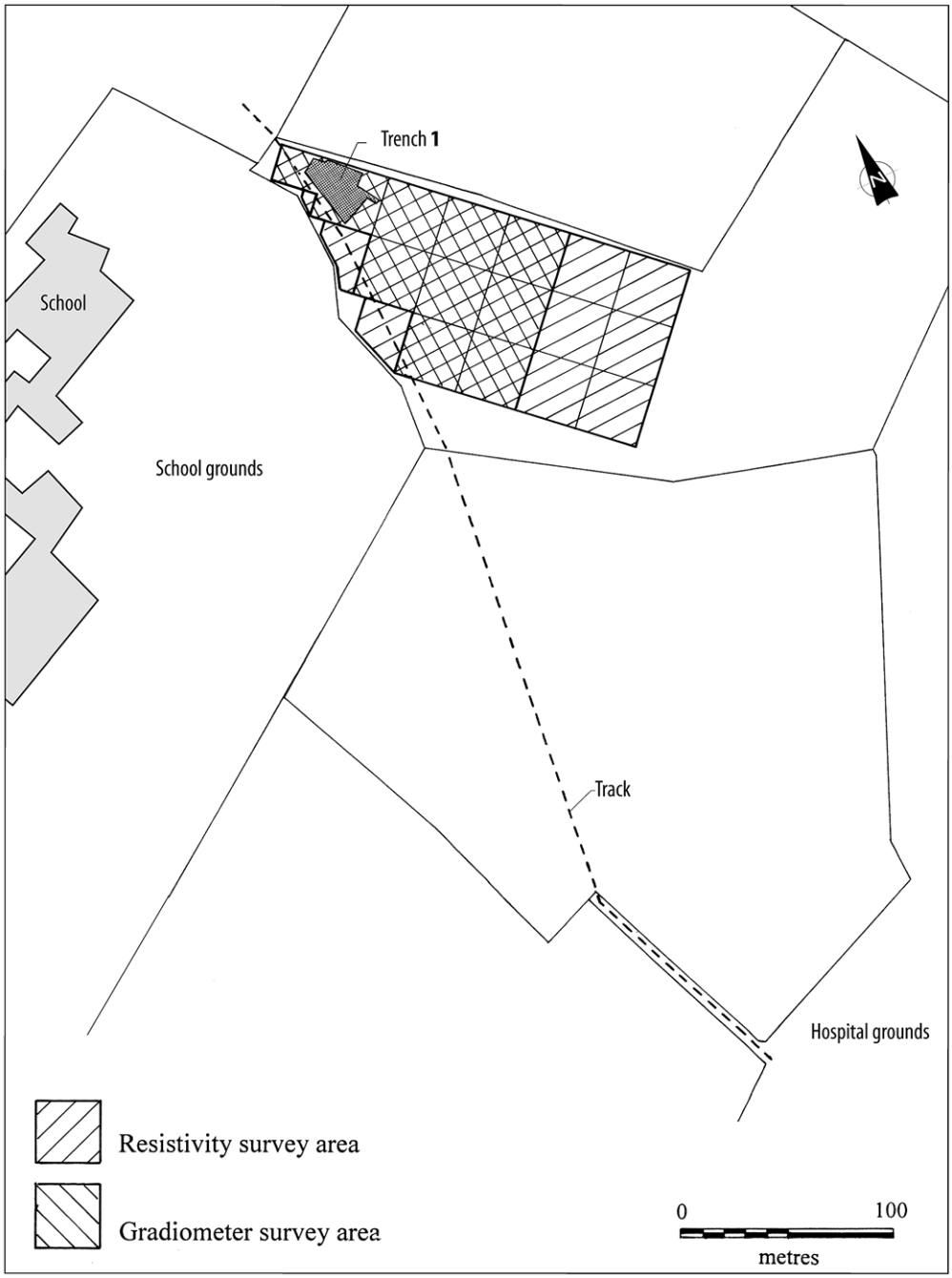

FIG. 2. Geophysical survey and trench location.

