

**N9/N10 KILCULLEN TO WATERFORD SCHEME,  
PHASE 4 – KNOCKTOPHER TO POWERSTOWN**



<b>Ministerial Scheme Reference No.</b>	<b>Direction</b>	A032
<b>Registration No.</b>		E3736
<b>Site Name</b>		AR156, Moanduff 3
<b>Townland</b>		Moanduff
<b>County</b>		Carlow
<b>Excavation Director</b>		Sinéad Phelan
<b>NGR</b>		267515 164979
<b>Chainage</b>		70780

**FINAL REPORT**

**ON BEHALF OF KILKENNY COUNTY COUNCIL**

**NOVEMBER 2013**



## PROJECT DETAILS

<b>Project</b>	N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown
<b>Ministerial Direction Reference No.</b>	A032
<b>Excavation Registration Number</b>	E3736
<b>Excavation Director</b>	Sinéad Phelan
<b>Senior Archaeologist</b>	Tim Coughlan
<b>Consultant</b>	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
<b>Client</b>	Kilkenny County Council
Site Name	AR156, Moanduff 3
Site Type	Pit with stakeholes
Townland(s)	Moanduff
Parish	Oldleighlin
County	Carlow
NGR (easting)	267515
NGR (northing)	164979
Chainage	70780
Height OD (m)	53.875
<b>RMP No.</b>	N/A
Excavation Dates	16–24 October 2007
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<b>Report Date</b>	November 2013
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This final report has been prepared by Irish Archaeological Consultancy Ltd in compliance with the directions issued to Kilkenny 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 Kilkenny County Council and Irish Archaeological Consultancy Ltd.

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## **ABSTRACT**

Irish Archaeological Consultancy Ltd (IAC), funded by the National Roads Authority (NRA) through Kilkenny County Council, undertook an excavation at the site of AR156, Moanduff 3 along the proposed N9/N10 Kilkullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown (Figure 1). The following report describes the results of archaeological excavation at that site. The area was fully excavated by Sinéad Phelan under Ministerial Direction A032 and Excavation Registration Number E3736 issued by the DoEHLG in consultation with the National Museum of Ireland for IAC. The fieldwork took place between the 16 and 24 October 2007.

The site was located in the townland of Moanduff, Co. Carlow and was located in marginal landscape subject to seasonal flooding c. 100m south of the Madlin River, a tributary of the Barrow. One main feature of archaeological significance was recorded, namely an oval pit (C9) filled with charcoal, burnt stone and clay, similar to burnt mound material. Eight stakeholes were associated with C9, and may represent a spit or other similar apparatus. The oval pit may have been a small trough or a pot-boiler. There was no associated burnt mound deposit. The C9 pit was truncated by a later, smaller pit of unknown date but it is felt that they may be broadly contemporary. Modern agricultural land drains extended across the site.

A sample of hazel charcoal from pit fill C8 was radiocarbon dated and produced a 2 sigma calibrated result of 1260–1020BC (UB 12261). A sample of young oak charcoal from stakehole fill C37 was radiocarbon dated and returned a 2 sigma calibrated result of 1259–1016BC (UB 12262).

Two pits were identified on the site, one with associated stakeholes which was truncated by the second pit. The pit may represent a trough or pot boiler associated with late Bronze Age burnt mound activity. The site probably represents peripheral activity to a larger multi-period settlement site located immediately to the south at Moanduff 2, although no directly contemporary activity was recorded. The site is important locally as it confirms late Bronze Age activity in the immediate proximity of the larger Moanduff 2 site and as such is an important addition to the multi-period evidence from Moanduff 2.

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# 1 INTRODUCTION

## 1.1 General

This report presents the results of the archaeological excavation of Moanduff 3, AR156 (Figure 1), in the townland of Moanduff undertaken by Sinéad Phelan of IAC, on behalf of Kilkenny County Council and the NRA, in accordance with the Code of Practice between the NRA and the Minister for Arts, Heritage, Gaeltacht and the Islands. It was carried out as part of the archaeological mitigation programme of the N9/N10 Kilcullen to Waterford Road Scheme, Phase 4, which extends between Knocktopher in Co. Kilkenny to Powerstown in Co. Carlow. 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 measured 20m<sup>2</sup> and was first identified during testing carried out in April 2007 by Yvonne Whitty (E3365) for IAC Ltd on behalf of the National Roads Authority. Moanduff 3 was excavated between 16 and 24 October 2007 with a team of one director, one supervisor and 10 assistant archaeologists.

## 1.2 The Development

For the purposes of construction, the N9/N10 Kilcullen to Waterford Road Scheme has been divided into separate sections, known as Phases 1–4. Phase 2 of the scheme extends from the tie-in to the Waterford City Bypass at Dunkitt, to Knocktopher in Co. Kilkenny (Ch. 2+000–Ch. 25+400). Phase 4 continues from Knocktopher to Powerstown in Co. Carlow (Ch. 25+400–Ch. 76+000) and includes the Kilkenny Link Road.

