

N18 Gort to Crusheen Road Scheme

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National Development Plan 2007 - 2013

Department of Transport
An Roinn Iompair



NRA
National Roads Authority
An tÚdards um Bóithre Náisiunta



Site Name: Clooneen 1

Ministerial Direction No.: 044
Excavation Registration No.: E3722

Burnt Mound

Final Report

On behalf of Galway County Council

Site Director: David Bayley
November 2009

IAC Irish Archaeological
Consultancy

PROJECT DETAILS

Project Reference No.	A044
Project	N18 Gort to Crusheen Road Scheme
Ministerial Direction Reference No.	A044
NMS Registration Number	E3722
Excavation Director	David Bayley
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Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Galway County Council
Site Name	Clooneen 1
Site Type	Burnt Mound
Townland	Clooneen
Parish	Inchicronan
County	Clare
NGR (Easting)	139186
NGR (Northing)	188268
Chainage	18115
Height m OD	32 m OD
RMP No.	N/A
Excavation Dates	1 – 17 October 2007
Excavation Duration	13 Days
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Report Date	18 November 2009
Report By	IAC Ltd

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The excavation was carried out in accordance with the Directions issued to Galway County Council by the Minister for Environment, Heritage and Local Government under Section 14A (2) of the National Monuments Acts 1930–2004 and the terms of the Contract between Galway County Council and Irish Archaeological Consultancy Ltd.

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ABSTRACT

Irish Archaeological Consultancy Ltd (IAC), funded by Galway County Council and the National Roads Authority (NRA), undertook the excavation of a burnt mound under Ministerial Directions at the site of Clooneen along the proposed N18 Gort to Crusheen road scheme (Figure 1). The following report describes the results of archaeological fieldwork at Clooneen 1. The area was fully excavated by Dave Bayley under Ministerial Direction A044 and Registration Number E3722 issued by the Department of Environment, Heritage and Local Government (DEHLG) in consultation with the National Museum of Ireland. The fieldwork took place in October 2007.

The site was located in a peat basin in Clooneen, Co. Clare at NGR 139186/188268 and at 32 m OD. The site was situated in gently undulating landscape, with the ground rising gently to the east and west of the site. Located on relatively dry bogland, this land was used for pasture. A post-medieval field drain was cut to the west of the site and ran on a north-south axis.

Clooneen 1 comprised a burnt spread measuring 12.10 m north–south x 11.50 m x 0.27 m maximum depth. The burnt spread sealed a timber-lined trough that measured 1.50 m north–south x 1.43 m x 0.22 m deep. It contained eight alder timbers lying horizontally at a depth of 0.15 m. Nine timbers made of ash were driven vertically around the sides of the trough, with two additional ash stakes in place to help secure the vertical timbers in place. All were in a relatively poor state of preservation. A second pit measuring 1.15 m north–south x 0.74 m x 0.15 m maximum depth was cut 0.88 m to the west of the trough. Three oak tree trunks were recorded to the south of the burnt spread. There was no evidence to suggest that these trees had been deliberately felled and no tool marks were discernable. However, it is possible that they provided a simple walkway around the burnt spread. The only finds from this site were two sherds of chinaware.

A fragment of alder charcoal from the base of the trough returned a 2 Sigma calibrated date of 2132–1909 BC (3637±33 BP: UBA 12730), placing the site in the early Bronze Age period. The only finds from this site were two sherds of modern chinaware.

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1 INTRODUCTION

1.1 General

This report describes the excavation of Clooneen 1 (Figures 1–3; Plate 1), in the townland of Clooneen undertaken by Dave Bayley of IAC Ltd, on behalf of Galway County Council and the NRA. It was carried out as part of the archaeological mitigation programme of the N18 Gort to Crusheen Road Scheme. The excavation was undertaken to offset the adverse impact of road construction on known and potential subsoil archaeological remains in order to preserve the site by record.

The site was not a Recorded Monument but was first identified during testing carried out by David Bayley in summer 2007 (Ministerial Direction No. A044, Licence No. 07E0456). All features identified during the assessment phase were subsequently re-identified and excavated during the full excavation phase of the site which took place between 8 and 19 October 2007 with a team of 1 director, 1 supervisor and 8 assistant archaeologists.

The site was located approximately 750 m to the west northwest of Crusheen cross road (Clare OS sheets 18).

The site was assigned the following identification data:

Site Name: Clooneen 1; Ministerial Direction No.: A044; NMS Registration No.: E3722; Route Chainage (Ch): 18115; NGR: 139186/188268.

1.2 The Development

The N18 Gort to Crusheen scheme involves the construction of a total of 44 km of road to include mainline roadworks (22 km), associated side roads (10 km) and access tracks (12 km). The road will have twin 7 m carriageways, 2.5 m hard shoulders adjacent to the verges and a median with a minimum width of 2.6 m which includes two 1m hard strips. The selected route bypasses the town of Gort to the east and the village of Crusheen to the west.

1.3 Archaeological Requirements

The archaeological requirements for the N18 Gort to Crusheen road scheme were defined in the Ministerial Directions issued to Galway County Council by the Minister for Environment, Heritage and Local Government under Section 14A (2) of the National Monuments Acts 1930–2004 and in the terms of the contract between Galway County Council and Irish Archaeological Consultancy Ltd. These instructions formed the basis of all archaeological works undertaken for this development. The archaeological excavation works under this contract were located between the townlands of Glenbrack, Co. Galway, and Carrowdotia, Co. Clare.

The proposed N18 was subjected to an Environmental Impact Assessment, the archaeology and cultural history section of which was carried out by Babbie Pettit Ltd in 2006. The Record of Monuments and Places, the Sites and Monuments Record, Topographical files of the National Museum of Ireland, aerial photography, and documentary sources were all consulted. Two phases of geophysical survey were conducted. The main phase was by RSKENSR (Bartlett 2004) during the preparation of the EIA (Babbie Pettit Ltd 2006). A supplementary survey was carried out in Ballyboy by Target Geophysics Ltd (Target Geophysics Ltd 2007). As a result of the paper survey, field inspections, geophysical survey, archaeological testing and archaeological monitoring, a total of 22 fully recorded manual excavations were carried out on this section of the overall route alignment. In some cases where a

number of sites of similar type were located together in a single townland, the sites were excavated under one excavation number.

Phase 1 archaeological testing was completed by IAC Ltd and Phase 2 excavation of the sites identified during testing was conducted by IAC Ltd on behalf of Galway County Council and the NRA.

1.4 Methodology

The presence of archaeological remains beneath the topsoil layer was confirmed by machine-cut test trenches. Following testing, the topsoil was reduced to the interface between topsoil and natural subsoil using a 20 tonne mechanical excavator equipped with a flat toothless bucket under strict archaeological supervision. The remaining topsoil was removed by the archaeological team with the use of shovels, hoes and trowels in order to expose and identify the archaeological remains. A site grid was set up at 10 m intervals and was subsequently calibrated to the national grid using GPS survey equipment.

All features were subsequently fully excavated by hand and recorded using the single context recording system with plans and sections being produced at a scale of 1:50, 1:20 or 1:10 as appropriate.

A complete photographic record was maintained throughout the excavation. Digital photographs were taken of all features and of work in progress.

An environmental strategy was devised at the beginning of the excavations. Features exhibiting large amounts of carbonised material were targeted. Animal bone, unburnt wood and stone samples were all retrieved through both hand and bulk collection and retained for specialist analysis wherever they were encountered during the excavations.

In the instances where artefacts were uncovered on site they were dealt with in accordance with guidelines issued by the National Museum of Ireland (NMI) and where warranted in consultation with the relevant specialists. All artefacts, ecofacts and paper archive are currently stored in IAC offices, Lismore, Co Waterford and will ultimately be deposited with the National Museum of Ireland.

Radiocarbon dating of the site was carried out by means of AMS (Accelerator Mass Spectrometry) dating of identified and recommended charcoal samples. All calibrated AMS dates in this report are quoted to 2 Sigma.

All excavation and post-excavation works were carried out in consultation and agreement with the Project Archaeologist, the National Monuments Section of the DEHLG and the National Museum of Ireland.

2 EXCAVATION RESULTS

The archaeological activity recorded at Clooneen 1 was an early Bronze Age burnt mound.

Detailed descriptions of all excavated features and deposits are listed in Appendix 1.

2.1 Phase 1: Natural Drift Geology

Most of the low-lying areas along the route are associated with poorly drained, bog and wet marshland areas of glacially formed depressions and seasonal lakes known as turloughs. The higher ground generally comprises well-drained, gently undulating pastureland with some uneven hummocky ridges, formed either of limestone epikarst or glacial features such as drumlins. The two dominant rock types of the region are Carboniferous Limestone, which underlies the entire length of the N18 Gort to Crusheen scheme, and the Devonian Old Red Sandstone, which forms the Slieve Aughty Mountains to the east of the proposed route.

The road alignment is predominantly underlain by either limestone derived till and sandy till deposited during the last glaciation or organic peat which has generally formed in the low-lying, poorly drained areas where standing water and slow percolation causes thin layers of peaty soil to accumulate.

A natural peat deposit was the first phase of activity at Clooneen 1. The natural mineral subsoil was never reached as the depth of the peat extended below the water table, but excavation revealed peat to be at least 0.25 m deep at the water table.

This deposit of peat was a natural accumulation that formed over time due to the breakdown of organic matter in waterlogged conditions. It was a humic deposit and was a dark brown/black colour and was of uniform composition across the site. Some light vegetation was visible in the upper levels. A large amount of root was visible, notably on the southeast of the site. A number of fallen oak trees were located across the site, some of which were still attached to roots (Figure 3). None of these had toolmarks. It is possible that these timbers may have functioned as walkways over the peat. No finds were recovered from this context.

2.2 Phase 2: Bronze Age Activity

Bronze Age activity on site consisted of the remains of a burnt mound.

2.2.1 Wood-lined Trough

Context	Fill of	L(m)	W(m)	D(m)	Basic description	Interpretation
8	N/A	1.5	1.43	0.22	Sub circular cut, steep sides	Cut of wood-lined trough
9	C8	1.05	0.91	0.07	Light grey yellow sandy ash, stones	Sandy ash fill of trough
10	C8	0.7	0.34	0.1	Charcoal-rich black clay silt	Charcoal-rich fill of trough
15	C8	1.2	1.2	0.05	Grey yellow sandy ash, charcoal	Layer under wooden base
16	C8	1.15	0.09	0.05	Timbers laid horizontally	Wooden base of the trough
20	C8	c. 0.54	0.07-0.09	0.04-0.06	Wooden stakes	Possible support for trough
21	C8	0.07	0.04	0.02	Wooden peg	Possible peg within C16
17	C8				Timbers arranged vertically	Timbers lining edge of trough
19	C8			0.12	Grey ash fill	Grey sandy ash fill of trough

Finds: None

Interpretation

C8 was a sub-circular, wooden-lined trough. It contained a primary fill of ash, C19, located behind and beneath the vertical timbers, C17 (Figures 3–5; Plate 2). This ash fill may have been a packing layer used to make the trough more watertight or possibly to keep the timbers in place. The nine vertical timbers, C17, were then placed around the perimeter of the trough. Each timber was placed so that it partly overlapped the timber adjacent to it. Again, this was probably to aid in making the trough watertight. There was a preference for ash wood (*Fraxinus excelsior*) for the vertical timbers (O’Carroll, Appendix 2.3).

Two ash wood stakes, C20, were then driven into the base of the trough and into the natural peat at opposing sides of the trough, one at the east and one at the west. The function of these stakes was most likely to support the vertical timbers.

A further two ash layers were identified: one, C15, was very similar to the primary fill C19, and lined the bottom of the trough. The stone from this fill was primarily quartzite (Mandal, Appendix 2.4). On top of this ash fill, C15, which possibly functioned as packing material, were horizontal timbers, C16, forming the base of the trough lining. Some of these timbers overlapped, which would have aided in ensuring the trough retained water. The basal timbers were ash (*Fraxinus excelsior*) and alder (*Alnus glutinosa*) (O’Carroll, Appendix 2.3). The second ash deposit, C9, overlay these horizontal timbers. These ash deposits were silty materials that would have settled from the heated stones that had been placed in the functioning trough.

There was no evidence of burning or singeing on any of the timbers. One AMS date was obtained from the ash spread C15. A fragment (6.6 g) of black/common alder (*Alnus glutinosa*) charcoal was identified (Cobain, Appendix 2.2). This charcoal returned an AMS result of 3637±33 BP (UBA 12730). The 2 Sigma calibrated result for this was 2132–1909 BC (Appendix 2.1), placing the activity in the early Bronze Age. Alder charcoal was also retrieved from this deposit.

A possible peg, C21, was located beneath the horizontal timbers, C16. This appeared to have been used to help hold one or more of the horizontal timbers in place. Alternatively it may have been a fragment of a natural timber that was in the peat beneath the trough. The trough was then filled with a dark-black, charcoal-rich layer, C10 which possibly represents the final use material within the trough. The final fill of the trough C8 was a pocket of burnt spread material, C3 that had been compressed into the top of the feature and represents the levelling of the mound possibly at a much later date.

2.2.2 Pit

Context	Fill of	L(m)	W(m)	D(m)	Basic description	Interpretation
7	C12	1.18	0.74	0.05	Dark brown black sandy clay	Uppermost fill of pit C12
12	N/A	1.15	0.74	0.15	Sub circular cut, gentle sloping sides	Cut of a pit
13	C12	1.15		0.1	Dark brown silty clay, stones, charcoal	Basal fill of a pit C12

Findings: None

Interpretation

The pit C12 contained two charcoal-rich and stony fills: C7 and C13 (Figures 3–5). This was possibly a storage pit associated with the trough and burnt spread. It was located beneath the burnt mound C3, just south of the centre of the site. The secondary fill C7 contained alder, alder/hazel and ash (*Fraxinus excelsior*) inclusions.

2.2.3 Hearth (area of scorching)

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
11	N/A	3.6	1.8	0.04	Orange brown peat, sand ash, charcoal	Loose thin peat layer
14	N/A	3.5	1.7	0.05	Light grey yellow ash sand, stone, charcoal	Thin layer of ash

Finds: None

Interpretation

C11 and C14 represent an area of scorching possibly the remains of a fire or a hearth. C14 was a thin layer of ashy sand, which may have been the result of the peat having been the base of a hearth. A thin layer of peat with occasional sand and ash inclusions, C11, sealed C14. This is likely to be the disturbed upper layer of the fire or hearth.

2.2.4 Burnt Mound

Context	Fill of	L(m)	W(m)	D(m)	Basic description	Interpretation
3	N/A	12.1	11.5	>0.27	Charcoal-rich black sandy silty clay, stones	Burnt mound material

Finds: None

Interpretation

The burnt mound was a roughly horseshoe-shaped mound comprising heat-shattered stone, ash and charcoal associated with the use of the trough, C8 (Figure 3; Plate 3). The burnt mound sealed the trough, C8, the pit, C12 and the area of scorching, C11 and C14. The mound was formed when the burnt stones used in the trough to heat water were discarded in the area surrounding the trough. The sample of stones identified from the trough reflects the material from the mound also and was identified as heat-altered angular cobbles of quartzite, which would have been chosen for its ability to absorb heat and is typical of the stone type used in burnt mounds (Mandal, Appendix 2.4). Charcoal identified from the burnt mound included alder, hazel, alder/hazel, ash and poplar/willow (Cobain, Appendix 2.2).

2.3 Phase 3: Post-Medieval Activity

2.3.1 Drain

Context	Fill of	L(m)	W(m)	D(m)	Basic description	Interpretation
4	N/A	14.5	1.2	0.23	Linear cut, irregular sides	Cut of modern ditch
5	C4	14.5	1.2	0.23	Mid grey brown sandy clay, stones	Upper fill of modern ditch
6	C4	7	0.35	0.13	Medium brown silty clay, stones	Lower fill of modern ditch

Finds:

Context	Find no.	Material	Period	Description
5	E3722:5:1	Ceramic	Post-medieval	Sherd of modern chinaware
5	E3722:5:2	Ceramic	Post-medieval	Sherd of modern chinaware

Interpretation

The above contexts represent a post-medieval ditch running NNE/SSW across the site. It was located approximately 0.5 m to the west of the burnt mound C3. Two sherds of post-medieval pottery were recovered from the uppermost fill of the ditch. One sherd was stoneware while the other was creamware (McCutcheon, Appendix 2.5).

2.4 Phase 4: Topsoil

Context	Fill of	L(m)	W(m)	D(m)	Description	Interpretation
1	N/A			0.35	Dark brown peat	Topsoil

Finds: None

Interpretation

The topsoil was a dark-brown, peat-dominated layer that was present and sealed the full extent of the site.

3 SYNTHESIS AND DISCUSSION

3.1 Landscape Setting

Most of the low-lying areas along the route were associated with poorly drained bog and wet marshland which have developed within glacially formed depressions and seasonal lakes known as turloughs. The higher ground generally comprised well-drained, gently undulating pastureland with some uneven hummocky ridges, formed either of limestone epikarst or glacial features such as drumlins. The two dominant rock types of the region were Carboniferous Limestone, which underlay the entire length of the N18 Gort to Crusheen scheme, and the Devonian Old Red Sandstone, which formed the Slieve Aughty Mountains to the east of the project. The road alignment was predominantly underlain by either limestone and sand derived till deposited during the last glaciation or organic peat which has generally formed since then in the low-lying, poorly drained areas where standing water and slow percolation caused thin layers of peaty soil to accumulate.

The site was located in a peat basin in Clooneen, Co. Clare at NGR 139186/188268 and at 32 m OD. The site was situated in gently undulating landscape, with the ground rising gently to the east and west. Located on relatively dry bogland, this land was used for pasture. A post-medieval field drain was cut to the west of the site and ran on a north-south axis. Nearby recorded monuments include a possible enclosure (CL018-085), a burial ground (CL018-042) and a *fulacht fiadh* (CL018-083) located c. 240 m southeast, c. 300 m east and 330 m southwest of Clooneen 1.

3.2 Bronze Age Archaeological Landscape

Following the test-excavation phase of the project it was apparent that most of the archaeological sites identified were located to the south of the scheme in County Clare. This trend appears to have resulted from landscape management in the recent past where the better drained lands to the north have been improved and the fields enlarged which would have had a negative effect on any buried archaeological sites. However, the area to the south, which coincides with crossing the county border, was of more marginal land prone to flooding and in this area the route of the new road tended to follow wet valley floors and steep valley slopes. The landscape encountered in County Clare was much the same as it was depicted on the first edition Ordnance Survey maps (1842).

