Project Name:
N5 Ballaghaderreen Bypass

Licence Reference No:
10E0302

Townland Names:
Banada, County Roscommon

Site Type:
Banada 1 *Fulacht Fiadh*

Nat. Grid Ref.
164416 / 295132

Consultant:
Irish Archaeological Consultancy Ltd.

Excavation Director:
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ABSTRACT

The following report describes the results of an archaeological excavation of Banada 1 (licence ref.: 10E0302), which was located along the route of N5 Ballaghaderreen Bypass, Co. Roscommon. Banada 1 was discovered during a first phase of archaeological testing along the proposed bypass undertaken in 2009 by Headland Archaeology (09E0476).

The Stage (iii) excavation work at Banada 1 was untaken on behalf of the National Roads Authority and it took place between the 24th and 31st of August 2010.

The site comprised of the remains of a burnt mound site (also commonly referred to as *fulacht fiadh*) one of the most common field monuments found in the Irish landscape. Two troughs, built of oak, alder, ash and hazel, were identified at the site and they were sealed by a mound of heat shattered stone (50% of which was outside the CPO). A trough timber (ash) from one of these was dated to 2009–1771 BC (UBA 16952).

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1 INTRODUCTION

1.1 General

This report presents the results of the Stage (iii) Excavation Services at Banada 1 carried out in the townland of Banada, Co. Roscommon (Figures 1–3). This work was undertaken as part of an archaeological mitigation program completed under the Archaeological Consultancy Services Contract for the N5 Ballaghaderreen Bypass, County Roscommon. Archaeological fieldwork was directed by James Kyle of Irish Archaeological Consultancy Ltd (IAC) under Licence as issued by the DOEHLG in consultation with the National Museum of Ireland (10E0302). The work was untaken on behalf of Roscommon County Council and the National Roads Authority and it took place between the 24th and 31st of August 2010.

The purpose of the Stage (iii) Excavation Services is to preserve-by-record through appropriate rescue excavation any significant archaeological features or deposits discovered by earlier investigations, so as to mitigate impacts on the archaeological remains that may be discovered within the footprint of the project.

1.2 The Development

The N5 National Primary Route stretches from Westport (Co. Mayo), through Co. Roscommon to join the N4 National Primary Route at Longford Town; a distance of *c*. 134km. The proposed development consists of the construction of a Bypass, 13.6km long, to the north of Ballaghaderreen Town to upgrade the N5 to National Primary Route Standard.

The scheme traverses the following townlands (from west to east) Currinah, Cashelcolaun, Bohalas, Tonregee, Bockagh, Coolaghtane, Derrynagur, Ballyoughter, Toobrackan, Magheraboy, Tullaghanrock, Banada, Keelbanada, Ballinphuill, Teevnacreeva, Ratra and Rathkeery.

1.3 Topography & Site Description

Banada 1 located in the townland of Banada, lies at *c*. 70m Ordnance Datum and is located in the parish of Kilcolman. The site is located *c*. 1.5km east of Ballaghaderreen town on the south bank of the River Lung. The surrounding topography comprises of relatively level boggy fields.

In terms of the Irish National Grid Banada 1 is located at 164416 / 295132.

2 EXCAVATION RESULTS

2.1 Excavation Methodology

The excavation area measured *c*. 625sqm and it had already been mechanically stripped of topsoil as part of the Stage (ii) Pre-excavation Services.

All archaeological features revealed were cleaned by hand and excavated and recorded using customised field record sheets or 'context sheets', as well as supporting records in the form of registers or lists of drawings, photographs, and the excavation director's field diary. All archaeological features found were drawn to scale, photographed and OD levels taken. Comprehensive drawings were produced at appropriate scales.

The excavation area and the locations of any features recorded within them were recorded by a surveyor using GPS survey equipment and have been tied into the National Grid for the report illustrations.

2.2 Excavation Results

The site comprised a flattened burnt mound with associated troughs. Charcoal retrieved form the main trough fill returned an early Bronze Age date.

2.2.1 Natural Geology

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C18	N/A	N/A	N/A	N/A	Compact grey clay with rounded stones	Subsoil.

Finds:
None.

Interpretation:
The natural subsoil consisted of compact grey sticky clay with moderate inclusions of rounded stones and was uniform across the site. It was the glacially deposited natural subsoil underlying the entire area.

2.2.2 Natural Peat growth

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
2	N/A	-	-	0.3-0.4	Compact dark brown clayey peat	Peat layer on which mound rested

Finds:
None.

Interpretation:
This deposit of peat was a natural accumulation that formed over time due to the breakdown of organic matter in waterlogged conditions. It was a humic deposit and was a dark brown/black colour and was of uniform composition across the site. Some light vegetation was visible in the upper levels. No finds were recovered from this context.

2.2.3 Archaeological Phase

2.2.3.1 Trough 1

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
4	N/A	1.80	1.80	0.70	Circular with steep sides and a flat base	Trough cut
6	C4	1.74	1.78	0.28	Black silty clay with heat shattered stone.	Upper fill of trough
7	C4	1.13	0.90	0.10	3 pieces of wood, poorly preserved	Upper layer of wood
11	C4	1.54	1.32	0.28	Compact layer of rounded stones.	Final fill of trough.
12	C4	0.64	0.21	0.24	Moderately compact reddish brown moss .	Moss lining.
13	C4	0.72	0.54	0.09	Scatter of 5 dumped timbers, poorly preserved	Wood layer in trough
14	C4	1.24	0.41	0.14	2 pieces of timber.	Floor plank
15	C4	0.90	0.74	0.28	7 stakes arranged around the floor plank	Stakes.
16	C4	1.20	0.70	0.10	5 stones arranged in the base of the trough.	Basal stones
17	C4	0.40	0.20	0.24	4 rods and 2 sails.	Wicker

Finds:
None.

Interpretation:
The trough, C4, was excavated into the existing peat. A layer of stones (C16) was placed on the base of the trough to allow an even surface for construction. These stones were flat and angular and were tightly packed. A series of seven stakes (C15) were identified in the base of the trough. These appeared to hold the floor planks (C14) in place (Plate 3). These stakes may also have been used to hold the wattle (C17) and moss (C12) lining in place. Ash, alder, hazel and oak were used to construct the trough. Wattle-lined troughs have also been identified at a number of other Early Bronze Age *fulachta fiadh* sites, including Derryville, Killoran, Co. Tipperary (2138-1935 cal. BC), Ballyshaneduff or The Derries, Co. Laois (03E0662) and Gortaroe 1 (01E0650ext.). At Derryville, corner rods were inserted into the surrounding soil to stabilise the wattle panels. Moss was used to plug any holes and to ensure the trough was filled with filtered ground water rather than bog water (O'Carroll, Appendix 2.2).

The working floor of the trough (C14) comprised of two timber planks. Timber 14:1 was a split alder plank with extensive and very well preserved tool marks on one side (Plate 4). Timber 14:2 was another large flat timber and it was wedged under timber 14:1 possibly to stabilise it. Traces of toolmarks including jam curves (between 5-7cms in diameter and 7-10cms in length) with slightly concave profiles were noted on the tangentially split ash plank (14:9:1), indicating that a large Early Bronze Age flat metal axe was used (O'Carroll, Appendix 2.2).

The timbers were sealed by C11 the final fill of the trough before it was abandoned. It consisted of a thick layer of densely packed unburnt stones in a matrix of silt and charcoal. A sample of the stones from C11 was identified as pale-grey, medium-grained sandstone (Unitt, Appendix 2.3). A scatter of five pieces of timber (C13) appeared to be dumped within this abandonment fill as if they had been dumped into it. A layer of timbers (C7) appeared to be laid on top of this deposit after it went out of use. It may have been an attempt to create a smaller expedient trough. The upper fill of the trough (C6) was formed through slippage from the surrounding burnt mound material (C3).

2.2.3.2 Trough 2

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
5	N/A	3.3m	1.78m	0.48m	Sub-oval pit	Trough or cistern
9	C5	1.4m	1.3m	0.26m	Timber in poor condition	Timber at base and sides of trough
8	C5	3.3m	1.78m	0.48m	Peat with heat shattered stone and charcoal	Fill of secondary pit

Finds:
None.

Interpretation:
This trough was excavated into the boulder clay (Plate 5). The cut was immediately southeast of Trough 1 (approximately 0.45m). Although not containing the same complexity of fills some worked timbers were present (C9). The feature had a tapered channel to the north which may indicate that the pit was used to collect and possibly store water much the same as a cistern for the main trough. Ash and alder were the main identifiable timber from this trough (O'Carroll, Appendix 2.2).

There was a concentration of heat shattered burnt material at the base of the feature and nine pieces of timber (C9) were dumped onto the northwest of the feature before it was abandoned. The main fill of the trough was C8 was peat and indicate that the pit was left open long enough for this to form after abandonment. A timber sample retrieved from the trough was identified as ash (*Fraxinus excelsior*) by the environmental specialist. The sample returned an AMS result of 3549+/-32 BP (UBA 16952). The 2 Sigma calibrated result for this was 2009–1771 BC (Appendix 2.1), dating this trough and the burnt mound to the early Bronze Age.

2.2.3.3 Burnt Mound

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
3	N/A	12m	8.5m	0.38m	Heat shattered stone with frequent charcoal	Burnt mound

Finds:
None.

Interpretation:
This represents the burnt mound material or waste from activity carried out in Trough 1 and 2 (C4 & C5). It was comprised of black silty clay with heat shattered stone and charcoal (Plate 1; Figure 3 and 4). Excavation was limited by the line of the lands made available and it is likely that only 50% of the mound was available for excavation. The mound was relatively shallow and may have been truncated in the past.

2.2.4 Topsoil

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
1	N/A	Site	Site	0.20	Compact dark brown peat	Topsoil overlying site

Finds:
None.

Interpretation:
The topsoil sealed all the archaeological features on site. It was a compact dark brown peaty clay and was consistent across the site. No finds were identified from the topsoil.

3 SYNTHESIS AND DISCUSSION

3.1 Landscape setting

Banada 1 located in the townland of Banada, lies at *c*. 70m Ordnance Datum and is located in the parish of Kilcolman. The site is located *c*. 1.5km east of Ballaghaderreen town on the south bank of the River Lung. The surrounding topography comprises of relatively level boggy fields.

The Topography, Geology and Hydrology of the N5 Ballaghaderreen Bypass in Co. Roscommon

The N5 Ballaghaderreen Bypass is located in the northwest corner of Co. Roscommon and travels in a north–west direction where it joins the N5 Charlestown Bypass and continues into Co. Mayo. It is an inland county with an area of 2463km² which is bounded by the River Shannon to the east and the River Suck to the west (Hickey & Drew 2003, 35). Roscommon has an abundance of surface streams and rivers, the majority of which feed into these two rivers (*ibid*, 37). The present road scheme traverses the River Lung which feeds into Lough Gara located *c*. 4km to the northeast. A cluster of lakes are also situated to the southwest of the scheme *c*. 10km away; these all feed into the River Suck which meanders to the south. A number of caves have also been explored in the county. The largely fossil Pollawaddy cave is located near Ballaghaderreen (*ibid*, 38) and some 1.5km to the south of Frenchpark (directly to the south of the present scheme), there are four stream sinks (*ibid*, 39). Pollnagollum Cave and Doline is also located in the southwest of Frenchpark (*ibid*, 45).