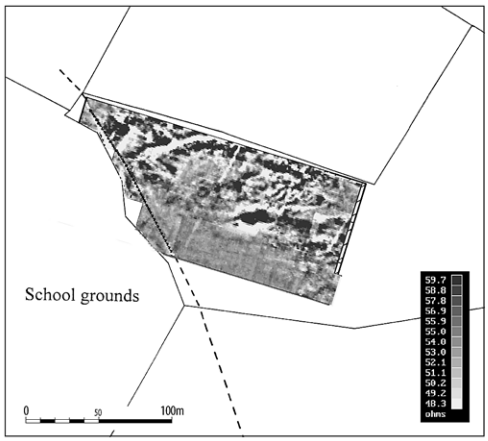

Fig. 3a - Geophysical survey results: resistivity.

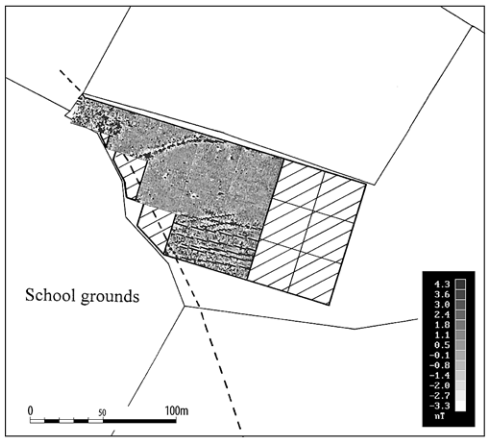

Fig. 3b - Geophysical survey results: gradiometry.

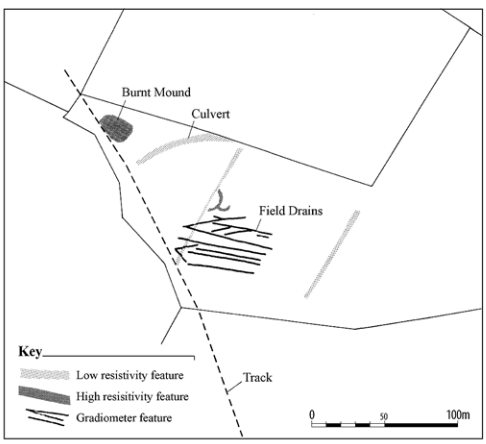

Fig. 3c - Geophysical survey results: interpretative.

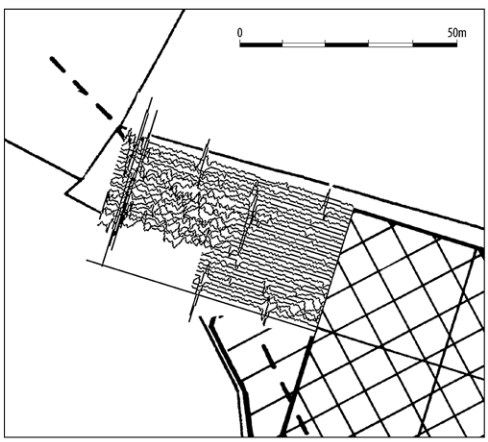

Fig. 3d - (detail) Geophysical survey results: detail of gradiometry results showing burnt mound.

FIG. 3. Geophysical survey results: (a) resistivity; (b) gradiometry; (c) interpretative plot; (d) detail of gradiometry results showing burnt mound.

the sides of either pit and it is possible that the survival of wood in the base of the fills is due to more consistent waterlogging at this level and is, therefore, a consequence of differential preservation. Equally, it is possible that the sides of the pits were never lined.

Between these two features lay a larger, oval, concave pit (107; Fig. 6). This pit had a layer of charcoal-rich silty clay overlying an orange, sticky clay and charcoal at its base and it seems likely that it had been used as a hearth.

A second oval pit (105; Fig. 6) with a flat bottom lay about 5 m south-east of the group of three pits just discussed (106-108); and a circular pit (104) lay *c.*1 m to the east of pit 106. The fill of pit 104 was similar to the bulk of the burnt mound material, with a higher charcoal content.

