

N18 Gort to Crusheen Road Scheme



Site Name: Derrygarriff 3

Ministerial Direction No.: 044
Excavation Registration No.: E3716

Burnt Mound

Final Report

On behalf of Galway County Council

Site Director: Joe Nunan
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	E3716
Excavation Director	Joe Nunan
Senior Archaeologist	Shane Delaney
Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Galway County Council
Site Name	Derrygarriff 3
Site Type	Burnt Mound
Townland	Derrygarriff
Parish	Inchicronan
County	Clare
NGR (Easting)	140399
NGR (Northing)	190444
Chainage	15,580
Height m OD	26 m OD
RMP No.	N/A
Excavation Dates	28 January – 6 February 2008
Excavation Duration	8 Days
Report Type	Final
Report Date	30 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 Derrygarriff 3 along the proposed N18 Gort to Crusheen road scheme (Figure 1). The following report describes the results of archaeological fieldwork at that site. The area was fully excavated by Joe Nunan under Ministerial Directions A044 and Registration Number E3716 issued by the Department of Environment, Heritage and Local Government (DEHLG) in consultation with the National Museum of Ireland. The fieldwork took place between January and February 2008.

A burnt spread was discovered on raised ground within a wetland area in Derrygarriff townland in north Co. Clare. The site was located at NGR 140187/190023 and was situated at 26 m OD.

This site consisted of the western edge of a burnt mound. The whole mound was horseshoe shaped and most of it lay outside the excavation area. It measured 11 m x 9 m in total. The mound was up to 0.77 m in depth. Removal of the mound of burnt stone material (within the available area) revealed a pit and two troughs. A possible drain was also located. There were no finds associated with this excavation. AMS dates from the two trough features at the site, 2 Sigma calibrations 1006–850 BC (UBA 12718) and 829–793 BC (UBA 12717), indicate that the site was in use during the late Bronze Age period.

CONTENTS

1	INTRODUCTION	1
1.1	General.....	1
1.2	The Development.....	1
1.3	Archaeological Requirements.....	1
1.4	Methodology.....	2
2	EXCAVATION RESULTS	3
2.1	Phase 1: Natural Drift Geology.....	3
2.2	Phase 2: Bronze Age Activity.....	3
2.2.1	Troughs, Pit and Drain.....	3
2.2.2	Burnt Spread/Mound Material.....	4
2.3	Phase 3: Topsoil.....	4
3	SYNTHESIS AND DISCUSSION	5
3.1	Landscape Setting.....	5
3.2	Bronze Age Archaeological Landscape.....	5
3.3	Typology of Burnt Mounds.....	9
3.4	Discussion.....	10
3.4.1	Phase 1: Natural Drift Geology.....	10
3.4.2	Phase 2: Bronze Age Activity.....	10
3.4.3	Phase 3: Topsoil.....	11
4	CONCLUSIONS	12
5	BIBLIOGRAPHY	13
5.1	References.....	13
5.2	Other Sources.....	15
	PLATES	17
APPENDIX 1	CATALOGUE OF PRIMARY DATA	I
Appendix 1.1	Context Register.....	i
Appendix 1.2	Catalogue of Artefacts.....	ii
Appendix 1.3	Catalogue of Ecofacts.....	iii
1.3.1	Animal Bone.....	iii
1.3.2	Charcoal.....	iii
Appendix 1.4	Archive Checklist.....	iv
APPENDIX 2	SPECIALIST REPORTS	V
Appendix 2.1	Radiocarbon Dating Results – QUB Laboratory.....	vii
Appendix 2.2	Charcoal Remains – Sarah Cobain.....	xi
Appendix 2.3	Petrological Analysis – Stephen Mandal.....	xxxi
APPENDIX 3	LIST OF RMP SITES IN AREA	XXXVII
APPENDIX 4	LIST OF N18 GORT TO CRUSHEEN SCHEME SITE NAMES	XXXVIII
	FIGURES	

List of Plates

- Plate 1: General view of site, facing east
Plate 2: Mid-excavation view of trough C6

List of Figures

- Figure 1: Derrygarriff 3 location on OSI Discovery Series background
Figure 2: Derrygarriff 3 showing Recorded Monuments and other excavated sites with OSI background
Figure 3: Derrygarriff 3 burnt mound site with horse-shoe mound
Figure 4: Derrygarriff 3 post-excavation plan of site with C12, C6 and C4
Figure 5: Derrygarriff 3 sections

1 INTRODUCTION

1.1 General

This report describes the excavation of Derrygarriff 3 (Figures 1–3), in the townland of Derrygarriff, Co. Clare, undertaken by Joe Nunan for 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 James Kyle in summer 2007 (Ministerial Direction No. A044, NMS Licence No. 07E0489). 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 28 January and 6 February 2008 with a team of 1 director and 7 assistant archaeologists.

The site was located approximately 4 km to the south of Tubber cross road and c. 250 m east of the Crusheen to Tubber road (Clare OS sheet 18).

The site was assigned the following identification data:

Site Name: Derrygarriff 3; Ministerial Direction No.: A044; NMS Registration No.: E3716; Route Chainage (Ch): 15880; NGR: 140187/190023.