As with the transition from the Mesolithic to Neolithic periods, the transition to the Early Bronze Age period brought with it many changes to society. In County Clare and particularly in the northwest of the county in the Burren where there is a highly visible prehistoric landscape due to the exposed bare rock nature of the terrain the large number of prehistoric sites including c. 80 wedge tombs (Jones 2004, 65) indicates a well organised late Neolithic/early Bronze Age landscape. The transition from the Neolithic to the Bronze Age reflects a continued and somewhat intensified population in north and east Clare. It is during this period that megalithic monuments were abandoned in favour of individual cist or pit burials, either located in isolation or in small cemeteries. Different forms of barrow monuments were also being constructed during the period, as well as ceremonial monuments such as circular henges, standing stones, stone rows and stone circles. A current research project in the Burren has also recorded middle and late Bronze Age ritual funerary deposition in Glencurran Cave, Co. Clare (Dowd 2007).

In recent years Bronze Age habitation sites have come more to the fore as they have been uncovered as part of development-led or infrastructural projects. They are well documented elsewhere but two interesting recently excavated sites include Bronze Age roundhouses at Tober 1, County Offaly (Walsh 2009) and Barnhill, Dromoland,

Co. Clare (Moore Group 2009). An important academic study of the spatial organisation of Bronze Age society and landscape has been undertaken of the north Munster area and in County Clare this is defined by the work undertaken by Grogan on the Bronze Age trivallate hillfort at Mooghaun (Grogan 2005). This study identified and mapped a Bronze Age landscape dominated by the hillfort which may have influenced a catchment area of up to 450 km sq (Grogan 2005, 95). Identified within the area of influence were ceremonial monuments, house sites, burnt mound sites and other more mundane features such as fish traps and trackways in the Fergus estuary (O'Sullivan and Dillon 2005). The Mooghaun study area is outside the sphere of influence of sites identified on the Gort to Crusheen scheme but indicates nonetheless that a similar societal organisation of the landscape may have existed for them too. A hoard of gold objects discovered at Mooghaun during the construction of the Limerick – Ennis railway in 1854 is one of the largest single discoveries of Bronze Age gold in Europe (Grogan 2005, 70). Another significant gold find from the north of the county was the Gleninsheen gorget, a large collar of hammered gold discovered by a farmer in 1932 (Jones 2004, 74).

The most widespread domestic sites from the Bronze Age are burnt mounds (also known as *fulacht fiadh*). They survive as low mounds of charcoal-rich soil mixed with heat-shattered stones. They are usually horseshoe shaped, located in low-lying areas near a water source and are often found in clusters. While it is generally thought that they were probably used as cooking places (Ó Drisceóil, 1988), finds from excavated examples where there is a noteworthy absence of animal bone does not easily support this theory. Lucas (1965) suggested that burnt mounds might have been used for processes such as bulk washing, dyeing and leather working while Barfield and Hodder (1987) have suggested that such sites were covered by light structures and used as sweat houses. Radiocarbon dates for this monument type have generally placed them in the Bronze Age (Brindley et al. 1990, 55) though evidence from early Irish texts (Ó Drisceóil, 1988) suggest use of this type of site up until the 16th century AD.

Burnt mounds make up a significant number of the Recorded Monuments within the immediate vicinity of the Gort to Crusheen road scheme and following examination of a one kilometre wide corridor, using the road as the centreline, of the scheme, these classic elements of the Bronze Age landscape became apparent. Within this defined corridor there were no recorded burnt mounds in south County Galway, whereas north County Clare was rich in the monument-type: RMP sites CL018-069, CL018-071, CL018-072, CL018-077, CL018-084, CL018-082, CL018-083, CL018-086, CL026-143, CL026-130, CL026-131, CL026-136, CL026-138, CL026-137, CL026-134, CL026-135, 02E1284 partly excavated as part of the Bord Gáis Éireann's pipeline to the west at Bearnafunshin (Dennehy 2002a), 02E0342 excavated as part of the Bord Gáis Éireann's pipeline to the west at Bearnafunshin (Halpin 2002), CL026-149, CL026-150, CL026-151, CL026-156, CL026-157, CL026-158, CL026-165, CL026-164, and Site AR25 Carrowdotia (Taylor 2006a). There appeared to be a tendency in the sites identified for clustering, often within 100 m or less of each other.

Single upright standing stones are a common feature of the Irish landscape and, though they may date to different periods and serve different functions, excavation has shown that some may mark prehistoric burials, while some may signify a route-way, a boundary, or serve a commemorative role. Generally speaking, it is likely that a large number date to the Bronze Age. The orientation of a stone may have had significance, with their long axes aligned to another stone or toward a cairn on a mountain top, although the latter is difficult to prove. A standing stone (RMP CL026-035) has been identified c. 150 m southeast of the southern end of the route.

Ring barrows consist of a low, usually circular mound or level area enclosed by a fosse and external bank, the diameter of the earthwork usually ranging between 4 m and 12 m and rarely exceeding 1 m in height or depth. Excavation has demonstrated that they usually sealed a burial deposit, often a cremation. Such forms of burial have a long tradition and individual examples have been assigned to the Neolithic, Bronze and Iron Ages. A ring barrow (Dennehy 2002b) was identified during monitoring of Bord Gáis Éireann's pipeline at Cloonagowan, Co. Clare. The archaeological remains represented a cremation pit with a ring ditch. Pits, stakeholes and a slot trench were identified within the ring ditch, with some pits indicating a probable domestic function. A second cremation pit was identified c. 75 m to the northeast, with an isolated posthole, which may have acted as a marker for the cremation pits, located further to the northeast. A single thumbnail scraper was recovered from the site, enabling the rough dating to the late Neolithic/early Bronze Age period (Dennehy 2002c). A single possibly Bronze Age cremation pit and industrial pits were identified during the monitoring of Bord Gáis Éireann's pipeline in Gortaficka (Dennehy and Sutton 2002). A wedge tomb (CL026-015) is located less than 500 m northeast of a concentration of burnt mounds and spreads which surround a peat bog, and were excavated as part of the N18 Gort to Crusheen road scheme, in Caheraphuca townland. The wedge tomb is also likely to date to the late Neolithic or early Bronze Age.

Our appreciation of the wider Bronze Age landscape in counties Clare and Galway is continuously being expanded as more sites are being uncovered during research, development-led and infrastructural projects such as the N18 road scheme. Excavations connected with construction of the N18 to the north (Gort to Oranmore) which is entirely within county Galway has also recently produced evidence for the Bronze Age landscape with eight burnt mound sites identified; one at Ballyglass West, a cluster in Caherweelder townland and further examples in Moyveela and Coldwood (Eachtra 2009).

Excavations undertaken by TVAS (Ireland) Ltd in 2003 in advance of construction of the N18 Ennis Bypass and N85 Western Relief Road, which terminated at the southern end of the N18 Gort to Crusheen road scheme revealed similar archaeological sites. This area was generally better drained and the variety of Bronze Age sites encountered during that project reflects the change in terrain. The marginal lands and areas closest to wetlands, rivers and streams produced evidence for burnt mounds such as the four burnt mound sites identified at Clare Abbey (Hull 2006a and b, Taylor 2006c and d) close to the Ardsollus river (a tributary of the Fergus). Burnt mound sites were also excavated at Killow (Taylor 2006b), Cahircalla More (Taylor 2006e) and Carrowdotia (Taylor 2006a) just to the very south of the Gort to Crusheen project. Apart from the burnt mound sites a number of funerary sites were also identified on the N18 Ennis Bypass and N85 Western Relief Road. Two cremation cemetery sites were identified in Manusmore townland (Hull 2006c and 2006d) both were located on slightly elevated free draining gravel ridges. A third site with cremation pits was identified at Killow (Taylor 2006b) in close proximity to a burnt mound; it was located on a low but well-drained gravel drumlin.

The landscape of County Clare is rich in sites dating to the Bronze Age, indicating that the area was widely inhabited during that period. Burnt mounds are the most frequent site of Bronze Age date encountered in this area of Clare, with twenty seven identified within the immediate area of the road scheme. There are no burnt mounds recorded within the tight constraints of the study area for Co. Galway but there are examples in the wider surrounding area and they were also located in the excavations on the N18 contract further to the north. The archaeological evidence to

date indicates that the study area and indeed its wider landscape was inhabited throughout the entire Bronze Age period.

Bronze Age Clooneen 1

The site at Clooneen 1 consisted of a spread of heat shattered stone which sealed a timber lined trough, pit and hearth. The site was situated in gently undulating landscape, with the ground rising gently to the east and west. The trough was cut into peat and returned a 2 Sigma calibrated date of 2132–1909 BC (3637±33 BP: UBA 12730) (Appendix 2.1) placing it in the early Bronze Age period.

Similar parallels in terms of morphology and dating to the Bronze Age period were identified and excavated across the project. The sites excavated across the scheme were generally identified as simple spreads or mounds of burnt and heat shattered stone, while some of these like the one at Drumminacloghaun 1 (McNamara 2009a) had evidence for a simple earth cut trough, other sites such as those at Gortavoher 1 (Delaney 2009b) and Caheraphuca 10 (Bayley 2009b) were represented simply by spreads of heat shattered stone.

Isolated burnt mound sites identified along the project were Rathwilladoon 4 (Lyne 2009), Drumminacloghaun 1 (McNamara 2009a) and Clooneen 1. As the route travelled further south it tended to follow marginal wetland and stream valleys and the burnt mounds appeared to become more concentrated. This concentration of sites was identified at Curtaun 1 and 2 (Delaney 2009a), Gortavoher/Monreagh (Delaney 2009b and McNamara 2009b), Derrygarraff (Nunan 2009a and 2009b), Sranagalloon/Gortaficka (Nunan 2009c, 2009d and 2009e), Caheraphuca (Bayley 2009a and 2009b) and Ballyline (McNamara 2009c). A similar pattern of clustered burnt mounds to the south in county Clare and a paucity of examples of burnt mounds in county Galway was also encountered during the construction of Bord Gáis Éireann pipeline (Grogan et al. 2007). The AMS dating indicates however that the sites were not necessarily contemporary but rather spanned the entire Bronze Age period and extended into the Iron Age (with one example at Derrygarraff 1 possibly indicating a medieval date) illustrating how the process of this pyrolithic technology remained the same across thousands of years.

More elaborate examples of troughs and pits from across the project (though serving the same function) displayed evidence for timber lining through the identification of stakeholes for upright supports at Curtaun (Delaney 2009a), Caheraphuca 1 (Bayley 2009a) and Gortaficka 1 and 2 and in some cases the actual remains of timber lining as at Clooneen 1, Caheraphuca 4 (Bayley 2009b), Sranagalloon 1 (Nunan 2009c) and Sranagalloon 3 (Nunan 2009d). Although the primary function of these sites was to heat water through the use of hot stones the actual purpose remains unknown. The sites at Caheraphuca 1 and Gortaficka 2 both displayed evidence for numerous troughs, drains, hearths and possibly preparation areas with stake lined pits suggesting that they may have been used for some more formal industrial function than the other sites.

Clooneen 1 was located approximately 900 m south of the group of burnt mounds at Gortaficka/Sranagalloon, with burnt mounds also located approximately 1.50 km to the north northwest in Sranagalloon (CL018–67) and 875 m to the west in Clooneen (CL018–76). The apparent industrial site of Caheraphuca 1 was located approximately 250 m to the south, with another approximately 250 m to the southwest (CL018–83) and the Caheraphuca group, focussed on a former wetland at Caheraphuca, was situated approximately 900 m to the south.

A review of the RMP records and the sites excavated as part of the N18 Gort to Crusheen road scheme indicate that the number of known or suspected burnt mounds increases towards the south of the project. In relation to Clooneen 1 there is also a cluster of burnt mound sites around the lakes on the eastern slopes of Mullagh More in the Burren (approximately 9 km to the northwest). A cluster of megalithic tombs and standing stones are located on the northern slopes of Maghera hill approximately 12 km to the northeast. A wedge tomb and two unclassified megalithic tombs are located approximately 3 km to the northeast in Knockmael East (CL016–026, CL016–027) and a wedge tomb is located in Caheraphuca (CL26–015) approximately 900 m to the south. Clusters of burnt mounds were also excavated on the project to the north in Monreagh and Derrygarraff and to the south as previously mentioned at Caheraphuca and Ballyline townlands.

3.3 Typology of Burnt Mounds

Burnt mound sites (also commonly referred to as *fulachta fiadh*) are one of the most common field monuments found in the Irish landscape. The last published survey (Power et al. 1997), carried out over a decade ago, recorded over 7,000 burnt mound sites and in excess of 1,000 sites have been excavated in recent years through development led archaeological investigations. In spite of this no clear understanding of the precise function of these sites has been forthcoming.

Burnt mound sites are typically located in areas where there is a readily available water source, often in proximity to a river or stream or in places with a high water table. In the field burnt mounds may be identified as charcoal-rich mounds or spreads of heat shattered stones, however, in many cases the sites have been disturbed by later agricultural activity and are no longer visible on the field surface. Nevertheless even disturbed spreads of burnt mound material often preserves the underlying associated features, such as troughs, pits and gullies, intact.

Ó Néill (2003–2004, 82) has aptly identified these sites as the apparatus and by-product of pyrolithic technology. This technology involved the heating or boiling of water by placing fire-heated stones into troughs of water. Small shallow round-bottomed pits, generally referred to as pot boiler pits or roasting pits, are often associated with burnt mound sites. The purpose of these pits remains unclear. Occasionally large pits are also identified and may have acted as wells or cisterns. Linear gullies may extend across the site, often linked to troughs and pits, and demonstrate a concern with onsite water management. Post and stakeholes are often found on burnt mound sites and these may represent the remains of small structures or wind breakers.

Burnt mound sites are principally Bronze Age monuments and reach their pinnacle of use in the middle/late Bronze Age (Brindley et al. 1989–90; Corlett 1997). Earlier sites, such as Enniscoffey Co. Westmeath (Grogan et al. 2007, 96), have been dated to the Neolithic and later sites, such as Peter Street, Co. Waterford (Walsh, 1990, 47), have been dated to the medieval period. Thus although burnt mound sites generally form a components of the Bronze Age landscape, the use of pyrolithic technology has a long history in Ireland.

Although there is a general consensus that burnt mound sites are the result of pyrolithic technology for the heating or boiling of water, the precise function of these sites has, to date, not been agreed upon. Several theories have been proposed but no single theory has received unanimous support. The most enduring theory is that burnt mounds sites were used as cooking sites. O’Kelly (1954) and Lawless (1990) have demonstrated how joints of meat could be efficiently cooked in trough of boiling water. The use of burnt mound sites for bathing or as saunas has been suggested as

an alternative function (Lucas 1965, Barfield and Hodder 1987, Ó Drisceóil 1988). This proposal is largely influenced by references in the early Irish literature to sites of a similar character and is very difficult to prove, or disprove. Others, such as Jeffrey (1991), argue that they may have been centres of textile production for the fulling or dyeing of cloth. More recent demonstrations by Quinn and Moore (2007) have shown that troughs could have been used for brewing, however, this theory has been criticised by specialist environmentalists due to the absence of cereal remains from most burnt mound sites (McClatchie et al. 2007).

3.4 Discussion

The site comprised an early Bronze Age timber-lined trough, pit and hearth that was sealed by a flattened burnt mound.

3.4.1 Phase 1: Natural Drift Geology

This phase represents the natural soil horizon, which was cut or sealed by all subsequent archaeological features. For the purposes of recording on-site this phase of activity was allocated the context number C2. The site was located on a natural peat deposit and the trough was cut through this. The natural subsoil was never reached as all the archaeological material was within the peat. Three oak tree trunks were identified at the same level as the timber trough in the peat and although they were not worked it is suggested that they may have been used as walkways over the wet peat.

3.4.2 Phase 2: Bronze Age Activity

The Bronze Age activity at Clooneen 1 consisted of a wood-lined trough, a pit, a hearth and a burnt mound. A sample of charcoal retrieved from the trough fill C15 was selected for AMS radiocarbon dating and returned a date of 2132–1909 BC (Appendix 2.1). The 2 Sigma calibrated result was 3637±33 BP (UBA 12730), dating this deposit to the early Bronze Age (ibid.).

Lab code	Context / sample	Sample material	Years BP	1 sigma	2 sigma
UBA 12730	C15 / S10	Charcoal Alder	3637±33	Cal 2108–1947 BC	Cal 2132–1909 BC

Three taxa were present in the wood samples from Clooneen 1. The most commonly occurring taxa was ash (*Fraxinus excelsior*) which was the main taxon identified from the trough. Alder (*Alnus glutinosa*) base timbers were also identified from the trough. Oak was identified from the three natural trees which were excavated close to the excavated burnt mound spread. The ash (*Fraxinus excelsior*) from the trough was split tangentially, radially and half split while the alder was so poorly preserved that it could only be described as split. Poorly preserved traces of curved tool marks on one of the planks indicating that a medium-sized, splayed, metal axe was used (O'Carroll, Appendix 2.3). The alder was probably selected from its growing location in the wetland close to the site while the ash would have been collected from the elevated dry land close by to the east or west (O'Carroll, Appendix 2.3).

The features were sealed by a disturbed mound of heat-altered cobbles of coarse grained quartzite which could easily have been sourced in the local glacial tills (Mandal, Appendix 2.4). This is a typical stone type used in burnt mounds due to the manner in which it absorbs heat and can be reused a number of times before shattering or flaking.

The closest excavated burnt mounds to Clooneen 1 are Caheraphuca 1 to the south which has returned a date of 1877–1620 BC and Gortaficka to the north which returned a date of 2287–2137 BC (both are 2 Sigma calibrations). These two sites

date either side of the activity identified at Clooneen 1 and reflect the continuity of this form of site in the immediate landscape during the early Bronze Age period.

3.4.3 Phase 3: Post-Medieval Activity

A post-medieval drainage ditch ran across the site from NNE/SSW. It was located approximately 0.5 m to the west of the burnt mound. The ditch was dug to drain the peat basin and to ensure it was dry enough to graze livestock.

Two sherds of post-medieval pottery were recovered from the uppermost fill of the ditch. The first sherd from this site is a piece of creamware, the rim of a plate. The second sherd is a piece of stoneware, dating to the 19th to early 20th century and possibly represents a large blacking bottle.

3.4.4 Phase 4: Topsoil

The topsoil was a dark-brown, peat-dominated layer that was present and sealed the full extent of the site.

4 CONCLUSIONS

Clooneen 1 was an early Bronze Age period burnt mound (2132–1909 BC -2 Sigma calibration) with associated wood-lined trough, pit and possible hearth. The site was located on an already existing peat deposit and the trough was cut into this enabling easy availability of water for the trough through the bogs high water table.