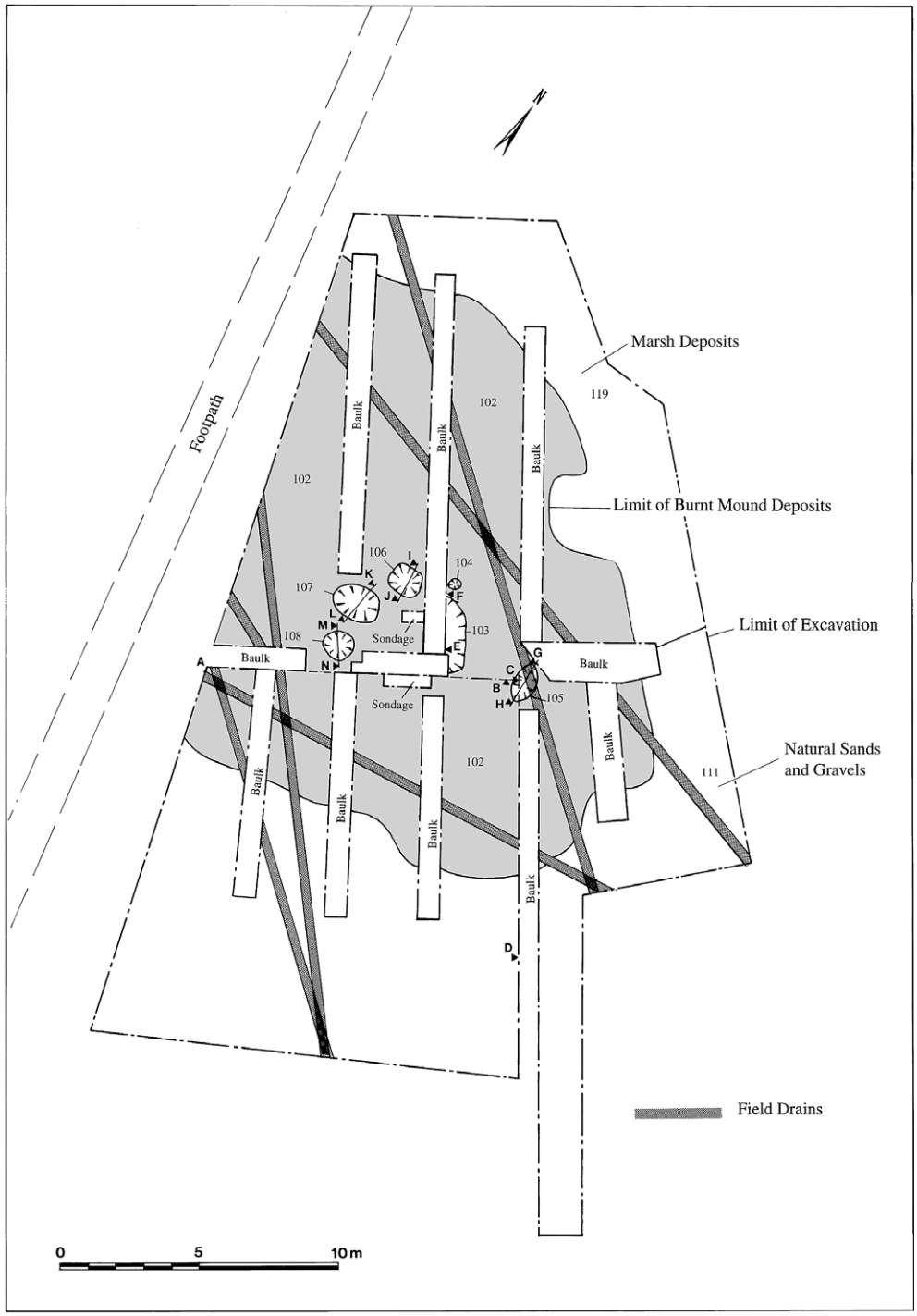

FIG. 4. Plan of burnt mound and associated features (capital letters indicate positions of drawn sections).

