

N18 Gort to Crusheen Road Scheme



Site Name: Rathwilladoon 5

Ministerial Direction No.: 044
Excavation Registration No.: E3657

Charcoal-production Kiln

Final Report

On behalf of Galway County Council

Site Director: Ed Lyne
November 2009

PROJECT DETAILS

Project Reference No.	A044
Project	N18 Gort to Crusheen Road Scheme
Ministerial Direction Reference No.	A044
NMS Registration Number	E3657
Excavation Director	Ed Lyne
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Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Galway County Council
Site Name	Rathwilladoon 5
Site Type	Charcoal-production Kiln
Townland	Rathwilladoon
Parish	Beagh
County	Galway
NGR (Easting)	141099
NGR (Northing)	193900
Chainage	11935
Height m OD	29 m OD
RMP No.	N/A
Excavation Dates	10 – 15 October 2007
Excavation Duration	5 Days
Report Type	Final
Report Date	23 November 2009
Report By	Ed Lyne and 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 charcoal-production kiln under Ministerial Directions at the site of Rathwilladoon 5 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 Ed Lyne under Ministerial Directions A044 and Registration Number E3657 issued by the Department of Environment, Heritage and Local Government (DEHLG) in consultation with the National Museum of Ireland. The fieldwork took place between 10 and 15 October 2007.

A charcoal-production kiln was discovered on raised ground to the west of a wetland area in Rathwilladoon townland in south Co. Galway. The site was located at NGR 141099 193900 and was situated at 29 m OD. The field was under pasture. The main feature, the charcoal production kiln, consisted of an oval pit, C3. The clay along the sides of this cut were scorched red from burning *in situ*, and the basal fill C5, which was 0.09 m in depth, consisted of pure charcoal pieces, predominantly oak, some of which were quite large. The upper fill, C4, consisted of brown sandy silt with some charcoal inclusions. This may have been a deliberate deposit, placed here to fill up the pit after use.

A small pit adjacent to the clamp contained some charcoal and some slag and is likely to represent a small furnace pit; suggesting that the charcoal was not being transported elsewhere, but instead was being used on site for the production of metal. An alternative explanation could be that a small amount of ore was tested on site to produce a small amount of iron, to ensure that the ore was of good quality. The reason for abandoning the layer of charcoal in the base of the clamp is unclear; perhaps it was not needed, or alternatively it may have become damp and lost its usefulness.

A fragment of hazel charcoal from the fill of the furnace pit returned a 2 Sigma calibrated date of 155 BC–AD 67 (2018±37 BP: UBA 12739), placing the site in the early Iron Age period. There were no further finds recovered from the site.

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1 INTRODUCTION

1.1 General

This report describes the excavation of Rathwilladoon 5 (Figures 1–3), in the townland of Rathwilladoon undertaken by Ed Lyne of IAC Ltd, on behalf of Galway County Council and the NRA. It was carried out as part of the archaeological mitigation programme of the N18 Gort to Crusheen road scheme. The excavation was undertaken to offset the adverse impact of road construction on known and potential subsoil archaeological remains in order to preserve the site by record.

The site was not a Recorded Monument but was first identified during testing carried out by Dave Bayley in summer 2007 (Ministerial Direction No. A044, Licence No. 07E0456). All features identified during the assessment phase were subsequently re-identified and excavated during the full excavation phase of the site which took place between 10 to 15 October 2007 with a team of 1 director, 1 supervisor and 2 assistant archaeologists.

The site was located approximately 750m south of Tubber crossroad (Galway OS sheets 128).

The site was assigned the following identification data:

Site Name: Rathwilladoon 5; Ministerial Direction No.: A044; NMS Registration No.: E3657; Route Chainage (Ch): 11935; NGR: 141099/193900.

1.2 The Development

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

1.3 Archaeological Requirements

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

The proposed N18 was subjected to an Environmental Impact Assessment, the archaeology and cultural history section of which was carried out by Babtie 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 (Babtie 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 specific 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 10m 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 excavation. 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 Rathwilladoon 5 consisted of a charcoal production kiln and associated furnace pit of Iron Age date.

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

2.1 Phase 1: Natural Drift Geology

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

The natural geology at Rathwilladoon 5 was an orange brown sandy clay till with some stone inclusions underlying a brown loam topsoil. It was cut by or sealed by all subsequent archaeological activity. The site was located on slightly elevated ground at 29 m OD on the edge of wetland to the east and was overlooked to the west by a very steep slope leading to a north south oriented ridge.

2.2 Phase 2: Iron Age Activity

2.2.1 Charcoal-production Kiln

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
3	N/A	2.82	1.22	0.14	Oval cut, steep to gradual sides	Charcoal-production kiln
4	C3	2.76	1.14	0.13	Mid greyish brown sandy silt, charcoal	Fill of pit
5	C3	2.15	1.2	0.09	Charcoal layer	Layer of charcoal
6	C3	2.82	1.22	0.04	Orange clay silt, charcoal	Re-deposited soil within pit

Finds: None

Interpretation

A sub-rectangular pit, C3, contained a main fill, C5, which consisted of densely packed oak charcoal (Cobain, Appendix 2.2). Evidence of burning *in situ* and the sheer quantity of charcoal suggest that this was a kiln or clamp for producing charcoal (Figures 3–4; Plates 1 and 2). Some hazel charcoal was identified in the upper fill C4, and it is likely that this was gathered as deadwood and used as kindling.

