IV: South Arclid Quarry, Sandbach, 2009–2014

A Bronze Age Burnt Mound and Other Archaeological Discoveries*

by Nigel W Jones with contributions by Phillipa Bradley, Lorne Elliott and Fiona Grant†

The continuing expansion of South Arclid Quarry near Sandbach resulted in several phases of archaeological assessment, together with successive watching briefs during soil-stripping operations between 2009 and 2014. These were conducted by the Clwyd-Powys Archaeological Trust (CPAT) on behalf of Bathgate Silica Sand Ltd. While the archaeological discoveries have generally been restricted to a few unstratified finds and a small number of dispersed features that were largely undatable, site works in 2014 uncovered the probable remains of a Bronze Age burnt mound and associated water trough dated to 1530–1420 cal BC. While a number of similar features have been recorded in Cheshire and the neighbouring counties, this is the first such discovery in the Sandbach area. Analysis of charcoal associated with the burnt mound together with pollen from a nearby peat deposit have provided evidence for the nature of the surrounding landscape during the Neolithic and Bronze Age periods.

Introduction

Nigel Jones

The quarry (centred on SJ 7811 6142) lies in central Cheshire, some 2.5km north-east of Sandbach, 8.5km west of Congleton and 5km south of Holmes Chapel. The A534 Congleton to Sandbach road splits the quarry and crosses the M6 Motorway at Junction 17, some 300m west of the quarry boundary. The quarry is divided into North Arclid and South Arclid, the latter being the current sand extraction area (Ill IV.1).

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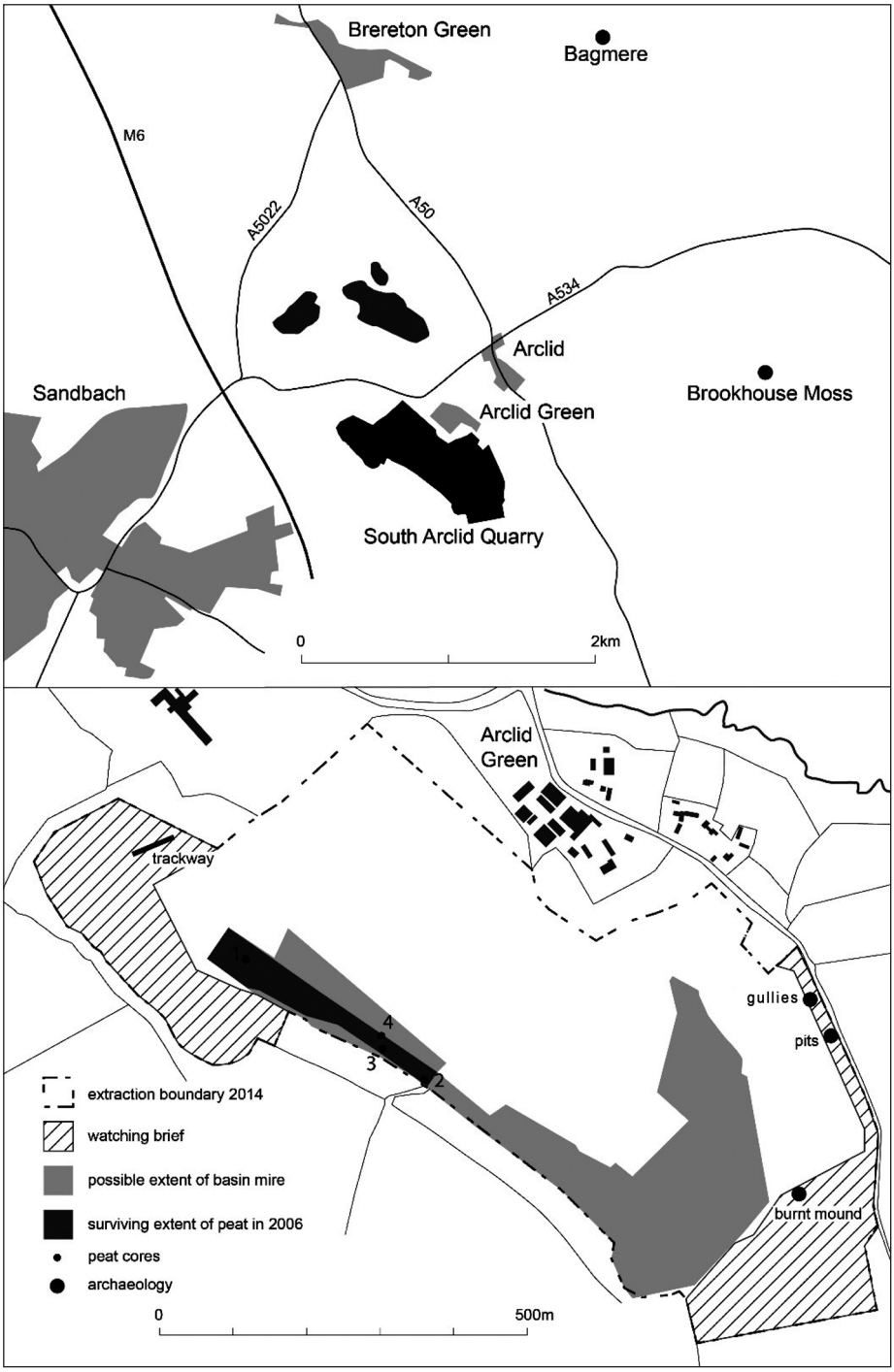
† Nigel Jones (Corresponding author), Principal Archaeologist, Clwyd-Powys Archaeological Trust, 41 Broad Street, Welshpool, Powys SY21 7RR. Email nigel@cpat.org.uk