The landscape of the scheme is undulating and the present road scheme passes through the Lung River Valley. Bockagh Hill (227m) rises to the north and Mullaghanoe Hill (234 m) is situated to the northwest of the scheme. To the northeast, the Curlew Mountains are situated *c*. 10km away and just beyond these to the north are the Bricklieve Mountains. The Curlew Mountains form a narrow ridge of resistant Devonian Sandstone (Lee & Daly 2003, 8). The geology of the county is complex with both temporal and lateral changes in rock composition (*ibid*, 8). The majority of the rocks of Roscommon (90%) are limestone of various degrees of purity and structure (Hickey & Drew 2003, 35) however the landscape crossed by the N5 Ballaghaderreen Bypass is underlain with Devonian Sandstone (EPA 2011). Deposition of the Old Red Sandstone (ORS) rocks took place on a desert like environment which was subjected to intense erosion and then the deposition of gravel, and some clay in the flood plains of the meandering rivers (Lee & Daly 2003, 11). The Sandstones are reddish-brown in colour reflecting the avid sub-arial oxidising conditions under which these rocks were formed (*ibid*.). In these rocks, the groundwater circulation is probably limited to faults and fractures and the assumed low permeability is supported by the drainage in the area, which is often poor with most of the rainfall running off to the nearest surface watercourse (*ibid*, 36). In the townland of Toobrackan, the underground geology consists of both Devonian and Carboniferous Sandstones (EPA 2011). The Lower Carboniferous was a period of marine deposition, where on land rivers deposited sand and silts; now represented by the Boyle Sandstone (Lee & Daly 2003, 11).

Many of the sub-soils in Co. Roscommon were laid down during the last glaciation affecting Ireland (Lee & Daly 2003, 11). The sub-soils underlying the present scheme consist of Devonian Sandstone Tills and cut-over peat with the exception of Toobrackan, where Carboniferous Sandstone Tills are also present (EPA 2011). Till is the dominant Quaternary deposit and has a variable thickness in Roscommon; it is generally thin or absent in uphill areas, with bedrock outcropping frequently, and

thickness in low-lying areas where till thickness of over 30m are not uncommon (Hickey & Drew 2003, 37). It is a diverse material that is largely deposited sub-glacially and has a wide range of characteristics due to the variety of parent materials and different processes of deposition (Lee & Daly 2003, 17). The deposition of peat occurred in post-glacial times with the onset of wetter and warmer climatic conditions (*ibid*.). Peat is an unconsolidated brown to black organic material comprising a mixture of decomposed and undecomposed plant matter that accumulated in a water logged environment (*ibid*.). The over lying soils of the scheme consist of Surface Water Gleys and Ground Water Gleys as well as Basin Peats and Blanket Peats (EPA 2011). Surface water gleys are formed in slowly permeable materials as a result of poor drainage of surface water and ground water Gleys are soils whose drainage problems stem not from the soil material but from their topographic position close to the water table (Conway 2011).

3.2 Bronze Age Archaeological Landscape

Dates ranging from the early to late Bronze Age (2400–800 BC) period have been recovered from nine sites along the N5 Ballaghaderreen Bypass. The Bronze Age activity uncovered consisted of burnt mound activity. Two of the nine sites, both of which were located in Bockagh townland, returned varying dates indicating a continuity of use at these sites throughout the Bronze Age period. It has been recognised that *fulachta fiadh*, and related sites, tend to be located in the vicinity of a water source, either beside streams or in waterlogged places (Ó Drisceoil 1991; Feehan 1991; Higgins 1991; O'Connor 2007, 20). The surrounding topography of the scheme comprises undulating bogland drained by small water courses ideal for burnt mound activity. Although known to date mostly to the Bronze Age, the precise function of *fulachta fiadh* or burnt mounds is not completely understood (O'Connor 2007, 5). Nevertheless, it is generally accepted that they were used to bring water to the boil by a form of hot-stone technology (Brindley, et al. 1989-90, 25; *ibid*.). *Fulachta fiadh*, or burnt mounds, are usually found as crescent shaped heaps of fire-cracked stones or, if they have been levelled as a spread of stones and charcoal in a ploughed field (Buckley 1998, 111). Excavation has shown that they usually had a pit or wood-lined trough with an adjacent hearth (*ibid*.). In Co. Roscommon there are 43 *fulachta fiadh*, 23 burnt mounds and one burnt spread recorded on the Record of Monuments and Places. The excavation of nine further sites as a result of the N5 Ballaghaderreen Bypass contributes significantly to this data; it also indicates that the count of this feature type throughout the county is much higher.

Early Bronze Age activity along the scheme was excavated at Bockagh 4 (10E0379) where burnt mound material produced a date of 2461–2209 BC (Kyle and Delaney 2011a). Troughs also excavated at this site returned a late Bronze Age date indicating this site was in use throughout the Bronze Age period. Bockagh 4 is located on the northwest end of the road scheme. An early Bronze Age date was also recovered from the fill of one of two hearths excavated at Toobrackan 1 (10E0301) (Kyle and Delaney 2011b), located *c*. 3.4km to the south-east of Bockagh 4. Additional activity at the site included a cluster of pits/postholes that may have formed a screen or perhaps they were all that was left of a truncated structure and may have been associated with the hearths (*ibid*.). At Keelbanada 2 (10E0304), a *fulacht fiadh* with two troughs and pits was also excavated (Bayley and Delaney 2011a); it was located *c*. 2.4km to the south-east of Toobrackan 1. A layer within one of these troughs has been dated to the early Bronze Age (*ibid*.).

Middle Bronze Age activity was also present along the scheme in the form of burnt mound activity. The remains of a burnt mound excavated at Keelbanada 1 (10E0303) returned a middle Bronze Age date (Bayley and Delaney 2011b) as did the timber lining of a trough excavated at Banada 1. Additionally, stakeholes excavated at the

base of a trough at Toobrackan 1 returned a similar date (Kyle and Delaney 2011b). A middle Bronze Age date was also recovered for the fill of a trough at Bockagh 1 (10E0300) however stakeholes within this trough yielded a late Bronze Age date; this site may have had a number of phases of activity (Janes and Delaney 2011). Bockagh 2 (10E0377) also produced middle Bronze Age timbers in its trough construction (Kyle and Delaney 2011d). Late Bronze Age activity along the scheme was represented by the aforementioned stakeholes excavated at Bockagh 1 (*ibid.*) and a mid–late Bronze Age date was recovered for the timber lining of a trough at Bockagh 4 (Kyle and Delaney 2011a). An additional timber lined trough at the site produced a late Bronze Age date (*ibid*.). At 10E0378 Bockagh 3 the burnt mound material excavated at the site has returned a late Bronze Age date (Kyle and Delaney 2011c) as has the slippage backfilling a trough at 10E0301 Toobrackan 2 (Kyle and Delaney 2011b).

There are no recorded burnt mounds or burnt spreads in the immediate vicinity of the N5 Ballaghaderreen Bypass. Of note are three *fulachta fiadh* recorded by the Record of Monuments and Places in Currinah (RO008C034, RO008C035001–002). These are situated *c*. 5km to the north-west of Bockagh townland on the northern end of the N5 Ballaghaderreen Bypass. *Fulachta fiadh* are also recorded approximately 5km to the southeast of the scheme at Mullen (RO015:06001–3) and at Cloonfinglas (RO014:077001–2), located approximately 8km to the southeast. Directly to the west in Co. Mayo *c*. 4km away, a cluster six *fulachta fiadh* are also recorded. This was also the most numerous and widespread monument type identified and excavated as part of the N5 Charlestown Bypass (Kerrigan *et al* 2010, 17). As part of that road scheme, three burnt mound sites were excavated at Currinah, Co. Roscommon (*ibid*.). A date returned from a hazel post places the trough construction and *fulacht fiadh* use at Currinah IV in the later part of the middle Bronze Age, contemporary with Currinah II (Kerrigan and Gillespie 2010, 137), where a burnt mound and a trough pit were excavated (*ibid*. 130). At Currinah 1, a burnt mound and a stone lined trough were also excavated however these returned a late Bronze Age date (*ibid*. 129).

Bronze Age funerary activity was not recovered as part of the N5 Ballaghaderreen Bypass excavations. Burial practice dating to this period is represented by a ring-barrow recorded at Magheraboy (RO008:024), located directly to the west of Toobrackan townland. Two unclassified barrows (MA082:043 & MA082:046) are also recorded to the south-west, *c*. 12km away in Co. Mayo at Aghamore (Costello By.) and at Scregg (Costello By.). An unclassified cairn is also recorded *c*. 5km to the south of Teevnacreeva at Mullaghnashee (RO014:066) and a cist burial is located *c*. 7.5km to the southwest at Cloonmullin (RO020:058002). A cist and a second possible cist are also recorded in the townlands of Bruff (MA081:019), Mountain Common (MA094:020002) and Coogue North (MA081:033001), *c*. 17km to the southwest. Additionally, three cairns are located *c*. 12km to the west in Co. Mayo at Barnacahoge (MA072:090 & MA0072:127002) and at Barnalyra (MA072:108). As part of the N5 Charlestown Bypass a single cremation burial associated with Bronze Age Food Vessel pottery sherds was excavated at Lowpark, Co. Mayo (Kerrigan *et al* 2010, 17). As part of the N6 Ballinasloe to Athlone national road scheme, a Bronze Age ring-ditch was recovered at Ardagawna, Co. Roscommon (O'Séaghdha 2010) and the fragmentary remains of a Bronze Age bog body were also recovered from Derrycashel bog in January 2005 (Mulhall 2008).

The Rathcroghan complex is situated *c*. 10km to the south-east of the N5 Ballaghaderreen Bypass and consists of over 60 archaeological monuments of different types located in six townlands, scattered over some 1000 hectares of elevated ground (Waddell *et al* 2009, 1). Archaeological evidence confirms that Rathcroghan was an important burial-ground and cult centre (Waddell 2009). Among

the monuments of ritual character identified by Herity (1983) burial tumuli dominate, with forty five examples; of these thirty-four are ring-barrows (Herity 1983, 137–138). The traditions which identify the area as a cemetery thus appear to be confirmed by the archaeological remains (*ibid*, 137). In addition to Rathcroghan, a cemetery mound containing eight cist burials and six secondary pit burials has been excavated at Grange, Co. Roscommon (Ó Riordáin *et al* 1997), located *c*. 24km to the south-east of the N5 Ballaghaderreen Bypass scheme.

Other finds dating to this period include an investigation in 1989 of Correen Ford in Correenbeg, in the south of the county where a late Bronze Age sword was found close to a portion of a pottery vessel, perhaps of the same age (Kelly 1990). A Bronze Age hoard has also been discovered more recently at Coggalbeg bog to the south of the scheme (Gaule 2010). It is clear that the Bronze Age people of Co. Roscommon were an established and affluent populace demonstrated by the funerary rites and high status finds associated with this period, and to a lesser extent the high incidence of burnt mound sites throughout the region. The frequency of this site type more readily reveals the distribution of this population and confirms, in the absence of excavated settlement sites, that Co. Roscommon was extensively settled during the Bronze Age period.

3.3 Typology of Burnt Mounds

Fulachta fiadh sites (also commonly referred to as burnt mounds) 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 component of the Bronze Age landscape, the use of pyrolithic technology has a long history in Ireland.

Although there is a general consensus that burnt mound sites are the result of pyrolithic technology for the heating or boiling of water, the precise function of these sites has, to date, not been agreed upon. Several theories have been proposed but no single theory has received unanimous support. The most enduring theory is that burnt mounds sites were used as cooking sites. O'Kelly (1954) and Lawless (1990) have demonstrated how joints of meat could be efficiently cooked in trough of boiling water. The use of burnt mound sites for bathing or as saunas has been suggested as an alternative function (Lucas 1965, Barfield and Hodder 1987, O' Drisceoil 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 leading Irish environmentalists due to the absence of cereal remains from most burnt mound sites (McClatchie *et al*. 2007).

3.4 Discussion and Conclusion

Banada 1 comprised two timber-lined troughs and a burnt spread. A trough timber (ash) from one of these was dated to 2009–1771 BC. Ash, Alder, hazel and oak were identified from the trough. The wood assemblage from Banada 1 showed that the inhabitants had knowledge and skill in timber splitting, as demonstrated by the different conversion methods, split types and pointed ends used to manufacture the timbers which lined the trough (O'Carroll, Appendix 2.2).