A sub-rectangular pit (103), between the group of three pits (106-108) and the oval pit (105), had been cut through the burnt mound and was backfilled with burnt mound material. The function of this pit is unclear, although it is clear that it had been formed some time after the burnt mound had fallen out of use.

The pits were all cut into naturally laid deposits, which varied in nature over the excavation area. To the north of the main east-west baulk were marsh deposits (119), which became deeper to the north. The marsh deposits overlay sands and gravels (111-114). To the south of the east-west baulk, no marsh deposits had formed, and the burnt mound (102) directly overlay sands and gravels (111-114).

It seems probable that a beck originally ran just to the west of the burnt mound. Six field drains were discovered cutting through the burnt mound (Figs 4 and 5) and additional field drains were detected by the geophysical survey. All led to an uncovered, gravel-filled ditch, which ran along the school fence on the western side of the track to the west of the burnt mound. It is likely that the ditch carried water that previously ran in a beck at, or close to, this location.

No artefacts were recovered during the excavation.

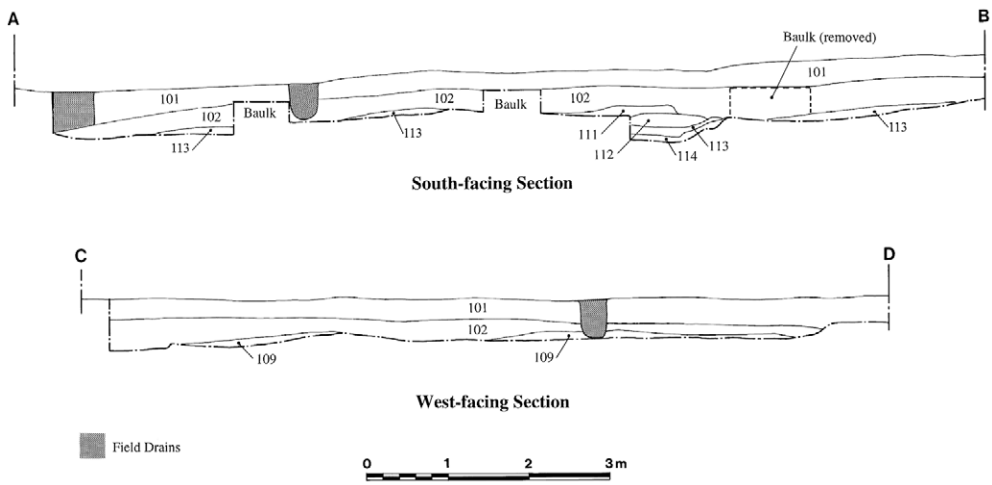

FIG. 5. Sections through the burnt mound (see Fig. 4 for locations).

Carbonised wood by Michael Cressey

Carbonised wood was recovered by flotation from bulk samples. Identifications were made using a binocular microscope at magnifications ranging between x10 and x200. Generally, identifications were carried out on transverse cross-sections on charcoal pieces of not less than 4-6 mm in width. Anatomical keys, listed in Schweingruber (1990); in-house reference charcoal; and slide-mounted micro-sections were used to aid identifications. Asymmetry and morphological characteristics were recorded. In this report "roundwood" is used as a term of reference for branch wood.

The charcoal samples were derived from burnt roundwood and were low in frequency and generally very small; the exceptions came from pit 105, which

contained many chunks larger than 4 mm. Five species were present within the assemblage: *Quercus* sp. (oak), *Alnus glutinosa* (alder), *Betula* sp. (birch) and *Rosaceae* type (wild cherry, blackthorn) and *Corylus avallana* (hazel). Hazel was the dominant species in the assemblage, but was nonetheless low in frequency with 40 identifications, amounting to a total weight of 5.3 g (pit 107). The assemblage was too small to allow environmental reconstruction of the locality of the burnt mound. All species of wood identified would have been suitable as fuel.