A lot of effort went into the construction of the timber trough. This amount of effort is at odds with the size of the burnt mound, which is quite small and suggests a short lifespan for the site. Alternatively, the mound could have been larger but was disturbed during land improvement and reclamation works in the area as evidenced by the modern ditch that was situated to the west of the burnt mound.

The trough was constructed of split alder and ash timbers that were overlaid to improve their seal. The alder was probably collected from the immediate area surrounding the site as this tree grows in marginally and damp conditions. The ash may have been collected from the higher ground to the east and the west. Three oak timbers were found surrounding the site and may have been used as walkways to access the site across the wet peat. They may however simply lie where they naturally fell.

No finds or animal bone were recovered from the trough or associated features and as a result it is impossible to posit a function other than to say that stones were placed in the trough to heat water for any number of reasons.

5 BIBLIOGRAPHY

5.1 References

- Babtie Pettit Ltd 2006 *Cultural Heritage Section of N18 Gort to Crusheen Scheme Environmental Impact Statement* undertaken on behalf of Galway County Council
- Bartlett, ADH 2004 N18 Gort to Crusheen Road Scheme: Report on Archaeogeophysical Survey of Proposed Route. RSKENSR, Helsby
- Barfield, L & Hodder, M 1987 'Burnt mounds as saunas and the prehistory of bathing'. *Antiquity* **64**, 370 – 379
- Bayley, D 2009a *Caheraphuca 1, E3654. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Bayley, D 2009b *Caheraphuca 3–12, E3653. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Brindley, A L; Lanting, J N and Mook, W G 1989–90 Radiocarbon dates from Irish *fulachta fiadh* and other burnt mounds, *Journal of Irish Archaeology* **5**, 25–33
- Corlett, C 1997 A *fulacht fiadh* site at Moynagh Lough, County Meath, *Ríocht na Míde* **9** (3), 46–49
- Delaney, S 2009a *Curtaun 1 & 2, E3721. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Delaney, S 2009b *Gortavoher 1, E3984. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Delaney, S 2009c *Monreagh 3, E4037. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Dennehy, E 2002a Bearnafunshin, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dennehy, E 2002b Cloonagowan, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dennehy, E 2002c Cloonagowan, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dennehy, E and Sutton, B 2002 Gortaficka, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dowd, M 2007 Living and dying in Glencurran Cave. *Archaeology Ireland* **21** (1), 36–39
- Grogan, E O'Donnell, L and Johnston, P 2007 *The Bronze Age Landscapes of the Pipeline to the West*. Bray, Margaret Gowen and Co. Ltd and Wordwell
- Grogan, E 2005 The North Munster Project, Vol 1, The later prehistoric landscape of south-east Clare, *Discovery Programme Monographs* **6**, Wordwell, Bray

- Grogan, E Condit, T O'Carroll, F O'Sullivan, A and Daly, A 1996 Tracing the Late Prehistoric landscape in North Munster, *Discovery Programme Reports 4*, 26–46 Dublin
- Halpin, B 2002 Bearnafunshin, Co Clare. In Bennett, I *Excavations 2002: Wordwell, Bray*
- Hull, G 2006c Site AR100, Manusmore, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Hull, G 2006d Site AR102, Manusmore, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Hull, G 2006a Site AR124, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Hull, G 2006b Site AR125, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Jeffrey, S 1991 Burnt mounds, fulling and early textiles? In M Hodder and L Barfield (eds), *Burnt mounds and hot stone technology*. Sandwell Metropolitan Borough Council, 97–102
- Jones, C 2004 *The Burren and the Aran Islands—Exploring the Archaeology*. Collins Press, Cork
- Lawless, C 1990 A *fulacht fiadh* Bronze Age cooking experiment at Turlough, Castlebar, *Cathair na Mart* **10**, 1-10
- Lucas, A T 1965 Washing and bathing in ancient Ireland, *JRSAI* **96**, 65–114
- Lyne, E 2000 *Rathwilladoon 4, E3655. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- McClatchie, M Brewer, A Dillon, M Johnston, P Lyons, S Monk, M Stewart, K and S Timpany 2007 Brewing and fulachta fiadh. *Archaeology Ireland* **21** (4), 46
- McNamara, S 2009a *Drumminacloghaun 1, E3720. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- McNamara, S 2009b *Monreagh 1 & 2, E3712. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- McNamara, S 2009c *Ballyline 1 & 2, E3717. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Nunan, J 2009a *Derrygarraff 1, E3710. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Nunan, J 2009b *Derrygarraff 3, E3716. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Nunan, J 2009c *Sranagalloon 1, E3713. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd

Nunan, J 2009d *Sranagalloon 3, E3897. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd

Nunan, J 2009e *Gortaficka 1 & 2, E3898. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd

Ó Drisceóil, D A 1988 Burnt mounds: cooking or bathing, *Antiquity*, **62**, 671–680

O' Kelly, M J 1954 Excavations and experiments in ancient Irish cooking-places, *JRSAI*, **84**, 105–155

Ó Néill, J 2003–2004 *Lapidibus in igne calefactis coquebatur*. The historical burnt mound 'tradition', *The Journal of Irish Archaeology* **12–13**, 79–85

O'Sullivan, A and Dillon, M 2005 *Intertidal archaeological survey of Bronze Age structures and medieval fishtraps on the Fergus estuary, Co. Clare*. UCD School of Archaeology, Dublin

Power, D Byrne, E Egan, U Land, S and Sleeman, M 1997 *Archaeological inventory of County Cork. Volume III–Mid Cork*. Dublin

Quinn, B and Moore, D 2007 Ale, brewing and *fulachta fiadh*, *Archaeology Ireland* **21** (3), 8–10

Target Geophysics Ltd. 2007. A Geophysical Survey at Ballyboy, Co. Galway. Unpublished Report

Taylor, K 2006a Site AR25, Carrowdotia, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006b Site AR104, Killow, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006c Site AR121, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006d Site AR122, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006e Site AR127, Cahircalla More, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Waddell, J 1998 *The Prehistoric Archaeology of Ireland*. Galway, Galway University Press

Walsh, C 1990 A Medieval Cooking Trough from Peter Street, Waterford in Buckley, V (ed.), *Burnt Offerings: International Contributions to Burnt Mound Archaeology*, 47–48., Wordwell. Bray

Walsh, F 2009 Site A016/051; E2677: Tober 1, Tober, County Offaly. Unpublished report prepared by Irish Archaeological Consultancy Ltd

5.2 Other Sources

Record of Monuments and Places (RMP), The Department of the Environment, Heritage and Local Government, 7 Ely Place Upper, Dublin 2

Topographical Files of the National Museum of Ireland, Kildare Street, Dublin 2

Cartographic References

Ordnance Survey, Map Editions 1842, 1899, 1915

Electronic References

<http://eachtra.ie/index.php/journal/n18-oranmore-gort/>

<http://mooregroup.wordpress.com/2009/02/04/bronze-age-roundhouse-in-clare>

PLATES



Plate 1 Pre-excitation view of site, facing north



Plate 2 Mid-excitation view of timber-lined trough C8, facing south



Plate 3 Mid-excavation view of site showing sections in burnt mound, C3, facing south. Note lengths of unworked oak roundwood bottom and right – possibly simple walkways.

APPENDIX 1 CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context Register

Context	Fill of	L (m)	W (m)	D (m)	Basic Description	Interpretation	Description	Finds	Context Above	Context Below
1	N/A				Dark brown peat dominated topsoil layer.	Topsoil	Dark brown peat dominated topsoil layer.			
2	N/A				Natural peat deposit	Peat	Humic dark brown/ black peat deposit			
3	N/A	12.1	11.5	>0.27	Charcoal rich black sandy silty clay, stones.	Spread of burnt mound material.	Medium compaction dark brown black charcoal rich sandy silty clay. >50% heat shattered stones.		C1	C10, C7, C2, C10, C9, C11
4	N/A	14.5 (extending to NNE)	1.2	0.23	Linear cut, irregular sides.	Cut of modern ditch.	Linear in plan. NNE-SSW cut. No corners. Sharp break of slope at top. Irregular sides.		C6, C5	C2
5	C4	14.5 (extending to NNE)	1.2	0.23	Mid grey brown sandy clay, stones.	Fill of modern ditch.	Tightly compacted mid grey brown sandy clay. Occasional small stone inclusions.	2 sherds of modern ceramic.	C1	C6
6	C4	7 (Where visible)	0.35	0.13	Medium brown silty clay, stones.	Lower fill of modern ditch.	Tightly compacted medium brown silty clay. Occasional small stone inclusions.		C5	C4
7	C12	1.18	0.74	0.05	Dark brown black sandy clay.	Uppermost fill of a pit.	Medium compaction dark brown black sandy clay.		C3	C13
8	N/A	1.5	1.43	0.22	Sub circular cut, steep sides.	Cut of a wood lined trough.	Sub circular in plan. East-west oriented cut. Curved corners. Gradual break of slope at top. Steep sides tapering towards base. Sharp break of slope at base. Tapering base.		C18	C2
9	C8	1.05	0.91	0.07	Light grey yellow sandy ash, stones.	Sandy ash fill.	Very loose light grey yellow sand and ash. Infrequent small stone inclusions. Seventh fill of C8.		C10	C16
10	C8	0.7	0.34	0.1	Charcoal rich black clay silt.	Charcoal rich fill of trough C8.	Slightly compacted dark black charcoal rich clayish silt. Eighth fill of C8.		C3	C9
11	N/A	3.6	1.8	0.04	Dark orange brown peat, sand ash, charcoal.	Loose thin peat layer.	Loose compaction dark orange brown peat mottled with sand and ash. Charcoal and sand with ash inclusions.		C3	C14

Context	Fill of	L (m)	W (m)	D (m)	Basic Description	Interpretation	Description	Finds	Context Above	Context Below
12	N/A	1.18	0.74	0.15	Sub circular cut, gentle sloping sides.	Cut of a pit.	Sub circular in plan. North-south cut. No corners. Sharp to irregular break of slope at top. Gently sloping sides. Gradual break of slope at base. Irregular base.		C13	C2
13	C12	1.15		0.1	Dark brown silty clay, stones, charcoal.	Basal fill of a pit C12.	Loose dark brown silty clay. Occasional small stones and charcoal inclusions.		C7	C12
14	N/A	3.5	1.7	0.05	Light grey yellow ash sand, stone, charcoal.	Thin layer of ash and sand.	Loose compaction light grey yellow ash sand. Occasional small stone and moderate charcoal inclusions.		C11	C2
15	C8	1.2	1.2	0.05	Grey yellow sandy ash, charcoal.	Ash and sand layer present directly beneath the wood lining.	Very loose compaction grey yellow ash and sand. Occasional charcoal flecks. Fourth fill of C8.		C17	C19
16	C8	1.15	0.09	0.05	Timbers.	Wooden base of the trough.	8 pieces of timber laid across the base of the trough. Sixth fill of C8.		C9	C17
17	C8				Timbers.	Timbers lining the edge of the trough.	9 vertical timbers lining a trough of a burnt spread. The bottom of each piece of timber have been straightened, some have also been trimmed. Second fill of C8.		C16	C15
18					Void	Void	Void			
19	C8			Approx. 0.12	Grey ash fill.	Grey sandy ash fill.	Loosely compacted grey ash fill. First fill of C8.		C15	C21
20	C8	0.49-0.54	0.07-0.09	0.04-0.06	Wooden stakes.	Possible support for trough.	2 wooden stakes at opposite sides of the trough (East and West). They are driven slightly into the cut. Third fill of C8.		C18	C8
21	C8	0.07	0.04	0.02	Timber.	Possible peg.	This fill comprises of 1 small timber peg. Fifth fill of C8.		C19	C18

Appendix 1.2 Catalogue of Artefacts

Registration Number	Context	Item No.	Simple Name	Full Name	Material	No. of Parts	Description
E3722:5:1	5	1	Pottery	Pottery	Ceramic	1	Sherd of modern ceramic
E3722:5:2	5	2	Pottery	Pottery	Ceramic	1	Sherd of modern ceramic

Appendix 1.3 Catalogue of Ecofacts

These results relate to the processed samples taken at the excavation. A full list of these samples was supplied with the preliminary reports lodged with Galway NRDO. A total of three samples were processed by means of flotation and sieving through a 250/300µm mesh. The resulting retrieved samples of this process are listed below. In addition to this, a total of 23 timber samples were hand retrieved on site.


1.3.1 Charcoal

Context number	Sample number	Feature	Sample weight (g)
C7	3	Pit	50.9g
C3	6	Burnt spread material	114.7g
C15	10	Trough	172.7g

1.3.2 Waterlogged wood

Context number	Sample number	Feature	Sample weight (g)
3	6	Burnt spread material	7.8g
15	10	Trough	20.4g
16	50	Trough	Timber # 1
16	51	Trough	Timber # 2
16	52	Trough	Timber # 3
16	53	Trough	Timber # 4
16	54	Trough	Timber # 5
16	55	Trough	Timber # 6
16	56	Trough	Timber # 7
16	57	Trough	Timber # 8
17	58	Trough	Timber # 9
17	59	Trough	Timber # 10
17	60	Trough	Timber # 11
17	61	Trough	Timber # 12
17	62	Trough	Timber # 13
17	63	Trough	Timber # 14
17	64	Trough	Timber # 15
17	65	Trough	Timber # 16
17	66	Trough	Timber # 17
20	67	Trough	Timber # 18
20	68	Trough	Timber # 19
21	69	Trough	Timber # 20
Within C2	70	Trough	Timber # 21
Within C2	71	Trough	Timber # 24
Within C2	72	Trough	Timber # 27

Appendix 1.4 Archive Checklist

Project:	N18 Gort to Crusheen	Irish Archaeological Consultancy Ltd	
Site Name:	Clooneen 1		
NMS Number:	E3722		
Site director:	Dave Bayley		
Date:	03/01/08		
Field Records		Items (quantity)	Comments
Site drawings (plans)		6	
Site sections, profiles, elevations		10	3 sheets
Other plans, sketches, etc.			
Timber drawings		1	Plan of trough timbers, Drw # 4 and sketches on timber sheets
Stone structural drawings		N/A	
Site diary/note books		1	
Site registers (folders)		1	
Survey/levels data (origin information)		134	
Context sheets		21	
Wood Sheets		23	
Skeleton Sheets		0	
Worked stone sheets		0	
Digital photographs		145	
Photographs (print)		0	
Photographs (slide)		0	
Finds and Environ. Archive			
Flint/chert		0	
Stone artefacts		0	
Pottery (specify periods/typology)		2	Post-medieval ceramic
Ceramic Building Material (specify types e.g. daub, tile)		0	
Metal artefacts (specify types - bronze, iron)		0	
Glass		0	
Other find types or special finds (specify)		0	
Timber and trough material		23	
Human bone (specify type e.g. cremated, skeleton, disarticulated)		0	
Animal bone		0	
Metallurgical waste		0	
Enviro bulk soil (specify no. of samples)		49	
Enviro (specify number of samples and number of tins per sample)		0	
Security copy of archive		Yes	IAC Digital

APPENDIX 2 SPECIALIST REPORTS

Appendix 2.1 Radiocarbon Dating Results – QUB Laboratory

Appendix 2.2 Charcoal Remains – Sarah Cobain

Appendix 2.3 Charcoal and Wood ID – Ellen O’Carroll

Appendix 2.4 Petrological Analysis – Stephen Mandal

Appendix 2.5 Modern Pottery – Clare McCutcheon

RADIOCARBON DATING RESULTS
CLOONEEN 1, CO. CLARE, E3722
CHRONO LABORATORY, QUEENS UNIVERSITY BELFAST

Colette Rynhart
 Irish Archaeological
 Consultancy Ltd
 120b Greenpark Road
 Bray
 Co. Wicklow, Ireland
 Rep. of Ireland
 VAT No. IE8288812U



¹⁴CCHRONO Centre
 Queens University
 Belfast
 42 Fitzwilliam Street
 Belfast BT9 6AX
 Northern Ireland

Radiocarbon Date Certificate

Laboratory Identification: UBA-12730
 Date of Measurement: 2009-10-19
 Site: E3722 Clooneen 1
 Sample ID: C15S10
 Material Dated: charcoal
 Pretreatment: AAA
 Submitted by: IAC

¹⁴C Date: 3637±33
 AMS δ¹³C: -34.8

Information about radiocarbon calibration

RADIOCARBON CALIBRATION PROGRAM*
 CALIB REV5.0.2
 Copyright 1986-2005 M Stuiver and PJ Reimer
 *To be used in conjunction with:
 Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.
 Annotated results (text) - -
 Export file - c14res.csv

```
C15S10
UBA-12730
Radiocarbon Age BP 3637 +/- 33
Calibration data set: intcal04.14c # Reimer et al. 2004
% area enclosed cal AD age ranges relative area under
probability distribution
68.3 (1 sigma) cal BC 2108- 2105 0.021
2035- 1947 0.979
95.4 (2 sigma) cal BC 2132- 2083 0.160
2058- 1909 0.840
```

References for calibration datasets:
 PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell,
 CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich,
 TP Guilderson, KA Hughen, B Kromer, FG McCormac, S Manning, C Bronk Ramsey,
 RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor,
 J van der Plicht, and CE Weyhenmeyer (2004), Radiocarbon 46:1029-1058.

Comments:
 * This standard deviation (error) includes a lab error multiplier.
 ** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2)
 ** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2)
 where ^2 = quantity squared.
 [] = calibrated range impinges on end of calibration data set
 0* represents a "negative" age BP
 1955* or 1960* denote influence of nuclear testing C-14

NOTE: Cal ages and ranges are rounded to the nearest year which
 may be too precise in many instances. Users are advised to
 round results to the nearest 10 yr for samples with standard
 deviation in the radiocarbon age greater than 50 yr.

THE CHARCOAL REMAINS
CLOONEEN 1, CO. CLARE, E3722
SARAH COBAIN

*De Faoite Archaeology,
Unit 10 Riverside Business Centre,
Tinahely, Co Wicklow*

Introduction

The survival of seed and charcoal macrofossils from dryland archaeology sites is dependent upon the water table being high enough to keep the archaeological features in damp/wet and anoxic conditions. This does not usually occur on archaeological sites in Ireland, unless they are located on riverine flood plains or close to lakes. Seeds and charcoal are however preserved abundantly in the form of charcoal and carbonised plant remains as a result of burning activities in features such as hearths, kilns, furnaces, burnt structures and as waste material disposed in ditches and pits.