2.2.2 Pit

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
7	N/A	0.19	0.15	0.13	Sub circular cut, irregular gradual sides	Cut of an irregular pit
8	C7	0.19	0.15	0.13	Brown, black silt, charcoal	Fill of pit

Finds: None

Interpretation

This small (probably highly-truncated) pit, C7 produced fragments of ferrous material (slag) and hazel charcoal and may have been a small furnace for working iron (Figures 3–4; Plate 3).

The pit and kiln described above, C3 and C7, appear to represent an episode of related activity involving the production of charcoal for metal production in a charcoal-production kiln, and the smelting of a small amount of iron in an adjacent furnace or smelting pit, perhaps in order to assess its quality.

One AMS date was obtained from deposit C8, the fill of the furnace pit. A fragment of hazel (*Corylus avellana*) was identified (Cobain, Appendix 2.2). This charcoal returned an AMS result of 2018±37 BP (UBA 12739). The 2 Sigma calibrated result for this was 155 BC–AD 67 (Appendix 2.1).

2.3 Phase 3: Non-Archaeological Features

2.3.1 Natural Hollow

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
9	N/A	1.15	0.85	0.1	Sub oval cut, gradual to steep sides	Natural hollow
10	C9	1.15	0.85	0.1	Mid greyish brown sandy silt, charcoal	Fill of natural hollow

Finds: None

Interpretation

This shallow feature, C9, was originally thought to be a possible pit, but on excavation it became apparent that it was a naturally silted up hollow in the natural underlying clay (Figure 3).

2.4 Phase 4: Topsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
1	N/A			0.3	Layer of mid to dark brown silty clay	Topsoil

Finds: None

Description

All of the archaeological features and the natural subsoil layers were sealed by topsoil. The topsoil was removed by mechanical excavator in advance of the hand excavation of archaeological features. No artefacts were recovered from the topsoil.

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 charcoal-production kiln was discovered on raised ground to the west of a wetland area in Rathwilladoon townland in south Co. Galway. The site was located at NGR 141099 193900 and was situated at 29 m OD. The field was under pasture with some scrub occurring to the east of the site in a low-lying area. A cillín (GA0128-069) and ringfort (GA0128-070) with associated souterrain (GA128-07001) are located c. 250 m north of Rathwilladoon 5.

3.2 Iron Age Landscape

In comparison with the Bronze Age, evidence for Iron Age activity in Ireland as a whole is somewhat scarce. The later first millennium BC and the early centuries AD are amongst the most obscure in Irish prehistoric archaeology (Waddell, 1998, 279). Waddell states that 'domestic occupation sites remain virtually unknown and our understanding of settlement, economy and social structure in the period from 600 BC to the early centuries AD is meagre in the extreme' (Ibid. 319).

This road scheme joins a number of recent large-scale infrastructural projects in the region which have included archaeological excavations, most notably the Gas Pipeline to the West (Grogan et al. 2007) which runs mostly parallel a short distance to the west of the N18, and the N18 road contracts to the north and south. Unfortunately despite these projects evidence for Iron Age settlement and activity remains relatively minor in this region.

One potential Iron Age site close to the N18 is the possible hilltop enclosure (GA122-078) located in the townland of Drumminacloghaun, Co. Galway, towards the northern end of the route (it is also possible however that this enclosure may simply have been an early medieval ringfort). The site appears on the 1st and 2nd edition Ordnance Survey map editions, apparently located on the edge of a ridge. It was subsequently destroyed and no trace of it was identified in the walkover survey conducted as part of the EIS for the scheme. Excavations at hilltop enclosures have produced evidence for occupation in the late Bronze Age and early Iron Age (Raftery, 1994, 58-62) and it is possible that some were only occupied sporadically in times of strife. They may have been used principally as meeting places on ceremonial, ritual or political occasions. Large resources would have been required to build these earthworks, indicating a movement perhaps towards larger population tribal groups.

The Iron Age is noted for its lack of native pottery and also the scant evidence for burials and settlements when compared to both the Bronze Age and early medieval periods. A concentration of funerary barrows is known to the north of the scheme, to the east and northeast of Ardrahan, and may well date to the Iron Age period. One

example at Grannagh (east of Ardrahan) was completely excavated (Waddell 1998, 367). The excavation revealed a 15 m diameter ringditch which contained pockets of cremated bone, and a variety of finds including glass beads, dumbbell shaped beads and pins. It has been dated to the 1st century AD. Another ringditch was excavated at Oran Beg (Rynne 1970), near Oranmore. It was 11 m in diameter and there were cremation deposits within the ditch fill. Over 80 glass beads, mainly blue but also yellow, were recovered during the excavation and some of these appeared to have been fused in the cremation pyre. The finds of both the Grannagh and Oran Beg sites indicate an Iron Age date.