Philippa Bradley, independent specialist, Faversham

Lorne Elliott, Archaeological Services, University of Durham. Email lorne.elliott@durham.ac.uk

Fiona Grant, Ardea Palaeoenvironmental and Archaeological Services



Ill IV.1 Location of South Arclid Quarry. (Scale 1.50,000) and plan of the quarry showing archaeological features and the basin mire. (Scale 1/10,000)

The topography is characterised by undulating farmland that typically lies at between 60 and 75m AOD. Small areas of mixed deciduous woodland survive, particularly in association with peat deposits. Cheshire contains a variety of lowland peat sites or mires, including basin, floodplain and valley mires, raised mires and peat-based organic soils (Shimwell 1985, 309). Around Arclid the majority of the mires have developed in depressions and hollows in the surface of the underlying fluvio-glacial sands and gravels.

The village of Arclid is first recorded as *Erclid* between 1188 and 1209; the place name underwent numerous changes in spelling over the centuries but is thought to have been originally derived from an old Norse or Danish name meaning 'Arnkell's hill-side' (Watts 2004, 16). The name Arclid Green, referring to the small settlement immediately to the north of the quarry, also suggests a possible medieval origin, as 'Green' place names are often first recorded at this time, although some may be as late as the fifteenth or sixteenth centuries (Prof N Higham, *pers comm*). Historical research and field survey, however, provided little evidence for the history of the quarry area other than identifying several areas of former ridge and furrow and the presence in the late nineteenth century of the Volunteers Rifle Range.

The first phase of expansion was carried out to the east of the existing quarry at the end of 2009, with subsequent phases of soil stripping in 2013 and 2014. The quarry continues to expand south-eastwards, with each phase of soil stripping being subject to a watching brief.