Banada 1 was located *c.* 1.1km north-west of another burnt mound site at Keelbanada 1 (10E303: Bayley and Delaney 2011b) which was also dated to the early Bronze Age (2018–1774 BC). This burnt mound site was defined by a single truncated burnt mound deposit. Approximately 200m further south-east was another burnt mound with associated troughs and pits, Keelbanada 2. This burnt mound was dated to the early Bronze Age (2195–1979 BC). It is possible, on the basis of the C14 determinations, that Keelbanada 1 and 2 and Banada 1 were contemporary.

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APPENDIX 1 CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Finds
1	N/A	N/A	N/A	N/A	Topsoil overlying site	Compact dark brown peat	None
2	N/A	N/A	N/A	0.3 - 0.4m	Peat layer on which mound rested	Compact dark brown clayey peat	None
3	N/A	12m	8.5m	0.38m	Burnt mound, roughly circular; width extended beyond CPO	Moderately compact black silty clay with red and yellow fragments of heat shattered stone and frequent inclusions of charcoal	None
4	N/A	1.8m	1.8m	0.7m	Cut in which main trough was constructed	Roughly circular with sharp breaks of slope at the top, steep sides a sharp break at bottom and a flat base	None
5	N/A	3.3m	1.78m	0.48m	Cut for the secondary pit, poss. for water collection	Sub-oval with gradual break of slope at the top, sharp at the S, gradual sides, steep at MW, gradual break at the bottom and a broad concave base.	None
6	C4	1.74m	1.78m	0.28	Upper fill of trough consisting of collapsed BM material	Moderately compact black silty clay with red and yellow fragments of heat shattered stone and frequent inclusions of charcoal	None
7	C4	1.13m	0.9m	0.1m	Upper layer of wood in trough	Linear, 3 pieces of wood, poorly preserved	None
8	C5	3.3m	1.78m	0.48m	Fill of secondary pit	Moderately compact mid brown peat with frequent inclusions of red and yellow fragments of heat shattered stone and occasional charcoal	None
9	C5	1.4m	1.3m	0.26m	Wood scatter in base and sides of C5	Dark brown wood in poor condition, 1Stake with a chisel point	None
10	NAS				Not Archaeologically Significant		
11	C4	1.54m	1.32m	0.28m	Final fill of trough unburnt stone	Very compact layer of rounded stones in a matrix of silt	None
12	C4	0.64m	0.21m	0.24m	Moss lining (partially preserved) in trough	Moderately compact reddish brown moss with occ flecks of charcoal	None
13	C4	0.72m	0.54m	0.09m	Wood layer in trough	Scatter of 5 dumped timbers, poorly preserved	None
14	C4	1.24m	0.41m	0.14m	Floor plank and wedge in trough	2 pieces of timber, one a wedge, 14:1 is a split alder plank with intensive tool marking on the underside	None
15	C4	0.9m	0.74m	0.28m	Stakes holding either the plank, 14:1 or the moss C12 in place	7 stakes arranged around the floor plank 14:1. 2 stakes had pencil points, the rest were poorly preserved	None
16	C4	1.2m	0.7m	0.1m	Stones at base of trough, holding floor plank in place	5 stones arranged in the base of the trough, grey sub angular, flat, some were arranged tightly together.	None
17	C4	0.4m	0.2m	0.24m	Wicker holding the moss (C12) in place	Very poorly preserved, only 4 rods and 2 sails survived, pieces were 2 -3cm diameter.	None
18	N/A				Natural layer of boulder clay into which C4 and C5 were cut	Very compact grey sticky clay with moderate incl. of rounded stones, 10cm x 10 cm x 10cm.	None

Note: All archives, artefacts and ecofacts are currently in storage with IAC Ltd at The Library, Chapel Street, Lismore, Co. Waterford awaiting final submission to facilities at the National Museum of Ireland.

Appendix 1.2 Catalogue of Samples

Sample No.	Context No.	Sample type:	Sample volume (l) / weight (g)	Description of context	Sieving result (g)
1	7	Wood ID		Timber from C4 primary trough	Timber
2	11	Bulk soil		Fill of trough in C4	2.6g charcoal & burnt stone
3	3	Bulk soil		Moss lining in C4	Moss – no results
4	12	Moss		Upper fill of C4 trough, burnt mound material	38g charcoal
5	6	Bulk soil 3 buckets			Not processed
6	8	Bulk soil 2 buckets		Fill of C5 (secondary pit)	2.3g charcoal
7	13	Wood ID		Timber from C4 primary trough	Timber
8	15	Wood Worked		Stakes from base of trough (C4)	Timber
9	14	Split timbers (2)		Planks from base of trough (C4)	Timber
10	9	Wood ID & 1 piece of Worked Wood		Wood from C4 (secondary pit)	Timber
11	17	Wood Wicker		Wicker from trough (C5) poorly preserved	Timber

Appendix 1.3 Wood Register

Element No.	Length (cm)	Width (cm)	Diameter	Thickness (cm)	Other Information
07:01	113	26		6.5	Split in Poor condition
07:02	75	22		10	Split in Poor condition some charring on SW end
07:03	83	17		7	Poor condition, charred on the E side
09:01	19	6		5	Split
09:02	27		2.5		
09:03	23		2.5		Very Poor Condition
09:04	13	4		3	Charred all over
09:05	N/A	N/A		N/A	Too poorly preserved to sample
09:06	24	11		5	Split, in poor condition
09:07	28	4		5	Very Poor Condition
09:08	88	14		1	Bark
09:09	41	17		2	Very Poor Condition
09:10	20		3.5		Worked wood, chisel point, possibly a collapsed stake
13:01	15	5		2	
13:02	28	8		1	Charred underside
13:03	18	11		5	In 2 pieces
13:04	27	15		9	Charred at top and bottom
13:05	37	21		4.5	Small portion sampled due to it's very poor condition
14:01	124	24		3.5	Split plank with working on underside
14:02	47		14		Small work mark on S end
15:01	17		3.2		Stake, worked, pencil point, 12 facets
15:02	NAS				NAS
15:03	21		2		Stake, worked, poor condition, in 2 pieces
15:04	13		2.5		Stake worked, pencil point, 5 facets
15:05	28		2.5		Stake, worked, poor condition
15:06	20		2.5		Stake, worked, poor condition,
15:07	14		2.5		Stake, worked, poor condition, worked end damaged in situ

15:08	22		2		Stake, worked, poor condition end slightly damaged

Appendix 1.4 Photograph Register

Photo number	Context #	Direction	Type	Comments
501	3	SE facing	pre ex WIP	Mound being excavated
502	3	SE facing	pre ex WIP	Mound being excavated
503	3	W facing	mid ex	Mound half sectioned
504	3	W facing	mid ex	Mound half sectioned
505	3	W facing	mid ex	overview of mound half sectioned
506	3	W facing	mid ex	overview of mound half sectioned
507	3	NW facing	section face	mound section face
508	3	NW facing	section face	mound section face
509	3	NW facing	section face	mound section face
510	3	NW facing	section face	mound section face
511		Deleted		
512		Deleted		
513	3	SW facing	WIP	2nd half of mound being excavated
514	4, 5, 6,8	SW facing	Pre ex	Trough & Secondary Pit Pre -Ex
515	4, 5, 6,8	SW facing	Pre ex	Trough & Secondary Pit Pre -Ex
516	4, 5, 6,8	NW facing	Pre ex	Trough & Secondary Pit Pre -Ex
517	4, 5, 6,8	SE facing	Pre ex	Trough & Secondary Pit Pre -Ex
518	3,4,5,6,8	NE facing	Section &Pre ex	Section face of Mound in baulk/CPO
1417	8	N facing	Section	S facing section of C8 fill of C5
1418	8	N facing	Section	S facing section of C8 fill of C5
1419	8	N facing	Section	S facing section of C8 fill of C5
1420	8	N facing	Section	S facing section of C8 fill of C5
1421	8	N facing	Section	S facing section of C8 fill of C5
1422	8	N facing	Section	S facing section of C8 fill of C5
1423	6	N facing	Section	S facing section of C8 fill of C5
1424	6	N facing	Section	S facing section of C6 fill of C4
1425	6	N facing	Section	S facing section of C6 fill of C4
1426	6	N facing	Section	S facing section of C6 fill of C4
1427	7	N facing	WIP	C7 wood being cleaned in C4
1428	7	N facing	WIP	C7 wood being cleaned in C4
1429	8	N facing	Section	S facing section through C8 in the channel of C5
1430	5, 8, 9	E facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9
1431	5,8,9	E facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9
1432	5,8,9	NW facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1433	5,8,9	NW facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1434	5,8,9	NW facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1435	5,8,9	NW facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1436	5,8,9	N facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1437	5,8,9	N facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1438	5,8,9	N facing	Mid- Ex	Mid ex of secondary Pit C5 with wood C9 & Element 9:8
1439	Deleted			
1440	5	S facing	Mid -Ex	View of C5 secondary pit
1441	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1442	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough

Photo number	Context #	Direction	Type	Comments
1443	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1444	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1445	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1446	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1447	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1448	7	S facing	Mid -Ex	C7 upper timber layer in C4 trough
1449	Deleted			
1450	Deleted			
1451	13	S facing	Mid Ex	C13 middle timber layer in C4 trough
1452	13	S facing	Mid Ex	C13 middle timber layer in C4 trough
1453	13	S facing	Mid Ex	C13 middle timber layer in C4 trough
1454	13	S facing	Mid Ex Close up	C13 middle timber layer in C4 trough
1455	13	S facing	Mid Ex Close up	C13 middle timber layer in C4 trough
1456	13	S facing	Mid Ex Close up	C13 middle timber layer in C4 trough
1457	13	S facing	Mid Ex Close up	C13 middle timber layer in C4 trough
1458	Deleted			
1459	12	S facing	Pre-Ex	C12 Moss lining in situ in C4 trough
1460	12	S facing	Pre-Ex	C12 Moss lining in situ in C4 trough
1461	12, 13	S facing	Pre-Ex	C13 timbers with C12 moss lining
1462	12, 13	S facing	Pre-Ex	C13 timbers with C12 moss lining
1463	5	S facing	Post -Ex	Post ex of Secondary Pit C5
1464	Deleted			
1465	5	NW facing	Post -Ex	Post ex of Secondary Pit C5
1466	5	SW facing	Post -Ex	Post ex of Secondary Pit C5
1467	Deleted			
1468	5	SW facing	Post -Ex	Post ex of Secondary Pit C5
1469	5	N facing	Post -Ex	Post ex of Secondary Pit C5
1470	5	N facing	Post -Ex	Post ex of Secondary Pit C5
1471	5	N facing	Post -Ex	Post ex of Secondary Pit C5
1472	Deleted			
1473	Deleted			
1474	Deleted			
1475	12, 14	SE facing	Pre-Ex	Pre-Ex of Moss C12 with C14 split plank visible
1476	Deleted			
1477	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1478	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1479	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1480	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1481	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1482	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1483	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1484	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1485	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1486	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1487	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being cleaned/excavated
1489	14	SE facing	Mid-Ex WIP	WIP of the split plank 14:1 being