The roadway of the entire scheme includes approximately 64km of mainline high quality dual carriageway and 6.2km of the Kilkenny Link Road, which will connect the road development to the Kilkenny Ring Road Extension. The road development requires the realignment and modification of existing national, regional and local roads where the mainline intersects them. It requires the acquisition of 305 hectares of land for its construction. A further link road will connect the scheme to Paulstown in County Kilkenny, while six new grade separated junctions and three roundabouts are part of the road development.

## 1.3 Archaeological Requirements

The archaeological requirements for the N9/N10 Kilcullen to Waterford Road Scheme, Phase 4: Knocktopher to Powerstown, are outlined in the Archaeological Directions issued to Kilkenny 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 Kilkenny County Council and Irish Archaeological Consultancy Ltd. These instructions form the basis of all archaeological works undertaken for this development. The archaeological excavation works under this contract are located between the townlands of Knocktopher, Co. Kilkenny, and Powerstown, Co. Carlow.

The proposed N9/N10 was subjected to an Environmental Impact Assessment, the archaeology and cultural history section of which was carried out by Valerie J. Keeley Ltd and published in February 2005. The Record of Monuments and Places, the Site Monument Record, Topographical files, aerial photography, the Kilkenny and Carlow County Archaeological Urban Survey, and literary sources were all consulted. Two phases of geophysical survey were also conducted by Target (post-EIS geophysics carried out by ArchaeoPhysica) and an aerial survey was carried out by Margaret Gowen & Co. Ltd. As a result of the paper survey, field inspections and geophysical

survey, 35 sites were recorded in proximity to this section of the overall route alignment.

A previous archaeological assessment of Phase 2 of the scheme (test trenching conducted by Margaret Gowen & Co. Ltd. in 2006) extended into the lands acquired for Phase 4 to a point at Ch. 37+100 in the townland of Rathclogh, Co. Kilkenny. Thirty-four archaeological sites were identified within this area between Knocktopher and Rathclogh and subsequently excavated by Irish Archaeological Consultancy Ltd. as part of this archaeological contract.

Advance archaeological testing of the area between Rathclogh (Ch. 37+100) and Powerstown (Ch. 76+000) was completed by IAC during March–May 2007 and excavation of the sites identified during this process was also conducted by IAC between August 2007 and April 2008.

#### **1.4 Methodology**

The methodology adopted was in accordance with the approved Method Statement. The topsoil was removed to the interface between natural and topsoil 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 archaeological features were fully excavated by hand and recorded on *pro forma* record sheets using a single context recording system best suited to rural environment, with multi context plans and sections being recorded 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 based on IAC in-house post-excavation and site methodologies and guidelines. Features exhibiting large amounts of carbonised material were the primary targets.

All artefacts uncovered on site were dealt with in accordance with the guidelines as issued by the NMI and where warranted in consultation with the relevant specialists. All archive is currently stored in IAC's facility in Lismore, Co Waterford and will ultimately be deposited with the National Museum of Ireland.

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

All excavation and post excavation works were carried out in accordance with the relevant approvals and in consultation and agreement with the National Roads Authority (NRA) Project Archaeologist, the National Monuments Section of the DoEHLG and the National Museum of Ireland. Where necessary licences to alter and export archaeological objects were sought from the National Museum of Ireland.

References to other sites excavated as part of the N9/N10 Phase 4: Knocktopher to Powerstown are referenced throughout this report only by their site name e.g.

Paulstown 1. A list of these sites and details including director's name and National Monuments Excavation Reference Number can be referenced in Appendix 4.

***Final Report Date Ranges***

The following date ranges for Irish prehistory and medieval periods are used for all final reports for the N9/N10 Phase 4: Knocktopher to Powerstown excavations.

Mesolithic: 7000–4000BC

Neolithic: 4000–2500BC

Early Bronze Age: 2500–1700BC

Middle Bronze Age: 1700–1200BC

Late Bronze Age: 1200–800BC

Iron Age: 800BC–AD500

Early medieval period: AD500–1100

Medieval period: AD1100–1600

Post-medieval: AD1600–1800

*Source:*

Carlin, N., Clarke, L. & Walsh, F. 2008 *The M4 Kinnegad-Enfield-Kilcock Motorway: The Archaeology of Life and Death on the Boyne Floodplain*. NRA Monograph Series No. 2, Wordwell, Bray.