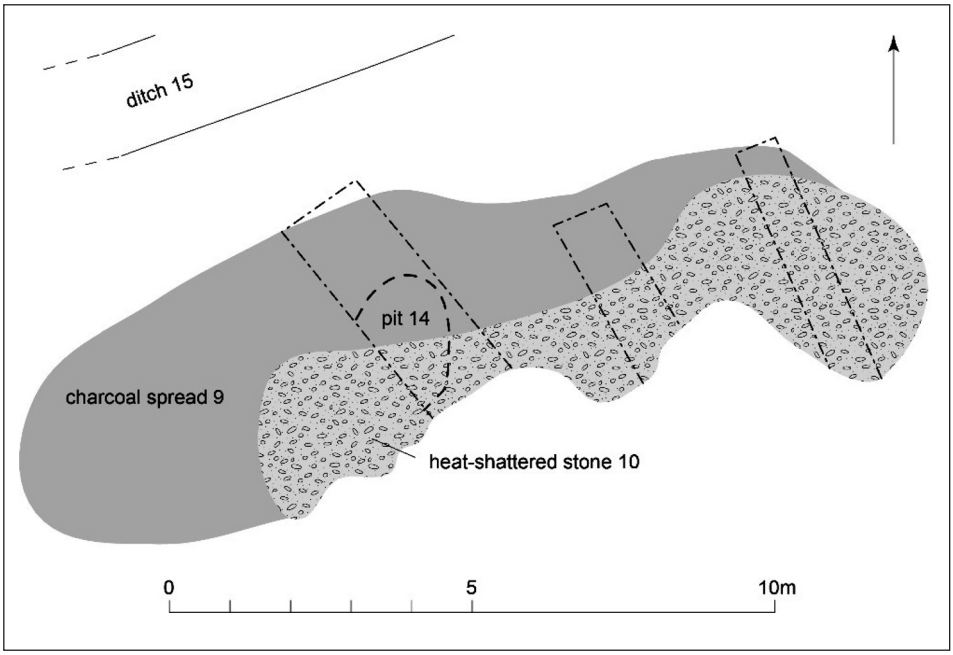
The excavation

The burnt mound and pit

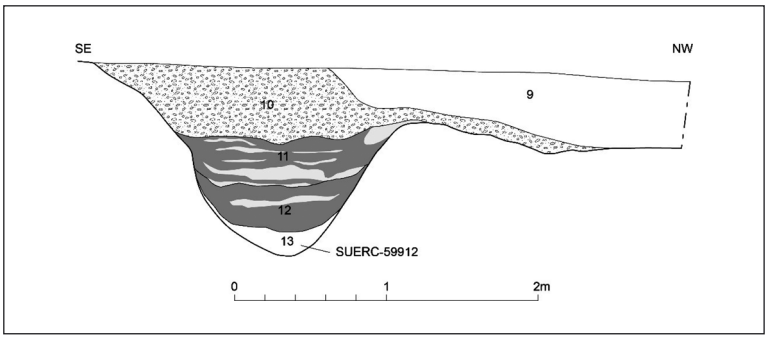
Soil-stripping operations at the eastern end of the quarry in May 2014 uncovered a concentration of burnt stones and charcoal, (10), centred at SJ 78725 61163, comprising an irregular spread within an area measuring 12m east to west by 5m metres north to south (Ill IV. 2). Three sondages were excavated across this area, providing differing results. The central and eastern sondages demonstrated that the spread was relatively shallow, no more than 0.2m thick. The western sondage revealed a greater thickness with the stones partly infilling a large, irregular pit, [14], about 1.9m across and 1.25m deep, with steeply sloping sides and a concave base (Ills IV.3–.4).

The primary fill of the pit, (13), consisted of a mid-brown silty sand, 0.15m thick, with very occasional charcoal flecks, the nature of which suggested an accumulation of humic material, apparently natural. This layer was sealed by very dark brown silt, (12), up to 0.35m thick, with a high charcoal content, and above this a black charcoally silt, (11), with horizontal lenses of fine yellow sand. The uppermost fill consisted of the heat-shattered stones within a matrix of black, charcoally silt, (10), that first drew attention to the presence of the feature. A single sherd of undiagnostic prehistoric was recovered from this layer. Radiocarbon dating of a sample of charcoal from (13) indicated a Bronze Age date of 1530–1420 cal BC (*see below*).

To the north of the pit the natural slope fell away, and it was evident that here the original ground surface had been sealed by a brown silty sand containing charcoal flecks, (9), which is likely to be a mixture of subsoil and cultivation soil redeposited through ploughing.



Ill IV. 2 Plan of the spread of material associated with the burnt mound, showing the location of Pit [14] and the excavated sondages. (Scale 1/125)



Ill IV.3 Section of pit [14] showing the location of the radiocarbon sample. (Scale 1/50)

The heat-shattered stones are likely to be derived from an archaeological feature known as a burnt mound, of which no other trace survives. They appear to have been deposited in the pit following a period of natural infilling and to have extended beyond its edge. There was no evidence to suggest the exact position of the mound, although it is likely to have been immediately adjacent to the pit in which the stones had been deposited. The pit is thought to have been dug as a water trough, a feature usually associated with burnt mounds (*see below*) and possibly providing access to the natural water table. The natural accumulation of sediment in the base of the pit indicates that it remained open for a period before gradual infilling commenced, initially through episodic deposits of charcoal interspersed with lenses of sand. Both are likely to have been wind-blown and their horizontal banding

Ill IV.4 Pit [14] showing the depositional sequence. Photo © CPAT 3724-0057

suggests that they were deposited in standing water. The charcoal presumably derived from an adjacent fire that would have been used to heat stones which were in turn used to heat water. Some time after the last use of the mound the heat-shattered stones were redeposited, partly within the pit, either as an act of deliberate clearance, or perhaps less likely through ploughing.

Miscellaneous features

A short length of a straight field ditch [15] was identified in the same area as the putative burnt mound (Ill IV. 2). This measured 1.25m in width and 0.65m in depth, and was aligned east to west. The primary fill, (17), consisted of a layer of fine brown sand up to 0.23m thick. This was sealed beneath a layer of silty black sand, (18), around 0.25m thick, with an upper fill, (20), of fine, light brown sand, 0.12m in thickness. The ditch produced a fragment of hand-made brick from the lower fill. Cartographic evidence indicates that the feature is related to a field boundary which is depicted on an eighteenth-century estate map and was still present when mapped by the Ordnance Survey at the end of the nineteenth century.

Two other features were identified in the same area as the burnt mound: a small pit measuring 1.2m in diameter and 0.4m in depth, and a small drainage gully, neither of which produced any cultural material. Four unstratified flints were also recovered from the same area (*see below*).

A small number of features were revealed around 220m north of the putative burnt mound (Ill IV.1) during the initial soil stripping for the eastern extension in October 2009, including a boundary ditch (SJ 7871 6145), which corresponded with a field boundary depicted on

the tithe survey of 1840. Four other undated features were also identified in close proximity to each other, including three small pits (SJ 78746 61407, SJ 78747 61401 and SJ 78747 61401) and an unusual feature defined by two curving gullies (SJ 78749 61413). There was no evidence to suggest the function of the pits or the gullies.

The western quarry extension in 2013 revealed only a former trackway, which is likely to be that depicted on the 1840 tithe survey.

The artefacts

Prehistoric pottery

A single sherd of undiagnostic prehistoric pottery in a dark grey, vesicular fabric was recovered from the upper fill, (10), of the pit [14] associated with the putative burnt mound. The sherd had no distinctive features to indicate a likely form or allow it to be attributed it to a period.

Worked flint

Philippa Bradley

The only other artefacts recovered during the 2014 watching brief were four unstratified worked flints: three flakes and a post-medieval gunflint. The flint is mid-dark brown in colour; cortex where present is buff and smooth. The flakes are irregular and one has been very heavily damaged by the plough – indeed it may be entirely natural. The gunflint is a small example with steep, neat retouch.