Photo number	Context #	Direction	Type	Comments
				cleaned/excavated
1490	Deleted			
1491	Deleted			
1492	14	NW facing	Mid -Ex	Split plank 14:1cleaned
1493	14	NW facing	Mid -Ex	Split plank 14:1cleaned
1494	14	NW facing	Mid -Ex	Split plank 14:1cleaned
1495	14	E facing	Mid -Ex	Split plank 14:1cleaned
1496	14	S facing	Mid -Ex	Split plank 14:1cleaned
1497	14	S facing	Mid -Ex	Split plank 14:1cleaned
1498	14	N facing	Mid -Ex	Split plank 14:1cleaned
1499	14	NW facing	Mid -Ex	Split plank 14:1cleaned, with C12 moss and C15 stake to left
1500	14	W facing	Mid -Ex	Split plank 14:1cleaned, with C12 moss and C15 stake to left
1501	14	W facing	Mid -Ex	Split plank 14:1cleaned
1502	14	W facing	Mid -Ex	Split plank 14:1cleaned
1503	14	W facing	Mid -Ex	Split plank 14:1cleaned
1504	14	W facing	Mid -Ex	Split plank 14:1cleaned
1505	14	SW facing	Mid -Ex	Split plank 14:1cleaned
1506	14	S facing	Mid -Ex	Split plank 14:1cleaned
1507	14	NW facing	Mid -Ex	N end of 14:1
1508	14, 15, 12	S facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1509	14, 15, 12	S facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1510	14, 15, 12	S facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1511	14, 15, 12	S facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1512	14, 15, 12	W facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1513	14, 15, 12	W facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1514	14, 15, 12	S facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1515	14, 15, 12	W facing	Mid -Ex	S end of 14:1 showing relationship to stake 15:4 & C12 moss
1516	Deleted			
1517	14	N facing	Post-Ex	14:1 after lifting
1518	14	N facing	Post-Ex	14:1 after lifting
1519	14	N facing	Post-Ex	14:1 detail of working/toolmarks on underside
1520	14	N facing	Post-Ex	14:1 detail of working/toolmarks on underside
1521	14	N facing	Post-Ex	14:1 detail of working/toolmarks on underside
1522	14	N facing	Post-Ex	14:1 detail of working/toolmarks on underside
1523	Deleted			
1524	15	N facing	Pre-Ex	Stake 15:1 in situ
1525	15	N facing	Pre-Ex	Stake 15:1 in situ
1526	Deleted			
1527	Deleted			
1528	17	S facing	Pre-Ex	Wicker in -situ
1529	15	N/A	Post-Ex	Stake 15:5 after lifting
1530	15	N/A	Post-Ex	Stake 15:5 after lifting
1531	15	N/A	Post-Ex	Stake 15:7 after lifting
1532	15	N/A	Post-Ex	Stake 15:3 after lifting
1533	15	N/A	Post-Ex	Stake 15:4 after lifting
1534	15	N/A	Post-Ex	Worked wood 9:10 after lifting
1535	15	N/A	Post-Ex	Worked wood 9:10 after lifting

Photo number	Context #	Direction	Type	Comments
1536	4 & 5	W facing	Post-Ex	Final Post Ex of trough & pit C4 & C5
1537	4 & 5	S facing	Post-Ex	Final Post Ex of trough & pit C4 & C5
1538	5	NE facing	Post-Ex	Final Post Ex of pit C5
1539	4	E facing	Post-Ex	Final Post Ex of trough C4
1540	4	NE facing	Post-Ex	Final Post Ex of trough C4
1541	4&5	SE facing	Post-Ex	Final Post Ex of trough & pit C4 & C5

Appendix 1.5 Plan Register and Section Register

Drawing No.	Plan/ Sections	Description	Scale
1	Plan & Section	1:1 N facing section of C3 mound	01:25
		1:2 Pre-Ex plan of C3 mound	01:50
2	Section	SW facing section of C1 C2 & C3	01:20
3	Plan	Intermediate Plan of C4 trough showing C13 timber and C12 moss	01:20
4	Plan & Section	4:1 SE facing section of C8	01:20
		4:2 SE facing section of C6	01:20
		4:3 S facing section of C8 in the main part of C5 (secondary pit)	01:20
5	Plan	Plan of C5 with C14 & C15 timbers/stakes	01:20
6	Plan & Profile	6:1 Post -Ex Plan of C4 & C5	01:20

APPENDIX 2 – SPECIALIST REPORTS

Appendix 2.1 AMS dates

Radiocarbon Dating Results – QUB Laboratory

The "Measured radiocarbon age" is quoted in conventional years BP (before AD 1950). The error is expressed at the one-sigma level of confidence.

The "Calibrated date range" is equivalent to the probable calendrical age of the sample material and is expressed at the one Sigma (68.3% probability) and two-Sigma (95.4% probability) level of confidence.

Calibration dataset: Calibration programme: CALIB REV5.0.2 - used in conjunction with Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215–230.

Context	Sample No	Material	Species id/ Weight	Lab	Lab Code	Date Type	Calibrated date ranges	Measured radiocarbon age (BP)	13C/12C Ratio ‰
C9 Trough timber	10	Wood	*Ash* (<162.9g)	QUB	UB16952	AMS(Std)	1944-1783 BC (1 sigma), 2009–1771 BC (2 sigma)	3549±32	-28.7

Appendix 2.2 Wood Report

Report on wood remains from Banada 1, Co. Roscommon 10E0300 N5 Ballaghaderreen By-pass

Ellen O'Carroll MA
February 2011

Introduction
This report comprises the results of wood analysis from samples recovered during excavations at Banada 1, Co. Roscommon (10E0302) carried out by IAC Ltd as part of the N5 Ballaghaderreen By-pass (NGR 164416, 295132). The site was located on marginal bogland, on the southern bank of the River Lung (Kyle and Delaney 2010a, 1). The wood was recovered from Trough 1 **[C4]** of a burnt mound and from a secondary pit/trough (Trough 2) **[C5]** (*ibid.*). A sample of ash wood from **C9**/S10/Trough 1 returned a radiocarbon date of 2009-1771 BC (cal. QUBA 2 Sigma), indicating that activity took place on site during the Early Bronze Age.

The wood assemblage
Thirty-two pieces of wood were recovered during the excavation at Banada 1, all of which were examined for this report (See Appendix 1). They comprised 10 timbers (Cs7, 13 and 14), 7 stakes (C15) and 6 fragments of wattle (C17) from Trough 1 and 9 timbers (C9) from Trough 2. Two timbers (C14) formed the floor of Trough 1 and were held in place by a series of stakes. A wattle panel held a layer of moss lining in place, which in turn may also have been stabilised by the stakes (*ibid*. 7). C13 represented a dump of wood found within backfilled material in the trough. C7 was interpreted as a possible later attempt to re-use the site. The wood from Trough 2 (C9) comprised a scatter of timber located at the base and sides of **[C5]**, a sub-oval pit or trough (*ibid*. 8).

The samples analysed ranged in size from a light brushwood 0.5cms in diameter (17:11), to a split timber 26cms in diameter (7:1). The wood was mainly in very poor (6 examples) to poor (15 examples) condition. One sample (9:1) was in moderate to poor condition. Only 2 samples from the assemblage were in moderate condition (9:10 and 14:1:9). Nine of the 10 stakes were in poor condition and the remaining sample (15:1) was in moderate condition.

Recording and Species identification Methodology
The wooden assemblage from Banada 1 (10E0302) was recorded in late August 2010 by the excavation crew using IAC recording sheets on which each sample was described and sketched. A second examination of the material was undertaken by Ellen O'Carroll in December 2010 and the initial records were amended. The wood samples were then cleaned, recorded, identified and photographed and a detailed analysis was undertaken. The original archive is still relevant in terms of contextual and other information on the assemblage. The samples are referenced by their context number/element number/sample number, to ensure consistency with the preliminary site report (Kyle and Delaney 2010a).

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

The majority of the worked wood was split and so the method of conversion and any further wood working evidence e.g. toolmarks, were recorded. An overview of the examined samples is presented below in Table 1. The appendices at the end of the

report provide dimension detail and a description of each sample. In some cases, it was not possible to identify the taxon or the wood-working technology. These samples are referred to as 'Indeterminate' in this report.

Table 1 Overview of examined samples

Element Type	No. of Records	Species identified
Split timber / wood	9	Ash (6 samples) Alder (2 samples) Oak (1 sample)
Brushwood	10	Ash (6 samples) Hazel (3 samples) Alder (1 sample)
Split brushwood	1	Species not identified
Wattle	6	Ash (Bulk sample)
Unidentified	6	Ash (3 samples) Indeterminate (2 samples) Alder (1 sample)

Definitions of Element Types and Woodworking Terminology

Constructional Elements

Brushwood Stems or rods measuring 6 cm or less in diameter.

Roundwood A piece of worked or unworked wood in the round and over 6 cm in diameter.

Vertical Stake/Post Upright brushwood or roundwood driven vertically or at an angle into the ground. Sometimes but not always used for stabilization.

Horizontal Brushwood/roundwood or split timber laid flat on the ground.

Twigs Small shoots or branches measuring less than 1 cm in diameter.

Split timber Wood converted from the round including planks, half splits and split pegs.

Woodworking terminology

Chisel point The end of a piece of wood cut to a point on one single face.

Conversion The way in which the primary trunk has been split into smaller elements.

Facet The cut surface produced on a piece of wood by a tool blow. The blow can leave behind a particular signature if the cutting edge of the tool is flawed.

Facet junction The nature of the junctions between each facet was also assessed as to whether they were clean, ragged or stepped.

Jam curves A toolmark on wood retaining the impression of the complete width of the blade used.

Pencil point The end of a piece of wood cut to a point on multiple faces.

Signature A signature is an imperfection in a woodcutter's blade which is transferred onto the timber when the wood is cut. A negative impression or a groove is created where a flange of metal extends beyond the axe blade where as a positive or raised signature is created by a gap in the blade edge.

Wedge point The end of a piece of wood cut to a point on two faces.

Results - Woodworking

The worked wood examined for this report is discussed below based on the classifications outlined above. Discussion of conversion methods and toolmark evidence is confined to samples examined by the author. It should be noted that in the case of some very poorly preserved samples, only very basic information could be ascertained. The discussion of wood working techniques is followed by a discussion of the wood species present.

Trough 1

Split timbers / wood

Nine samples in total were recorded as having been split or converted from the round. Five examples were half split roundwoods (7:3, 13:2, 13:3, 13:4, 13:5), and all were associated with the upper layers of Trough 1. Four tangentially split timbers were also identified from the assemblage, comprising 7:1 and 7:2 from the upper layer of Trough 1, as well as 14:1 and 14:2, timbers which formed the floor of Trough 1 (Plates 1 and 2). Six were identified as ash (*Fraxinus excelsior*; 7:1, 7:2, 13:2, 13:3, 13:4, 14:9:1), 2 as alder (*Alnus glutinosa*; 7:3, 13:5) and one as oak (*Quercus* sp; 14:2). Tangential splitting involves splitting a tree across its width by cutting across, rather than with the grain. This allows for the production of wide planks, with a maximum width of the diameter of the tree, but requires greater wood working skills. The split roundwoods were between 8-21cms in diameter (see Appendix 1). The tangentially split timbers were larger, measuring between 16-26cms in diameter.

Traces of toolmarks including jam curves (between 5-7cms in diameter and 7-10cms in length) with slightly concave profiles were noted on the tangentially split ash plank (14:9:1), indicating that a large Early Bronze Age flat metal axe was used (Plate 7). Unfortunately these toolmarks had somewhat decayed when the author examined the wood and they were much more prominent on the photographs taken on-site (Plate 1).

Plate 1 Timber 14:9:1, a tangentially split ash plank with wide toolmarks/jam curves, from the floor of Trough 1 (photograph courtesy of IAC).

Plate 2 Fragment of a tangentially split oak plank 14:9:2

Brushwood

Eight samples of brushwood were identified from Trough 1 (13:1, 15:1, 15:3 to 8) with diameters of between 2-5cms, although the majority were between 2-3cms in diameter; see also Appendix 1). The brushwood was identified as mainly ash (*Fraxinus excelsior*), with 3 samples of hazel (*Corylus avellana*). It was suggested by the excavator that the brushwood stakes held the moss lining and wattle in place, as well as stabilising the plank floor of the trough.