There were 24 burnt mound sites spanning from the early to late Bronze Age period in date on the N18 Gort to Crusheen road scheme. The burnt mound activity from Caheraphuca 5, 8, 9, 10, 11, Ballyline 3, Drumminacloghaun, Clooneen and Gortavoher dated from the early Bronze Age. Ballyline 1 and 2 and Gortaficka 1 and 2 were from the early to mid Bronze Age and Sranagalloon 1, 3 Caheraphuca 1, 3, 4, 6, 7, 12, Rathwilladoon 4, Monreagh, Monreagh 3 and Derrygarriff 3 were dated to the mid to late Bronze Age. These sites consisted of archaeological features associated with burnt mound activity and included spread, troughs, pits and gullies. Plant macrofossil and charcoal remains provide valuable information to determine socio-economic activity on archaeology sites. It is the aim of this report to identify the seed and charcoal species recovered from all these sites and to use this information to:

- 1) provide additional information regarding the function of features sampled
- 2) interpret the diet and living conditions of the occupants of the site
- 3) interpret socio-economic and industrial activities on the site
- 4) infer the composition of the local flora and woodland

Methodology

There were 3 samples to be analysed for charcoal remains. The following methodology was used to identify the plant macrofossil and charcoal fragments.

Charcoal

The number of charcoal fragments to be identified is dependent on the diversity of the flora. A study by Keepax (1988:120–124) has indicated that depending on the location of the archaeology site, 100–400 fragments of charcoal would need to be identified in order to obtain a full range of species diversity. As Britain and Ireland have a narrow flora diversity in comparison to that of mainland Europe, an identification limit of 100 fragments has been deemed sufficient for samples from either of these two countries (Keepax, 1988; cited in Austin, 2005:1). As the majority of the samples contained more than 100 fragments, in accordance with Keepax (1998), a maximum of 100 fragments were identified. Of the samples which contained greater than 100 fragments these were sieved through a 10 mm, 4 mm and 2mm sieve and an equal proportion of each sieve were identified. This was to prevent any bias that might have occurred if only larger pieces were identified (thereby ensuring any potential smaller species are equally represented).

Each charcoal fragment was fractured by hand to reveal the wood anatomy on radial, tangential and transverse planes. The pieces were then supported in a sand bath and identified under an epi-illuminating microscope (Brunel SP400) at magnifications from x40 to x400. The sand bath allowed the charcoal pieces to be manipulated into the flattest possible position to aid identification. As fragments less than 2 mm in size cannot be accurately identified (it is not possible to get a wide enough field of vision to encompass the necessary anatomical features for identification) only fragments above this size were examined. During identification, any notable growth-ring

characteristics, evidence of thermal and biological degradation and any other unusual microscopic features were recorded. Identifications were carried out with reference to images and descriptions by Cutler and Gale (2000) and Heller et al. (2004) and Wheeler et al. (1989). Nomenclature of species follows Stace (1997).

Plant macrofossils

Plant macrofossil remains were retrieved by standard flotation procedures by IAC Ltd using 1 mm and 250 micron sieves. The floated material was sorted and seeds identified using a low-power stereo-microscope (Brunel MX1) at magnifications of x4 to x40. Identifications were made with reference to Cappers et al. (2006), Berggren (1981) and Anderberg (1994). Nomenclature follows Stace (1997).

Results

The plant macrofossil and charcoal results are fully tabulated in Tables 8 in the Appendix at the end of the report.

Charcoal identification notes:

The anatomical similarities between (a) the Maloideae species (hawthorn, rowan, crab apple); (b) alder/hazel; (c) sessile/pedunculate oak; (d) wild/bird cherry and (e) poplar/willow mean that it was not possible to identify these taxa to species level (Cutler and Gale, 2000).

E3653 Caheraphuca 1

There were five samples retrieved from Caheraphuca 1. Sample 15 (C29) was recovered from pit C100, C101 and contained hazel, oak, ash, cf hawthorn, and poplar/willow charcoal inclusions. The fill (C58-sample 18) of pit/trough, C57 contained alder/hazel and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Burnt spread material C95 (sample 30) contained alder/hazel, birch, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal inclusions. Two samples were retrieved from pit C102. Secondary fill C106 (sample 39) contained alder/hazel charcoal fragments and tertiary fill C107 (sample 35) contained alder/hazel, oak, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and elm charcoal inclusions.

E3653 Caheraphuca 3

Five samples were analysed from Caheraphuca 3. Burnt spread C327 contained no charcoal inclusions and pit/tree hole C332 (sample 21-C333, samples 20 and 32--C334 and sample 38 C344) contained hazel, alder/hazel oak and ash charcoal inclusions. Sample 20 (fill C334) also contained a single carbonised hazelnut shell.

E3653 Caheraphuca 4

Burnt spreads C404 and C405 were retrieved as samples 2 and 3, respectively. C405 contained hazel, alder/hazel, oak, ash, cf hawthorn, blackthorn/sloe, poplar/willow and elm charcoal inclusions. Burnt spread C405 contained alder, hazel, alder/hazel, birch, oak, ash, cf hawthorn, cf crab apple and blackthorn/sloe charcoal inclusions.

E3653 Caheraphuca 5

A single sample (sample 1) was retrieved from the burnt spread C504 at Caheraphuca 5. This sample contained hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and yew charcoal inclusions.

E3653 Caheraphuca 6

Three samples were retrieved from burnt mound material at Caheraphuca 6. Deposit C604 (sample 3) contained alder and hazel charcoal inclusions, deposit C605 (sample 1) contained alder/hazel, oak, cf hawthorn, blackthorn/sloe and elm charcoal fragments and deposit C608 (sample 12) contained hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal inclusions. Sample 7 was retrieved from fill C617, which was a packing fill supporting timber C612. This fill contained alder, hazel, oak and ash charcoal inclusions.

E3653 Caheraphuca 7

Samples 2 and 7 were retrieved from burnt spread deposits C708 and C709 (respectively). Sample 2 (C708) contained hazel, alder/hazel, birch, oak, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal fragments. Deposit C709 contained alder/hazel, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal inclusions. Trough C715 contained fill C713 (sample 8), which contained alder/hazel, birch, oak and ash charcoal inclusions. Sample 5 was retrieved from the fill (C710) of pit C711. This pit contained alder/hazel, oak, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry and blackthorn/sloe charcoal inclusions. Pit C712 contained fill C704 (sample 3), which included alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry and blackthorn/sloe charcoal inclusions.

E3653 Caheraphuca 8

Five samples were analysed from burnt mound activity at Caheraphuca 8. Sample 10, 39, 48 and 54 were retrieved from burnt mound spreads C810, C827, C829 and C835 respectively. Sample 10 (C810) contained alder and oak charcoal inclusions and a single carbonised hazelnut shell fragment. Burnt mound spread C827 (sample 48) included alder/hazel and ash charcoal fragments. Alder, hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn and poplar/willow were recovered from burnt mound spread C829 (sample 54). Sample 88 (C835) contained alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn, cf crab apple and yew charcoal fragments. One additional sample (sample 39) was retrieved as a packing fill (C825) located under timber plank C814. This packing fill (C825) contained hazel, alder/hazel, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions.

E3653 Caheraphuca 9

Sample 2 was retrieved from the fill (C906) of pit C904 and contained alder and ash charcoal inclusions.

E3653 Caheraphuca 10

Two samples were retrieved from burnt mound activity at Caheraphuca 10. Burnt mound spread C1008 was retrieved as sample 4 and contained alder/hazel and oak charcoal fragments. The spread of unburnt stones C1005 (sample 1) contained alder/hazel, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions.

E3653 Caheraphuca 11

Trough C1109 contained the fill C1118 (sample 5) which included alder/hazel, oak and elm charcoal fragments.

E3653 Caheraphuca 12

Two samples were retrieved from Caheraphuca 12. Sample 1 was taken from burnt mound spread C1203 and contained alder, hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry, yew and elm charcoal fragments.

Sample 2 was retrieved from the fill (C1204) of trough C1204. This fill contained elder, alder, hazel, alder/hazel, oak, ash and wild/bird cherry charcoal inclusions.

E3655 Rathwilladoon 4

The burnt mound spread (C3 – sample 1) at Rathwilladoon 4 contained hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal inclusions and a single carbonised hazelnut shell inclusion. The fill (C6) of boundary ditch, C5 contained hazel, alder/hazel, oak and ash charcoal inclusions.

E3712 Monreagh 1 and 2

Four samples were retrieved from Monreagh 1 and 2. Sample 13 was recovered from the fill (C25) of trough C24 and contained alder, hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), blackthorn/sloe and yew charcoal fragments. Fill C36 (sample 18) from trough C35 contained alder/hazel, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Sample 21 was retrieved from fill C41 within pit C40. This fill contained ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions. Sample 14 was retrieved from fill C27 within well C26. This sample contained elder, hazel, oak, cf hawthorn and wild/bird cherry.

E3713 Sranagalloon 1

Sample 2 was retrieved from burnt mound spread C5 and contained alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and elm charcoal inclusions. Trough C8 contained fills C11, C12, C9 which were retrieved as sample 22. This sample contained hazel, alder/hazel, birch, oak, ash, traveller's joy and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments.

E3715 Ballyline 3

Sample 1 (C4) was retrieved from pit C3. This pit contained hazel, alder/hazel, birch, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. The sample (sample 2) retrieved from burnt mound material, C5, contained hazel, alder/hazel, oak, ash, cf hawthorn and elm charcoal inclusions.

E3716 Derrygarriff 3

Three samples were retrieved from burnt mound activity at Derrygarriff 3. Sample 8 was recovered from burnt mound material (C3) and contained alder/hazel, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn and poplar/willow charcoal fragments. Hazel, alder/hazel, birch, ash, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry, poplar/willow and elm charcoal inclusions were obtained from fill C5 (sample 1) within trough C4. Sample 6 was retrieved from the fill (C8) of trough C6 and contained alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal fragments.

E3717 Ballyline 1 and 2

Troughs C22 and C6 were analysed for charcoal remains from burnt mound activity at Ballyline 1 and 2. The fill (C25-sample 1) of trough C22 contained alder/hazel, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Sample 9 was recovered from fill C7 within trough C6. This fill contained alder, hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and poplar/willow charcoal inclusions.

E3720 Drumminacloghaun 1

Burnt spread material C3 (sample 2) from Drumminacloghaun 1 contained alder/hazel, oak, ash, yew and elm charcoal fragments and a single carbonised

yellow water lily seed. The fill (C6-sample 5) from trough C4 only contained three ash charcoal fragments.

E3722 Clooneen 1

There were three samples retrieved from burnt mound activity at Clooneen 1. Sample 6 was recovered from burnt spread material C3 and contained alder, hazel, alder/hazel, ash and poplar/willow charcoal inclusions. A packing fill layer (C15 – sample 10) which was located under the wooden base of trough C8 contained alder and ash charcoal inclusions. The fill C7 (sample 3) from pit C7 contained alder, hazel, alder/hazel and ash charcoal inclusions.

E3897 Sranagalloon 3

There were eight samples recovered from burnt mound activity at Sranagalloon 3. The spread (C34-sample 40) from possible up cast material contained birch, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions. Burnt spread material C3 (sample 38) contained hazel, alder/hazel, cf hawthorn, cf crab apple, blackthorn/sloe and elm charcoal inclusions. Two fills (C30 and C35 –samples 28 and 27 respectively) were recovered from trough C28. Fill C30 contained alder, hazel, alder/hazel, cf hawthorn, cf crab apple, blackthorn/sloe and elm charcoal inclusions and a single carbonised hazelnut shell. Fill C35 contained hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and poplar/willow charcoal fragments and a single carbonised hazelnut shell. Trough C50 contained fill C8 (sample 41). This fill included alder, hazel, alder/hazel, ash and cf hawthorn charcoal fragments. Two fills were sampled from pit C19. Sample 10 was taken from fill C22 and contained hazel, ash, wild/bird cherry and poplar/willow charcoal inclusions. Sample 12 (C27) contained alder/hazel and poplar/willow charcoal fragments.

E3898 Gortaficka 1 and 2

A single sample (sample 1) was recovered from burnt spread material C3 at Gortaficka 1. This sample contained hazel, alder/hazel, ash and wild/bird cherry charcoal inclusions. Two samples were taken from burnt mound material at Gortaficka 2. Sample 5 was retrieved from deposit C10 and contained alder, hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and yew charcoal inclusions. Deposit C20 (sample 8) contained hazel, alder/hazel, oak, ash and yew charcoal fragments. Fill C41 (sample 35) from within trough C39 and contained wayfaring tree, alder/hazel, traveller's joy and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Sample 20 was retrieved from fill 29 within pit C21. This sample contained hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow, yew and elm charcoal inclusions. Drainage gully C53 contained fill C55. The sample from this fill (sample 37) contained two fragments of wayfaring tree charcoal.

E3984 Gortavoher 1

There were two samples recovered from burnt mound material deposits from Gortavoher 1. Sample 1 was recovered from deposit C3 and contained wayfaring tree, hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), cf crab apple, blackthorn/sloe, poplar/willow, yew and elm charcoal fragments and carbonised mustard/cabbage, tufted vetch and water pepper seeds. Deposit C6 (sample 2) contained hazel, alder/hazel, birch, oak, Maloideae species (hawthorn/rowan/crab apple), poplar/willow, yew and elm charcoal inclusions.

E4037 Monreagh 3

Three samples were retrieved from burnt mound activity at Monreagh 3. Sample 2 was recovered from burnt mound material C3 and contained alder, hazel,

alder/hazel, oak, ash and elm charcoal inclusions and two carbonised hazelnut shell inclusions. The fill C11 (sample 3) from trough C10 contained alder/hazel, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments and uncharred blackberry and stone bramble seeds. The fill from pit C8 contained alder/hazel, birch, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions.

Discussion

Burnt mound/spreads

Table 1: Burnt mounds, spreads and deposits excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3653 Caheraphuca 1	Burnt spread material	C95
E3653 Caheraphuca 3 *	Burnt spread material	C327
E3653 Caheraphuca 4	Burnt mound material	C404, C405
E3653 Caheraphuca 5	Burnt spread material	C504
E3653 Caheraphuca 6	Burnt mound material	C604, C605, C608
E3653 Caheraphuca 7	Burnt deposit	C708, C709
E3653 Caheraphuca 8*	Burnt spread	C810
E3653 Caheraphuca 8	Shallow burnt spread	C827, C835
E3653 Caheraphuca 8	Burnt spread material	C829
E3653 Caheraphuca 10	Burnt mound material	C1008
E3653 Caheraphuca 10	Spread of unburnt stones	C1005
E3653 Caheraphuca 12	Burnt mound material	C1203
E3655 Rathwilladoon 4*	Burnt mound material	C3
E3713 Sranagalloon 1	Burnt spread material	C5
E3715 Ballyline 3	Burnt spread material	C5
E3716 Derrygarraff 3	Burnt spread material	C3
E3720 Drumminacloghaun 1 *	Burnt spread material	C3
E3722 Clooneen 1	Burnt mound material	C3
E3897 Sranagalloon 3	Spread – up cast from trough	C34
E3897 Sranagalloon 3	Burnt spread material	C3
E3898 Gortaficka 1	Burnt spread material	C3
E3898 Gortaficka 2	Burnt mound material	C10, C20
E3984 Gortavoher 1 *	Burnt mound material	C3, C6
E4037 Monreagh 3 *	Burnt mound material	C3

* - also contained plant macrofossils

Table 1 shows context numbers of the burnt mound deposits/burnt spreads from each site sampled on the N18. This activity involved heating stones on a hearth and then placing these into troughs filled with water, thereby heating or boiling the water. The stones were then raked out of the trough and ultimately piled as waste material into a horseshoe-shaped mound around the working area. The mounds usually contain burnt stones along with frequent charcoal inclusions which represent the remains of the firing debris used within the hearth/s to heat the stones. All of the burnt spreads/mounds along the N18 route (with the exception of C317 Caheraphuca 3) contained moderate to frequent charcoal inclusions which would represent the firing debris from fuel used within the hearths. The burnt spread samples from Caheraphuca 3 (C327), Caheraphuca 8 (C810), Rathwilladoon 4 (C3), Gortavoher 1

(C3) and Monreagh 3 (C3) also contained carbonised hazelnut shells which may represent either remains of food consumed during burnt mound activities or hazelnuts still attached to the hazel branches which used as fuel.

The spread of unburnt stones (C1005) at Caheraphuca 10 and spread of uncast material (C34) at Sranagalloon 3 both contained only occasional charcoal inclusions as a result no further information about the use/function of these two spreads can be deduced from palaeoenvironmental activity.

Troughs

Table 2: Troughs excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3653 Caheraphuca 1	Fill of pit/trough C57	C58
E3653 Caheraphuca 6	Fill of trough – fill supporting timber C612	C617
E3653 Caheraphuca 7	Fill of trough, C715	C713
E3653 Caheraphuca 11	Top fill of waste pit/trough, C1109	C1118
E3653 Caheraphuca 12	Fill of trough C1205	C1204
E3712 Monreagh 1 and 2	Fill of trough C24	C25
E3712 Monreagh 1 and 2	Fill of trough C35	C36
E3713 Sranagalloon 1	Fill of trough, C8	C9, C11, C12
E3716 Derrygarriff 3	Fill of trough C4	C5
E3716 Derrygarriff 3	Fill of trough, C6	C8
E3717 Ballyline 1 and 2	Fill of trough, C22	C25
E3717 Ballyline 1 and 2	Fill of trough, C6	C7
E3720 Drumminacloghaun 1	Fill of trough, C4	C6
E3722 Clooneen 1	Layer under wooden base of trough, C8	C15
E3897 Sranagalloon 3 *	Fill of trough C28	C30, C35
E3897 Sranagalloon 3	Fill of trough, C50	C8
E3898 Gortaficka 2	Fill of trough, C39	C41
E4037 Monreagh 3 *	Fill of trough C10	C11

* - also contained plant macrofossils

The troughs outlined in Table 2 from Sranagalloon 1, Caheraphuca 1, 7, 11, 12, Monreagh, 1 and 2, Derrygarriff 3, Ballyline 1 and 2 and Drumminacloghaun 1 all contained a mixture of silty material, burnt stones and charcoal indicating that they were backfilled with burnt mound material soon after use, either deliberately or through collapse or animal treading whereas the troughs from Sranagalloon 3 Gortaficka 2 and Monreagh 3 contained less charcoal and burnt stones which suggests they silted in naturally. Fill C15 was located under the wooden base of trough C8 at Clooneen 1 and C617 was located under timber plank C612 at Caheraphuca 6. These fills have been interpreted as deliberately placed packing fills for their respective trough structures. The charcoal within these fills is most likely intrusive and was derived from the charcoal/stones being deposited into the trough above.