Palaeoenvironmental analysis of samples associated with the burnt mound

Lorne Elliott

A programme of palaeoenvironmental and charcoal analysis was conducted for three bulk samples, comprising the top, (10), middle, (11) and basal, (13), fills of pit [14], associated with the burnt mound.

Methodology

The samples were manually floated and sieved through a 500µm mesh. The flots were examined at up to x60 magnification using a Leica MZ7.5 stereomicroscope for water-logged and charred botanical remains.

Given the large quantities of charcoal retrieved from the samples, a minimum of 200 fragments per context was examined. Identifications were generally made on fragments >4mm following Boardman (1995). Contexts (10), (11) and (13) contained substantial quantities of charcoal and were therefore subsampled using a riffle box, with 7% analysed from contexts (10) and (11) and 50% from context (13). The <4mm fraction was scanned for the presence of any additional taxa. Fragments >10mm were described as large and <4mm as small. Fragments <2mm were considered too small for secure identifications, particularly in view of the poor preservation of much of the material.

Transverse, radial, and tangential sections were examined at up to x600 magnifications using a Leica DM/LM microscope. Analysis was undertaken following Marguerie &

Hunot (2007) and included examination of the number of tree rings and tree-ring curvature; where possible the diameter of roundwood was measured. The presence of pith, bark, tyloses, insect degradation and reaction wood and alteration by fusion or radial cracks were also recorded. Identifications were assisted by the descriptions of Schweingruber (1990), Gale & Cutler (2000) and Hather (2000), and modern reference material held in the Palaeoenvironmental Laboratory at Archaeological Services Durham University. Plant nomenclature follows Stace (2010). The different species were weighed and bagged separately, and material available for radiocarbon dating was cleaned of adhering material and wrapped in foil. One sample of alder charcoal from (13), the primary fill of the pit, was submitted to SUERC in East Kilbride for AMS dating.

Palaeoenvironmental analysis

The samples produced large flots, containing sizeable quantities of charcoal. Charred plant macrofossil remains were absent, and there was no evidence of food waste or industrial residues. Abundant fire-cracked stones were present in fills (10) and (11), and the fragment of prehistoric pot was recovered from the upper fill (10). Charred remains of the soil fungus *Cenococcum geophilum* occurred in low numbers, in the primary fill (13). The results of the palaeoenvironmental analysis are presented in Table IV.1.

Charcoal analysis

Total charcoal weights from the samples ranged from 130g (13) to nearly 2kg (11). Much of the material was within the <1mm fraction, but as much as 40% of the charcoal remains occurred in the >4mm fraction, of which 10% was >10mm. Positive identifications were obtained for a minimum of ten species comprising, in order of abundance, alder, hazel, oak, birch, holly, pine, yew, Maloideae, cherries and ivy. The results of the charcoal analysis are presented in Table IV.2.

Poor condition and comparable anatomical structure meant that fragments of hawthorn and apple were recorded as the subfamily Maloideae. The diffuse, porous nature and evenly spaced vessels of the Maloideae charcoal resulted in indistinct ring boundaries and prevented examination of curvature and ring count. Further identification of the genus *Prunus* (blackthorn, wild plum, bird- and wild cherry) was likewise prevented by poor preservation and small fragment size.

Complete roundwood charcoal containing pith and bark, charred buds and twigs, was absent, possibly reflecting an alternative use for material of this nature prior to burning, such as fodder. Charcoal fragments were generally subrounded to subangular and the condition varied from predominantly very poor (soft/friable) to moderate (firm). Frequent mineral inclusions prevented identification in some instances. Vitrification (low brilliance) and radial cracks were occasionally observed in fragments of oak and hazel charcoal.

A high incidence of insect degradation comprising unevenly edged holes from burrowing insects was noted in deposits (13) and (11) and to a much lesser extent in upper fill (10). Insect damage was more noticeable in larger fragments (>10mm) and was recorded in five different species (alder, hazel, birch, holly and oak) from the primary fill (13), nearly two-thirds of alder fragments and nearly half of hazel being affected. The number of affected

Table IV.1 Palaeoenvironmental analysis of samples from Pit [14]

Sample no *Context no*	<104> (10)	<105> (11)	<106> (13)
Volume processed (l)	18	17	15
Volume of flot (ml)	3800	4500	300
Residue contents			
Charcoal	+++	+++	-
Fire-cracked stones	++++	+++	-
Pot (number of fragments)	1	-	-
Flot matrix			
Charcoal	++++	++++	+++
Charred remains (total count)			
Cenococcum geophilum (Soil fungus) sclerotia	-	-	14
Identified charcoal (* = presence)			
Alnus glutinosa (Alder)	*	*	*
Betula sp (Birches)	*	*	*
Corylus avellana (Hazel)	*	*	*
Hedera helix (Ivy)	*	-	-
Ilex aquifolium (Holly)	*	*	*
Maloideae (Hawthorn, Apple, Whitebeams)	-	-	*
Pinus sylvestris (Scots Pine)	*	-	-
Prunus sp (Cherries -			
Blackthorn, Wild and Bird			
Cherry)	*	-	-
Quercus sp (Oaks)	*	*	*
Taxus baccata (Yew)	-	*	-

* = present; (+) = trace; + = rare; ++ = occasional; +++ = common; ++++ = abundant

taxa dropped to four for fill (11), with 40% of alder and a third of hazel fragments showing evidence of damage. For upper fill (10) only three species revealed evidence of degradation (18% of alder, 10% of hazel and 5% of oak), although fragments of yew showed signs of disease, possibly resulting from insect or fungal attack.