Moving south of the Gort to Crusheen road scheme there was evidence for Iron Age funerary activity recovered from the N18 Ennis Bypass and N85 Western Relief Road archaeological excavations. A site at Manusmore, identified as containing 27 pits, returned a date range from the Neolithic to the Iron Age periods (Hull 2006a); the later dated pits contained burnt animal bone and may not specifically be related to the cremations. Approximately 900 m to the northeast another pit burial site was located which too produced evidence for an Iron Age date (Hull 2006b). At Killow, a site was identified which contained evidence for late Bronze Age and Iron Age activity, apart from a burnt mound this was mainly in the form of pits (one of the probable cremation pits was dated to the very early Iron Age). A wooden bowl found in peat close to the site also returned a similar Iron Age date (04E0191:50:1). A ringditch with a diameter of 6 m was also excavated as part of the N18 Ennis Bypass and N85 Western Relief Road and produced an Iron Age date. The site had been heavily truncated but produced cremated bone deposits and finds including yellow glass beads and fragments of quartz (Hull 2006c). Two ringditches have also been excavated as part of the N18 Gort to Crusheen scheme in Ballyboy townland and have been dated to the Iron Age period.

Most Iron Age sites identified within close proximity to the N18 Gort to Crusheen road scheme relate to the funerary deposition of cremated bone at the sites, either in ringditches or in pits. At most of these sites the cremated remains did not represent complete individuals and this may indicate that at times only token deposits were placed in the monuments. We know very little of the everyday activities of domestic life during this period as very little evidence of their houses or artefacts have been identified within the archaeological record. The site at Rathwilladoon 2 and 3 (Lyne 2009) produced evidence for the foundation gully of a circular structure approximately 300 m to the north. This may be the remains of an Iron Age structure or dwelling and may be associated with the activity at the charcoal production kiln. It dates to 186–52 BC (2103±22; UBA 12731), a date range which overlaps with that of Rathwilladoon 5.

Other sites excavated along the Gort to Crusheen road scheme with Iron Age period dates include Derrygarriff 2. This site, which appeared to also contain a charcoal-production kiln (however dating of the feature returned a modern) was found in marginal land adjacent to a low-lying wetland area. Its location was probably influenced by the presence of suitable timber for charcoal. The kiln was found alongside a metalworking furnace which returned a 2 Sigma calibration date of 350–100 BC (2144±21:UBA12716). Perhaps this poor quality land may have been used for the deliberate coppicing of certain types of tree for the purpose of making charcoal. A second possibility, given the discovery of the metalworking feature, could be that the metal was being sourced nearby from the wetland area in the form of bog iron and was smelted close to the source for convenience.

3.3 Typology of Charcoal-production Kilns

Charcoal-production kilns/clamps were essential to the ironworking process as charcoal was used as a fuel in the smelting and forging stages. According to Tylecote (1986, 225) very little was known about charcoal production more than 20 years ago and this has changed little since (O'Sullivan and Harney 2008, 198). However, there has been an ever increasing discovery of such sites during the boom in development-led archaeology and excavations of charcoal-production kilns are beginning to feature in recent publications (Carlin et al. 2008; Grogan et al. 2007; Hull and Taylor 2006).

An unpublished paper by Niall Kenny (2008) has identified approximately 100 charcoal-production kilns in Ireland that range in plan from rectangular, oval and circular, with sub-variations of these, and there is an approximately equal amount of each type. It appears, on current evidence, that the classic type is large and rectangular in plan, such as Hardwood 3, Co. Meath for example, where long carbonised pieces of oak were found along the axis of the kiln that made up almost 100% of the deposit (Carlin et al. 2008, 101; Illus. 5.8b, 102). The rectangular kilns tend to be larger than oval and circular types with an average length of 2.5 m but they can also be as long as 4 m (Kenny 2008, 14-5). The oval kilns tend to be shallower than the other types, while the circular examples are usually smaller but deeper compared to rectangular and oval charcoal-production kilns (ibid. 15).

Charcoal-production kilns are identifiable archaeologically as earth-cut pits, with charcoal-rich fills, and evidence for extensive *in situ* burning along the base and sides (Carlin et al. 2008, 101; Kenny 2008, 15). Those discovered along the M4 were rectangular or sub-rectangular in plan (Carlin et al. 2008), whereas Kenny (2008) has also identified circular and oval types. However, it is important to stress that charcoal-production kilns, such as Hardwood 3 and Kilmaniheen West 10 and 12, Co. Kerry (Hull and Taylor 2006, 29-30), were recognisable because the carbonised wood had survived *in situ* upon excavation. These kilns were abandoned possibly due to the charcoal becoming wet, which left it useless as a fuel. Successful kilns would not leave abundant charcoal within their primary fills so would appear archaeologically as heat-scorched pits probably containing only moderate amounts of charcoal. This, therefore, conveys the problems of positively identifying charcoal-production kilns as many charcoal yields will have been previously removed.

The majority of charcoal-production kilns are located away from settlements and close to resources required for the primary ironworking processes such as bog and woodlands. Large quantities of trees were required for charcoal production and, similarly, large quantities of iron ore, available within surrounding bogs (Mytum 1992, 230; Raftery 1994, 147), were needed during the smelting process. Therefore, it made sense, logistically and for safety reasons, for charcoal-production kilns to be situated at a distance from dwellings and farms and close to available raw materials. Kenny's (2008, 20-2) research has also shown that the majority of kilns are located on sloping and agriculturally unproductive ground and drainage was probably an important factor because it was imperative to keep the charcoal dry.