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 1 m 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 Derrygarriff 3 was a late Bronze Age burnt mound.

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

2.1 Phase 1: Natural Drift Geology

Derrygarriff 3 was located on the west-facing slope of a low gravel ridge running through an area of bog. It bordered wetland on the east and south. The natural subsoil was a mottled yellow-grey clay and covered the entire site.

2.2 Phase 2: Bronze Age Activity

Bronze Age activity on site consisted of a burnt mound and associated activity (Figure 3).

2.2.1 Troughs, Pit and Drain

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
4	N/A	2.85	1.88	0.5	Oval cut, steep to moderate sides	Cut of a possible trough
5	C4	1.62	1.8	0.15	Grey silt, charcoal, stones	Base fill of a possible trough
6	N/A	1.6	1.2	0.4	Irregular cut, gradual to sharp sides	Cut of a possible trough
7	C6	1.6	1.2	0.24	Mid greyish silty clay, stones, ash	Uppermost fill of trough
8	C6	1.1	1.1	0.15	Mid black silty clay, charcoal, stone	Basal fill of a possible trough
9	C4	2.85	1.88	0.3	Black charcoal rich silty clay, stones	Middle fill of a possible trough
10	C4	2	1.6	0.15	Brown peaty clay	Upper fill of a possible trough
11	C12	1	0.7	0.18	Dark grey silty clay, stones, charcoal	Fill of a possible pit
12	N/A	1	0.7	0.18	Irregular cut, gradual sides	Cut of a possible pit
15	N/A		0.8	0.2	Linear cut, gradual sides	Cut of a possible drain

Finds: None

Interpretation

An oval trough, C6, was excavated on the western edge of the mound, its full extent was not determined as half of it extended eastwards (lengthways) beyond the excavation area (Figures 4–5; Plate 1). It measured 1.6 m x 1.2 m x 0.4 m and was orientated NE/SW. The trough held two fills, C8 and C7, which contained heat-affected stones in a charcoal-rich material. Both of these fills were similar to the burnt mound material, C3, which suggested that the trough and spread were contemporary. The trough C6 would have been used to heat water, as the water table was high and it filled up with water constantly during excavation.

One AMS date was obtained from C8, the basal fill of pit C6. A fragment (1.3g) of alder/hazel (*Alnus glutinosa* /*Corylus avellana*) charcoal was identified (Cobain, Appendix 2.2). This charcoal returned an AMS result of 2788±24 BP (UBA 12718). The 2 Sigma calibrated result for this was 1006–850 BC (Appendix 2.1), placing the use of the trough in the late Bronze Age period. Oak, ash, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal fragments were also identified from the sample.

A sub-oval trough, C4, measured 2.85 m x 2 m x 0.5 m, and orientated north–south, was cut into the subsoil (Figures 4–5). There were three fills – C5 (lower), C9 (middle), and C10 (upper) – which all contained some form of charcoal-enriched, sandy silt with inclusions of heat-shattered stone (80%) with an upper peat deposit. The middle fill C9 contained fragments of undiagnostic burnt animal bone. The

bottom and upper fill of the trough were similar to C3, the burnt mound material, which suggests that the trough and spread were contemporary.

As with trough C6, trough C4 would have been used to heat water as it filled up constantly during excavation. One AMS date was obtained from C5, the charcoal-rich basal fill of pit C4. A fragment (1.1g) of alder/hazel (*Alnus glutinosa/Corylus avellana*) charcoal was identified (Cobain, Appendix 2.2). This charcoal returned an AMS result of 2640±21 BP (UBA 12717). The 2 Sigma calibrated result for this was 829–793 BC (Appendix 2.1). Birch, ash, Maloideae (hawthorn/rowan/crab apple), wild/bird cherry, poplar/willow and elm charcoal inclusions were also identified from the primary fill.

The pit, C12, was very shallow with an irregular cut (Figures 4–5). It was located between drain C15 and trough C4. It is not clear what precise function it served but it was most likely associated with the two troughs. The fill of the pit, C11, contained stone and charcoal inclusions in a loose dark-grey black soft mix. This was very similar to C3, the burnt mound material, containing a high proportion of charcoal and heat-affected stones which suggested the pit and spread were contemporary.

C15 was a possible prehistoric drain designed to conduct water to the nearby trough C4 (Figures 4–5). Drain C15 extended beyond the limits of excavation. It was orientated NNE/SSW, located under the northern arm of the horseshoe mound and only identified in section.

2.2.2 Burnt Spread/Mound Material

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
3 = 13	C15	8.5	6		Mid black clay loam, stone, charcoal, ash.	Burnt spread layer

Finds: None

Interpretation

C3 and C13 represent a mound of burnt material which comprised of heat-affected stones in a charcoal-rich material that sealed the drain, pit and troughs (Figures 3–5). The whole mound was a classic horseshoe-shape and most of it lay outside the excavation area. Removal of the burnt mound revealed the two troughs, pit and drain that were described above. The burnt stone used at the site was limestone (Mandal, Appendix 2.3) which is not typically associated with burnt mound material. Charcoal identified from the mound material was identified as alder/hazel, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn and poplar/willow charcoal fragments (Cobain, Appendix 2.1).