Several fragments of oak charcoal from (13) exhibited a warped structure, probably representing the remains of deadwood. Possible oak root wood (distorted anatomy, no visible growth rings and small random vessels) was noted in the primary deposit (13). Observed growth ring curvature indicates the use of small- to medium-calibre wood, with branchwood and stemwood anatomical properties noted from all of the deposits.

Table IV.2 Charcoal analysis of the samples from Pit [14]

	Weight (g) and no of fragments (F)		
Sample no *Context no*	<104> (10)	<105> (11)	<106> (13)
Alnus glutinosa (Alder)	10.382 (106F)	39.039 (168F)	9.128 (104F)
Betula sp (Birch)	0.189 (5F)	1.182 (7F)	0.224 (6F)
Corylus avellana (Hazel)	5.381 (73F)	4.692 (47F)	3.654 (51F)
Corylus/Alnus (Hazel/Alder)	0.445 (7F)	-	-
Hedera helix (Ivy)	0.125 (1F)	-	-
Ilex aquifolium (Holly)	0.046 (1F)	0.139 (5F)	0.215 (7F)
Maloideae (Hawthorn, Apple)	-	-	0.152 (3F)
Pinus sylvestris (Scots Pine)	0.283 (6F)	-	-
Prunus sp (Cherries - Blackthorn, Wild and Bird Cherry)	0.058 (1F)	-	-
Quercus sp (Oak)	3.517 (41F)	3.450 (26F)	2.042 (47F)
Taxus baccata (Yew)	-	0.438 (2F)	-
Bark	1.390 (19F)	2.581 (9F)	0.139 (6F)
Indet >4mm	0.302 (6F)	1.219 (22F)	0.501 (7F)
% of fragments >4mm analysed	7	7	50
Charcoal >4mm analysed (g)	22.118	52.74	16.055
Charcoal >4mm analysed (F)	266	286	231
Charcoal <4mm (g)	1436.8	1169.31	97.28

Discussion

The charcoal assemblages predominantly comprise alder and hazel, with moderate occurrence of oak. The presence of at least seven other woody species highlights the random selection of fuelwood. The identified taxa range from evergreen undershrubs and climbers (holly/ivy) to coniferous trees (pine and yew). The presence of pine is unsurprising as dendrochronological analysis of subfossil stumps/trunks from the mire at White Moss, 8km south of Arclid, provided evidence for three episodes of pine colonisation during the Neolithic and early Bronze Age periods (Lageard *et al* 1999).

The abundance of alder charcoal is likely to reflect the predominance of this species in the local landscape rather than specific selection. Alder is inefficient as firewood as it burns quickly and gives off little heat, although the addition of faster-burning alder logs can liven up an oak fire (Boulton & Jay 1946, 112; Eco Tree Care & Conservation Ltd 2012). Alder also makes an excellent, steady-burning charcoal (Boulton & Jay 1946, 38). The wide growth rings noted for many of the alder fragments reflect the typically fast growth for this moisture- and light-demanding species (Claessens *et al* 2010) and may reflect an open

aspect nearby. Fast growing, light-demanding trees and shrubs from such forest clearings are relatively easy to harvest owing to pole size and height (Asouti & Austin 2005).

Charcoal remains comprising several tree species provided common evidence for the use of decaying, dead or dying wood and probably represent the presence of easily collectable deadwood from the forest floor or the gathering of dry, dead timber on trees. This high dry wood availability for low effort probably reflects new settlement in a relatively unexploited area where there was plenty of fuelwood (dead or living) and considerable species diversity (Shackleton & Prins 1992). A decrease in the recorded incidences of insect damage and in the number of tree species affected by this degradation occurred from the primary through to the upper fills of pit [14]. This evidence may reflect a decline in the availability of deadwood at the site, if the deposition of charred material within the pit was contemporary with the use the feature. Whether abundant insect degradation and possible fungal disease is a reflection of climatic conditions is uncertain. However, ample amounts of deadwood are typical of old-growth stands consisting of mature and over-mature or fallen trees (Asouti & Austin 2005), and may be evidence that the area was generally wooded during the use of the burnt mound.

The soil fungus *Cenococcum geophilum* recorded in the primary fill, (13), would have lived in the upper layers of the woodland soil. It is an ectomycorrhizal species that has mutualistic associations with some tree roots, particularly with members of the Fagaceae (oak), Pinaceae (pine) and Betulaceae (birch, alder and hazel) families (Hudson 1986, 184–5). The presence of these charred fungal remains within pit [14] is further evidence that the site was wooded at the time the pit was dug. The sclerotia of the fungus may have been attached to root material collected for burning. Possible oak root wood charcoal was noted in (13).