Radiocarbon dates are beginning to emerge from a number of charcoal-production kilns and possible examples. Of those dated, the majority appear to date to the latter part of the early medieval period. The kilns at Hardwood 3, Rossan 3, Ardnamullan and Newcastle 2, excavated along the M4, returned radiocarbon dates between the eighth and thirteenth centuries (Carlin et al. 2008, 88). The dates appear to converge at a point between the eleventh and twelfth centuries. Kilns at Kilmaniheen West, Co. Kerry, and Barefield, Co. Clare, also returned radiocarbon dates spanning the latter part of the early medieval period (Hull and Taylor 2006). A circular kiln at Mondaniel

2, Co. Cork, was dated to AD 1420–1640 (Kenny 2008, 18) but, on current evidence, charcoal-production kilns generally date to the latter part of the early medieval period into the early years of the later middle ages. Therefore, it appears that charcoal-production was at its most prolific during these years but dating of further features may alter this picture. As we have seen at Rathwilladoon 5 some at least date back to the Iron Age, and future dating of these features may help to fill in some of the gaps in our knowledge of Iron Age activity and population distributions across the country.

3.4 Discussion

3.4.1 Phase 1: Natural Drift Geology

This phase represents the natural subsoil, which was cut or sealed by all subsequent archaeological features. The natural geology at Rathwilladoon 5 was an orange brown sandy clay, with some stone inclusions. It was cut by or sealed by all subsequent archaeological activity. The site was located on slightly elevated ground at 29 m OD on the edge of wetland to the east and was overlooked to the west by a very steep slope leading to a north south oriented ridge.

3.4.2 Phase 2: Iron Age Activity

The charcoal-production kiln consisted of an oval or sub-rectangular pit. The clay along the sides of this cut was scorched red from burning *in situ*, and the basal fill consisted of pure charcoal pieces, some of which were quite large. The upper fill was a brown, sandy silt with some charcoal inclusions. This may have been a deliberate deposit, placed here to fill up the pit after use. The charcoal-produced in the kiln was oak (*Quercus robur/ petraeae*). Some hazel (*Corylus avellana*) was identified in the upper fill which could have been used as kindling

Charcoal-production kilns were used to produce good quality charcoal, which was required for metalworking. Charcoal is produced from the incomplete combustion of wood. It was used as an effective fuel, much more so than wood or turf for example, during the smelting and forging stages of ironworking. It was produced through the placement of wood, mainly oak, against a vertical post in earth-cut pits that were covered by layers of straw or bracken and were then sealed by a layer of earth or turf. The post was removed and the kiln was subsequently ignited as the wood was roasted to produce the charcoal over a number of days (Carlin et al. 2008, 89-91). In this kind of atmosphere, over a period of some 24 hours, good quality charcoal could be produced. This was a labour-intensive process that required careful supervision and plentiful raw materials. The identification of increasing numbers of charcoal-production kilns emphasises that it was a much more widespread industrial activity than previously considered and that it was an essential component of the iron production process.

A small pit adjacent to the kiln contained charcoal and some ferrous (slag) fragments. A small amount of ore may have been tested here to produce a limited amount of metal on site, perhaps to ensure that the bog ore was of good quality prior to transporting it elsewhere. Hazel (*Corylus avellana*) was the dominant charcoal from the possible furnace.

One AMS date was obtained from deposit C8, the fill of the furnace pit. A fragment of hazel (*Corylus avellana*) was identified (Cobain, Appendix 2.2). This charcoal returned an AMS result of 2018±37 BP (UBA 12739). The 2 Sigma calibrated result for this was 155 BC–AD 67 (Appendix 2.1).

Lab code	Context / sample	Sample material	Years BP	1 sigma	2 sigma
UBA 12739	C8 / S1	Charcoal Hazel	2018±37	Cal 53 BC– AD 49	Cal 155 BC– AD 67

3.4.3 Phase 3: Non-Archaeological Features

A shallow feature, C9, was originally thought to be a possible pit, but on excavation it became apparent that it was a naturally silted up hollow in the natural underlying clay

3.4.4 Phase 4: Topsoil

All of the archaeological features and the natural subsoil layers were sealed by topsoil. The topsoil was removed by mechanical excavator in advance of the hand excavation of archaeological features. No artefacts were recovered from the topsoil.

4 CONCLUSIONS

Rathwilladoon 5 comprised a small industrial site dating to 155 BC–67 AD (2 Sigma calibration). The remains of one charcoal-production kiln and a single small possible metalworking furnace were identified. Charcoal-production kilns are often found associated with metalworking furnaces, which require the charcoal for fuel. The kilns were generally located away from major settlement *foci* and are instead found close to the source of the raw material (woodland or bog). At Rathwilladoon 5 oak charcoal was produced; oak charcoal is the most common wood species identified in kilns of this type, though to an extent this may reflect the fact that this charcoal survives in larger fragments and is more frequently identified. Hazel appears to have been used for kindling. The site at Rathwilladoon 5 was located c. 300 m south of an Iron Age period structure found at Rathwilladoon 3.

The site at Rathwilladoon 3 (Lyne 2009) produced evidence for the partial foundation gully of a circular structure. This appears to be the remains of an Iron Age structure or dwelling and may well be associated with the activity at the charcoal-production kiln. The structure dates to 186–52 BC (2103±22; UBA 12731), a date range which overlaps with that of Rathwilladoon 5. Both sites present clear evidence for Iron Age activity in the region, and given that the structure only partially survived probably due to the large scale land improvements carried out in the area over the past 30 years, it may well be that this was a relatively busy area in the Iron Age but with little physical evidence remaining today.