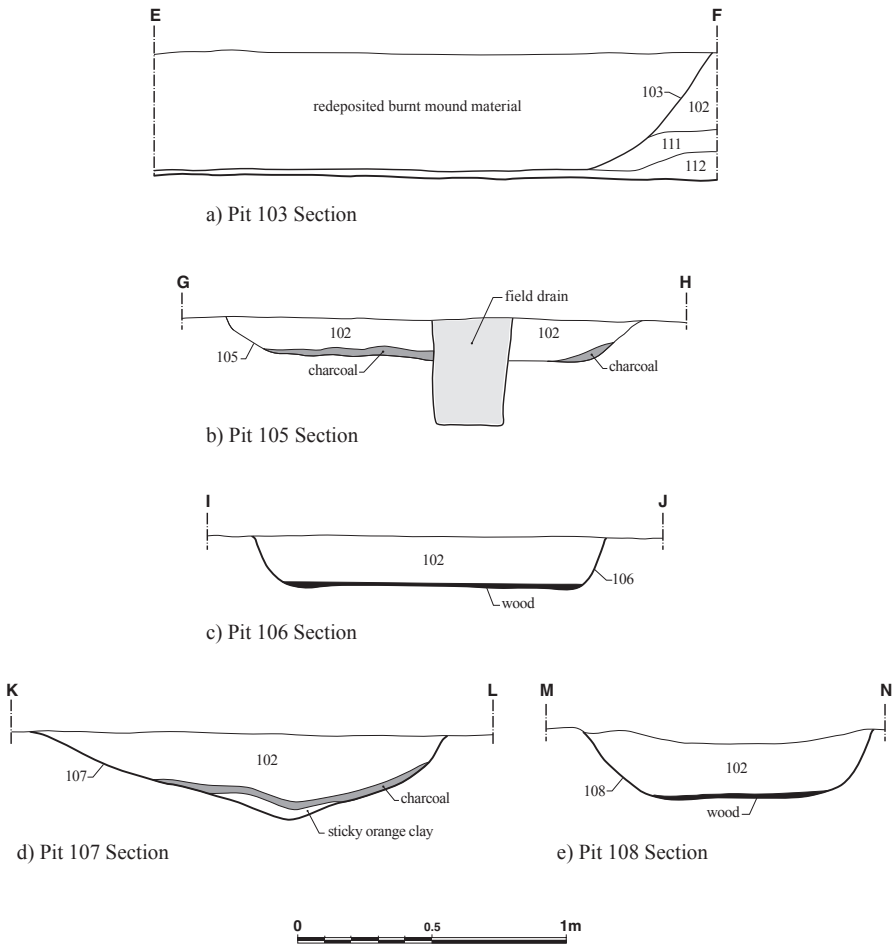

FIG. 6. Sections through pits (see Fig. 4 for locations).

Waterlogged wood by Michael Cressey

The waterlogged wood recovered from the pits (105, 106 and 108) was identified as alder, most of which was in a relatively good state of preservation; the exception was one piece from pit 106, which was heavily mineralised. All the wood appears to have suffered compression, which is unsurprising as all recovered pieces were originally under a mound. A single piece of wood from one of the pits (106) had clearly been

worked. It had been cut longitudinally from a tree limb and fashioned into a small board.

Radiocarbon dating results

Three samples of waterlogged uncarbonised wood were submitted to the Scottish Universities Research Reactor Centre (SURRC) for radiometric radiocarbon dating. The dates are cited at 1 and 2 sigma confidence limits (see Table 1). The calibrated age ranges were determined from the University of Washington, Quaternary Isotope Laboratory, Radiocarbon Dating Program 1987.

Two of the samples (GU-8007 and GU-8008) were derived from the wood recovered from the base of pits (106 and 108) sealed beneath the burnt mound, while the third (GU-8009) came from an *in situ* marsh deposit (119) sealed by plough-spread burnt mound material.

TABLE 1. Radiocarbon dating results.