Pollen evidence from the peat deposits nearby indicates that during the mid- to late Neolithic period the local vegetation consisted of woodland dominated by oak and hazel with alder/birch carr (*see below*). These are the four most frequently occurring taxa in the charcoal assemblages, indicating that little had changed by the middle Bronze Age – the period of the burnt mound. Indeed, wider palaeoenvironmental studies have suggested the region was largely wooded until the late Bronze Age or early Iron Age. Throughout the Bronze Age these woodlands were dominated by alder, hazel, oak and lime, with small-scale sporadic clearings (Reid 2014, 259–60; Lageard *et al* 1999, 325–30), although lime has not been recorded in the charcoal assemblages at Arclid.

Identification and analysis of charcoal recovered from a similarly dated burnt mound site at Uttoxeter in Staffordshire found evidence for the exclusive use of small-calibre stem and branchwood of alder (Gale 2007). Likewise, charcoal analysis of burnt mound spreads along the route of a gas pipeline between Pwllheli and Blaenau Ffestiniog, Gwynedd, showed a marked use of alder, and evidence of insect tunnels in several fragments (Challinor *et al* 2013). This was thought by the authors to be the result of deliberate seasoning of wood that had lain around for a period prior to burning, although it could also be interpreted as the collection of deadwood.

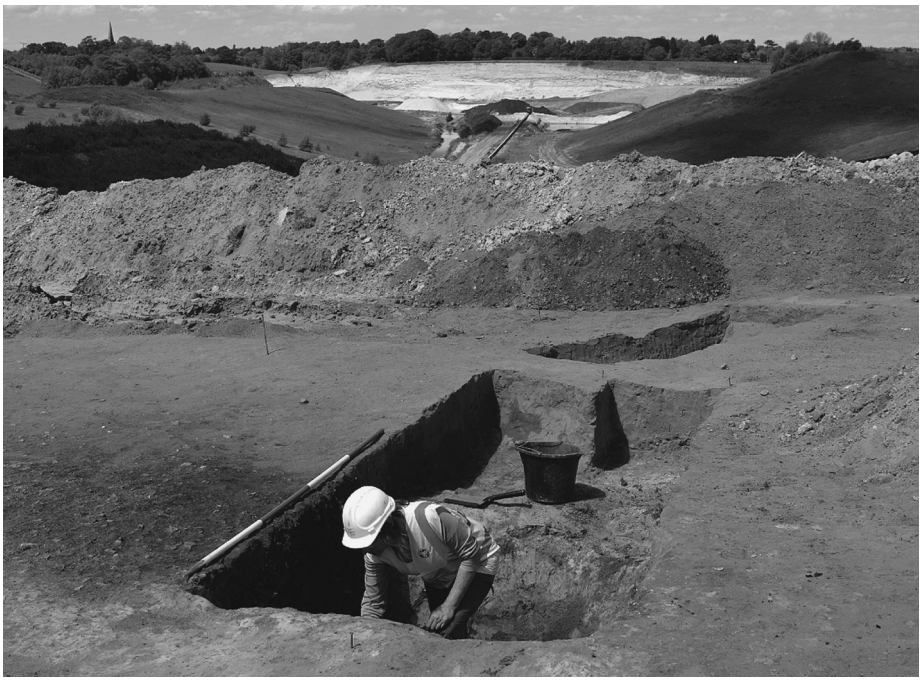
The common association of burnt mounds with wetland margins probably explains the frequent predominance of moisture-demanding alder (Claessens *et al* 2010) in charcoal assemblages from such sites as a result of its use as fuelwood (O'Donnell 2007, 31–2).

Assessment of peat deposits at South Arclid

Fiona Grant

Peat deposits at Arclid Green were recorded during the North-West Wetlands Survey (Leah *et al* 1997, 87–90), and the presence of potentially significant deposits at South Arclid was noted during a later archaeological assessment (Jones 2000). The study reported on here was undertaken in October 2006 to determine the potential and significance of the peat as part of a subsequent phase of assessment in advance of quarry expansion in 2006 (Grant 2006), although no further work was conducted prior to the expansion of the quarry into that area.

In 2006 the mire survived within a *c* 750m-long linear hollow. Its surviving width was around 100m across at its north-western end, less to the south-east. The nature of the topography and the dark, peaty topsoil suggests that the mire may have originally extended further to the north-west, while place name evidence from the tithe survey suggests that most of it had earlier lain to the south-east but had already been lost to quarrying prior to 2006 (*see* Ill IV. 1). At the time of the assessment the mire was predominantly wooded, with birch, elder and oak in the drier areas, and a willow and alder carr with open water at the north-western end (Ill IV.5).



Ill IV.5 The excavation of the burnt mound. The location of the nearby peat deposit is marked by the woodland in the upper left-hand corner. Photo © CPAT 3724-0054

Methods

Three main cores were extracted using a 30mm Eijkelkamp gouge auger in order to assess the depth and stratigraphy of the peat deposits (*see* Ill IV.1 for locations). The cores were cleaned and a visual stratigraphic description was compiled, based upon elements of Troels-Smith's (1955) classification and the ten-class scale of peat humification (von Post 1924). A further core was extracted from the base of the drainage ditch, but only limited stratigraphic detail was noted from this.