Other sites excavated along the Gort to Crusheen road scheme with Iron Age dates include Derrygarriff 2, a few kilometres to the south. At this site a charcoal-production kiln was found alongside a metalworking furnace which returned a 2 Sigma calibration date of 350–100 BC (2144±21; UBA12716), a date which again overlaps with the sites in Rathwilladoon. Derrygarriff 2 was located in marginal land, on a hillside adjacent to a low-lying wetland area, a very similar type of location to the site at Rathwilladoon 5.

Small though these sites are, given the dearth of dated Iron Age sites in Ireland they are of some significance, and help to fill in our knowledge of the period in this area. The charcoal clamps and furnaces taken in conjunction with the structure at Rathwilladoon 3 give us a new insight into the Iron Age landscape of Counties Galway and Clare, and give us a glimpse of day to day life during this period.

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PLATES



Plate 1 Mid-excavation view of charcoal-production kiln C3 and fills, facing northeast



Plate 2 Post-excavation view of charcoal-production kiln C3, facing northwest



Plate 3 Pre-excavation view of the metalworking pit C7, facing southeast



Plate 4 Overview of Rathwilladoon 5, facing west

APPENDIX 1 CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Finds	Context Above	Context Below
1	N/A				Topsoil	Mid-dark brown silty clay	N/A		
2	N/A				Natural subsoil	Orange-brown sandy clay	N/A		
3	N/A	2.82	1.22	0.14	Charcoal production pit, 'clamp'	Oval cut in plan. NE-SW cut. Rounded corners. Sharp break of slope at top to SE and NW. Gradual break of slope at top to S and N. Steep sides to SE. Gradual sides to all other sides. Sharp break of slope at base to SE and E. Gradual break of slope at base to all other sides. Sub oval base	N/A	C4, C5	C6
4	C3	2.76	1.14	0.13	Fill of pit	Soft mid-greyish brown sandy silt. Medium to high amounts of charcoal inclusions	N/A	C1	c5, c6
5	C3	2.15	1.2	0.09	Layer of charcoal	Soft black pure layer of charcoal pieces, some quite large	N/A	C4	C3
6	C3	2.82	1.22	0.04	Patchy context within production pit	Soft orange clayey silt. Small amounts of charcoal flecks	N/A	C4, C5	C3
7	N/A	0.19	0.15	0.13	Cut of an irregular pit	Sub circular cut in plan. Rounded corners. Gradual break of slope at top. Irregular gradual sides. Sharp break of slope at base. Irregular concave base	N/A	C8	C2
8	C7	0.19	0.15	0.13	Fill of pit	Soft brown and black silt. 45% charcoal inclusions	N/A	C1	C7
9	N/A	1.15	0.85	0.1	Possibly a naturally occurring hollow	Sub oval cut in plan. N-S cut. Rounded corners. Gradual break of slope at top to W and S. Sharp break of slope at top to N and E. Steep sides to N and E. Gradual sides to S and W. Sharp break of slope at base to N and E. Imperceptible break of slope at base to S and W. Irregular rounded base	N/A	C10	C2
10	C9	1.15	0.85	0.1	Fill of probable natural hollow	Soft mid-greyish brown sandy silt. 10% charcoal inclusions	N/A	C1	C9

Appendix 1.2 Catalogue of Artefacts

There were no artefacts recovered from the excavations at Rathwilladoon 5.

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 five bulk soil samples were taken during the course of excavation at this site. All of these were processed by means of flotation and sieving through a 250/300µm mesh. The resulting retrieved samples from this process are listed below. In addition one sample of metallurgical waste was hand retrieved on site.

1.3.1 Charcoal

Charcoal was recovered from five samples following flotation.

Context number	Sample number	Feature	Sample weight (g)
8	1	Pit	12.7g
4	2	Pit	32.9g
5	4	Pit	>1664.9g
10	5	Pit	4.0g
6	6	Pit	0.2

1.3.2 Metallurgical Waste

One sample of slag like material was hand retrieved from site.

Context number	Sample number	Feature	Sample weight (g)
8	3	Pit	Fragments

Appendix 1.4 Archive Checklist

Project:	N18 Gort to Crusheen	Irish Archaeological Consultancy Ltd	
Site Name:	Rathwilladoon 5		
NMS Number:	E3657		
Site director:	Ed Lyne		
Date:	February 2008		
Field Records		Items (quantity)	Comments
Site drawings (plans)		2	
Site sections, profiles, elevations		3	
Other plans, sketches, etc.		0	
Timber drawings		0	
Stone structural drawings		0	
Site diary/note books		1	
Site registers (folders)		1	
Survey/levels data (origin information)		On disc and original plans	
Context sheets		10	
Wood Sheets		0	
Skeleton Sheets		0	
Worked stone sheets		0	
Digital photographs		42	
Photographs (print)		0	
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	
Human bone (specify type e.g. cremated, skeleton, disarticulated)		0	
Animal bone		0	
Metallurgical waste		1	slag
Enviro bulk soil (specify no. of samples)		5	C5 (Sample 4) consisted of pure charcoal
Enviro monolith (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