The hazelnut shells recovered from fills C30 and C35 within trough C28 at Sranagalloon 3 were most likely deposited through disposal of hazelnut shells into the fire after consumption on the site, or through hazelnuts attached to branches

used as fuel in the fires. The blackberry and stone bramble seeds were uncharred and most likely silted into or deposited by birds/ small mammals into trough C10 at Monreagh after it went out of use.

Pits

Table 3: Pits excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3653 Caheraphuca 1	Fill of pits C100 and C101	C29
E3653 Caheraphuca 1	Secondary (C106) and tertiary (C107) fill of pit C102	C106 and C107
E3653 Caheraphuca 3	Fills of pit/tree root C332	C333, C334, C344
E3653 Caheraphuca 7	Fills of pits C711 and C712	C710 and C704
E3653 Caheraphuca 9	Secondary fill of pit C904	C906
E3712 Monreagh 1 and 2	Fill of pit, C40	C41
E3715 Ballyline 3	Fill of pit, C3	C4
E3722 Clooneen 1	Fill of pit C12	C7
E3897 Sranagalloon 3	Fill of pit, C19	C22, C27
E3898 Gortaficka 2	Fill of pit, C21	C22, C29
E4037 Monreagh 3	Fill of pit	C8

The pits at Caheraphuca 1 (pit C29), Ballyline 3, Clooneen 1, Caheraphuca 3 Caheraphuca 7 Caheraphuca 9, Monreagh 3 and Monreagh 1 and 2 as outlined in Table 3 were all deliberately backfilled with burnt mound material and contained frequent charcoal inclusions. This charcoal can be attributed to residual firing debris from hearths used to heat stones. The pits at Sranagalloon 3, Gortaficka 2, Caheraphuca 1 (C102) and Caheraphuca 3 silted up naturally and the charcoal within these features was most likely residual from firing debris.

Well

Table 4: Well excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3712 Monreagh 1 and 2	Fill of a well C26	C27

The fill (C27) from well C26 at Monreagh sites 1 and 2 contained frequent charcoal inclusions. There was no burning *in situ* recorded around the edges of this cut and this together with the burnt stone inclusions indicates that the well was deliberately backfilled after its final use with charcoal-rich burnt mound material.

Linear features

Table 5: Linear feature excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3898 Gortaficka 2	Fill of drainage gully C53	C55

The fill (C55) from drainage gully C53 at Gortaficka 2 contained only two fragments of charcoal. It is most likely this residual charcoal accumulated through natural silting into the drainage gully after the gully went out of use.

Platform/Timber features

Table 6: Timber feature excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal).

Site Name	Details	Context Number
E3653 Caheraphuca 8	Burnt material under timber plank, C814	C825

The fill (C825) from under timber plank C814 at Caheraphuca 8 contained only occasional fragments of charcoal. It is most likely this residual charcoal accumulated from nearby burnt mound activity and silted under the timber plank during the use of the structure.

Economic and Industrial Activities

Burnt Mound Activity

The plant macrofossil evidence from the samples recovered from burnt mound activity from sites Gortavoher 1, Monreagh 3, Sranagalloon 1, 3, Rathwilladoon 4, Caheraphuca 3, 8, 12 not provide any definitive explanation for the use of these features. The hazelnut shells recovered are indicative of a food source being consumed, perhaps as a snack during burnt mound use or they could have been attached to hazel branches which were subsequently burnt. The vetch, mustard/pepper, yellow water lily, blackberry and water pepper can all be consumed (discussed below), although they were recovered in very small quantities from these sites suggesting they were accidental inclusions (accidental losses during harvesting, the burning of weeds or they were dropped by animals/birds) rather than an indication of food production.

Fuel use

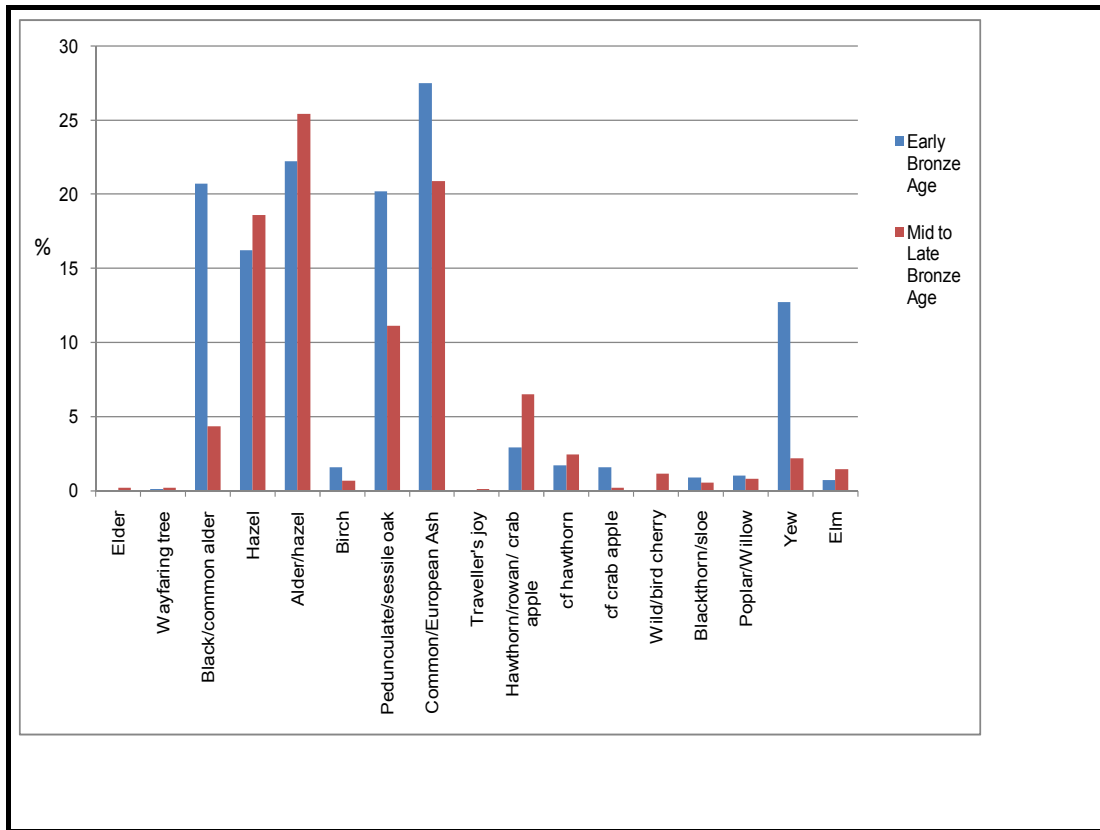
The woodland species exploited for fuel for burnt mound activities was similar throughout the Bronze Age period. The main fuels used as firing material for burnt mound activity on the N18 were ash, oak and elm. There was a high proportion of oak, ash and elm charcoal fragments which did not show obvious curved growth rings: therefore it is likely the wood was derived from larger branches or stem (trunk) wood which would have been deliberately cut with the intention of burning (rather than opportunistic gathering of brushwood). There was also a proportion of the oak and ash charcoal which did exhibit curved growth rings, which is likely to represent smaller branches. Ash, oak and elm would have been chosen as they have dense heartwood and with good ventilation, and burn slowly, maintaining an even temperature (Cutler and Gale, 2000:120, 205, Stuijts, 2005:145). This is essential for a fire being used to heat up stones as it would require constant heat for relatively long periods of time; and as collection of wood is a labour intensive activity, selection of species according to their burning properties would have been commonplace. There was also a high percentage of hazel and alder/hazel charcoal from all the N18 sites. Hazel is recorded as a reasonable fuel wood and was widely available within oak woodlands, particularly on the fringes of cleared areas (Grogan et al. 2007:30). It is possible that the hazel was used as a dominant fuel wood where oak and ash was not available.

The remaining charcoal recorded from the N18 sites consisted of elder, wayfaring tree, alder, hazel, birch, traveller's joy, hawthorn, rowan, crab apple, wild/bird cherry, blackthorn/sloe, poplar/willow and yew. The majority of the charcoal from these species exhibited curved growth rings, which suggests they derived from round wood lateral branches rather than stem/trunk wood. It is therefore likely that these branches were collected as deadwood and used within brushwood bundles as kindling for the fire. Alder, elder, birch, poplar/willow are species that are ideal to use for kindling. They are all anatomically less dense than for example, oak and ash, and burn quickly at relatively high temperatures (Cutler and Gale, 2000:34, 50, 236, Grogan et al. 2007:29, 31). This property makes them good to use as kindling, as the high temperatures produced would encourage the oak and ash to ignite and start to burn.

The hawthorn, rowan, crab apple, yew, wild/bird cherry, blackthorn/sloe have a closer grain anatomical structure, and as a result make reasonable firewood (Grogan et al. 2007:30-31; Cutler and Gale, 2000:196; Stuijts, 2005:144); however, the majority of charcoal from these species originated from small twigs which indicates that rather than being the dominant fuels, these were kindling used to ignite the oak, ash and elm. Wild/bird cherry and blackthorn/sloe can be slow to ignite and burn therefore they need assistance from other species such as alder or birch which burn at high temperatures in order to continue to burn. Travellers joy and wayfaring tree have both been recorded as good fuel woods, however as these species are both small shrub species, and because of their small representation within the charcoal assemblage, it is most likely they were collected inadvertently while gathering other twigs/roundwood for brushwood bundles (Stuijts, 2005:145, Cutler and Gale, 2000:80).

There were several slight percentage changes in species used in the early compared to mid to late Bronze Age as indicated by Figure 1. While these trends have been observed, they must be interpreted with caution because the percentage fragment count cannot be used to deduce the actual abundance of these species within the woodland (see composition of local woodlands section below for a more detailed discussion). Therefore the percentages outlined below can only realistically be used to indicate a 'presence'/'absence' variable for each species within the environment.

Figure 1: Percentage change (fragment count) in species used as fuel in the early to late Bronze Age period.



The most noticeable percentage change was the decrease in the presence of oak and ash from the early to late Bronze Age period. This can be attributed to the increase in deforestation throughout the Bronze Age period to make way for settlement, agriculture and industrial activities, which resulted in oak and ash becoming less widely available. This trend is mirrored in the pollen core results obtained from Sheeauns Lough in Connemara. Research by Molloy and O’Connell (1991:79) demonstrated a similar trend with a decrease in oak and ash pollen occurring during the late Bronze Age period. The other large percentage change to occur was the drop in yew between the early and late Bronze Age period. Yew was one of the dominant trees along with oak during the late Neolithic period; however the increase in forest clearance led to a sharp decrease in its presence within oak woodlands. This is again observed in Molloy and O’Connell’s (1991:102) research which shows an increase in yew tree pollen until the early Bronze Age, when its abundance starts to decrease. In tandem with the N18 Gort to Crusheen scheme an environmental study has been carried out in the vicinity of the burnt mound sites at Caheraphuca townland. Unfortunately the analysis was not complete by the time that the final excavation reports were compiled.

Management of the local environment

Fuel wood has been a valuable commodity throughout history and has been systematically cleared for settlement, agricultural and industrial activities from the Neolithic period onwards. There are at least 7000 known examples of burnt mounds in Ireland (Power et al. 1997 cited in Grogan et al. 2007:81) which indicates that their use was widespread throughout the Bronze Age period and subsequently this would have had a huge impact on woodland. Bronze Age, communities would have been

aware of the impact of deforestation, and coppicing would have been introduced to manage and retain this valuable resource. The high volume of hazel and alder roundwood within the charcoal is indicative of woodland management by coppicing. This type of woodland management would have been undertaken by cutting the tree to a stump every five to seven years and allowing it to re-generate. The new stems produced were harvested and used for fuel and construction of other wooden structures. This management ensured that the woodland resource was maintained for future generations (Van der Verf 1991:97; Rackham 1980:103).

Diet and socio-economic activities

Herbaceous taxa and diet

Herbaceous plants were often exploited to be used as herbs in cooking, vegetables or eaten raw in salads, all of which would have helped add flavour to food and to provide vitamins, minerals and additional fibre. Cabbage/mustard has been recorded as being eaten raw as salad, boiled down and used as pottage in stews and soups and as a vegetable similar to spinach (Behre 2008:67-8). Vetches were also retrieved on the site and are recorded to have been used to thicken stews. Water pepper is also present. It has a very acrid taste and for this reason, its seeds have been used for spices in food (Timson 1966:817). There is also evidence of fruit seeds and nuts – stone bramble and blackberries. These berries would have provided additional vitamin C and were possibly eaten raw or added into tarts/cakes (Pearson 1997: 14). Hazelnut shells were also recovered from various sites. The consumption of hazelnuts would have provided a valuable source of vitamins and minerals and would be eaten raw or could be crushed and added to stews (Pearson 1997:13).

All these species have been recorded as food through documentary sources, analysis of archaeological ecofacts and also information based on foods we eat today. Macrofossil analysis of the stomach contents of bog bodies from Kayhausen (Oldenburg, Germany), the Grauballe man (Jutland, Denmark), the Tollund man (Jutland, Denmark) and Lindow man (Lindow Moss, Cheshire, Britain) have shown indicated the presence of species such as cabbage/mustard and various fruits and nuts within the stomach contents of these people when they died. As these taxa were all found in Ireland during the prehistoric period, it can be assumed that they would have been selected and consumed (or processed to use in/or with cooking food) in Ireland. Their inclusion within the plant macrofossil record from the N18 may purely be indicative of weed species establishing in disturbed areas of the site, however it cannot be disregarded that some of these species were being exploited and consumed.

Composition of local woodlands and flora

All the archaeological sites within this report were located in areas of wetland, peat or areas prone to flooding as described in Table 7 below.

Table 7: Location of Burnt mound sites on the N18 Gort to Crusheen road scheme.

Site Name/Code	Description of present day ecological setting	Reference
E3653 Caheraphuca 1	A hollow between two peat basins	Bayley (2009a:1)
E3653 Caheraphuca 3-12	Located around a peat basin formed on the site of the now drained Caheraphuca Lough	Bayley (2009b:2)
E3655 Rathwilladoon 4	Located on the edge of a wetland area	Lyne (2009:1)
E3712 Monreagh 1 and 2	Undulating peat covered land	McNamara (2009a:1)
E3713 Sranagalloon 1	Located on an area of flat pasture land, prone to flooding	Nunan (2009a:1)
E3715 Ballyline 3		Nunan, (2009b:)
E 3716 Derrygarriff 3	Raised ground in a wetland area	Nunan (2009c:1)
E3717 Ballyline 1 and 2	Low lying flat land, close to the base of a hill	McNamara (2009b:1)
E3720 Drumminacloghaun 1	Raised area of pasture land with a natural spring and wetland area to the north	McNamara (2009c:1)
E3722 Clooneen 1	Located in a peat basin on drained bog land	Bayley (2009c:7)
E3897 Sranagalloon 3	Located between pasture and peat covered area along the base of a steeply sloping N-S orientated stream valley	Nunan (2009d:1)
E3898 Gortaficka 1 and 2	Marginal land between a pasture and peat covered area, adjacent to a N-S orientated stream	Nunan (2009e:2)
E3984 Gortavoher 1	Located at the base of a slope, positioned where the slope ended and an area of peat land began, close to the Scarriff stream	Delaney (2009a:3)
E4037 Monreagh 3	Located on the edge of a wetland area.	Delaney (2009b:3)

Local flora - Evidence from plant macrofossils

Submerged water plants

There were no submerged water plants retrieved from the N18 burnt mound sites.

Marsh/fen species

Water-pepper and yellow water lily are both species which grow in marshy, waterlogged areas and were found at Gortavoher 1 and Drumminacloghaun 1 (respectively) Water-pepper may possibly have been hand selected to use in foods (as discussed above), however it is most likely that both these species were transported by birds or other small animals and dropped/dropped of on the site.

Opportunistic/ruderal species

Cabbage/mustard, blackberry, stone bramble are all opportunistic species which grow well on cleared/waste ground. These species all could have grown easily within the N18 burnt mound sites (Gortavoher 1 and Monreagh 3 respectively) taking advantage of drier cleared areas and waste ground around the site and adjacent to tracks leading the site. While these are all considered 'weed' species, it cannot be disregarded that these were also food sources during this time, so their inclusion within the archaeological features could indicate their consumption. However as so few were recovered, it most likely signifies their accidental collection with brushwood fuel or was an indication of local flora growing in and around the site.

Dryland species

Vetch was the only dryland species recovered from the burnt mound sites (Gortavoher 1) (Holland 1919:9-10). As these were recovered in small quantities it is most likely they were either dropped by birds or small animals or were inadvertently collected with brushwood and burnt in the fires.

Local woodlands – Evidence from charcoal remains

As asserted by Scholtz (1986) cited in Prins and Shackleton (1992:632), the “Principle of Least Effort” suggests that communities of the past collected firewood from the closest possible available wooded area. If this theory were to be used it would assume that from the species collected the woodland surrounding the site would consist of oak-ash woodland in dryland areas (usually away from the sites) and alder-carr fen in areas close to the sites. Whilst this can be used as the basic theory, other variables affecting wood collection must be taken into account (Prins and Shackleton 1992:632). These include:

1) Selection of particular species in favour of others within the woodland

Oak, ash and elm were likely to have been deliberately selected as fuel to use in a hearth/furnace (used to heat stones for burnt mound activity) as they are considered long lasting and effective fuels (Stuijts 2005:141 and 143) so it is likely they were preferentially searched for and harvested and would have a higher percentage representation within the charcoal assemblage.

2) Deliberately cultivated species

The evidence of hazel and alder coppicing during the Bronze Age is another variable, which by altering and managing the environment would have increased the amount of available wood therefore its representation within the charcoal assemblages.

3) Differential preservation of charcoal/non-uniform survival of charcoal over time

Preservation rate of charcoal can be affected by a number of variables, for example

- a) Mechanical abrasion on a site with stony subsoil may cause the charcoal fragments to be broken into smaller unidentifiable fragments.
- b) Two identical pieces of wood may fragment into different numbers of charcoal fragments when burnt. Some, all or none of these may be recovered from the archaeological record which would affect possible woodland reconstructions.
- c) The overall heat of the fire may cause the wood to turn to ash and not be represented at all in the archaeological record (Asouti and Austin, 2005:1-5).