## 2 EXCAVATION RESULTS

This site was situated in a generally flat field within the lowlands of the River Barrow Valley. The Madlin River, a tributary of the River Barrow, was located c. 100m north of the site. The site measured 20m<sup>2</sup> and the features were situated immediately north of Moanduff 2; a large prehistoric settlement site where habitation evidence ranged from the early Neolithic to the medieval period. It is highly likely that the sites excavated at Moanduff 2 and 3 were both part of the same settlement complex. Just 25m south of the pit recorded at Moanduff 3, three 'cooking pits', filled with the same material as the pit excavated at this site, were recorded at Moanduff 2. All of these pits may have at one time, been sealed by a single burnt mound although no evidence of a mound remained, most likely as result of the intensive insertion of agricultural land drains in the 1950s (Figure 4). There are no recorded monuments located in the immediate vicinity of this site.

### 2.1 PHASE 1 Natural Drift Geology

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C2	N/A	N/A	N/A	N/A	Dark yellow brown silty clay with stones	Subsoil

The natural geology on this site consisted of dark yellow brown silty clay with occasional stone inclusions across the site. This material was cut or sealed by all subsequent archaeological activity.

### 2.2 PHASE 2 Prehistoric Activity

#### 2.2.1 Pit

A pit, C9, filled with burnt material and cut by eight stakeholes was excavated.

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C3	C9	0.74	0.90	0.09	Ash grey silty clay	Upper fill of pit
C8	C9	1.40	1.12	0.18	Black grey clay silt	Fill of pit
C9	N/A	1.40	1.12	0.18	Oval pit with flat base	Cut of pit
C15	C16	0.07	0.06	0.08	Black grey silty clay with charcoal	Fill of stakehole
C16	N/A	0.07	0.06	0.08	Circular shaped feature with rounded base	Cut of stakehole
C17	C18	0.08	0.07	0.10	Black grey silty clay with charcoal	Fill of stakehole
C18	N/A	0.08	0.07	0.10	Circular shaped feature with rounded base	Cut of stakehole
C19	C20	0.08	0.08	0.10	Black grey silty clay with charcoal	Fill of stakehole
C20	N/A	0.08	0.08	0.10	Circular shaped feature with rounded base	Cut of stakehole
C29	C30	0.05	0.04	0.08	Black grey silty clay with charcoal	Fill of stakehole
C30	N/A	0.05	0.04	0.08	Circular shaped feature with rounded base	Cut of stakehole
C31	C32	0.06	0.05	0.10	Black grey silty clay with charcoal	Fill of stakehole
C32	N/A	0.06	0.05	0.10	Circular shaped feature with rounded base	Cut of stakehole
C33	C34	0.07	0.06	0.09	Black grey silty clay with charcoal	Fill of stakehole
C34	N/A	0.07	0.06	0.09	Circular shaped feature with rounded base	Cut of stakehole
C35	C36	0.06	0.05	0.06	Black grey silty clay with charcoal	Fill of stakehole
C36	N/A	0.06	0.05	0.06	Circular shaped feature with rounded base	Cut of stakehole
C37	C38	0.10	0.08	0.07	Black grey silty clay with charcoal	Fill of stakehole
C38	N/A	0.10	0.08	0.07	Circular shaped feature with rounded base	Cut of stakehole

**Finds:** None

A shallow pit, C9, with a sharp break of slope and a flat base was located at the centre of the site (Figures 4–5; Plates 1–2). This pit was associated with eight stakeholes that cut its eastern and northern edge and was cut by a later pit C28

(Figure 4). Pit C9 was filled with C8, black grey clayey silt with frequent charcoal inclusions, and with C3, an ashy grey silty clay with fragments of heat fractured stones – a deposit similar to that of burnt mounds/ *fulachtaí fiadh*.

Eight stakeholes, C16, C18, C20, C30, C32, C34, C36, and C38, cut the eastern and northern edge of C9; they were vertically driven into each side of this pit (Plate 2). Their fills were similar, namely a black-grey silty clay. One stakehole (C38) was partially cut by pit C28. All stakeholes were sealed with the pit fill C8.

Charcoal was recovered from the pit fill C8 during post-excavation flotation. The charcoal was subsequently identified to species. The majority of the charcoal fragments were identified as hazel (*Corylus avellana*) charcoal and the remainder were pomaceous fruitwoods charcoal (*Maloideae spp.*). Hazel is a very tolerant tree; it can grow from wet to dry conditions (but not waterlogged ones). Charcoal was also recovered from the stakehole fill C37 and subsequently identified to species. A small amount of charcoal fragments were identified as oak (*Quercus sp.*) and pomaceous fruitwoods charcoal (*Maloideae spp.*). The low level of charcoal and presence of two tree types makes it difficult to conclude what species the original stake may have been made from (O'Donnell, Appendix 2.1).