RADIOCARBON DATING RESULTS
RATHWILLADOON 5, CO. GALWAY, E3657

CHRONO LABORATORY, QUEENS UNIVERSITY BELFAST

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



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

Radiocarbon Date Certificate

Laboratory Identification: UBA-12739
Date of Measurement: 2009-10-20
Site: E3657 Rathwilladoon 5
Sample ID: C8S1
Material Dated: charcoal
Pretreatment: AAA
Submitted by: IAC

¹⁴C Date: 2018±37
AMS δ¹³C: -27.5

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 - cl4res.csv

C8S1
UBA-12739
Radiocarbon Age BP 2018 +/- 37
Calibration data set: intcal04.14c # Reimer et al. 2004
% area enclosed cal AD age ranges relative area under
probability distribution

68.3 (1 sigma)	cal BC 53- cal AD 27	0.936
	cal AD 40- 49	0.064
95.4 (2 sigma)	cal BC 155- 138	0.023
	112- cal AD 67	0.977

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

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

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

THE CHARCOAL REMAINS
FROM
N18 GORT TO CRUSHEEN:
RATHWILLADOON 5, CO. GALWAY, E3657
SARAH COBAIN

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

Introduction

The survival of plant macrofossils from dryland archaeology sites is usually dependant on 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. Wood is however preserved abundantly in the form of charcoal as a result of burning activities in features such as hearths, kilns, furnaces, burnt structures and as waste material disposed in ditches and pits.

The site at Rathwilladoon 5, Co. Galway was located on a raised plateau with an area of wetland located to the west. The site consisted of a charcoal-production kiln and a possible associated metal-working furnace (Lyne, 2009:1-2). Charcoal remains provide valuable information to determine industrial and socio-economic activity on archaeology sites. It is the aim of this report to identify the charcoal species recovered from the site at Rathwilladoon 5 and to use this information to:

- 1) provide additional information regarding the function of features sampled
- 2) interpret socio-economic and industrial activities on the site
- 3) infer the composition of the local woodland.

Methodology

There were three samples to be analysed for charcoal remains from Rathwilladoon 5. The following methodology was used to identify the charcoal species.

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). All of the samples contained more than 100 fragments, therefore in accordance with Keepax (1998) a maximum of 100 fragments were identified. Of the samples which contained greater than 100 fragments these were sieved through a 10 mm, 4 mm and 2 mm sieve and an equal proportion of each sieve was identified. This was to prevent any bias that might have occurred if only larger pieces were identified (thereby ensuring any potential smaller species are equally represented).

Each charcoal fragment was fractured by hand to reveal the wood anatomy on radial, tangential and transverse planes. The pieces were then supported in a sand bath and identified under an epi-illuminating microscope (Brunel SP400) at magnifications from x40 to x400. The sand bath allowed the charcoal pieces to be manipulated into the flattest possible position to aid identification. As fragments less than 2 mm in size cannot be accurately identified (it is not possible to get a wide enough field of vision to encompass the necessary anatomical features for identification) only fragments above this size were examined. During identification, any notable growth-ring characteristics, evidence of thermal and biological degradation and any other unusual microscopic features were recorded. Identifications were carried out with reference to images and descriptions by Cutler and Gale (2000) and Heller et al. (2004) and Wheeler et al. (1989). Nomenclature of species follows Stace (1997).

Results

The charcoal results are fully tabulated in Table 1 in the Appendix at the end of the report.

Charcoal identification notes

The anatomical similarities between (a) sessile/pedunculate oak mean that these taxa cannot be identified to species level (Cutler and Gale, 2000).

Fill C8 (sample 1) was the primary and only fill of possible furnace C7 and contained hazel charcoal inclusions. There were two samples recovered from the charcoal-production kiln/clamp C3. Sample 2 (fill C4) was retrieved from the upper fill of charcoal-production kiln C3 and contained hazel and oak charcoal fragments. The basal fill, C5 (sample 4) of charcoal-production kiln C3 contained oak charcoal inclusions.

Discussion

Wood selection and fuel use is affected by two variables. The first being the availability of wood nearby (type of woodland) and the second being the requirements of the community and the types of activities that were being undertaken (Asouti and Austin 2005). Using the samples from Rathwilladoon 5, it was possible to draw inferences of the composition of local woodland vegetation and to discuss the reasons for fuel selection on the site.

Function of Features

Pit C3 contained large chunks of oak charcoal and exhibited significant *in situ* burning around edges the cut, suggesting that it is a charcoal-production kiln. These kilns were typically earth-cut features in oval, circular or sub-rectangular shapes. The wood was stacked into the pit cut and then covered with vegetation and soil to produce an air-tight chamber with a controlled air flow/smoke outlet. The wood was ignited using kindling deposited through the air flow vent. As it is deprived of oxygen, it was not able to fully combust, thereby carbonising the wood and forming charcoal (Kenny, 2008:28-31).

The metallurgical furnace C7 also had *in situ* burning around the edges of the cut, contained frequent charcoal, and also had slag inclusions, suggesting a metal-working function. This site would have been an ideal location for charcoal-production as the ground is on a slope, allowing water to drain away easily, thus keeping the charcoal as dry as possible,

Social, economic and industrial activity on site including the selection/avoidance of wood for fuel

The archaeological evidence from Rathwilladoon 5 suggests that charcoal production and associated metallurgical activity was being carried out on the site. It appears that the charcoal produced within the kiln (C3) was oak as the charcoal did not exhibit any obvious curved growth rings, which suggests that large branches or stem wood was being used within the kiln to form charcoal. Oak, although, is an excellent fuel when burnt as wood, is a more effective fuel when turned into charcoal. This would be essential for industrial activities, such as metal-working, which required very high temperatures.