A single subsample from the base of Core 2, at a depth of 4.80m (the deepest core extracted during this assessment), was processed for pollen analysis using standard potassium hydroxide digestion and acetolysis. Counting and identification was carried out using a Zeiss Axiolab at x400 magnification and with the aid of the reference collection type slides of the Palaeoecological Research Unit at the University of Manchester, the online pollen image database of Bangor and Aberystwyth Universities, and the pollen and spore key in Moore *et al* 1991 (86–162). Linear traverses of the slide were carried out at 1mm intervals from one edge to the other and in one direction only. A minimum total pollen sum of 400 pollen grains (excluding aquatics) plus spores was attained from the sample. The count results are tabulated in Table IV.3. Values are expressed in the text in terms of percentages of total land pollen (TLP) unless otherwise specified. Microscopic charcoal particles encountered during pollen counting were recorded as numbers of fragments > 10μm and expressed as percentages of total land pollen (TLP). In order to allow an initiation date for the peat deposit to be obtained, a further subsample from the base of the same core was submitted to Beta Analytic for AMS dating to complement the data retrieved from pollen analysis.

Results and discussion

The results indicate that the mire at South Arclid contained rheotrophic (minerotrophic) peat deposits of at least 4.80m in depth, occupying a relatively steeply sided, narrow linear hollow, with an undulating subsurface of sandy glacial material. The peats consist primarily of wood and monocot peats, with a layer of poorly decomposed wood evident towards the south-eastern end of the mire at a depth of 1m to 2m. Pollen preservation in the sample from the base of Core 2 was good, with pollen analysis and C^{14} dating suggesting that peat formation began *c* 3360–3010 cal BC, during the mid- to late Neolithic period.

Typically, the basal peats from the central and south-eastern area comprised woody layers dominated by the remains of alder, oak and birch. Preserved trunk and branch material was apparent from *c* 1.00m depth, both from the core profiles and from a section of drainage ditch on the edge of the quarry workings, forming the north-eastern edge of the mire as it survived in 2006 (Ill IV.1). The wood peats were overlain by a variable sequence of sedge/heather peats with some bog-moss. In the north-western area wood peats appeared less dominant, apart from an initial basal layer of birch and heather. Here a sedge/heather/bog-moss peat predominated throughout the core. This suggested that wetter conditions have prevailed in the north-western end of the mire from the beginning.

Charcoal values were relatively low, at 4.1% TLP, and human impact indicators were absent from the sample, suggesting a lack of activity in the area at the onset of peat formation.

Table IV.3 Pollen analysis from base of peat Core 2

Pollen	*No of grains*	*% Total Land Pollen (TLP)*
Arboreal		
Alnus glutinosa (Alder)	122	26.3
Betula sp. (Birches)	44	9.5
Fraxinus excelsior (Ash)	5	1.1
Pinus sylvestris (Scots Pine)	7	1.5
Prunus sp. (Cherries – Blackthorn, Wild and Bird Cherry)	1	0.2
Quercus (Oak)	125	26.9
Tilia cordata (Lime)	15	3.2
Ulmus	8	1.7
Total arboreal pollen (AP)	327	70.5
Shrub		
Corylus avellana-type (Hazel)	94	20.3
Salix (Willow)	1	0.2
Total shrub pollen	95	20.5
Dwarf shrub		
Ericales *(Heathers)*	1	0.2
Total dwarf shrub pollen	1	0.2
Herbs		
Apiaceae undiff (Parsleys)	1	0.2
Cyperaceae undiff (Sedges)	10	2.2
Filipendula ulmaria (Meadowsweet)	2	0.4
Hedera helix (Ivy)	2	0.4
Poaceae (Grasses)	14	3.0
Potentilla-type (eg Cinquefoil)	1	0.2
Ranunculus undiff Buttercups)	1	0.2
Rubiaceae	3	0.6
Total herb pollen	34	7.3
Spores		
Polypodium (Polypody)	4	0.9
Pteropsida monolete indet (Ferns)	1	0.2
Total spores	5	1.1
Unidentified/crumpled	2	0.4
Microscopic charcoal	19	4.1
Total land pollen	464	100.0

However, the presence of a band of sand identified towards the base of Core 2, interleaved between peat deposits, suggests an influx of mineral material after the initial onset of peat formation. Several factors could have triggered such an event, such as changes in the hydrology of the mire and its environs and increases in erosion from the surrounding area, perhaps as a result of woodland clearance, or possible subsidence of the mire subsurface, as may occur in a salt subsidence hollow. A similar salt subsidence formation process is suggested for Brookhouse Moss, *c* 2.5km to the east (Leah *et al* 1997, 187; Ill IV.1).