2.3 Phase 3: Topsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
1	N/A	Site	Site	1.0	Peaty loam	Topsoil

Finds: None

Interpretation

A dark brown peaty soil covered the entire site varying in depth from 0.1 m in the northeast to 0.32 m in the southwest.

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 burnt mound was discovered on raised ground within a wetland area in Derrygarriff townland in north Co. Clare. The site was located at NGR 140187/190023 and was situated at 26 m OD. An enclosure (CL018-019) is located c. 440 m south of Derrygarriff 3.

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, do not 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 Bord Gáis Éireann's pipeline to the west at Bearnafunshin (Dennehy 2002a), 02E0342 excavated as part of 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 continually 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 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) to the south of the Gort to Crusheen project. Apart from the burnt mound sites a number of funerary sites were also identified 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 Derrygarriff 3

The site at Derrygarriff 3 consisted of a horseshoe-shaped mound of heat-shattered stone which sealed two troughs. It was located on raised ground within a wetland area with the Derrygarriff stream to the north. The site mostly lay outside of the landtake so only the area within the footprint of the road was excavated. This site returned 2 sigma calibrated date ranges of 1006–850 BC (UBA 12718) and 829–793 BC (UBA 12717) (Appendix 2.1).

Similar parallels in terms of morphology and dating 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 2009c) 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 (Bayley 2009a). As the route travelled further south it tended to follow marginal wetland and stream valleys and the burnt mounds appeared to become more clustered. This clustering of sites was identified at Curtaun 1 and 2 (Delaney 2009a), Gortavoher/Monreagh (Delaney 2009b and McNamara 2009b), Derrygarriff (Nunan 2009a), Sranagalloon/Gortaficka (Nunan 2009b, 2009c and 2009d), Caheraphuca (Bayley 2009b and 2009c) 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 Derrygarriff 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 2009b) and Gortaficka 1 and 2 (Nunan 2009e) and in some cases the actual remains of timber lining as at Clooneen 1 (Bayley 2009a), Caheraphuca 4 (Bayley 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.

Derrygarriff 3 was located approximately 550 m to the south of the burnt mound (not contemporary) at Derrygarriff 1 (Nunan 2009a) and was located approximately 550 m north of the burnt mound at Sranagalloon 1 (Nunan 2009b) which for one phase was contemporary with it.

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 Derrygarriff 3 there is also a cluster of burnt mound sites around the lakes on the eastern slopes of Mullagh More in the Burren (approximately 8 km to the west northwest). A cluster of megalithic tombs and standing stones are located on the northern slopes of Maghera

hill approximately 10 km to the east. A wedge tomb and two unclassified megalithic tombs are located approximately 2 km to the east southeast in Knockmael East (CL016–026, CL016–027) and a wedge tomb is located in Caheraphuca (CL26–015) approximately 3 km to the south with clusters of burnt mounds encountered throughout the rest of the southern route of the project in Sranagalloon, 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 troughs 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

3.4.1 Phase 1: Natural Drift Geology

Derrygarriff 3 was located on the west-facing slope of a low gravel ridge running through an area of bog. It bordered wetland on the east and south. The natural subsoil was a mottled yellow-grey clay and covered the entire site.

3.4.2 Phase 2: Bronze Age Activity

The site was situated mostly outside of the lands available for excavation. The mound formed a classic horseshoe shape with a curved ridge and a hollow in the centre. This hollow would have been the main trough and focus of activity as the mound represented material that had been cast out of the central trough.

Excavation at the site centred on some features that were sealed by material that had washed and rolled down the edge of the mound to the west. These features were cut features and represented two troughs and a pit (this appears too small to have been a trough). A possible drainage feature was also identified that may have been used to direct water to one of the troughs.

Fills from the two investigated troughs were dated and indicated close continuity of use. The dates were 1006–850 BC (UBA 12718) and 829–793 BC (UBA 12717), both 2 Sigma calibrations, and indicate that the site was in use during the late Bronze Age period. The size of the mound would indicate that the site may have been used episodically rather than in use for the timespan indicated by the dates.

Lab code	Context / sample	Sample material	Years BP	1 sigma	2 sigma
UBA 12717	C5 / S1	Charcoal Alder/ Hazel	2640±21	Cal 813–798 BC	Cal 829–793 BC
UBA 12718	C8 / S6	Charcoal Alder/ Hazel	2788±24	Cal 976–904 BC	Cal 1006–850 BC

The charcoal samples analysed from the troughs and the burnt mound material indicate that there may have been an ash-oak woodland close by on the better drained ground with a variety of understorey vegetation including hazel, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal fragments. Alder and willow were also identified which would have grown and been gathered in the wetter areas surrounding the site.

A sample of the heat-shattered stone (from C3/13) was identified as burnt limestone which is not a typical stone associated with burnt mounds (Mandal, Appendix 2.3). Limestone is part of the underlying geology at Derrygarriff and was visible on site as bedrock and would have been widely available in the environs of the site. It is not however, an ideal stone for use in a burnt mound, as its ability to absorb heat is not as good as sandstone for example (ibid.). Therefore it is likely that it was chosen because of its widespread availability on site; or alternatively it was required for a specific function. If limestone is burnt at a high temperature it can fracture and reduce to quicklime. This is a skin irritant and can cause discomfort in the upper respiratory tract and major discomfort if ingested. If this is then added to water it produces calcium hydroxide (Ca (OH) 2); which produces similar symptoms (Irishlime.com). This suggests that this burnt mound site was not used for cooking or preparing food.