Sample	Context	Identity	Years BP	1 sigma	2 sigma	Delta ^{13}C
GU-8007	106	Wood: *Alnus*	3730 ± 50	2202-2042 BC	2300-1985 BC	–27.9%
GU-8008	108	Wood: *Alnus*	3470 ± 90	1909-1685 BC	2030-1530 BC	–28.2%
GU-8009	119	Wood: *Alnus*	3910 ± 60	2484-2333 BC	2577-2205 BC	–26.7%

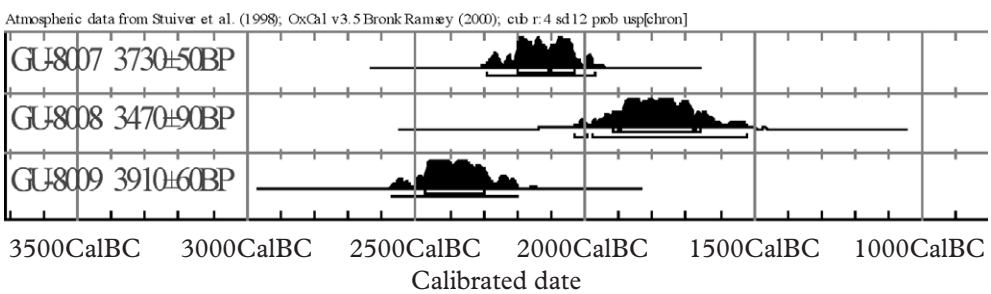

FIG. 7. Calibrated radiocarbon dates, after Stuiver *et al* (1998).

The dates obtained from the wood within pits 106 and 108 overlap at the 2-sigma range only when calibrated (Fig. 7). A Chi-squared test was run to determine if the dates were statistically identical. The test failed, indicating that the wood from the two pits cannot be viewed as contemporary. The wood from pit 106 has an older date-range than that from pit 108.

These results are surprising, as it would otherwise be tempting to assume either that the pits were contemporary or that one replaced the other in rapid succession. Rather, it appears that the burnt mound location was in use for a period of several centuries, although whether that use was continuous or occurred in two or more discrete phases is unknowable, given the imprecision of radiocarbon dating and the limited number of suitable samples. Nevertheless, the dates from the pits fall into the second half of the third millennium B.C. and first half of the second millennium B.C., the early Bronze Age, and are consistent with the radiocarbon dates from

other sites, such as the burnt mound at Sparrowmire Farm, Kendal (Heawood and Huckerby, 2002); four burnt mounds at Machrie North on the Isle of Arran (Barber, 1990, 102, Table 4); the wooden trough associated with a burnt mound at Beechwood Farm, near Inverness (Cressey and Strachan forthcoming); and a large number of wooden troughs beneath burnt mounds in Ireland (Brindley and Lanting, 1990).

Discussion

The burnt mound at Garlands Hospital is the first to be recognised in lowland Cumbria and is therefore an important contribution to our understanding of the distribution of these features.

The recorded distribution of burnt mounds within the British Isles can best be summarised as the extreme north (Shetland, Orkney and Caithness) and a large part of the west (Ireland, Wales, Isle of Man, South-west Scotland, Staffordshire, Warwickshire and the New Forest) (Hedges, 1975, 61). The first burnt mound to be excavated in the Western Isles, at Ceann nan Clachan on North Uist, extends this distribution further (Armit and Braby, 2002). A considerable number of burnt mounds has been recorded in southern Scotland, particularly in Dumfries and Galloway (Duncan forthcoming), and several putative burnt mounds have been identified through survey in southern Cumbria, in the Furness Fells near Coniston (Nixon, 1990). The Garlands site falls between these two regional distributions.

In Dumfries and Galloway the majority of burnt mounds known are on upland ground, beyond the upper limit of medieval and later cultivation (Duncan forthcoming). This pattern is repeated in the uplands of Clydesdale and Tweeddale (Ward, 1992), with burnt mounds often situated alongside streams. Thus, the apparent invisibility of burnt mounds in lowland areas may be a consequence of destruction by cultivation and concealment through alluviation (Duncan forthcoming). The burnt mound at Garlands is an important discovery, lying as it did on a gentle slope in lowland pastoral land close to Carlisle.