Wattle

Six fragments of wattle were found during the excavation of Trough 1 (Plate 3). The wattle was bulk sampled. Although its condition was poor, the wood was identified as ash measuring between 0.5-1cms in diameter and retained between 3-4 annual tree rings. It was noted during the excavation that 4 rods and 2 sails survived (see Kyle and Delaney 2010a, Appendix 1).

Plate 3 Fragmentary remains of wattle from Trough 1.

Trough 2
Brushwood
Two samples of brushwood were identified from Trough 2 (9:2 and 9:10). They were identified as alder and ash respectively. The alder brushwood was the larger of the two, with a diameter of 5.5cms. The ash brushwood was 3.5cms in diameter.

Split brushwood
One split brushwood (9:3) was recorded from the assemblage recovered from Trough 2. It was 1.4cms in diameter but could not be identified to species.

Unidentified wood
The majority of the samples from Trough 2 comprised fragmentary remains (9:1, 9:4, 9:6, 9:7, 9:8, 9:9). Four samples could not be identified to species (9:4, 9:6, 9:7, 9:8). The remaining 2 samples were ash. The brushwood and split brushwood may represent the remains of discarded wattle. Some of the unidentified wood is likely to represent the surviving remains of larger elements.

Pointed ends
Although most the wood from Banada 1 was in poor condition, worked points were recorded on several examples. Most of the pointed ends on the wood from Trough 1 was identified as chisel pointed (5 examples; 15:3, 15:4, 15:5, 15:6 and 15:8; Plate 4). Single examples of wedge points (15:7; Plate 5) and a pencil point (15:1; Plate 6) were also present. Two chisel points (9:2 and 9:10) were noted from the Trough 2 assemblage.

Plate 4 Chisel points from Trough 1. There is evidence for scorching on 15:5.

Plate 5 Wedge point on ash brushwood 15:7 from Trough 1.

Plate 6 Well-preserved pencil point on hazel brushwood 15:1 from Trough 1.

The facet size from the brushwood assemblage at Banada 1 was very consistent. The majority were between 1.1-1.5cm in diameter. The toolmarks/facets on the sampled wood were flat to slightly dished in character (Plate 11). No signatures, where a nick in the axe blade resulted in a raised or inverted ridge on the surface of the wood, were noted on the analysed samples.

Between 3 and 50 annual tree rings were noted on the samples analysed from the assemblage at Banada 1, although over half of the samples examined had between 3-6 annual tree rings (see Appendix 1). A number of samples could not be analysed due to the poor condition of the wood.

A tree-ring does not necessarily correspond to a year as different taxa lay down rings in different ways. Oak, for example, forms an annual tree-ring. However, ash, hazel and alder, diffuse-porous species, do not. This constrained a more detailed analysis of the Banada assemblage, as the majority of wood belonged to the diffuse-porous group and only one sample of oak was present. For a tree-ring analysis to produce effective results, the more tree rings on wood samples, the better. As a result, the information gleaned from tree-ring analysis was limited. The ages of the trees, however, may indicate regenerating conditions.

Discussion-Woodworking

The worked wood assemblage from Banada 1 (10E0302) varied in condition, although overall, the degree of preservation was poor. The best preserved examples comprised an ash brushwood (9:10) from Trough 2, a brushwood stake (15:1) and an ash plank (14:9:1), both of which formed part of the floor of Trough 1. The brushwood, split brushwood and wattle from the assemblage was generally in poorer condition. In the majority of cases, the tips had been crushed as a result of having been inserted into the ground. Scorching was noted on one side of an ash brushwood (15:5; Plate 4 above).

Some of the wood was regarded as dumped material, which may mean that even at the time the sites were in use the material may have been regarded as detritus.

The use of a tangentially split ash plank in Trough 1 has parallels from other analysed sites around the country. A tangentially split ash plank formed part of the trough lining at an Early Bronze Age *fulacht fiadh* in the townland of Cooltymurraghy, Co. Galway (E2448; Drumm and Fallon 2009, 26). Tangentially split ash planks were also recovered from the trough of an Early Bronze Age *fulacht fiadh* at Clooneen 1 (E3722) excavated during archaeological work on the N18 Gort to Crusheen Road Scheme (2132-1909 cal. BC; Bayley 2009). Although only a fragment of a tangentially split oak plank (14:9:2) survived from Trough 1, a tangentially split oak timber was recovered from Trough B at Fauleens 1, Co. Mayo, which was also Early Bronze Age in date (OCarroll 2007a).

The jam curves recorded from Banada (timber no. 14:9:1) can be compared to those noted on some timbers from an Early Bronze Age assemblage at Fauleens 1, a trough excavated as part of the N5 Charlestown Bypass (1911-1746 cal. BC; O'Carroll 2007a). Analysis showed that the jam curves at Fauleens 1 were generally wide with curved cutting edges measuring between 5.4- 7cm in width. Thjs indicates the use of a flat axe with a wide cutting edge (*ibid.*, 58). The jam curves also were very similar in size and shape to facets recorded from oak timbers at Corlea 6, an Early Bronze Age trackway in Co. Longford (2259±9 cal. BC; O'Sullivan 1996, 310).

Although no further jam curves were noted on the timbers from Banada 1, the split timbers and pointed ends indicate a knowledge of wood working and indirectly the

use of wooden tools. Splitting would have been carried out using wooden wedges and a mallet or club. There are no known Irish examples of mallets dating from the Bronze Age, however wooden mallets have been recovered from Iron Age trackways at Edercloon and Corlea, Co. Longford (Moore 2007; Raftery 1996).

Plate 7 Example of an Early Bronze Age metal axe. Although this example is from Glenamaddy, Co. Galway, its cutting blade is similar in size to that used at Banada 1.

The stakes from the Banada 1 assemblage derived from a fast-growing hazel tree, possibly of a coppiced nature. At Sonnagh IX, a trough dated to 2137-1914 cal. BC excavated during archaeological work on the N5 Charlestown Bypass, hazel wattle was found to have held a moss lining in place (O'Carroll 2007a, 21-2). Wattle-lined troughs have also been discovered at a number of Early Bronze Age *fulachta fiadh* sites, including Derryville, Killoran, Co. Tipperary (2138-1935 cal. BC; Dennehy 2008), Ballyshaneduff or The Derries, Co. Laois (03E0662) and Gortaroe 1 (01E0650ext.). At Derryville, corner rods were inserted into the surrounding soil to stabilise the wattle panels. Moss was used to plug any holes and to ensure the trough was filled with filtered ground water rather than bog water (Dennehy 2008, 10). Although it was dated to the later Bronze Age, a sub-oval trough with a double wattle lining made from hazel was also uncovered at Ballyclogh North (AO22-46; O'Carroll 2007b). The use of ash wood for wattle is therefore unusual, as hazel, a flexible wood, is more often the preferred choice for such structures attested to through the identifications noted above.

As no wood chips were noted from the assemblage, this suggests that construction may have taken place away from the site.

Wood identification

All of the samples were identified to species. Four taxa types were identified from the wood assemblage comprising ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), hazel (*Corylus avellana*) and oak (*Quercus sp*) in order of representation (see Appendix 1 and Figure 1). The floor of Trough 1 comprised one ash plank and one poorly preserved oak plank. Two additional split alder roundwoods (7:3 and 13:5) were also identified. The remainder of the wood from Trough 1 was identified as ash (5 samples). The stake assemblage from Trough 1 comprised 5 ash brushwoods and 1 hazel brushwood. One alder and 1 ash brushwood survived from Trough 2 (Figure 2).

The wood types identified suggest that the area surrounding Banada was a marginal environment during the Early Bronze Age. Hazel is an understorey or scrubland tree and could have been found within or growing on the edges of mixed oak/ash woodlands or on scrubland on the edge of woods. Alder prefers a wetter growing environment and would have grown close or adjacent to the river. It is also possible

that the hazel and possibly the ash came from coppiced woodlands nearby. It was noted during analysis that the brushwood from Trough 1 (notably C15) was very straight in nature, which is an indication of coppicing. Another way of establishing whether natural or managed situations are involved is to compare the age to the diameter of the wood fragments (see Appendix 1). In a coppice system, wood grows fast and the wood is harvested at a young age. This seemed to be the case at Banada, where the stakes had diameters of between 2.5-3.5cms.

Figure 1 Taxa identified from trough features at Banada 1, Trough 1

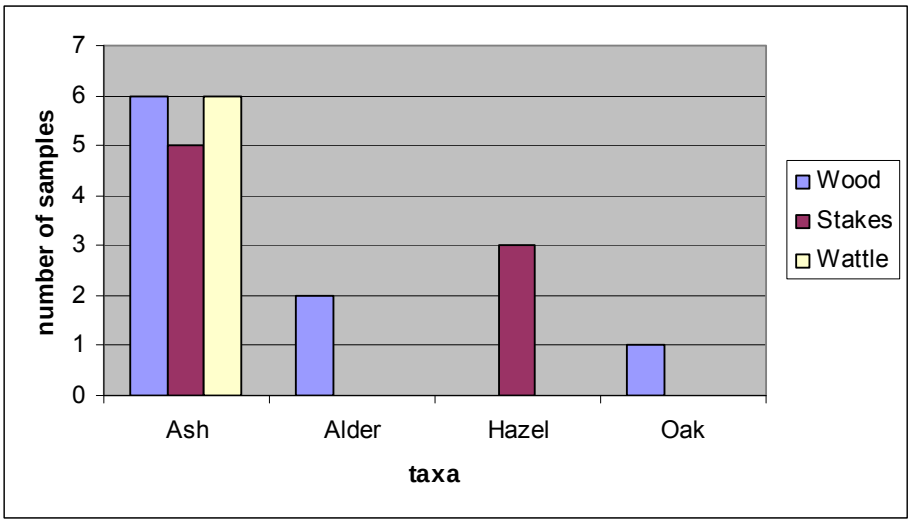
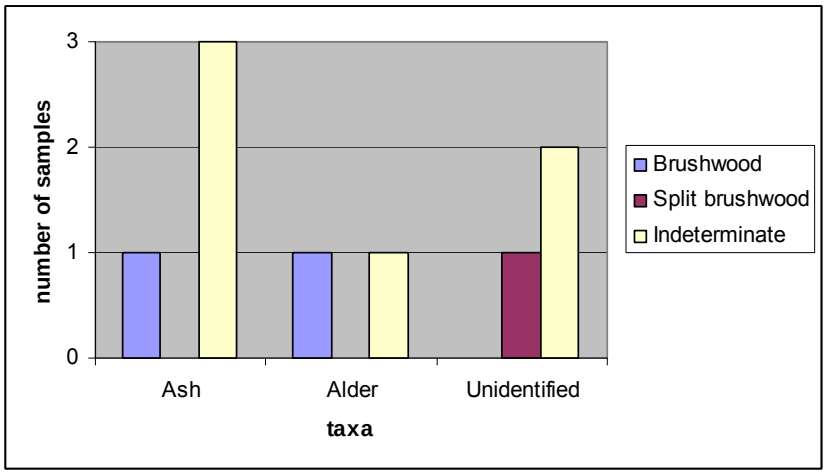


Figure 2 Taxa identified from Banada 1, Trough 2



The wood identification and selection of wood types from the trough at Banada 1 varies from other similarly dated sites in the vicinity. Ash and oak were entirely absent from the Early Bronze Age assemblage analysed at Bockagh 2 (1900-1740 cal. BC; 10E0300). No ash was recorded from the Early Bronze Age phase at Bockagh 4 (2461-2209 cal. BC; 10E0397). Oak and alder were the preferred taxa used for lining the troughs of *fulachta fiadh* in the Early Bronze Age and excavated as part of the N5 Charlestown Bypass (O'Carroll 2007a) (e.g. Sonnagh III, Sonnagh IX and Fauleeens 1). Trough B at Fauleens 1 (E3353) was found to have been lined with split alder roundwoods (O'Carroll 2007a, 33-4). This site is broadly coeval with

Banada 1, as it was dated to 1911-1756 cal. BC (*ibid.*, 22). Ash was entirely absent from the assemblage. These results suggest that a form of limited wood/forest clearance may have occurred in the immediate area, which would have encouraged the colonization of ash and hazel species.