Calcium hydroxide has a number of known uses, one of which is in the preparation of hides for tanning. Once a hide or skin has been soaked in a solution of lime-rich water it can be stretched over a frame and deaired without fear of its decomposing.

Although on fragment of burnt bone was recorded from the site it is not compelling evidence for food processing. Considering the lack of evidence for food preparation at this site it is reasonable then to offer tanning as a possible alternative function of the site.

The closest excavated burnt mound to Derrygarriff 3 is Sranagalloon 1 to the south which has returned a date of 1260–1012 BC (making it broadly contemporary) and the sites at Monreagh to the north with contemporary dates from Monreagh 2 and 3.

3.4.3 Phase 3: Topsoil

The topsoil that sealed all the archaeological features at the site was a dark brown peat. The peat developed naturally after the abandonment of the site. No artefacts were recorded from the site.

4 CONCLUSIONS

Derrygarriff 3 was a late Bronze Age burnt mound (1006–850 BC and 829–793 BC, 2 Sigma calibration). It consisted of the western-facing edge of a horseshoe-shaped mound of heat-shattered limestone. Most of the site was situated outside the lands available for excavation and was left intact. Removal of the mound material revealed two troughs, a pit and a possible drain. The drain may have been designed to divert water into one of the troughs. The troughs both retained water during the excavation and would have been used to generate hot water. The small pit was located at the western edge of the mound material and was filled with an organic peat layer. The heat-shattered stone has been identified as limestone and in the light of any other evidence to suggest a use may indicate that the trough was used for tanning or a similar industrial function. The site was sealed with peat topsoil which had formed after the abandonment of the site.

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PLATES



Plate 1 General view of site, facing east



Plate 2 Mid-excavation view of trough C6

APPENDIX 1 CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation	Description	Findings	Context Above	Context Below
1					Peaty loam	Topsoil	Peaty loam			
2					Mottled yellow-grey clay	Natural subsoil	Mottled yellow-grey clay			
3	C15	8.5	6		Mid black clay loam, stone, charcoal, ash	Burnt spread layer	Loose, soft mid black very stoney silty clay loam. Ash and charcoal inclusions.		C13	C16, C10, C7, C11
4		2.85	1.88	0.5	Sub oval cut, steep to moderate sides	Cut of a possible trough	Sub oval in plan. N-S cut. Rounded corners. Sharp to moderate break of slope at base. Steep to moderate sides. Gradual break of slope at base. Uneven base.		C5	C2
5	C4	1.62	1.8	0.1-0.15	Grey silt, charcoal, stones	Base fill of a possible trough	Loose grey silt. Charcoal and heat affected stone inclusions.		C4	C9
6		1.6	1.2	0.4	Irregular cut, gradual to sharp sides	Cut of a possible trough	Irregular in plan. NW-SE cut. Rounded corners. Sharp to gradual break of slope at top. Gradual to sharp sides. Imperceptible break of slope at base. Irregular flat base.		C8	C2
7	C6	1.6	1.2	0.24	Mid greyish black silty clay, stones, ash	Uppermost fill of a possible trough	Soft mid greyish black, moderately stony peat silty clay. Stone, ash and charcoal inclusions.		C3, C13	C8
8	C6	1.1	1.1	0.15	Mid black silty clay, charcoal, stone	Base fill of a possible trough	Very soft mid black moderately stony peat silty clay. Stone and charcoal inclusions.		C7	C6
9	C4	2.85	1.88	0.2-0.3	Black charcoal rich silty clay, stones	2 nd fill of a possible trough	Very soft, loose black peat silty clay. Charcoal, stone and root inclusions.		C10	C5
10	C4	2	1.6	0.1-0.15	Brown peaty clay, root, seeds, charcoal	Uppermost fill of a possible trough	Loose, soft brown peaty clay. Seed, charcoal and root inclusions.		C3	C9
11	C12	1	0.7	0.18	Dark greyish black silty clay, stones, charcoal	Fill of a possible pit	Loose, very soft dark greyish black peat silty clay. Occasional stone and charcoal inclusions.		C3	C12
12		1	0.7	0.18	Irregular cut, gradual to imperceptible sides	Cut of a possible pit	Irregular in plan. NW-SE cut. Irregular corners. Sharp to gradual break of slope at top. Gradual to imperceptible sides. Imperceptible break of slope at base. Irregular flat base.		C11	C2

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation	Description	Finds	Context Above	Context Below
13		8.5	6	0.3	Brown silty clay, burnt stones	Burnt stone layer	Loose brown silty clay. Burnt stone inclusions. Similar to c3 but without the concentration of burnt clay.		C1	C17, C10, C11
14					Non-archaeological	Non-archaeological	Non-archaeological			
15			0.8	0.2	Linear cut, gradual sides	Cut of a possible drain	Linear cut in plan. No corners. Gradual break of slope at top. Gradual sloping sides. Gradual break of slope at base. Concave base. Drain extends beyond site limit.		C3	C2

Appendix 1.2 Catalogue of Artefacts

There were no artefacts recovered from the excavations at Derrygarraff 3.