The fuel used within metal production furnace C7 consisted of hazel. As detailed above hazel wood is not usually used to make charcoal (Miller and Ramsey in O'Hara, 2003:31) therefore it is most likely that charcoal recovered from this feature was burnt as wood fuel rather than charcoal produced from the kiln. A possible

reason for this is that the metal ore was being tested on site to ensure that it was of good quality, perhaps even as the charcoal was being produced nearby. Thereby instead of wasting precious charcoal to test the metal ores, (which requires a huge amount of labour to produce), hazel wood was used instead. This would be something that could be done during the long periods when charcoal-production kilns had to be supervised. Hazel would have been ideal for testing on this small scale as it is a widespread species, which is also often coppiced, therefore readily available and as a fuel it burns at very high temperatures (Cutler and Gale 2000:88-89) which is ideal for smelting metal ores.

The evidence of curved growth rings within the hazel could also be explained by the coppicing of hazel trees. 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).

Composition of local woodlands

The archaeological site at Rathwilladoon 5 was located on well drained land on the slope of a small ridge surrounding wetlands (Lyne, 2009:1-2). The relatively dry location of the site would have meant the process of ecological succession would have allowed the development of climax ash-oak woodland community vegetation up the slope away from the wetland areas (Cox and Moore, 2005).

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 the woodland surrounding the site would consist of an oak-ash climax community on drier land up slope closer to the site. 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 was likely to have been selected for use in the charcoal-production kiln and metal working furnace as it is considered long lasting and effective fuels (Stuijts, 2005:142) so it is likely it was preferentially searched for and harvested and may have a higher percentage representation within the charcoal assemblage.

2) 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) preservation conditions – 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 and 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 use these species to determine the composition of local woodlands in the Rathwilladoon area. This because on charcoal-production sites the wood is selected for a specific purpose based on its

ability as an effective fuel, therefore may be over represented within the record. As the climax community vegetation within Ireland is oak woodland, it is likely that oak and hazel were growing nearby to the site; however it cannot be disregarded that people may have travelled relatively long distances to obtain the fuel they required.

Conclusion

The samples retrieved from Rathwilladoon 5 have allowed an interesting insight into the use of fuel within metallurgical working areas. The remains identified from the charcoal-production kiln, C3, indicate that oak was undergoing the combustion process to produce charcoal, with the use of hazel as kindling to ignite the oak wood. Hazel appears to have been the dominant fuel used within the metal working furnace, C3, however as there are few recordings of the production of hazel charcoal, it is most likely that hazel wood was being used as fuel. This furnace may have been a used to test the metal ore and by using the more freely available hazel wood, it saved wasting the charcoal on metal ore that may not have been of sufficient quality for metal working.

The reconstruction of local woodlands is difficult to assess using this charcoal assemblage as there are several variables that need to be taken into account, for example the selection of particular species in favour of others within the woodland, differential preservation of charcoal/non-uniform survival of charcoal over time or the influence of trade. Although the dominant woodland in Ireland during this period was oak, this cannot be confirmed through the charcoal fragments retained from this site as the fuel used would have been sought over a wide area and would have been deliberately selected for specific tasks, and therefore over-represented in the charcoal record.

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Appendix

Table 1: Charcoal species identified from E3657 Rathwilladoon 5, Co Galway.

Sample Number			1	2	4
Fill Number			C8	C4	C5
Cut Number			C7	C3	C3
Family	Species	Common Name			
Betulaceae	<i>Corylus avellana</i>	Hazel	100	2	
	<i>Quercus robur/ petraea</i>	Pedunculate/sessile oak		98	100
		Indeterminate species	0	0	0
Total fragments identified			100	100	100