The vegetation in the area around the mire at the time of peat initiation can be summarised as one of dryland wood dominated by oak with lime, ash and elm, with birch and alder occupying the mire itself. Hazel occupied the more open areas of the dryland woods, in clearings or at the woodland edge, with damp, marsh-loving herbs such as bedstraws, buttercups, marsh cinquefoil and umbellifers such as angelica in the damper areas, along with sedges and grasses. However, the small size of the mire may have contributed to limiting the sources of pollen input to a relatively local area (Moore *et al* 1991, 14). As noted above, no indication of human activity was evident in the sample. Oak/alder woodland with increasing herbs and grasses is typical of the early Flandrian III phase of the British Holocene, and this is supported by the radiocarbon date. This places peat initiation at this site in the mid- to later Neolithic period, and may be compared with the suggested initiation dates for other mires in the general area, such as Cocks Moss and Congleton Moss (Leah *et al* 1997, 187–8).

As noted above, several of the mires within the wider area have also been subject to palaeoenvironmental investigation and typically exhibit a range of depths of organic material and periods of initiation. The topography of the region accounts for the variety of forms of mire present, which include small basin mires, valley mires, and mires forming in kettle hole and salt subsidence hollows. Limited probing at Brookhouse Moss (SJ 8060 6200), *c* 2.5km to the east, demonstrated *c* 3.5m of wood and monocot peat, which suggests that it is highly likely that a well preserved archive spanning at least the later prehistoric period survives in this mire (Leah *et al* 1997, 187). Bagmere (SJ 7950 6430; Ill IV.1) contains peat of up to 9m in depth and appears to have formed during the latter periods of the most recent glacial stage, the Devensian (Birks 1965). At Whitemoss (SJ 7740 5500), a 6.5m profile provided an initiation date of 10715+/-65BP within a late glacial lake. Early human exploitation of this area was suggested by the find of a flint arrowhead (Leah *et al* 1997, 119).

Radiocarbon dating

Burnt mound

SUERC-59912
Context: (13), fill of Pit [14]
Material: charcoal, alder
Calibrated results at 95.4% probability: 1530–1420 cal BC (3211+/- 27 BP)

Peat Core 2

Beta-223308
Context: base of peat core
Material: peat
Calibrated results at 95.4% probability: 3360–3010 cal BC (4480 +/- 50 BP)

The dates have been calibrated using OxCal v4.2 (Bronk Ramsey 2009) and the IntCal13 atmospheric calibration curve with atmospheric data from Reimer *et al* 2013.

Discussion

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The Bronze Age remains at South Arclid Quarry are probably those of a burnt mound and what may have been an associated water-storage pit. Burnt mounds are usually characterised by deep pits or troughs and fire sites covered or surrounded by an often crescentic mound of heat-shattered stones. The mounds are generally about 10m across, although examples twice that size are known. The stones are normally fractured as a result of heating followed by rapid cooling, probably through immersion in water; the presence of a trough or water-filled pit seems to be a consistent feature of such sites. There is evidence to suggest that some of the pits may have been lined, as at Nant Farm, Porth Neigwl, in north-west Wales (Kenney 2012, 262), although the example at Arclid produced no evidence of this treatment. In Wales, at Parc Bryn Cegin, Bangor, the earliest date for a burnt mound is 3490–3120 BC to 3340–3020 BC. Although generally assumed to be prehistoric there are examples, such as the Deanery Yard, Bangor Cathedral, which clearly indicate that this type of archaeological feature could continue into the medieval period (AD 1020–1210). While there is some debate regarding the function of burnt mounds, they are still generally thought of as cooking sites involving the boiling of a relatively large quantity of water; other suggestions include brewing and even sweat lodges (Kenney 2012). The absence of any obvious industrial residues or food waste at South Arclid prevents any firm conclusions about the function of the present feature.

Significantly, the site of the putative burnt mound at Arclid overlooks the site of a basin mire, indicating the former proximity of water. The results of the sampling there suggests that peat formation began during the mid- to late Neolithic period, around 3360–3010 cal BC. At that time the local vegetation consisted of dryland oak- and hazel-dominated woodlands and an alder carr, with sedge, birch and marsh-loving herbs occupying the mire. Evidence from the wider region indicates that such mires frequently have associated evidence for prehistoric activity in the form of worked flints, many of which belong to the late Neolithic and Bronze Age periods (*c* 3200–800 BC), although occasionally to the late Mesolithic and early Neolithic periods (*c* 6700–3200 BC) (Leah *et al* 1997, 149).

Spreads of heat-shattered stones in locations similar to that at South Arclid have been identified in Shropshire but are rare in Cheshire, and none of the latter has been investigated. At Baggy Moor and Smithy Moor in northern Shropshire concentrations of burnt stone were recorded on the edges of peat deposits and adjacent sand ridges (Leah *et al* 1998, 43–4 and 143). Similarly, around the Weald Moors in east Shropshire a number of burnt mounds are located on 'islands' surrounded by peat, or as at Arclid, on the edge of the moors, where the land dips down suddenly to the peat (Leah *et al* 1998, 121).

The presence of the burnt mound, together with the few worked flints, is good evidence for prehistoric activity in the area and raises the strong possibility that further, as yet unidentified features may be present in the surrounding landscape.

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