Alder and hazel were among the dominant taxa from the Early Bronze Age sites on the N5 (O'Carroll 2007a). Wood from troughs identified from the N11 Rathnew to Arklow Road Improvement Scheme show that alder and oak were preferred, with hazel used for wattle panelling (O'Carroll 2007b). O' Donnell's (2007) research from the Gas Pipeline to the West shows that in most cases oak was the preferred structural timber for use in the troughs (O' Donnell 2007, 40). Although oak is present at Banada 1, only one example was identified. This may be an indication of the localised vernacular nature of these *fulachta fiadh* sites whereby small extended families were constructing the troughs using locally available trees and timbers. The findings at Banada 1 support this hypothesis.

Description of wood types identified from the assemblage

Fraxinus excelsior (Ash)
Two tangentially split ash timbers from C7, 4 split ash roundwoods from C13, 1 tangentially split timber from C14 and 5 ash brushwoods from C15 were identified at Banada 1. It was the only taxon identified from the wattle remains at the site (6 poorly preserved fragments). Three fragments of ash wood were also identified from random wood fragments in C9 (9:1, 9:6 and 9:7). Ash is a native species to Ireland preferring lime rich freely draining soils. It is not a very durable timber in waterlogged conditions but has a strong elastic nature and is easily worked. Ash appears to have colonised the open land after the first farmers removed much of the native woodland therefore it is frequently used as structural timber in the Later Bronze Age periods. It is a broad, spreading, deciduous tree growing at a fast rate to 25 metres in height by 20 metres spread. This rapid growth and the ability to re-sprout after being coppiced made ash a valuable renewable tree to the early Irish. It is not a very durable timber in waterlogged conditions but has a strong elastic nature and is easily worked. Ash appears to have colonised the open land after the first farmers removed much of the native woodland. It is frequently used as structural timber in the Later Bronze Age. Ash is also abundant in native hedgerows and was quite common in the later historic period.

Alnus glutinosa (Alder)
Four of the 32 samples recovered from the troughs at Banada 1 were identified as alder. Two comprised split roundwoods, 1 was identified as an alder brushwood and the remaining example comprised an unidentified wood fragment from C9. Alder is a widespread native tree and occupies wet habitats along stream and river banks. It is an easily worked and split timber and therefore quite commonly manufactured into planks. Though it certainly flourishes best where its main roots are just above the water, the alder is also tolerant of stagnant water. The wood of the tree is white when growing, but when it is cut, turns red. It is soft, with short fibres, giving it a homogeneous texture and of moderate density. It is a very durable wood and was specially selected for boat-making and for dug-out canoes. Alder was used by the Romans for water-pipes, bridges and as a revetting timber for riverbanks. The city of Ravenna, in northeastern Italy, was founded on piles of alder wood. It loses about a third of its weight and a twelfth of its bulk in drying, but does not warp. It is suitable for wood-turning and is a common timber in barrel- and wheel-making. Because of its almost waterproof nature, wood analysis has shown that alder wood was used to line troughs associated with burnt spread/*fulachta fiadh* sites.

Corylus avellana (Hazel)
Three hazel brushwoods were identified from C13/Trough 1 (13:1) and C15/Trough 1 (15:1 and 15:4). Hazel is a native species and was very common up to the end of the 17th century. McCracken (1971, 19) points out that 'it was once widespread to a degree that is hard to imagine today'. With the introduction of brick, steel and slate the crafts associated with hazel became obsolete, and today the woods that supplied hazel have diminished rapidly. Hazel wood has been used for making furniture, fencing and wattlework. Hazel is normally only about 3-5m in height and is often found as an understory tree in broadleaf woods dominated by oak. It also occurs as pure copses on shallow soils over limestone, as seen today in The Burren in Co. Clare and survives for 30 to 50 years. Its main advantage is seen in the production of long flexible straight rods through the process known as coppicing. Hazel also makes good fuel. In early Irish law, hazel was considered one of the *airig fedo* or 'nobles of the wood'. It also played a central role in Irish mythology and was associated with wisdom, truth and kingship (Mac Coitir 2006, 72-81). In folklore, it was used as a protection against evil (*ibid.*).

Quercus sp (Oak)
The fragmentary remains of an oak plank (14:9:2) was recovered from the floor of Trough 1 at Banada. Sessile oak *(Quercus petraea)* and pedunculate oak *(Quercus robur)* are both native and common in Ireland and the wood of these species can not be differentiated on the basis of their anatomic characteristics. Pedunculate oak (*Quercus robur*) prefers alkaline or neutral soils rich in minerals, particularly damp clay soils and is usually found in mixed woodland. Sessile oak (*Quercus petraea*) prefers acid and lighter well- drained soils and is often found in pure stands. Both species are naturally distributed throughout Ireland (Gannon 2006b). Oak woods were valued as a natural resource, including as a raw material for metalworking activities. It has excellent properties of great durability and strength and was frequently used throughout the prehistory for the production of large timbers, for charcoal production and for activities associated with metalworking. Oak timbers are often used to line troughs at burnt mound sites. At the Late Bronze Age site of Cahiracon (02E0952), Co. Clare, radially-split oak timbers lined the trough (O'Donnell 2005). A *fulacht fiadh* at Fauleens townlands, excavated as part of the N5 Charlestown Bypass in Co. Mayo, uncovered the well-preserved remains of an oak trough under the mound (O'Carroll 2007a). Oak was also the dominant taxa identified at a burnt mound site at Urraghry, Co. Galway, which was dated to the Early Bronze Age (Drumm *et al* 2009).

Summary and Conclusions
Four taxa types were identified from the wood assemblage at Banada 1 comprising ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), hazel (*Corylus avellana*) and oak (*Quercus sp*) in order of representation. The floor of Trough 1 comprised one ash plank and one poorly preserved oak plank. Two additional split alder roundwoods were also identified. The remainder of the wood from Trough 1 was identified as ash. The stake assemblage from Trough 1 comprised 5 ash brushwoods and 1 hazel brushwood. One alder and 1 ash brushwood survived from Trough 2. The wood types identified compare well with wood types identified and used for the construction of wooden troughs in Early Bronze Age Ireland, although the use of ash for the wattle panelling is somewhat unusual. Alder prefers a wetter growing environment while ash and oak indicate the presence of mixed woodlands. Hazel is an understorey or scrubland tree and could have been found within or growing on the edges of mixed woodlands or on scrubland on the edge of the oak and ash woods.
The wood assemblage from Banada 1 (10E0302) showed that the inhabitants had the knowledge and skill in timber splitting, as demonstrated by the different conversion methods, split types and pointed ends used to manufacture the timbers

which lined the trough. The axe type used on site was probably akin to a wide bladed flat metal axe similar to the Glanamaddy example from Co. Galway pictured above. This axe type corresponds well with the Early Bronze Age dates obtained from the wood at Banada 1.

Recommendations

The timbers have been recorded in detail on timber sheets and dated. They have also been dated, planned, photographed, species identified and analysed and carpentry techniques have also been described. It is my specialist opinion that this material has been recorded sufficiently and may be disposed of.

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Appendix 1 Catalogue of wooden remains

Context no	Element No	Sample no	Sample type	Species	Condition	Diameter/Length	Annual tree rings present	Woodworking	Point type	Facet (cm)	Jam curve	Comment	Context type
7		1	Wood	Ash	Poor	26cms (d); 1.13m (l)	Indt.	Tangentially split rdwd	n/a	n/a	n/a	Very degraded	Trough 1. Upper layer of wood.
7		2	Wood	Ash	Poor	22cms (d); 75cms (l)	Indt.	Tangentially split rdwd	n/a	n/a	n/a	Very degraded	
7		3	Wood	Alder	Poor	17cms (d); 83cms (l)	Indt.	Split rdwd	n/a	n/a	n/a	Very degraded	
9		1	Wood	Ash	Moderate to poor	5.5cms (d); 16cms (l)	50	Indt.	n/a	n/a	n/a	Fragment. 1.1cms in thickness. Really slow growth	Timber from associated pit/Trough 2
9		2	Wood	Alder	Poor	1.5cms(d); 7.4cms (l)	Indt.	Brushwood	Chisel	1.5cms x 2cms	No	Fragment of poorly preserved wattle	
9		3	Wood	Indt.	Poor	1.4cms (d); 7cms (l)	Indt.	Split brushwood	n/a	n/a	n/a	Fragment of wattle?	
9		4	Wood	Indt.	Poor	3cms (d); 12cms (l)	Indt.	Indt.	n/a	n/a	n/a	Fragment of split rdwd?	
9		6	Wood	Ash	Poor	7cms (d); 9cms (l)	20	Indt.	n/a	n/a	n/a	Poorly preserved wood fragment, possibly part of another element.	
9		7	Wood	Ash	Poor	3cms (d); 5.9cms (l)	10	Indt.	n/a	n/a	n/a	Appears to be cut across	

Context no	Element No	Sample no	Sample type	Species	Condition	Diameter/Length	Annual tree rings present	Woodworking	Point type	Facet (cm)	Jam curve	Comment	Context type
												the grain and curving.	
9		8	Wood	Indt.	Poor	10cms (d); 12cms (l)	Indt.	Indt.	n/a	n/a	n/a	Very degraded. 3cms thick. Coated in a layer of grey, charcoal rich silt, which held it together.	
9		9	Wood	Alder	Poor	4cms(d); 10cms (l)	Indt.	Indt.	n/a	n/a	n/a	Very degraded- mush really. Approx. 2cms thick	
9		10	Wood	Ash	Moderate	3.5cms (d); 20cms (l)	4	Brushwood	Chisel	n/a	n/a	25° cutting angle. Dating sample.	
13		1	Wood	Hazel	Poor	5cms (d); 15cms (l)	25	Brushwood	n/a	n/a	n/a	Very degraded	Wood layer in Trough 1
13		2	Wood	Ash	Poor	8cms (d); 28cms (l)	Indt.	Split rdwd	None	n/a	n/a	Very degraded	
13		3	Wood	Ash	Poor	11cms (d); 18cms (l)	45	Split rdwd	None	n/a	n/a	Fragmentary and degraded	
13		4	Wood	Ash	Poor	13cms (d); 27cms (l)	23	Split rdwd	None	n/a	n/a	Fragmentary and degraded	
13		5	Wood	Alder	Poor	21cms (d); 13cms (l)	21	Split rdwd	None	n/a	n/a	Fragmentary and degraded	

Context no	Element No	Sample no	Sample type	Species	Condition	Diameter/Length	Annual tree rings present	Woodworking	Point type	Facet (cm)	Jam curve	Comment	Context type
14	1	9	Wood	Ash	Moderate	23cms (d); 1.03m (l)		Tangentially split rdwd	n/a	10.1 x 5cms	Yes (av. dims 7cms (w) x 9cms (l)	Toolmarks noted, flat to slightly dished in nature with jam curves surviving. . Plank is max. 3.4cms in thickness. Thicker at centre and narrow on edge.	Floor layer Trough 1
14	2	9	Wood	Oak	Poor	16cms (d); 36cms (l)		Tangentially split rdwd	None	n/a	n/a		Used to support 14:1 above
15		1	Wood	Hazel	Moderate	3cms (d); 1cms (l)	5	Brushwood	Pencil	1.6 x 4.7cms	None	Best surviving example. 10 toolmarks, facet junction with some tearing noted on one toolmark. Tip survived.	Stakes Trough 1
15		3	Wood	Ash	Poor	2cms (d); 21cms (l)	3	Brushwood	Chisel	1.3 x 3.1	n/a	Condition too poor to identify toolmarks	
15		4	Wood	Hazel	Poor	2.4cms (d); 13cms (l)	6	Brushwood	Chisel	1.4 x 5cms	n/a		
15		5	Wood	Ash	Poor	2.5cms (d); 28cms (l)	3	Brushwood	Chisel	1.4 x 6cms	n/a		
15		6	Wood	Ash	Poor	2.5cms (d); 20cms (l)	5	Brushwood	Chisel	1.1 x 4.8cms	n/a		