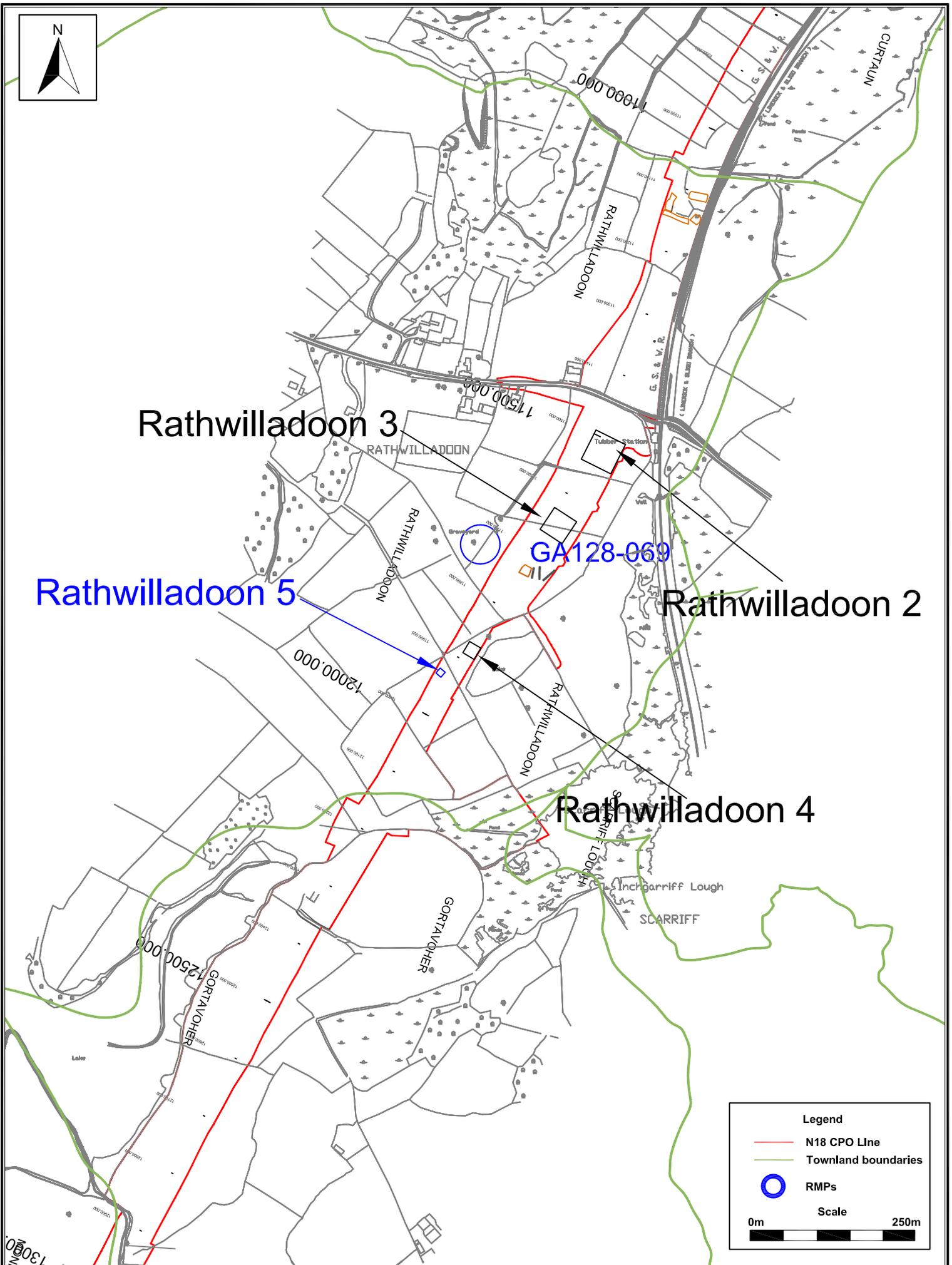
APPENDIX 3 LIST OF RMP SITES IN AREA

RMP No	Description
GA128-069	Graveyard
GA128-070	Ringfort – unclassified
GA128-070001	Souterrain

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



Legend

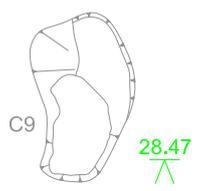
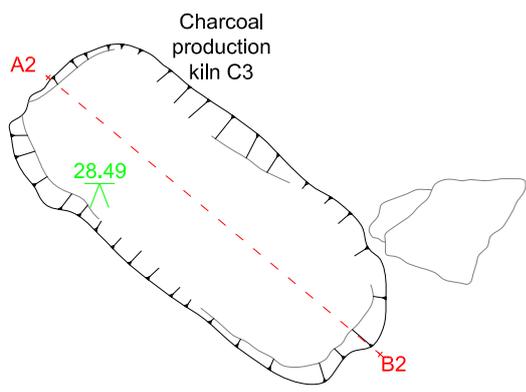
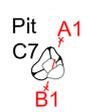
- N18 CPO Line
- Townland boundaries
- RMPs

Scale

0m 250m



Limit of excavation



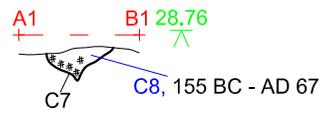
Scale
0m 2.5m

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

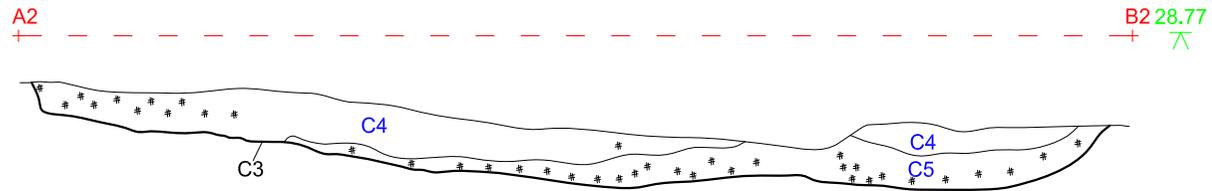


Title:	E3657 Rathwilladoon 5 post-excavation plan	Scale:	1:50 @ A4
Project:	N18 Gort to Crusheen	Date:	17/11/09
Client:	Galway County Council	Produced by:	G Kearney
		Job No:	J2440
		Figure No:	3

Northwest facing section of C7



Southwest facing section of C3



Scale



Legend

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

IAC Irish Archaeological
Consultancy

Title: E3657 Rathwilladoon 5 section of charcoal production kiln C3 & furnace pit C7
Project: N18 Gort to Crusheen
Client: Galway County Council

Scale: 1:20 @ A4
Date: 17/11/09
Produced by: G Kearney
Job No: J2440
Figure No: 4