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 seven bulk soil samples were taken during the course of excavation at this site. Of these five 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, one animal bone samples were hand retrieved on site.

1.3.1 Animal Bone

One sample of burnt bone was hand retrieved from site. It was too small to be analysed.

Context number	Sample number	Feature	Sample weight (g)
C9	4	Trough	<0.1g

1.3.2 Charcoal

Four charcoal samples were recovered following flotation. Three were sent for analysis.

Context number	Sample number	Feature	Sample weight (g)
C5	1	Trough	12.7g
C7	5	Trough	8.8g
C8	6	Trough	4.4g
C3	8	Burnt spread	32.5g

Appendix 1.4 Archive Checklist

Project:	N18 Gort to Crusheen	Irish Archaeological Consultancy Ltd	
Site Name:	Derrygarriff 3		
NMS Number:	E3716		
Site director:	Joe Nunan		
Date:	15/02/08		
Field Records		Items (quantity)	Comments
Site drawings (plans)		3	3 Sheets
Site sections, profiles, elevations		2 Sheets	
Other plans, sketches, etc.		1 Plan	
Timber drawings		0	
Stone structural drawings		0	
Site diary/note books		0	
Site registers (folders)		0	
Survey/levels data (origin information)		0	
Context sheets		15	1 N/A
Wood Sheets		0	
Skeleton Sheets		0	
Worked stone sheets		0	
Digital photographs		0	
Photographs (print)		51	3 Films
Photographs (slide)		0	
Finds and Environ. Archive			
Flint/chert		0	
Stone artefacts		0	
Pottery (specify periods/typology)		0	
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		0	
Human bone (specify type e.g. cremated, skeleton, disarticulated)		0	
Animal bone		1	Fragment
Metallurgical waste		0	
Enviro bulk soil (specify no. of samples)		7	19 Buckets
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 Petrological Analysis – Stephen Mandal

RADIOCARBON DATING RESULTS
DERRYGARRIFF 3, CO. CLARE, E3716

CHRONO LABORATORY, QUEENS UNIVERSITY BELFAST

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Irish Archaeological
Consultancy Ltd
120b Greenpark Road
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VAT No. IE8288812U



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

Radiocarbon Date Certificate

Laboratory Identification: UBA-12717
Date of Measurement: 2009-10-16
Site: E3716 Derrygarriff 3
Sample ID: C5S1
Material Dated: charcoal
Pretreatment: AAA
Submitted by: IAC

¹⁴C Date: 2640±21
AMS δ¹³C: -30.0

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

```
C5S1
UBA-12717
Radiocarbon Age BP 2640 +/- 21
Calibration data set: intcal04.14c
% area enclosed      cal AD age ranges      # Reimer et al. 2004
                        relative area under
                        probability distribution
68.3 (1 sigma)      cal BC 813- 798      1.000
95.4 (2 sigma)      cal BC 829- 793      1.000
```

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 Rennele, 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.

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 42 Fitzwilliam Street
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 Northern Ireland

Radiocarbon Date Certificate

Laboratory Identification: UBA-12718
 Date of Measurement: 2009-10-16
 Site: E3716 Derrygarriff 3
 Sample ID: C8S6
 Material Dated: charcoal
 Pretreatment: AAA
 Submitted by: IAC

¹⁴C Date: 2788±24
 AMS δ¹³C: -28.2

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

C8S6

UBA-12718

Radiocarbon Age BP 2788 +/- 24

Calibration data set: intcal04.14c

% area enclosed	cal AD age ranges	# Reimer et al. 2004 relative area under probability distribution
68.3 (1 sigma)	cal BC 976- 952	0.358
	947- 904	0.642
95.4 (2 sigma)	cal BC 1006- 894	0.948
	874- 850	0.052

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, EG 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
DERRYGARRIFF 3, CO. CLARE, E3716

SARAH COBAIN

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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 *fulacht fiadh* activity and included burnt mounds, 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 (1988), 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 2 mm sieve and an equal proportion of each sieve were identified. This is to prevent any bias that may occur if only larger pieces are 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 1mm 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 Table 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 pit 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 Derrygarriff 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 from nearby 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