Context no	Element No	Sample no	Sample type	Species	Condition	Diameter/Length	Annual tree rings present	Woodworking	Point type	Facet (cm)	Jam curve	Comment	Context type
15		7	Wood	Ash	Poor	2.5cms (d); 14cms (l)	4	Brushwood	Wedge	1.2 x 3.9	n/a		
15		8	Wood	Ash	Poor	2cms (d); 20cms (l)	5	Brushwood	Chisel	1.1 x 3.1cms	n/a	Condition too poor to identify toolmarks	
17	Bulk sample	11	Wattle	Ash	Very poor	0.5cms (d)	3	Light brushwood	n/a	n/a	n/a	Very degraded- when grey silt removed, wood disintegrated. Wattle from wattle panel. Only 4 rods and 2 sails survived.	Wattle holding moss lining C12 in place. Trough 1.
			Wattle	Ash	Very poor	0.5cms (d)	3	Light brushwood	n/a	n/a	n/a		
			Wattle	Ash	Very poor	1cms (d) approx.	4	Light brushwood	n/a	n/a	n/a		
			Wattle	Ash	Very poor	1cm (d) approx.	3	Light brushwood	n/a	n/a	n/a		
			Wattle	Ash	Very poor	1cm (d) approx.	3	Light brushwood	n/a	n/a	n/a		
			Wattle	Ash	Very poor	1cm (d) approx.	4	Light brushwood	n/a	n/a	n/a		

*Indt. = Indt.
*rdwd= roundwood

Appendix 2 Summary of samples examined

Context no	Element No	Sample no	Excavation Record	Wood working examination	Species examination	IAC Sample list	Comment
7		1	Context sheets, site drawings and photographs taken during excavation provided.	Y	Y	Y	
7		2		Y	Y	Y	
7		3		Y	Y	Y	
9		1		Y	Y	Y	
9		2		Y	Y	Y	
9		3		Y	Y	Y	
9		4		Y	Y	Y	
9		6		Y	Y	Y	
9		7		Y	Y	Y	
9		8		Y	Y	Y	
9		9		Y	Y	Y	
9		10		Y	Y	Y	
13		1		Y	Y	Y	
13		2		Y	Y	Y	
13		3		Y	Y	Y	
13		4		Y	Y	Y	
13		5		Y	Y	Y	
14	1	9		Y	Y	Y	Listed as alder on preliminary report.
14	2	9		Y	Y	Y	
15		1		Y	Y	Y	
15		3		Y	Y	Y	
15		4		Y	Y	Y	
15		5		Y	Y	Y	
15		6		Y	Y	Y	
15		7		Y	Y	Y	
15		8		Y	Y	Y	
17	Bulk sample	11		Y	Y	Y	
				Y	Y	Y	
				Y	Y	Y	

Appendix 2.3 Petrological Report – Richard Unitt

Stone Artefacts from the N5 Ballaghaderreen Bypass

Dr Richard Unitt

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Stone Artefacts from the Ballaghaderreen Bypass

Introduction to the Geology
The geology of the Ballaghaderreen area is a mixture of Lower Devonian rocks (~410Ma) belonging to the Curlew Mountain Inlier and the basal clastic rocks of the overlying Lower Carboniferous period (~350Ma).

The oldest rocks belong to the Moygara and Keadew Formations, believed to be Lower Devonian in age. The Moygara Formation consists mainly of conglomerates, with minor red brown coarse and pebbly sandstones. The Keadew Formation consists of sheets of quartz-rich sandstone with minor sun-cracked mudstone. The Bockagh Member of the Keadew Formation consists of andesitic volcanics, a mixture of lavas and pyroclastic rocks.

The Lower Devonian succession is unconformably overlain by sediments of the Lower Carboniferous age Boyle Sandstone Formation. The formation is made up from minor conglomerates and purple sandstones grading into pale grey and occasionally pink sandstones.

The townlands north and east of Ballaghaderreen are underlain by the Keadew Formation and the Boyle Sandstone Formation.

Results
The burnt stones, recovered from *Fulacht Fiadh*, reflect the underlying geology and were derived locally.

The andesitic rocks were derived from the Bockagh Member of the Keadew Formation. The sandstones, however, may have come from any of the underlying formations. It is most probable, however, that the pale-grey sandstones were derived from the Boyle Sandstone Formation.

10E0302 Banada 1, S2, C11
Pale-grey, medium-grained sandstone.

APPENDIX 3 GLOSSARY OF TECHNICAL TERMS

Access Road	A new private/public road provided for access to lands where previous access has been cut off by road development
Barrow	Circular burial monument of the Bronze Age and Iron Age with a central area defined by a ditch and an external bank
Bivallate	Two sets of ramparts
Bronze Age	*c*. 2400–800 BC the introduction of metallurgy in Ireland. A time of technological, social and economic development and change
Cairn	Mound composed of stones, sometimes with internal structures; usually a burial monument, but sometimes used as a memorial
Cashel	A ringfort with stone instead of earthen banks
Cist	Pits lined with stone flags containing a burial
Code of Practice	The Code of Practice is an agreement between the Minister (Department of Environment, Heritage and Local Government) and the National Roads Authority acting on behalf of the Authority and the local authorities in relation to archaeology and the development of national roads
Chainage	Road scheme centreline distance in metres from scheme start point to finish, in this case south to north
Context No	The individual number used to record a feature uncovered in an archaeological excavation.
CPO	Compulsory Purchase Order used to compulsorily acquire land required for the development, in this case a road
Cropmark	Where buried features such as ditches or walls affect the covering soil and alter the colour of the surface vegetation and/or crop
Directions	Under 2004 National Monuments (Amendment)Act Section 14A(2) – any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the Minister with the Director of the National Museum of Ireland
DoEHLG	Department of the Environment Heritage and Local Government

Dún	A ringfort, usually with earthen banks, but a name also given to prehistoric ceremonial enclosures
Earthwork	Any monument made entirely or largely of earth
Enclosure	Any monument consisting of an enclosing feature, such as a bank or a ditch, usually earthen, such as barrows or ringforts.
Excavation	Or resolution is an archaeological term and means the manual and mechanical excavation by an archaeologist-led team with specific objectives with regard to information, preservation, recording, etc. of archaeological information. Its purpose is to fully investigate archaeological deposits and features
Feature	Archaeological feature, an artificial (man-made) structure or cut or deposit
Field system	Pattern of fields, now no longer in use, sometimes visible as low earthworks and often associated with medieval or earlier settlements
Fosse	A ditch
Fulacht fiadh	Bronze Age cooking site characterised by a crescentic mound of burnt stone; usually built in damp areas, where the trench for cooking in would fill with water; usually found in groups and also referred to as Burnt Mounds (plural: *fulachta fiadh*).
Geophysics	A non-invasive survey method involving one or more of the following; earth resistance, various types of magnetometry and ground penetrating radar
Henge	Large earthen embanked enclosure with an internal ditch and external bank
Hillfort	Large late Bronze Age/Iron Age defensive hilltop enclosure defined by one or more large ramparts and consisting of banks with external ditches
Holy well	A natural spring or well associated with a saint or a tradition of cures
In situ	Archaeological features or artefacts found in their original position in the ground
Iron Age	Prehistoric period from *c*. 500 BC to *c*. AD 500. Also described as the Celtic period, when influences from central Europe and Britain led to the adoption of the Celtic language and the development of an Irish style of Celtic art.
Landtake	The land acquired for the road development (see CPO)

Licencee	An archaeologist qualified under the DoEHLG to direct the excavation of archaeological sites
Lime kiln	A stone and brick structure utilised for the burning of lime. Mostly built in the 18th and 19th centuries when the burning of lime as an agricultural fertiliser was widespread.
Megalithic tomb	Literally 'large stone,' a Neolithic tomb
Mesolithic	Prehistoric period from *c*. 7000–4000 BC
Moated site	An Anglo-Norman defended homestead consisting of a square or rectangular enclosure defined by a bank and a broad, flat-bottomed ditch; date to the thirteenth and fourteenth centuries and often built in damp land in order that the moat would fill with water
Motte and bailey	An Anglo-Norman defensive structure consisting of a large, steep-sided earthen mound – the motte – with a rectangular enclosure at the base – the bailey; date from the twelfth and thirteenth centuries
Multivallate	More than two sets of ramparts
National Monument	A monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto.
NGR	National Grid Reference
NMI	National Museum of Ireland
Natural	Natural sub soils located beneath the topsoil in which archaeological features are located
Neolithic	Pertaining to the New Stone Age *c*. 4000–2500 BC, when agriculture and cattle husbandry was developed in Ireland
Occupation site	A settlement site; the term is usually used to indicate a prehistoric site
OS	Ordnance Survey
Passage tomb	Megalithic tomb dating to the Neolithic characterised by an oval or circular mound, kerbing, and a passage, often terminating with a chamber in which cremated burials were placed; often situated on hilltops
Rath	A ringfort, usually with earthen banks, or any circular enclosure
Raheen	Small fort