As a result of these variables it is not possible to infer from the fragment counts obtained the percentages/numbers of each of these species within the local environment. However, based on the assumption that communities will collect wood from the closest possible source (Scholtz 1986) and, in particular, the collection of economically less important kindling fuel wood (which was most likely obtained from the area close to the site), the charcoal assemblage does suggest that the local vegetation throughout the Bronze Age would have consisted of alder-carr fen in the immediate vicinity of the sites due to their wetland location. There was, however, a large assemblage of charcoal from species indicative of dryland areas which indicate the presence of oak-ash woodland on raised areas/slopes close to the sites.

Alder-carr woodland

The evidence of alder-carr fen woodland indicates a damp to waterlogged environment close to the burnt mound sites. This type of woodland would have consisted of alder, willow and poplar are all trees which thrive in waterlogged and damp soils, particularly in areas close to streams or with a high water table (McVean 1953:451, Stuijts 2005:143 and Cutler and Gale 2000:190). Viburnum and elder are both understory shrubby plants/small trees which grow in damp, waterlogged soils again adjacent to streams, lakes and in areas with a high water table (Stuijts 2005:145; Aitkinson and Aitkinson 2002:897). Birch is a tree which can tolerate both dry and damp soils and would most likely be located in marginal areas between the damp, waterlogged soil and drier areas, upslope from the burnt mound sites (Stuijts 2005:140).

Oak-Ash woodland

The large assemblage of dryland wood species indicates the presence of an oak-ash woodland, close to the burnt mound sites. This would have consisted of oak, ash and elm trees which would be the dominant large tree species (Cutler and Gale 2000:120, 205, Stuijts 2005:145). On the marginal areas of oak-ash woodlands or in clearings, yew, rowan, hazel, hawthorn, crab apple, wild/bird cherry and blackthorn all thrive. These species are all lower level woodland species and will grow in shaded conditions, however, they are usually located where there is a higher light availability to allow flowers and fruits to develop (Stuijts 2005:142, 144; Cutler and Gale 2000:88, 183, 196). Traveller's joy is an understory shrub plant which clings to trees within oak woodlands to grow (Cutler and Gale 2000:80).

Conclusion

The archaeological features excavated from the N18 burnt mound sites have provided a rich assemblage of charcoal which allows an interesting insight into the industrial activities of the Bronze Age community. The charcoal remains identified from all burnt mound features (troughs, burnt mounds, burnt spreads, pits, gullies, wooden structures) represented firing debris from the fuel used in hearths to heat stones. These stones would then have been used either to heat/boil water within troughs on site.

The fuel used to heat the stones appears to have been exploited from alder-carr fen woodland consisting of alder, willow, poplar, viburnum and birch, and oak-ash woodland consisting of oak, ash, elm, hazel, yew, rowan, hawthorn, crab apple, wild/bird cherry, blackthorn and traveller's joy. The oak, ash and elm would most likely have provided the main fuels for the fire as they provide long-lasting heat at relatively high temperatures. The remaining species were likely to have been used as kindling material for the fire.

There are several variables that affect the reconstruction of local woodland using charcoal assemblages; however, if the charcoal were to be used as a 'presence' indicator it can be assumed that as the fuel wood (in particular kindling material) was usually selected from local woodlands. These charcoal remains have also made it possible to suggest that the woodland in the close vicinity to the N18 burnt mound sites would have consisted of both alder-carr fen in waterlogged areas close to the sites and oak-ash climax community woodland upslope/on higher ground..

References

- Aitkinson, E and Aitkinson, M D 2002 *Sambucus nigra*. *The Journal of Ecology*, 90 (5), 895-923.
- Anderberg A-L 1994 *Atlas of Seeds: Part 4*. Swedish Museum of Natural History, Risbergs, Trycgeri AB, Uddevalla, Sweden.
- Asouti, E & Austin, P 2005 Reconstructing woodland vegetation and its exploitation by past societies, based on the analysis and interpretation of archaeological wood charcoal macro-remains. *Environmental Archaeology* 10:1-18
- Austin, P J 2005 Analysis of wood charcoal macro-remains from Glanworth Castle, Co. Cork. Excavation No. E236. Unpublished palaeobotanical report.
- Bayley, D 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3653 Caheraphuca 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Bayley, D 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3653 Caheraphuca 3-12. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Bayley, D 2009c Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3722 Clooneen 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Behre, K-E 2008 Collected seeds and fruits from herbs as prehistoric food. *Vegetation History and Archaeobotany*, 17, 65-73.

Berggren, G 1981 *Atlas of Seeds: Part 3*. Swedish Museum of Natural History, Berlings, Arlöv, Sweden.

Cappers, R T J, Bekker R M, and Gronigen, J E A 2006 *Digital Seed Atlas of the Netherlands*. Archaeological Studies 4, Barkhuis Publishing, Eelde, The Netherlands. www.seedatlas.nl.

Cutler, D F and Gale, R 2000 *Plants in Archaeology – Identification Manual of Artefacts of plant origin from Europe and the Mediterranean*, Westbury Scientific Publishing and Royal Botanic Gardens, Kew.

Delaney, S 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3984 Gortavoher 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Delaney, S 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E4037 Monreagh 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Grogan, E, Johnston, P, O'Donnell, L 2007 *The Bronze Age Landscapes of the Pipeline to the West: An Integrated Archaeological and Environmental Assessment*, Wordwell Ltd, Bray: Co Wicklow.

Heller, I, Kienast, F, Schoch, W, Schweingruber, F H 2004 *Wood Anatomy of Central European Species* Online version: www.woodanatomy.ch.

Holland, J H 1919 Food and fodder plants. *Bulletin of Miscellaneous Information*, 112, 1-84.

Keepax, C A 1988 *Charcoal Analysis with Particular Reference to Archaeological Sites in Britain*. Unpublished PhD thesis, University of London.

Lyne, E 2009 Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3655 Rathwilladoon 4. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McNamara, S 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3712 Monreagh 1 and 2. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McNamara, S 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3717 Ballyline 1 and 2. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McNamara, S 2009c Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3720 Drumminacloghaun 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McVean, D N 1953 *Alnus glutinosa* (L.) Gaertn. *The Journal of Ecology*, 41, 2, 447-466.

Molloy, K and O'Connell, M 1991 Palaeoecological investigations towards the reconstruction of woodland and land-use history at Lough Sheeauns, Connemara, western Ireland, 67, 75-113.

Nunan, J 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3713 Sranagalloon 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3715 Ballyline 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009c Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3716 Derrygarraiff 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009d Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3897 Sranagalloon 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009e Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3898 Gortaficka 1 and 2. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Pearson, K L 1997 Nutrition and the Early-Medieval Diet. *Speculum*, 72 (1), 1-32.

Prins, F and Shackleton, C M 1992 Charcoal analysis and the "Principle of Least Effort" - A conceptual Model. *Journal of Archaeological Science*, 19, 631-637.

Rackham, O 1980 The medieval landscape of Essex. In Buckley, D G (ed.) *Archaeology in Essex to AD1500*. Council for British Archaeology, Research Report No. 34.

Scholtz, A 1986 *Palynological and Palaeobotanical Studies in the Southern Cape*, MA Thesis of Stellenbosch, Stellenbosch, South Africa.

Stace, C 1997 *A New British Flora*. Cambridge: Cambridge University Press.

Stuijts, I 2005 Wood and Charcoal Identification. In Gowen, M, O'Neill, J and Phillips, M, *The Lisheen Mine Archaeological Project 1996-1998*, Wordwell Ltd, Bray: Co Wicklow.

Timson, J 1966 *Polygonum hydropiper*. *The Journal of Ecology*, 54, 3, 815-821.

Van der Verf, S 1991 The influence of coppicing on vegetation. *Vegetatio*, 92 (2), 97-110.

Wheeler, E A, Baas, P and Gasson, P E (eds) 1989 IAWA List of Microscopic Features for Hardwood Identification. *IAWA Bulletin* ns 10: 219-332.

Appendix

Table 8: Charcoal species identified from E3722 Clooneen 1, Co Clare.

Sample Number			3	6	10
Fill Number			C7	C3	C15
Cut Number			C12	N/A	C8
Family	Species	Common Name			
Betulaceae	<i>Alnus glutinosa</i>	Black/common alder	17	2	72
	<i>Corylus avellana</i>	Hazel	30	47	
	<i>Alnus glutinosa /Corylus avellana</i>	Alder/hazel	31	1	
Oleaceae	<i>Fraxinus excelsior</i>	Common/European Ash	22	48	28
Salicaceae	<i>Populus spp/Salix spp</i>	Poplar/Willow		2	
		Indeterminate	0	0	0
Total fragments identified			100	100	100

AN ANALYSIS OF THE WOOD
EXCAVATED FROM A TROUGH,
CLOONEEN 1, CO. CLARE, E3722

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Introduction

A total of 23 wood samples from the excavation of a wooden trough and some natural wood associated with burnt mound activity were analysed by the author. The wood was in poor condition and was sampled from two features, a trough (C16, 17, 20) and some natural wood which may have served as a platform structure. The wood assemblage, although undated, possibly relates to the Bronze Age period.

The analysis presented here concentrates on species identification, species selection and the composition of the local woodland during the Bronze Age period in the area surrounding Clooneen. Woodworking analysis which is sometimes a useful indicator of tool types being used at any given period was also undertaken.

The work undertaken here at Clooneen townland will add important information to the rapidly expanding database of environmental indicators and use of woodlands particularly in relation to the Bronze Age period of Clare. This area of work is especially important in Ireland where there were no written records up to the 18th century relating to the amount and type of woodland (McCracken 1971, 15).

Methods

The wood was firstly washed and was carefully examined for signs of toolmarks or surface treatment and was then identified to species under a microscope. The process for identifying wood, whether it is charred, dried or waterlogged is carried out by comparing the anatomical structure of wood samples with known comparative material or keys (Schweingruber 1990). Thin slices were taken from the transversal, tangential and longitudinal sections of each piece of wood and sampled using a razor blade. These slices were then mounted on a slide and glycerine was painted onto the wood to aid identification. Each slide was then examined under a microscope at magnifications of 10x to 450x. By close examination of the microanatomical features of the samples the species were determined. The diagnostic features used for the identification of wood are micro-structural characteristics such as the vessels and their arrangement, the size and arrangement of rays, vessel pit arrangement and also the type of perforation plates.

All wood samples were analysed at the N18 site offices in Crusheen, Co. Clare between the 30 June and the 1 July 2008. Where appropriate, the samples were measured and described in terms of their function and wood technology. This included point types, split types and individual toolmarks such as facets (individual tool marks) and tool signatures.

The annual tree rings were counted partially under a microscope and partially by eye therefore it is only an approximate age. The annual tree ring counts for the split timbers do not give a real estimate of the age of the parent tree when it was cut down as splitting implies division and therefore only partial remains of the parent tree will survive. Average growth rates were also established. A fast growth rate is around 4mm per year. As different factors (weather and soil conditions) determine growth rates of trees and growth rates vary across each sample average growth rates were calculated for each sample. The growth rates for some samples varied significantly therefore these samples were classified as slow to moderate, moderate to fast and so on (see Appendix).

Definitions of Element Types and woodworking terminology

Constructional Elements

Brushwood:	Stems or rods measuring 6cm or less in diameter.
Roundwood:	A piece of worked or unworked wood in the round and over 6 cm in diameter.
Vertical Stake/Post:	Upright brushwood or roundwood driven vertically or at an angle into the ground. Sometimes but not always used for stabilization.
Horizontal:	Brushwood/roundwood or split timber laid flat on the ground.
Twigs:	Small shoots or branches measuring around 1 cm in diameter.
Split timber:	Wood converted from the round including planks, half splits and split pegs.

Woodworking terms and definitions

Chisel point:	The end of a piece of wood cut to a point on one single face.
Conversion:	The way in which the primary trunk has been split into smaller elements.
Facet:	The cut surface produced on a piece of wood by a tool blow. The blow can leave behind a particular signature if the cutting edge of the tool is flawed.
Facet junction:	The nature of the junctions between each facet was also assessed as to whether they were clean, ragged or stepped
Jam curves:	A complete tool mark on wood retaining the impression of the complete width of the blade used
Pencil point:	The end of a piece of wood cut to a point on multiple faces.
Signature:	A signature is an imperfection in a woodcutter's blade which is transferred onto the timber when the wood is cut. A negative impression or a groove is created where a flange of metal extends beyond the axe blade where as a positive or raised signature is created by a gap in the blade edge.
Wedge point:	The end of a piece of wood cut to a point on two faces.

Description of feature types

Clooneen 1 comprised a burnt spread measuring 11.75 m north–south x 11.60 m east–west x 0.24 m maximum depth. The burnt spread sealed a timber-lined trough that measured 1.44 m north–south x 1.70 m east–west x 0.55 m deep. It contained eight timbers lying horizontally at a depth of 0.15 m (C16). Nine timbers were driven vertically around the sides of the trough (C17), with two additional stakes (C20) in place to help secure the vertical timbers in place. All were in a relatively poor state of preservation. A second pit measuring 1.22 m north–south x 0.74 m east–west x 0.16 m maximum depth was cut 0.88 m to the west of the trough. Three tree trunks were recorded to the south of the burnt spread. There was no evidence to suggest that these trees had been deliberately felled and no tool marks were discernable. However, it is possible that they provided a simple east–west-oriented walkway around the burnt spread. The only finds from this site were two sherds of chinaware.

Results

A total of twenty-three wood samples were analysed with regard to species identification, species selection and wood working technology. One sample (timber no. 20) was unidentifiable due to its desiccated nature (see Table 1).

The analysed samples were identified as *Alnus glutinosa* (alder), *Fraxinus excelsior* (ash) and the natural wood was identified as *Quercus* spp (oak). There was a preference for ash wood in the construction of the side lining for the trough C17 and

the base was of ash and alder (C16). The two posts were constructed from ash timbers (C20). The ash wood was split both tangentially, radially and half split. The type of split of the alder wood could not be discerned due to the desiccated nature and as a result they have been recorded as split. One faded partial jam curved measuring 4.8 cm in width was recorded on timber no. 10, C17.

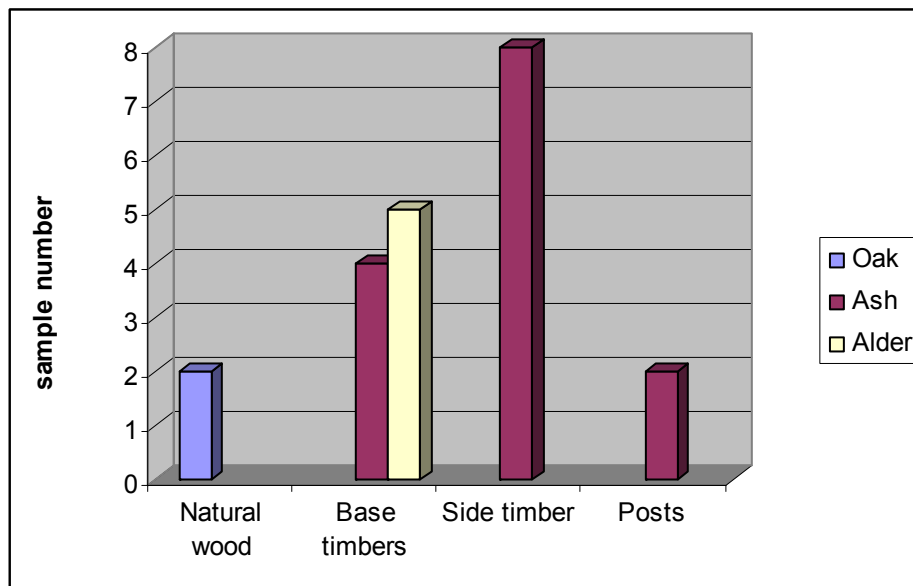


Figure 1: Results from wood identifications at Clooneen 1

The trough



Plate 1: Wooden trough

The timbers analysed from the lining of the trough contained alder and ash split timbers. The wood examined from this feature was in poor condition and each timber piece had broken up into several pieces (plate 1). The side timbers measured 0.40 m in maximum length x 0.68 m in maximum width and 0.21 m in maximum depth. The ash timbers were tangential, radial and half split and there were faded toolmarks including a partial jam curve measuring 4.8 cm in width present on sample no. 10 (Plate 2). This suggests a medium sized splayed blade. The split types were indeterminate from the analysis of the alder timbers.

The annual tree rings present on the ash timbers ranged between 10 and 70 years (depending on split types) and the growth rate determined on the majority of the ash timbers was fast, some annual tree rings recorded as being 4mm in width. This growth rate may be a reflection of either the climatic/soil conditions or the density of the woodlands and the presence of natural light that was available to the trees. It was unclear due to the degraded state of the wood whether the ash samples were manufactured from the same tree but similar tree ring patterns were discernable from one timber to each other which suggests the wood samples were selected from the same stand of ash trees.

Five of the base timbers of the trough were of ash and four were manufactured from the alder tree. The base timbers measured between 0.46 m and 1.21 m in length and 0.25 x 0.16 m in maximum depth and width. They were radial and half split which is in slight comparison to the side timbers of the trough which were radial, half and tangential splits. Four timbers from the base of the trough were split alder planks. The alder trees analysed had on average 35 annual tree rings present and their growth rate was indeterminate.



Plate 2: Timber (no. 10) examined from trough C17 – detail of excavated trough



Plate 3: Timber no. 10, C17, evidence of degraded tooling.

Timbers identified from natural wood

All of the timbers identified from the natural wood were oak (*Quercus sp.*). The wood was too degraded to count the annual tree rings and there was no woodworking evidence noted on the analysed samples.

Discussion of Wood Assemblage

Aims of the study

- To determine the types of woods selected for use as structural wood within the excavated features.
- To re-construct the environment that the wood was selected from and assess the conditions under which the local woodlands grew through tree ring analysis.
- To establish whether any wood was selected from coppiced or managed woodland.
- To determine and analyse any woodworking present on the samples

Three taxa were present in the wood samples from Clooneen 1. The most commonly occurring taxa was ash (*Fraxinus excelsior*) and was the main taxon identified from the trough. Alder (*Alnus glutinosa*) base timbers were also identified from the trough. Oak was identified from the three natural trees which were excavated close to the excavated burnt mound spread.

The tree ring evidence indicates that the ash trees grew in favourable conditions as their growth rates were mostly determined as fast. The natural oak trees showed evidence of slower growth rates.

The analysed wood was, for the most part, in a poor state of degradation therefore there was very little woodworking evidence present on the samples. The timbers were half split, radially and tangentially split in the construction of the timber lined trough. There was a slight preference for radial split in the construction of the side timbers of the trough. Radial split timbers are when a tree is split along its rays and this generally produces stronger timbers as the rays can act as a strengthening factor for the planks. Tangentially split is where the timber is split against the rays and half split is a timber that is split in half.