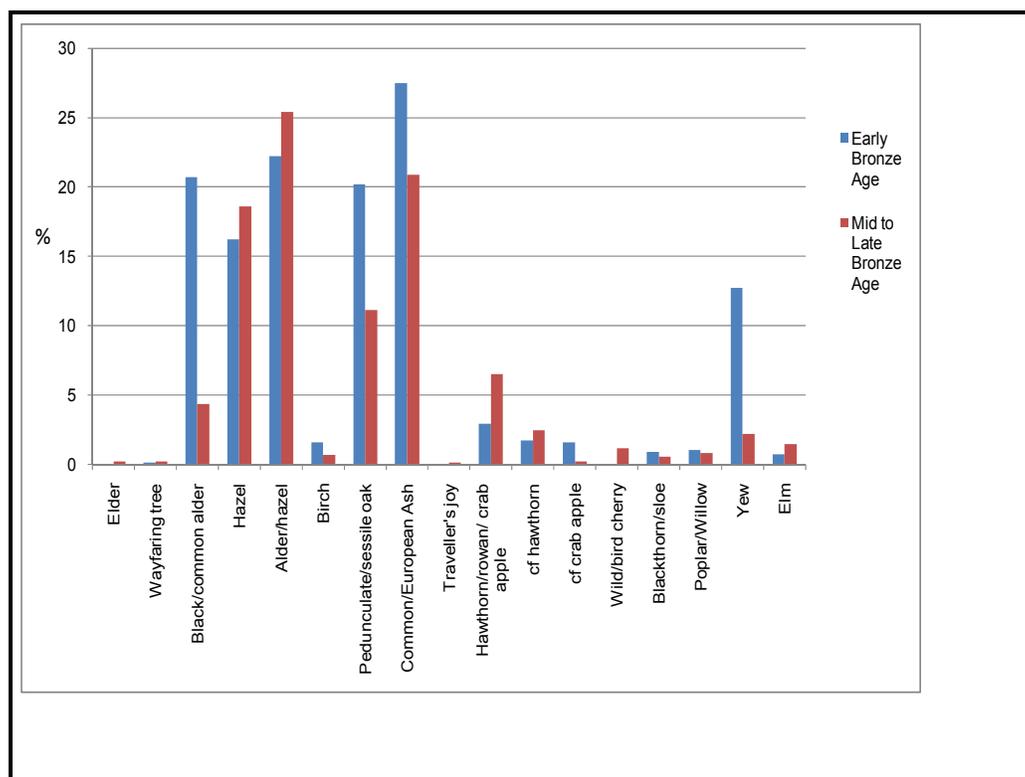
The woodland species exploited for fuel for burnt mound activities was similar throughout the Bronze Age period. The main fuels used as firing material for burnt mound activity on the N18 were ash, oak and elm. There was a high proportion of oak, ash and elm charcoal fragments which did not show obvious 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).

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 that were 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
E3653 Caheraphuca 1	A hollow between two peat basins
E3653 Caheraphuca 3-12	Located around a peat basin formed on the site of the now drained Caheraphuca Lough
E3655 Rathwilladoon 4	Located on the edge of a wetland area
E3712 Monreagh 1 and 2	Undulating peat covered land
E3713 Sranagalloon 1	Located on an area of flat pasture land, prone to flooding
E3715 Ballyline 3	
E 3716 Derrygarriff 3	Raised ground in a wetland area

E3717 Ballyline 1 and 2	Low lying flat land, close to the base of a hill
E3720 Drumminacloghaun 1	Raised area of pasture land with a natural spring and wetland area to the north
E3722 Clooneen 1	Located in a peat basin on drained bog land
E3897 Sranagalloon 3	Located between pasture and peat covered area along the base of a steeply sloping N-S orientated stream valley
E3898 Gortaficka 1 and 2	Marginal land between a pasture and peat covered area, adjacent to a N-S orientated stream
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
E4037 Monreagh 3	Located on the edge of a wetland area.

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.

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Appendix

Table 8: Charcoal species identified from E3716 Derrygarriff 3, Co Clare.

Sample Number			1	6	8
Fill Number			C5	C8	C3
Cut Number			C4	C6	N/A
Family	Species	Common Name			
Betulaceae	<i>Corylus avellana</i>	Hazel	5		
	<i>Alnus glutinosa /Corylus avellana</i>	Alder/hazel	25	2	46
Fagaceae	<i>Betula</i> spp	Birch	2		
	<i>Quercus robur/ petraea</i>	Pedunculate/sessile oak		1	
Oleaceae	<i>Fraxinus excelsior</i>	Common/European Ash	51	29	29
Roseaceae	<i>Maloideae</i> spp (<i>Crateagus monogyna/Sorbus</i> spp/ <i>Malus sylvestris</i>)	Hawthorn/rowan/ crab apple	13	2	4
	cf <i>Crateagus monogyna</i>	cf hawthorn			19
	<i>Prunus avium/padus</i>	Wild/bird cherry	2	3	
Salicaceae	<i>Populus</i> spp/ <i>Salix</i> spp	Poplar/Willow	1		2
Ulmaceae	<i>Ulmus glabra</i>	Elm	1		
		Indeterminate	8	0	2
Total fragments identified:			100	37	100

NB – All plant macrofossil material is carbonised unless otherwise stated.

PETROGRAPHICAL REPORT ON STONE SAMPLES TAKEN
DURING ARCHAEOLOGICAL EXCAVATIONS AT
DERRYGARRIFF 3, CO. CLARE, E3716

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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 is 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		
Derrygarriff 3	8	3	Altered	Sub-rounded to sub-angular cobbles	Limestone

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. 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 coarse rock types such as sandstone and dolerite (e.g. see Mandal 2004).