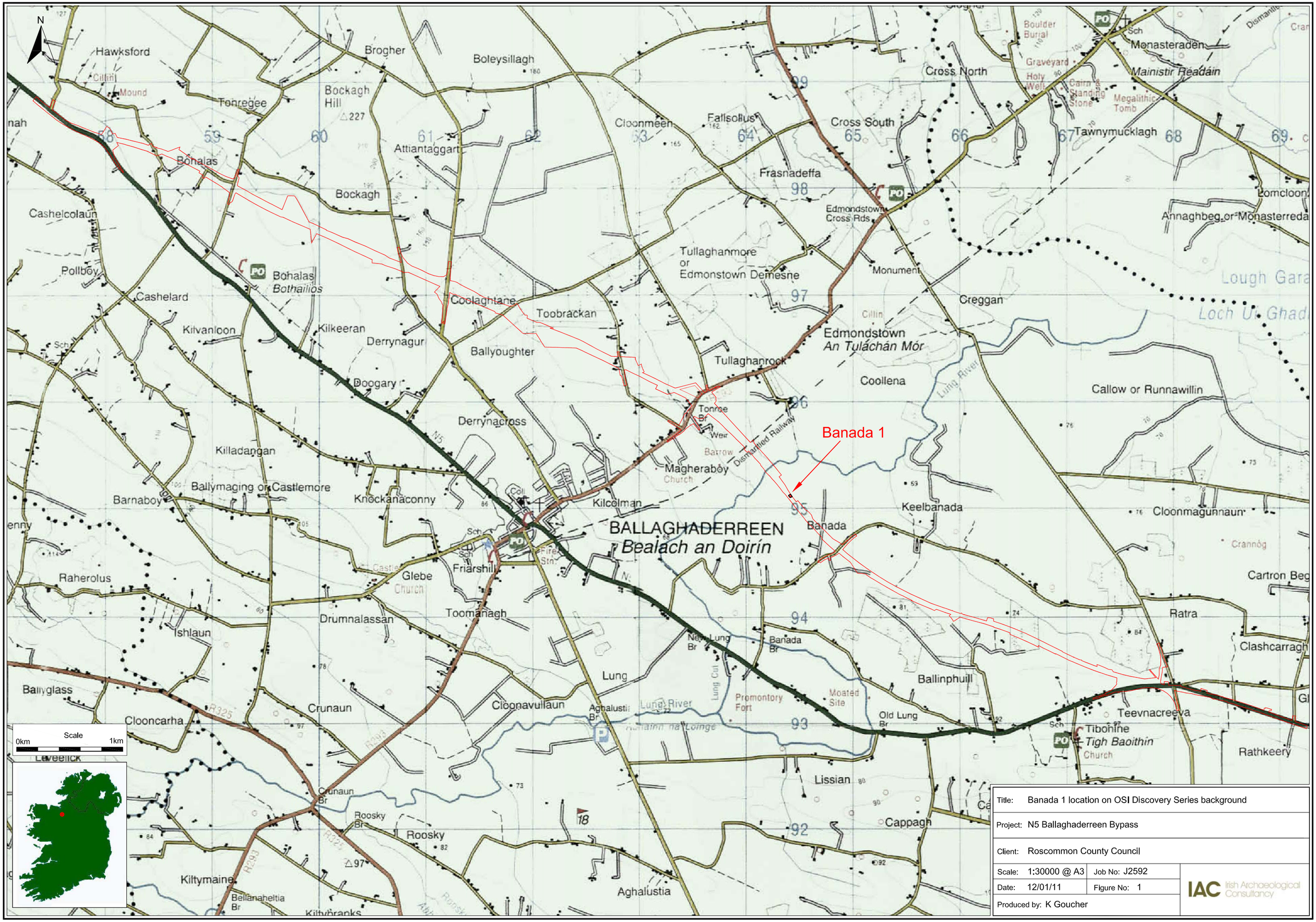
Resolution	See excavation above
Ring barrow	Barrow with raised or domed central area
Ring ditch	Barrow with flat or dished central area
Ringfort	Early Christian (*c*. AD 500 to 1100) defended secular settlement consisting of a bank and external ditch defining a central circular area that contained dwelling structures of occupants; also called fairy fort, rath, lios, or cashel (the latter constructed of stone as opposed to earth)
RMP	Record of Monuments and Places – a list of monuments and places and accompanying maps complied by the State. Sites designated an RMP are subject to statutory protection under the National Monuments Act.
Roadtake	The outer edge of the road including any embankment.
Souterrain	Underground passages, probably built for storage purposes or possibly as temporary refuges; often associated with ringforts
Standing stone	Upright stone, usually single but sometimes in pairs and groups. They can be shaped or natural and are usually dated to the Bronze Age but occasionally to the Neolithic. Used to mark routes, sacred areas, boundaries or, occasionally, burials
Site	Archaeological site – an individual or group of artefacts and/or features in an area.
Test excavation	A form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location that is proposed for development. Its purpose is not to fully investigate those deposits or features.
Test trenching	See Test excavation
Tower house	Small castle, usually of three storeys, dating from the 14th to 16th centuries
Tumulus	Burial mound composed of earth, sometimes with internal structures
Uncoursed masonry	Wall laid in a random form
Univallate	Single set of ramparts

Zone of archaeological Potential

A buffer area around an archaeological site or monument where greatest potential exists for the recovery of archaeology associated with a site or monument

APPENDIX 4 COPY OF NRA DATABASE ENTRY

Database entry	Comment
Excavation number	10E0302
Townland	Banada
Site name	Banada 1
County	Roscommon
Project reference	N/A
Year of excavation	2010
Grid reference (Easting)	164416
Grid reference (Northing)	295132
OD Height (m)	70m
Landscape setting	The site is located c. 1.5 km east of Ballaghaderreen town on the south bank of the River Lung. The surrounding topography comprises of relatively level boggy fields.
Project Archaeologist	Deirdre McCarthy
Site Director	James Kyle
Archaeological consultancy	Irish Archaeological Consultancy Ltd.
Identification technique	Archaeological Test Trenching
Site type	Burnt mound
Site activity	Burnt mound
Dating period	Early Bronze Age
Radiocarbon dates	UBA 16952 Cal. 2009–1771 BC (2 sigma)
Dendro-chronological dates	None
Description	The site comprised of the remains of a burnt mound site (also commonly referred to as *fulacht fiadh*) one of the most common field monuments found in the Irish landscape. Two troughs, built of oak, alder, ash and hazel, were identified at the site and they were sealed by a mound of heat shattered stone (50% of which was outside the CPO).
Artefacts	None
Environmental evidence	*Environmental:* Wood: alder (*Alnus sp.*), ash (*Fraxinus excelsior)*, hazel (*Corylus avellana*) and oak (*Quercus sp.*) were identified from the trough timbers. *Petrological:* Burnt stone from spread identified as pale-grey medium-grained sandstone.
Additional information	N/A
Publication	Publication proposal submitted to client.



Title:	Banada 1 location on OSI Discovery Series background		
Project:	N5 Ballaghaderreen Bypass		
Client:	Roscommon County Council		
Scale:	1:30000 @ A3	Job No:	J2592
Date:	12/01/11	Figure No:	1
Produced by:	K Goucher		

IAC Irish Archaeological Consultancy

N

BANADA

CR

CS

CR

Banada 1
2009 - 1771 BC

Legend

CPO boundary

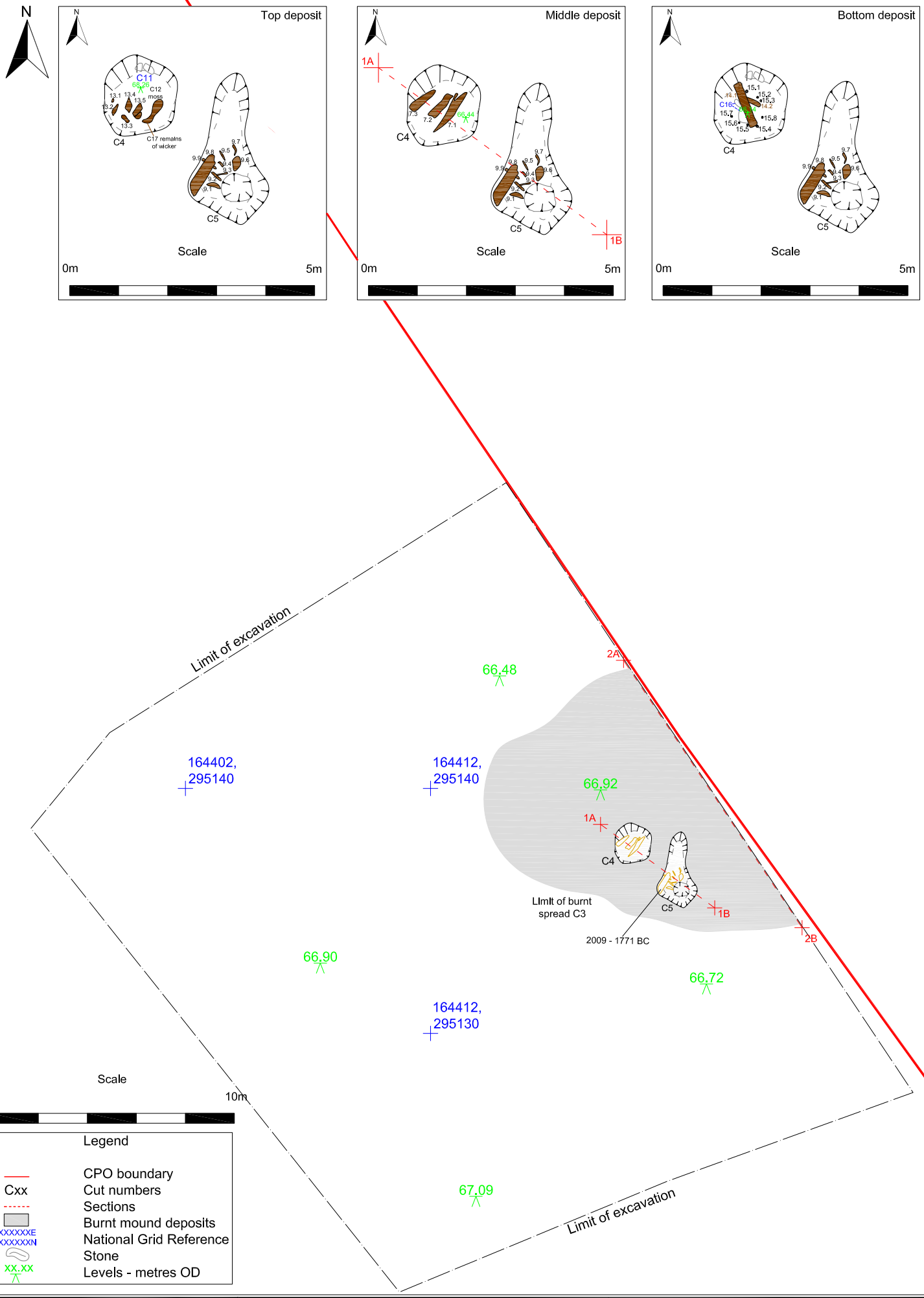
RMP Site

Excavated site

Scale

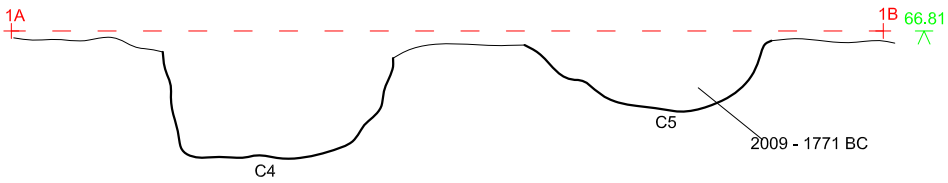
0m 100m

Title:	Banada 1 site location	
Project:	N5 Ballaghaderreen Bypass	
Client:	Roscommon County Council	
Scale: 1:2000 @ A3	Job No: J2592	IAC Irish Archaeological Consultancy
Date: 20/12/10	Figure No: 2	
Produced by: G Kearney		

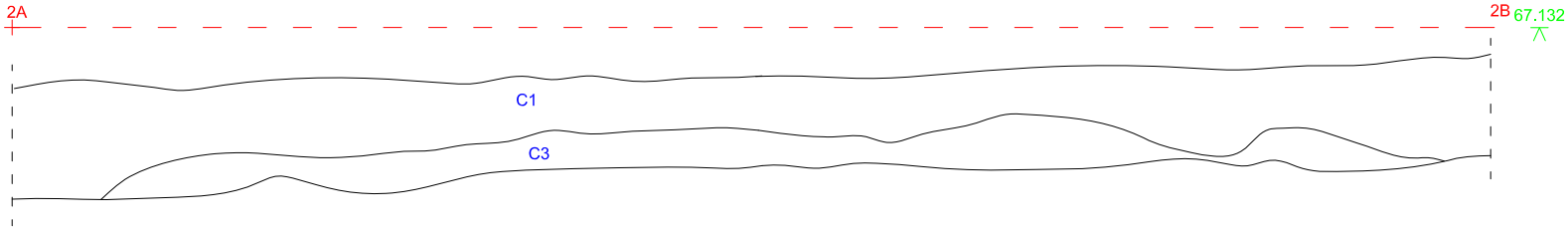


IAC Irish Archaeological Consultancy	Title:	Banada 1 plan of site	Scale: As shown @ A4
			Date: 05/01/11
	Project:	N5 Ballaghaderreen Bypass	Produced by: G Kearney
	Client:	Roscommon County Council	Job No: J2592
			Figure No: 3

Northwest - Southeast profile of C4 and C5



Southwest facing section of C3



Scale

0m 2.5m

Legend

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

IAC Irish Archaeological Consultancy

Title:	Banada 1 section and profile
Project:	N5 Ballaghaderreen Bypass
Client:	Roscommon County Council

Scale:	1:50 @ A4
Date:	06/01/11
Produced by:	G Kearney
Job No:	J2592
Figure No:	4

Plates

Plate 1 - Southeast facing section of the mound

Plate 2 - South facing section of C5

Plate 3 - Upper timber layer in trough C4

Plate 4 - Split plank (14:1) in trough C4

Plate 5 - Detail of tool marks on plank 14:1

Plate 6 - Post-excavation view of trough and pit (C4 and C5)