The two posts were also half splits and there was no evidence of working at the ends of the timbers. There was one partial jam curve present on sample no. 10. This jam curve measured 4.8 cm in width and suggests the use of medium sized splayed metal axe.

Large assemblages of wood from the numerous road schemes are currently under analysis throughout Ireland. The wood analysis from this site at Clooneen fits in with the wood types identified from troughs elsewhere in the country. Alder and ash are commonly used as timbers to line troughs as evidenced along the Charlestown bypass in Co. Mayo and the N11 in Co. Wicklow (O Carroll, 2007). The gas pipe line to the west shows that oak was the main timber used for wood lined troughs (Grogan, O Donnell and Johnston). In general though it is very difficult to determine a pattern of wood use for specific feature and trough types associated with burnt mounds. Alder, ash and oak are the most frequent species used in the construction of plank-lined troughs while hazel and ash are selected for posts also used in the construction of wattle troughs.

Environmental information relating to the wood remains

Ash wood is a native species preferring lime-rich freely draining soils. It is not a very durable timber in waterlogged conditions but has a strong elastic nature. It is easily worked and lends itself well to a range of different requirements like the turning of wooden bowls.

Alder is a widespread native tree and prefers wet habitats along stream and river banks. It is an easily worked and split timber and therefore quite commonly manufactured into planks. Alder poles were a favourite timber for underground foundations in damp or wet conditions. It was used as piles under houses, bridges, boat jetties, canal lock gates, pumps and troughs. The timber can resist decay in a wet environment almost indefinitely. Venice floats partly on the strength of alder trees.

The wood identified from the natural trees belonged to an oak wood which grew in the area in the past. A date for this oak wood is unclear but previous dates of bog oak have shown that they range between 2,000 and 6,000 years old. Trees need nutrients to grow so whenever trees are found in a peat/wet/fen environment this means they must have been in contact with nutrient rich water or underlying rich mineral soil. The oak trees probably established themselves on the mineral soils and then when the water table began to rise and the fen peat began to develop the trees may have died and subsequently became preserved in the fen peat layers.

Sessile oak (*Quercus petraea*) and pedunculate oak (*Quercus robur*) are both native and common in Ireland. The wood of these species cannot be differentiated on the basis of its microstructure. Pedunculate oak is common on heavy clays and loams particularly where the soil is of alkaline pH. Sessile oak is common on acid soils often in pure stands and although it thrives on well-drained soils it is also tolerant of

flooding (Beckett 1979, 40-41). Both species of oak grow to be very large trees (30-40m).

Conclusions & Summary on Wood Assemblage

Three taxon were identified in the wood samples from Clooneen 1 E3722. The identified samples were identified as *Alnus glutinosa* (alder), *Fraxinus excelsior* (ash) and *Quercus sp* (oak). Alder and ash wood was selected, split and used in the construction of the trough while oak wood was identified from the natural wood. The wood analysed from the trough was split both tangentially, radial and half split. The wood analysed from the trough was in poor condition and there were only traces of toolmarks present on one of the wood pieces. This tool mark showed a partial jam curve measuring 4.8 cm in width and is reminiscent of a medium sized splayed metal axe.

The wood types identified and used at Clooneen 1 comprise alder trees which are suggestive of a wetland type environment and ash trees which prefer lime-rich freely draining soils. As stated above there are two types of oak trees that grow in Ireland. Pendunculate oak is common on heavy clays and loams particularly where the soil is of alkaline pH. Sessile oak is common on acid soils often in pure stands and although it thrives on well-drained soils it is also tolerant of flooding (Beckett 1979, 40-41).

The alder used within the excavated features and associated with the burnt mound spread may have been selected from nearby to the site, possibly from the natural wood growing in the area as evidenced from the analysis completed at Caheraphuca and Sranagalloon. The ash would have been selected from the nearby dryland edges.

The oak most likely grew in the surrounding areas prior to the deep water logging of the soils after which they died and were preserved.

References

- Beckett, J K 1979 Planting Native Trees and Shrubs. Jarrold and Sons Ltd, Norwich.
- Eogan, G 1983 Hoards of the Irish Later Bronze Age. University College Dublin, Dublin.
- Grogan, E, O'Donnell, L and Johnston P 2007 The Bronze Age Landscapes to the West. Wordwell, Wicklow.
- Hall, V 1995 Woodland Depletion in Ireland over the last Millennium. In J R Pilcher and S Mac An tSaoir (eds) Wood, Trees and Forests in Ireland, 23-35. Royal Irish Academy, Dublin.
- Hurley, M F 1982 Wooden artefacts from the excavation of the medieval City of Cork. In S Mc Grail, Woodworking Techniques before A.D 1500, BAR 129, 301-311.
- Hurley, MF 1986, A study of Skeletal and Wooden Artefacts from Medieval Cork. Unpublished M.A. Thesis, University College Cork.
- Hurley, M & Scully, O 1997 Late Viking Age and Medieval Waterford Excavations 1986-1992. Waterford Corporation.
- Kelly, F 1988 A Guide to Early Irish Law. Institute for Advanced Studies, Dublin.
- McCracken, E 1971 The Irish Woods Since Tudor Times. Institute of Irish Studies, Belfast.
- Morgan, R 1975 The Selection and Sampling of Timber from Archaeological Sites for Identification and Tree-ring analysis, Journal of Archaeological Science, 2, 221-230.
- Nelson E C 1993 Trees of Ireland. The Lilliput Press, Dublin.
- O Carroll, E 1994 The analysis of two wooden assemblages from Corlea Bog, Co. Longford and King John's Castle, Co. Limerick. Unpublished M.A. Thesis, University College Cork.
- O Carroll, E 1994 The analysis wood remains from Caheraphuca 5, 8 and 6a, Co. Clare Unpublished post excavation report, IAC and NRA.
- O Carroll, E 2004 The analysis of wood and charcoal from Monanny, Co. Monaghan, Unpublished report for IAC.
- O Carroll, E 2007 The analysis of wood and charcoal from Charlestown by-pass, Co. Mayo, Unpublished report for Mayo County Council.
- O Carroll, E 2007 The analysis of wood and charcoal from the N11, Arklow to Rathnew, Co. Wicklow, Unpublished report for the NRA/Wicklow County Council.
- O Donnell, L 2005 Wood and charcoal identifications from Charlesland, Co. Wicklow, Unpublished specialist report for Margaret Gowen and Co.
- O Donnell, L 2005 Wood and charcoal identifications from Ballynagran, Co. Wicklow, Unpublished specialist report for Margaret Gowen and Co.

- O' Sullivan, A 1987 Wood in Archaeology, *Archaeology Ireland* 4 , 69-73.
- O' Sullivan, A 1994 The use of Trees and Woodland in early medieval Ireland, *Irish Forestry* 51, 80-94.
- Rackham, O 1976 *Trees and Woodlands in the British Landscape*. Weidenfeld & Nicholson, London.
- Rackham, O 1980 *Ancient Woodland: its history, vegetation and uses in England*. Edward Arnold, London.
- Sands, R 1997 *Pre-historic woodworking. The Analysis and Interpretation of Bronze and Iron Age toolmarks*. Institute of Archaeology, University of London
- Schweingruber, F H 1990 (3rd edition) *Microscopic Wood Anatomy*. Birmensdorf: Swiss Federal Institute for Forest, Snow and Landscape Research.
- Webb, D A 1977 *An Irish Flora*. Dundalgan Press Ltd., Dundalk.
- Western, C A 1970 Wood and Charcoal in Archaeology, *Science in Archaeology*, 178-187.

Table 1: Catalogue of identified wood

Context	Timber No.	Element type	Feature type	Identification	Length	Width x Depth / Diameter	Annual tree rings	Growth Rate	Woodworking evidence	Comment	Recommendations
	T27	Natural		<i>Quercus sp</i>	0.36m	0.1m x 0.05m				Natural wood	Discard
	T21	Natural		<i>Quercus sp</i>	0.15m	0.09m x 0.03m	70	Slow		Degraded - Natural?	Discard
	T24	Natural		<i>Quercus sp</i>	0.30m	0.07m x 0.025m		Slow		Degraded - Natural?	Discard
17	10	Side timber	Trough	<i>Fraxinus excelsior</i>	0.31	0.23m x 0.09m	18	Very fast	Half Split. One partial jam curve - 4.8cm W. Slightly curved.	Quite degraded.	Discard
17	11	Side timber	Trough	<i>Fraxinus excelsior</i>	0.34m	0.17m x 0.02m	15	Moderate	Tangential Split	Poor Condition	Discard
17	12	Side timber	Trough	<i>Fraxinus excelsior</i>	0.37m	0.21m x 0.68m	70	Fast	Radial Split	Poor Condition	Discard
17	13	Side timber	Trough	<i>Fraxinus excelsior</i>	0.4m	0.15m x 0.06m	70	Fast - some tree rings more than 4mm in size	Radial Split	Very Poor Condition	Discard
17	14	Side timber	Trough	<i>Fraxinus excelsior</i>	0.33m	0.17m x 0.05m	60		Radial Split	Very Poor Condition	Discard
17	15	Side timber	Trough	<i>Fraxinus excelsior</i>	0.28m	0.18m x 0.05m	25		Radial Split	Very Poor Condition	Discard
17	16	Side timber	Trough	<i>Fraxinus excelsior</i>	0.3m	0.25m x 0.09m	10		Tangential Split	Very Poor Condition	Discard
17	17	Side timber	Trough	<i>Fraxinus excelsior</i>	0.21m	0.19m x 0.03m	15	Fast	Tangential Split	Very Poor Condition	Discard
20	18	Post	Trough	<i>Fraxinus excelsior</i>	0.49m	0.07m x 0.04m	26	Slow, fast and slow	Half split	Moderate Condition	Discard
21	20	Scrap of wood	Trough	<i>Fraxinus excelsior</i>	0.07m	0.04m x 0.02m	12			Possibly Broken	Discard
20	19	Post?	Trough	<i>Fraxinus excelsior</i>	0.55m	0.09m x 0.06	32	Moderate	Half split	Good Condition	Discard
16	1	Base timber	Trough	<i>Alnus glutinosa</i>	0.74m	0.1m x 0.02m				Poor Condition	Discard
16	2	Base timber	Trough	<i>Alnus glutinosa</i>	0.73m	0.11m x 0.03m				Good Condition	Discard
16	3	Base timber	Trough	<i>Fraxinus excelsior</i>	1.07m	0.11m x 0.04m	22		Radial Split	Poor Condition	Discard
16	4	Base timber	Trough	<i>Fraxinus excelsior</i>	1.22m	0.16m x 0.25m	15	Fast	Half Split	Poor Condition	Discard

Context	Timber No.	Element type	Feature type	Identification	Length	Width x Depth / Diameter	Annual tree rings	Growth Rate	Woodworking evidence	Comment	Recommendations
16	5	Base timber	Trough	<i>Fraxinus excelsior</i>	1.03m	0.14m x 0.02m	35		Radial Split	Poor Condition	Discard
16	6	Base timber	Trough	<i>Alnus glutinosa</i>	0.84m	0.12m x 0.02m	35		Split	Poor Condition	Discard
16	7	Base timber	Trough	<i>Alnus glutinosa</i>	0.72m	0.09m			Split		Discard
16	8	Base timber	Trough	<i>Fraxinus excelsior</i>	0.52m	0.05m	15	Moderate		Very Poor Condition	Discard
16	9	Base timber	Trough	<i>Fraxinus excelsior</i>	0.46m	0.045m				Poor Condition	Discard

PETROGRAPHICAL REPORT ON STONE SAMPLES TAKEN
DURING ARCHAEOLOGICAL EXCAVATIONS AT
CLOONEEN 1, CO. CLARE, E3722

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Introduction

This report is based on the macroscopic (hand specimen) examination of stone samples taken during archaeological excavations in advance of the N18 Gort to Crusheen Road Improvement Scheme. The purpose of the study was to identify the rock types from which the stone objects were made, to highlight potential sources for them, and to comment on their possible function. It is important to note that macroscopic petrographical studies have been considered of limited value in comparison to microscopic (thin section and geochemical analysis) studies. On the other hand, macroscopic studies provide an excellent preliminary assessment tool and have proven to be of considerable value in petrographical studies (e.g. see Mandal 1997; Cooney and Mandal 1998).

Solid Geology and Soils of the Site (see Figure 1)

The bedrock under the site consists of Lower Carboniferous Tubber Formation (see below).

The geology of the area is predominantly made up of Lower Carboniferous Age rocks. However, older rocks make up the west and southwest of the area; the oldest rocks in the area occur as inliers (areas of older rocks surrounded by younger rocks) of Ordovician age tuff, lavas and clastic sediments, known as the Caher Hill Formation (shown as CH on Figure 1). Silurian Age rocks also occur as inliers in the area, in the form of the Derryfadda Formation (DF), consisting of greywackes, siltstones and mudstones. These are stratigraphically overlain unconformably by the Upper Devonian to Lower Carboniferous Ayle River Formation (AR) of mudstones, siltstones and conglomerates. This formation marks the start of a conformable sequence making up much of the study area, comprising: the Lower Limestone Shale (LLS), sandstone, siltstone and thin limestone; the Ballysteen Formation (BA), fossiliferous dark-grey muddy limestone which includes in this area the Ballynash Member (BAbn), wavy-bedded cherty limestone and this shale; and the Waulsortian Limestones (WA), massive bedded lime-mudstone.

There is a minor gap in the sequence in this area, the next youngest rocks belonging to the Tubber Formation (TU), consisting of crinoidal and cherty limestone and dolomite and the Burren Formation (BU), consisting of pale grey clean skeletal limestone. Both of these formations contain numerous distinct members, all represented in the area. Each of the members consist of a distinctive type of limestone, for example, the Aillwee Member (lower) (BUal) of bedded and massive fossiliferous limestones.

These Lower Carboniferous rocks, which make up much of the Midlands of Ireland, represent the northward return of the sea at the end of the Devonian, c. 360 million years ago, owing to the opening of a new ocean to the south called the Palaeo-Tethys in what is now central Europe.

Bedrock is not generally exposed in the area; instead it is covered by boulder clay, which are the result of glacial action during the last glaciation. Drumlins - an elongated hill formed by glacial action - are common in the area. The soils of the area consist of shallow brown earths (Aalen et al. 1997).

Results

Site	Sample	Context	Notes		
Clooneen 1	10	15	Heat altered / shattered	Angular cobbles	Quartzite, very coarse grained white; some limestone, cherty

Potential Sources

It is likely that the sources for all of the samples are local. There are abundant sources for limestone of all varieties in the Carboniferous succession. Sandstone, quartz sandstone and quartzite are most likely sourced within the Caher Hill Formation and / or Ayle River Formation. It is, however, important to note that these rock types were not necessarily sourced from bedrock, but could also have come from secondary sources, such as in the glacial tills / sub-soils at the site.

Discussion

While it is not possible to determine a definitive source for these stone samples based on macroscopic examination alone, it can be stated that these rock types are available locally in outcrop and within the glacial tills / sub-soils. It is therefore highly probable that the material in these samples were sourced in the immediate vicinity of the site.

A total of 38 samples were examined from sites across the N18 Gort to Crusheen scheme (see Table 1). Of these 30 are clearly decayed; only 13 are clearly burnt. A total of 33 contain angular to sub-angular blocks of stone; 28 contain rounded to sub-rounded cobbles / pebbles. It is not possible to determine with a degree of certainty whether the material was used in its broken state, or if large blocks were deliberately broken. A total of 24 samples contain limestone and / or cherty limestone as their principal stone type. Of these, one (from Caheraphuca 3; E3653 sample 12) also contains quartzite and sandstone; eight others contain quartzite and three others contain sandstone. A total of 11 samples contain quartzite as their primary stone source; of these three contain limestone, one sandstone, and three both. Finally, three samples contain sandstone as the primary stone type, one (Gortaficka 1; E3898 sample 1) containing chert and one (Gortaficka 2; E3898 sample 8) containing limestone. Coarse grained sandstone and quartzite of these types are typical of burnt mound material. Limestone is however atypical of burnt mound material – fine grained rock types such as limestone do not absorb heat in the same manner as that coarse rock types such as sandstone and dolerite (e.g. see Mandal 2004).

Bibliography

Aalen, F H A, Whelan, K and Stout, M 1997 Atlas of the Irish Rural Landscape. Cork University Press: Cork.

Cooney, G and Mandal, S 1998 The Irish Stone Axe Project: Monograph I. Wordwell: Wicklow.

Mandal, S 1997 Striking the balance: the roles of petrography and geochemistry in stone axe studies in Ireland. *Archaeometry* 39(2), 289-308.

McConnell, B (ed), Pracht, M, Lees, A, Leake, B, Feely, M, Long, B and Morris, J 2004 Geology of Galway Bay: to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 14. Geological Survey of Ireland Publications. Westprint Ltd: Sligo.