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Table 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
Sranagaloon 1	E3713	2	5	Altered / decayed	Angular to sub-rounded cobbles	Limestone

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
Sranagaloon 3	E3897	1	3	Altered / decayed	Sub-rounded cobbles	Limestone
Sranagaloon 3	E3897	6	9	Decayed	Sub-angular blocks	Limestone
Sranagaloon 3	E3897	38	3	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Sranagaloon 3	E3897	40	34	Altered / decayed	Sub-rounded cobbles	Limestone; some chert
Sranagaloon 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
Derrygarraff 3	E3710	8	3	Altered	Sub-rounded to sub-angular cobbles	Limestone

APPENDIX 3 LIST OF RMP SITES IN AREA

RMP No	Description
CL018-006001	Bridge
CL018-006002	Watermill unclassified
CL018-017	Ringfort Rath
CL018-018001	Ringfort Cashel
CL018-018002	House – undetermined date
CL018-019	Enclosure
CL018-021	Ringfort Cashel

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
Derrygarriff 1	A044	E3716	Burnt mound
Derrygarriff 2	A044	E3711	Metal production site
Derrygarriff 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



CL018-006

Derrygarriff 2

Derrygarriff 1

CL018-021

CL018-018

Derrygarriff 3

CL018-069

Sranagalloon 1

CL018-071

CL018-072