Burnt mounds vary in size, but are generally morphologically similar: a low, roughly horseshoe-shaped mound of heat-shattered stone, ash and carbon surrounds a large, water-tight trough; and traces of hearths are often found. Burnt mounds are normally found near to a source of fresh water. The remains at Garlands follow this pattern, with pit 107 interpreted as a hearth with two pits on either side (106 and 108), containing wooden boards in their bases, and considered likely to represent the remains of wooden troughs. A beck to the west of the mound would have formed the nearest source of water. Although the burnt mound at Garlands had been ploughed flat, there is no reason to assume that the stones had not once formed a horseshoe-shaped mound.

The materials used to ensure that a trough was watertight vary from site to site but appear to have been locally available. Wooden troughs have been noted on a number of burnt mound sites (e.g. Beechwood Farm, Inshes, Inverness: Cressey and Strachan, 2003). In areas lacking timber supplies, stone was used (e.g. Tangwick, Shetland: Moore and Wilson, 1999) and the use of clay linings has also been recorded (e.g. Mound 10, Machrie North: Barber, 1990). A good comparison for the Garlands trough is found at Mound 1, Dervaird, East Rhins of Galloway where

a partially stone-lined trough had oak timber lining in its base (Russell-White, 1990). The particular method used to line a trough probably also relates to the nature of the subsoil. At Garlands, the free-draining sand and gravel subsoil would require a trough lining to prevent water seepage and it is likely that alder was readily available from local woodland. The presence of two troughs at Garlands is unusual, but radiocarbon dates suggest that they were not contemporary and that the site was used over several hundred years. There was no evidence within the area excavated to suggest the presence of any associated domestic structures. However, associated structures are rarely found; two of the few examples known are at Liddle and Beaquoy on Orkney (Hedges, 1975).

Burnt mounds are predominantly dated to the second millennium B.C. (Bronze Age), although later dates are known from some regions and literary references attest to their formation continuing into the 16th century A.D. in Eire (O'Kelly, 1954). The dates from the Garlands burnt mound place it squarely in the Bronze Age.

There is debate concerning the function of burnt mounds, and although they are generally thought to be the remains of cooking places, with food boiled in the trough using hot rocks plunged into the water, alternative explanations have been offered, such as primitive saunas or sweat-lodges (Barfield and Hodder, 1987; cf. O'Drisceoil, 1988). Of course there is no reason that these sites should not have fulfilled both, and indeed other, functions (Barber, 1990, 101). The results from the excavation at Garlands provide no evidence with which to enhance this debate.

Past excavations in the locality have revealed evidence for considerable Bronze Age activity in the vicinity of the Garlands site. In 1861, during the construction of Garlands Hospital, about 15 Early Bronze Age funerary urns were discovered (Hodgson, 1956). Although the precise position of these finds is no longer known, it is clear that they must have been recovered from within a few hundred metres of the burnt mound at Garlands. More significantly, a number of recent excavations around Carlisle have uncovered the traces of Bronze Age settlement and potentially ritual sites of that period. During excavations to the north-west of Garlands at Botcherby Nurseries, a ring of post-holes was discovered and interpreted as the remains of a timber ring with a ritual use (Barkle, 1998). At High Crosby, to the north-east of Carlisle, a multiple palisaded enclosure of Bronze Age date was excavated (Flynn and McCarthy, 1994) and, closer to Garlands, at Scotby Road, Durranhill, a further palisaded enclosure was discovered associated with a variety of pits and other features, including burnt areas and deposits (Hirst, 1998). The excavators suggest that at least two phases of activity were represented by the remains. These sites fit into the northern English/southern Scottish settlement pattern which comprises unenclosed platform settlements, palisaded enclosures, field systems and hillforts (Annable, 1987). It is likely that the affinities recognised between these areas in terms of settlement types may also now apply to burnt mounds.

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A technical report detailing the work conducted at Garlands has been produced. A copy is lodged with the Cumbria County Council Sites and Monuments Record (Neighbour, 1997).

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