Appendix 1 – Results of the assessment of samples for the scheme

Site	License	Sample	Context	Notes		
Caheraphuca 10	E3653	1	1005	Not altered	Angular blocks	Limestone; chert
Caheraphuca 10	E3653	4	1008	Altered	Angular (cherty limestone) to sub-angular (limestone) blocks	Limestone, cherty; limestone; some sandstone, coarse grained red quartz rich
Caheraphuca 10	E3653	5	1009	Not altered (limestone); altered (quartzite)	Angular (limestone) to sub-rounded (quartzite)	Limestone; chert; some quartzite, yellow
Caheraphuca 12	E3653	2	1204	Not altered / not burnt	Shattered blocks and rounded cobbles	Quartzite, very coarse
Caheraphuca 3	E3653	12	327	Altered / burnt soil	Rounded to angular pebbles	Limestone; quartzite; chert; sandstone
Caheraphuca 4	E3653	2	4	Heat altered	Angular blocks and broken rounded cobbles	Quartzite / sandstone; red-yellow-grey, coarse grained
Caheraphuca 4	E3653	3	5	Not altered / not burnt	Rounded to sub-rounded cobbles	Limestone; some quartzite
Caheraphuca 5	E3653	1	504	Altered / burnt	Sub-angular blocks	Quartzite, very coarse grained yellow
Caheraphuca 6	E3653	1	605	Heat altered	Rounded / fractured cobbles	Limestone; some quartzite, coarse
Caheraphuca 6	E3653	3	604	Not altered / not burnt	Rounded to sub-rounded cobbles	Limestone; some quartzite
Caheraphuca 6	E3653	7	617	Heat altered	Rounded to sub-rounded cobbles	Limestone; some quartzite
Caheraphuca 6	E3653	12	608	Heat altered	Angular to rounded cobbles	Quartzite, very coarse; sandstone, red quartz rich; minor amounts of limestone, calcite and chert
Caheraphuca 7	E3653	2	708	Decayed / burnt	Angular to sub-rounded blocks	Limestone; sandstone, coarse grained red
Caheraphuca 7	E3653	7	709	Not altered / not burnt	Angular blocks	Limestone, cherty; sandstone, coarse grained red quartz rich
Caheraphuca 8	E3653	48	827	Heat altered	Angular to rounded pebbles	Sandstone, coarse grained yellow
Caheraphuca 8	E3653	54	829	Altered / decayed	Angular (limestone) & sub-rounded (sandstone)	Limestone, cherty; sandstone, coarse grained red quartz rich
Caheraphuca 8	E3653	88	835	Altered / decayed	Angular	Quartzite, coarse grained yellow; limestone; chert
Caheraphuca 1B	E3654	15	29	Altered / decayed	Angular blocks	Limestone; chert
Rathwilladoon 4	E3655	1	3	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Rathwilladoon 4	E3655	4	6	Decayed (angular blocks)	Angular blocks to rounded pebbles	Limestone; chert; quartzite, very coarse grained; vein quartz; sandstone
Monreagh 2	E3712	13	25	Not altered / not burnt	Rounded to sub-rounded cobbles	Limestone; some quartzite
Monreagh 2	E3712	14	27	Not altered / not burnt	Rounded cobbles	Limestone; some quartzite
Sranagalloon 1	E3713	2	5	Altered /	Angular to sub-	Limestone

				decayed	rounded cobbles	
Ballyline 3	E3715	1	4	Altered	Rounded to sub-angular blocks and fractured cobbles	Quartzite, coarse grained red-yellow-grey
Ballyline 3	E3715	2	5	Altered	Rounded to sub-angular blocks and fractured cobbles	Quartzite, coarse grained red-yellow-grey
Ballyline 1	E3717	9	7	Not altered / not burnt	Angular to sub-rounded cobbles	Quartzite; sandstone, yellow red quartz rich; limestone; chert; vein quartz
Ballyline 2	E3717	1	25	Altered	Angular to sub-angular blocks	Quartzite, coarse grained yellow; minor amounts of limestone, cherty
Drumminacloghaun	E3720	2	3	Altered / decayed	Sub-rounded cobbles	Limestone
Clooneen 1	E3722	10	15	Heat altered / shattered	Angular cobbles	Quartzite, very coarse grained white; some limestone, cherty
Sranagalloon 3	E3897	1	3	Altered / decayed	Sub-rounded cobbles	Limestone
Sranagalloon 3	E3897	6	9	Decayed	Sub-angular blocks	Limestone
Sranagalloon 3	E3897	38	3	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Sranagalloon 3	E3897	40	34	Altered / decayed	Sub-rounded cobbles	Limestone; some chert
Sranagalloon 3	E3897	41	8	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Gortaficka 1	E3898	1	3	Altered / burnt	Angular to sub-rounded cobbles	Sandstone, coarse grained yellow-red quartz rich; some chert
Gortaficka 2	E3898	8	20	Altered / decayed	Sub-angular to sub-rounded blocks	Sandstone, coarse grained yellow quartz rich; some limestone; chert
Gortaficka 2	E3898	9	8	Altered / decayed	Angular blocks	Quartzite, very coarse grained; sandstone, yellow quartz rich; limestone, cherty
Derrygarraiff 3	E3710	8	3	Altered	Sub-rounded to sub-angular cobbles	Limestone

A NOTE ON THE MODERN POTTERY
CLOONEEN 1, CO. CLARE, E3722

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Introduction

Two sherds of pottery were presented for study. Both of these are from the same context and date from the 18th to the 20th century

Creamware

In the 1760s, cream coloured earthenware with a creamy glaze was developed by Josiah Wedgwood to combat the overwhelming influx of blue and white Chinese Porcelain. Instead, it only succeeded in putting tin glazed earthenwares out of business and creamware became known as English faience on the continent.

The first sherd from this site (5:1) is a piece of creamware, the rim of a plate.

Stoneware

The second sherd (5:2) is a piece of stoneware, dating to the 19th to early 20th century. It possibly represents a large blacking bottle rather than a whiskey bottle which is generally a very shiny finish rather than the matte finish on this sherd.

The term is used here to cover all English stonewares, made of a clay and fusible stone, which can be fired to partial vitrification, not then requiring a glaze to make it impervious to liquids (Savage & Newman 2000, 275).

Bibliography

Savage, G & Newman, H 2000 *An illustrated dictionary of ceramics*. London. Reprint 1985 edn.

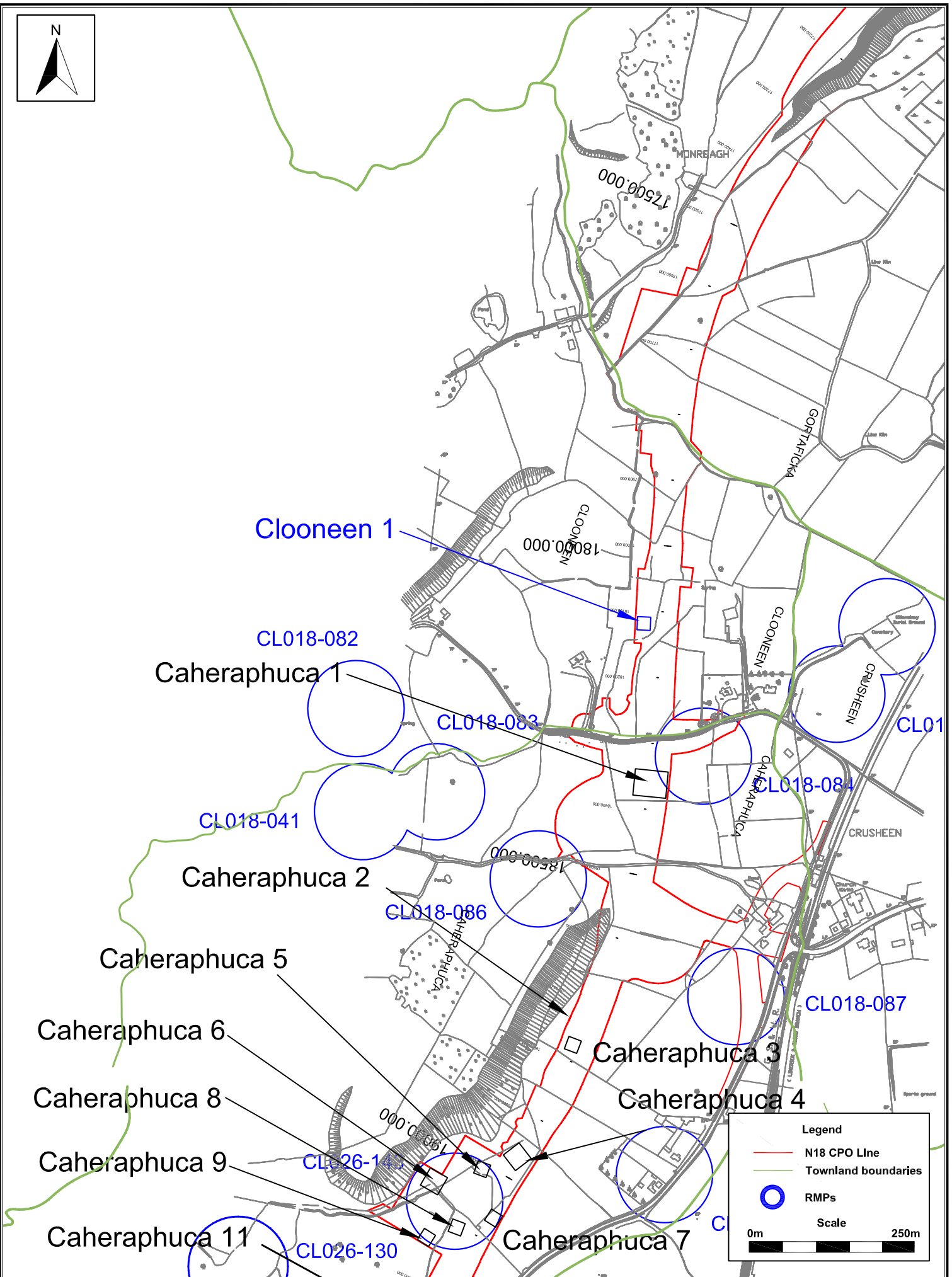
APPENDIX 3 LIST OF RMP SITES IN AREA

RMP No	Description
CL018-041	Ringfort Cashel
CL018-042	Burial Ground
CL018-082	Redundant Record
CL018-083	<i>Fulacht Fiadh</i>
CL018-084	Redundant Record
CL018-085	Enclosure possible
CL018-086	Redundant Record
CL018-087	Redundant Record
CL026-013001	Ringfort Cashel
CL026-013002	House
CL026-015	Megalithic Tomb
CL026-130	Redundant Record
CL026-131	Redundant Record
CL026-136	<i>Fulacht Fiadh</i>
CL026-137	<i>Fulacht Fiadh</i>
CL026-138	<i>Fulacht Fiadh</i>
CL026-143	<i>Fulacht Fiadh</i> possible

See Figure 2 for location.

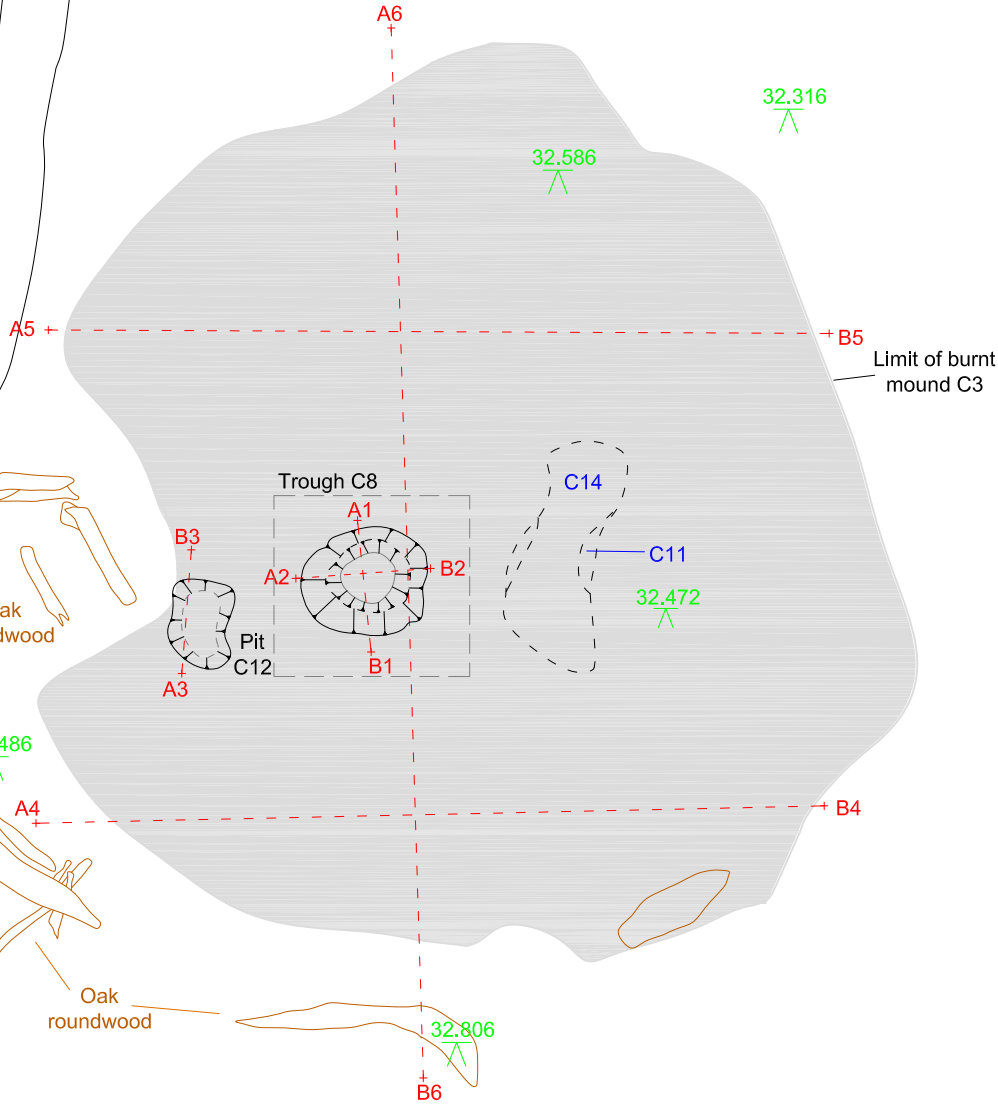
APPENDIX 4 LIST OF N18 GORT TO CRUSHEEN SCHEME SITE NAMES

Site Name	Ministerial Direction No.	NMS Registration Number	Site Type
Drumminacloghaun 1	A044	E3720	Burnt mound
Ballyboy 1	A044	E3719	Ringditch
Ballyboy 2	A044	E3718	Ringditch
Curtaun	A044	E3721	Burnt mounds and early medieval cereal kilns
Rathwilladoon 2 & 3	A044	E3656	Prehistoric settlement
Rathwilladoon 4	A044	E3655	Burnt mound
Rathwilladoon 5	A044	E3657	Charcoal production kiln
Gortavoher 1	A044	E3904	Burnt mound
Monreagh 1 & 2	A044	E3712	Burnt mound
Monreagh 3	A044	E4037	Burnt mounds
Derrygarraff 1	A044	E3716	Burnt mound
Derrygarraff 2	A044	E3711	Metal production site
Derrygarraff 3	A044	E3710	Burnt mound
Sranagalloon 1	A044	E3713	Burnt mound
Sranagalloon 2/Site 146	A044	E3714	Enclosure
Sranagalloon 3	A044	E3897	Burnt mound
Gortaficka 1 & 2	A044	E3898	Burnt mounds
Clooneen 1	A044	E3722	Burnt mound
Caheraphuca 1	A044	E3654	Burnt mound
Caheraphuca 3 - 12	A044	E3653	Burnt mounds
Ballyline 1 & 2	A044	E3717	Burnt mounds
Ballyline 3	A044	E3715	Prehistoric pit

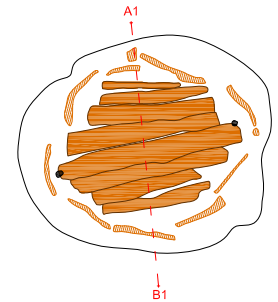




Drain
C4



Mid excavation plan of trough C8



● Stakes
 Horizontal timbers
 Vertical timbers



Limit of excavation

Scale

0m 5m

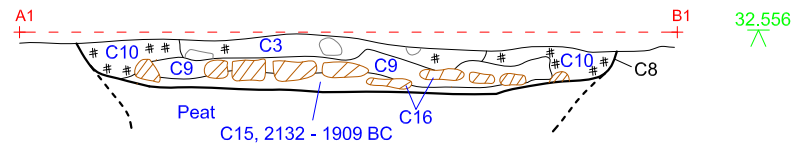
Legend	
---	Break of slope
- - -	Sections
Cxx	Cut numbers
■	Burnt mound deposits
—	Timber
—	Stone
xx.xx ▲	Levels - metres OD

IAC Irish Archaeological
 Consultancy

Title: E3722 Clooneen 1 - Site plan
 Project: N18 Gort to Crusheen
 Client: Galway County Council

Scale: 1:100 @ A4
 Date: 18/11/09
 Produced by: G Kearney
 Job No: J2440
 Figure No: 3

West facing section of pit C8

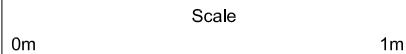
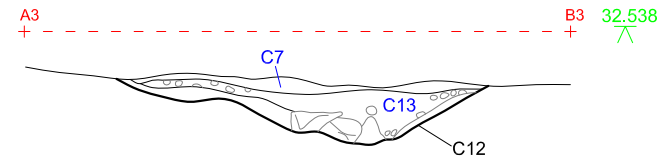


East-West profile of C8



This area was overcut to remove the vertical timbers that had been driven into the peat

East facing section of trough C12

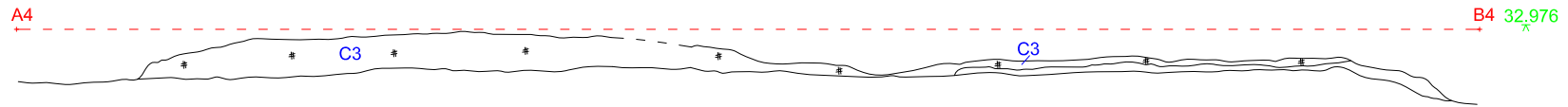


Legend	
Cxx	Cut numbers
Cxx	Fill numbers
○	Stone
#	Charcoal
○	Timbers
xx.xx	Levels - metres OD

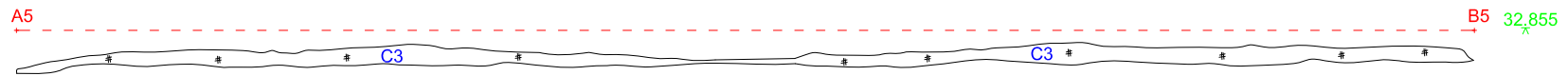


Title:	E3722 Clooneen 1 sections	Scale:	1:20 @ A4
Project:	N18 Gort to Crusheen	Date:	18/11/09
Client:	Galway County Council	Produced by:	G Kearney
		Job No:	J2440
		Figure No:	4

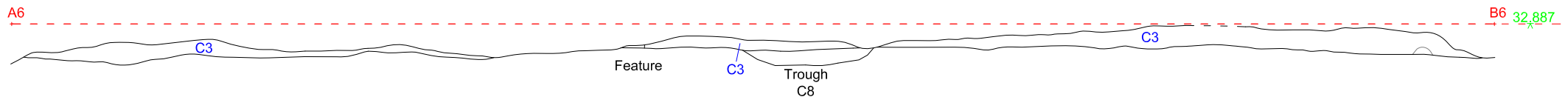
South-facing section of C3



South-facing section of C3



West-facing section of C3



Legend	
Cxx	Cut numbers
Cxx	Fill numbers
	Stone
#	Charcoal
xx.xx ^	Levels - metres OD

IAC Irish Archaeological
Consultancy

Title:	E3722 Clooneen 1 sections	Scale:	1:50 @ A4
Project:	N18 Gort to Crusheen	Date:	18/11/09
Client:	Galway County Council	Produced by:	G Kearney
		Job No:	J2440
		Figure No:	5