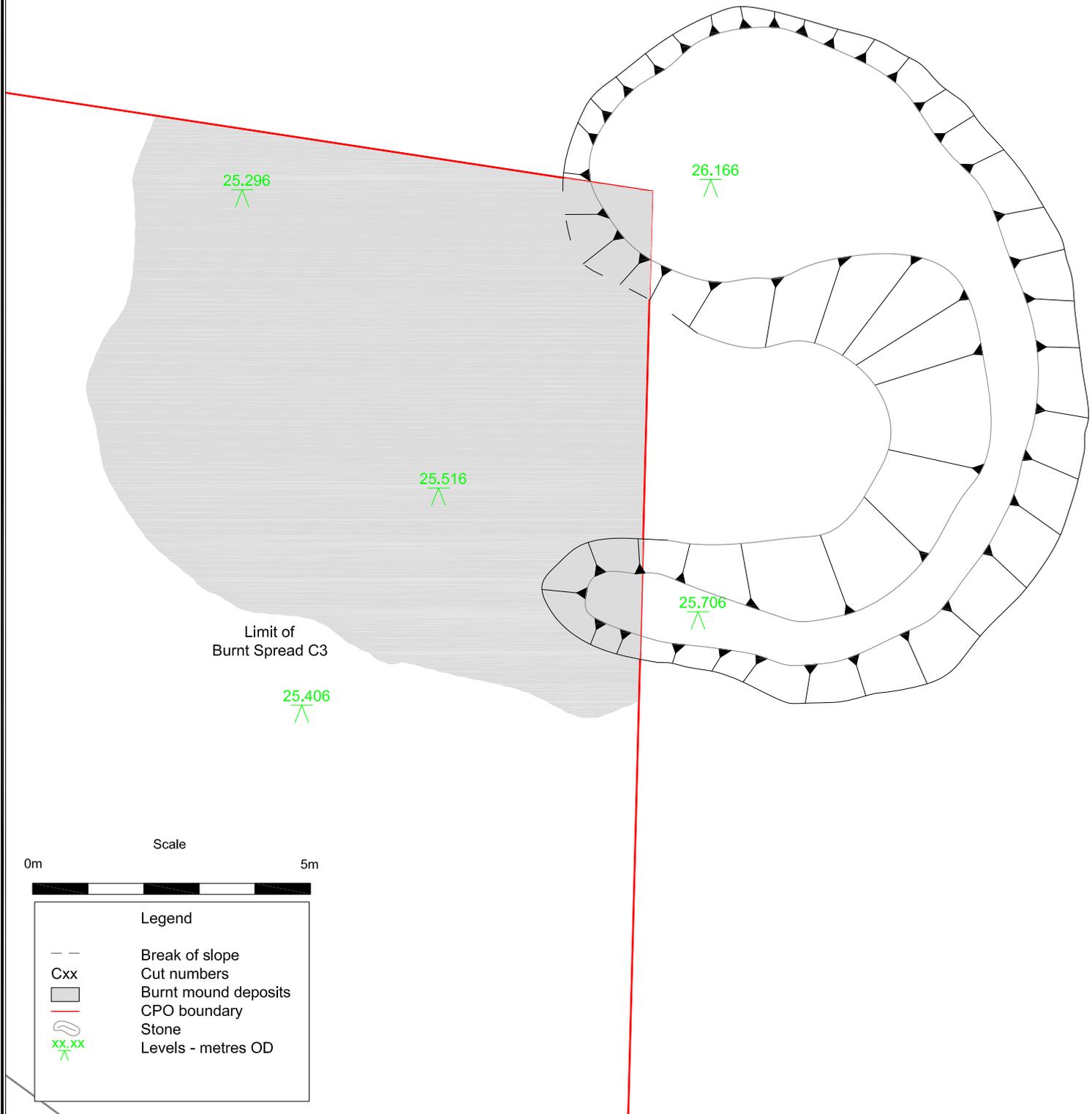
CL018-01

Legend

- N18 CPO Line
- Townland boundaries
- RMPs

Scale

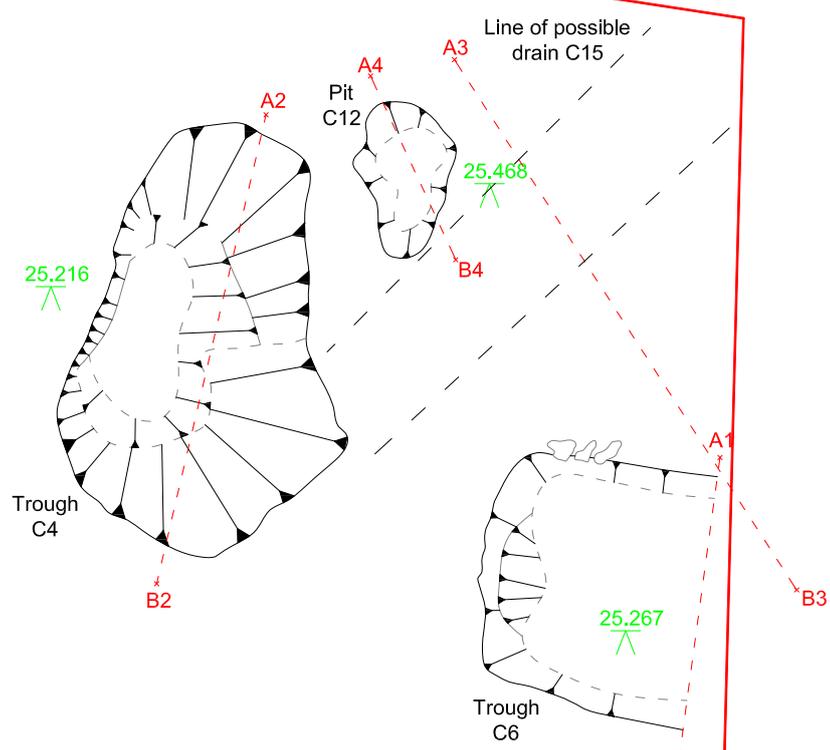
0m 250m



Scale
0m 5m

Legend

- Break of slope
- Cxx Cut numbers
- █ Burnt mound deposits
- CPO boundary
- ⊞ Stone
- xx.xx
^ Levels - metres OD



0m Scale 2.5m

Limit of burnt spread C3

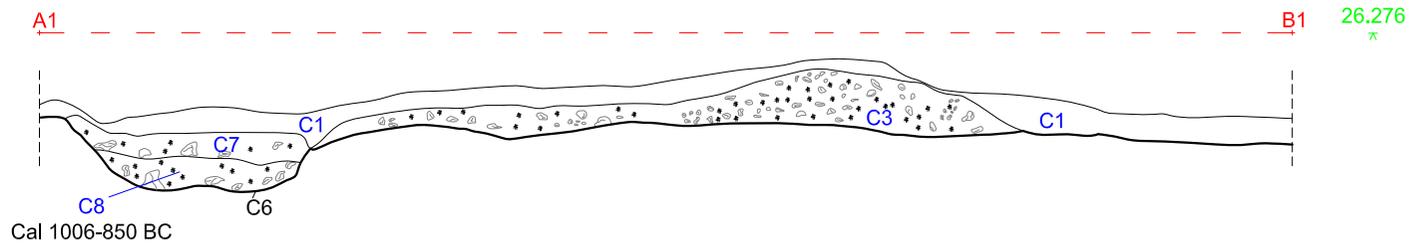
Legend	
---	Break of slope
---	Sections
---	CPO boundary
Cxx	Cut numbers
	Stone
xx.xx	Levels - metres OD



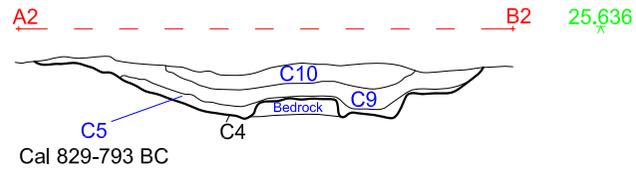
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Project:	N18 Gort to Crusheen
Client:	Galway County Council

Scale:	1:50 @ A4
Date:	08/12/09
Produced by:	G Kearney
Job No:	J2440
Figure No:	4

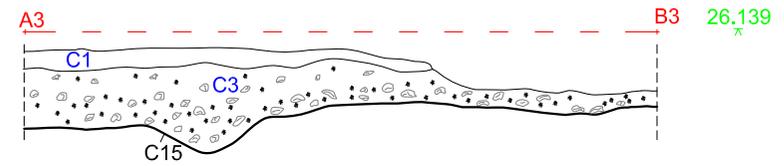
Southwest facing section of burnt mound C6



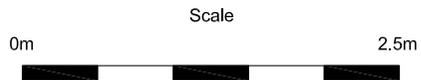
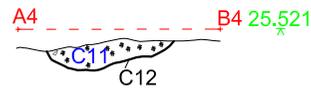
Northeast facing section of C4



Southwest facing section of C15



Northeast facing section of C12



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

IAC Irish Archaeological Consultancy

Title: E3716 Derrygarriff 3 sections

Project: N18 Gort to Crusheen

Client: Galway County Council

Scale: 1:50 @ A4

Date: 08/12/09

Produced by: G Kearney

Job No: J2440

Figure No: 5