Stone retrieved from deposit C31 was analysed and was found to be coarse grained, quartz rich, yellow/red sandstone. Coarse grained sandstone is typical of *fulacht fiadh* material. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally (Mandal, Appendix 2.2).

A small fragment (0.1g) of young oak retrieved from stakehole fill C37 was chosen for AMS dating and returned a result of 2927±34 (UBA 12262). The 2 Sigma calibrated result for this was 1259–1016BC (QUB, Appendix 2.3) dating this feature to the late Bronze Age.

A small fragment (0.31g) of hazel from pit fill C8 was chosen for AMS dating and returned a result of 2931±34 (UBA 12261). The 2 Sigma calibrated result for this was 1260–1020BC (QUB, Appendix 2.3) dating this feature to the late Bronze Age.

### 2.2.2 Pit C28

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C27	C28	0.65	0.50	0.23	Dark grey silt with charcoal	Fill of pit
C28	N/A	0.65	0.50	0.23	Oval feature with flat base	Cut of pit

**Finds:** None

A later, oval pit, C28, cut the southern side of pit C9 (Figures 4–5; Plate 1). It was filled with a dark grey silt with charcoal inclusions, C27. The function of this pit is not known.

A single fragment of hazel (*Corylus avellana*) charcoal was identified from the pit fill C27, the charcoal was badly preserved and difficult to identify (O'Donnell, Appendix 2.1).

## 2.3 PHASE 3 Post-medieval/Modern Activity

### 2.3.1 Field drainage system and field boundary

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C4	C10	20	2.25	0.25	Ash grey silty sand	Fill of field ditch



Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C5	C11	20	1.75	0.25	Brown sandy clay	Fill of drain
C6	C12	20	2.15	0.44	Brown grey silty clay	Fill of ditch
C7	C13	20	0.90	0.15	Yellow brown clay	Top fill of ditch
C10	N/A	20	2.25	0.25	Linear field boundary running NW-SE	Cut of field ditch
C11	N/A	20	1.75	0.46	Linear drain running NW-SE	Cut of drain
C12	N/A	20	2.15	0.70	Linear ditch running NE-SW	Cut of ditch
C13	N/A	20	0.90	0.70	Linear ditch	Cut of ditch
C14	C10	20	1.10	0.05	Grey brown sandy clay	Fill of field boundary
C21	C13	20	0.90	0.55	Dark grey brown silt	Fill of ditch
C22	C13	20	0.15	0.15	Clay pipe	Fill of ditch
C23	C12	20	0.75	0.25	Grey silt	Fill of ditch
C24	C11	20	0.08	0.29	Limestone drain	Fill of drain
C25	C11	20	0.10	0.27	Grey brown sandy clay	Fill of drain
C26	C12	20	0.25	0.20	Yellow brown clay - natural redeposit	Fill of ditch

### Finds: None

A linear drainage ditch C11 extended west-northwest–east-southeast across the site (Figures 4–5). C11 was a stone-lined drain. Parallel to C11 was a linear ditch, C10 - a shallow ditch associated with modern agricultural drainage activity. This system of drainage ditches continued across the entire field, as similar drains and ditches were recorded across Moanduff 2 (AR155). A field boundary is shown on the first edition 6-inch and 25-inch OS maps in this location.

A modern ditch, C13 (Figure 4), was part of a series of agricultural land drains inserted into the ground in the 1950s (Mr Bolger: landowner, pers. comm.). A ceramic pipe was identified at the base of the ditch.

Ditch C12 ran at right angles to the other (drainage) ditches. It was considerably deeper than the drainage ditches at 0.70m. While its function may also have been for drainage its depth suggests that it may also have acted as a boundary ditch. This is not shown on any of the historic maps though.

## 2.4 PHASE 4 Topsoil and Ploughsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C1	N/A	N/A	N/A	0.10	Loose friable brown soil	Topsoil

### Finds: None

The topsoil was a loose, friable brown soil from which no artefacts were derived.

### 3 SYNTHESIS

The synthesis presents the combined results of all of the archaeological analysis carried out at Moanduff 3. This includes the analysis of the physical and archaeological landscape, the compilation of information gathered during research into the site type, date, and function, and the results of the excavation and specialist analysis of samples taken during the course of on-site works.

#### 3.1 Landscape Setting – compiled by Michelle Brick

##### 3.1.1 The General Landscape

The topography of the region through which the route passes is generally flat with an average height of 70m O.D. The southern periphery of the route is bordered by Kilmacoliver (261m) and Carricktriss Gorse (314m), with Slievenamon (721m) further west. The Slieveardagh hills (340m) are visible on the western horizon in the south of the route and with the exception of Knockadrina Hill (140m), the enclosed landscape is made up of minor undulations. In the centre of the route Freestone Hill (130m) and Knocknagappoge (334m) further north are the significant uplands. A number of hills and mountains are visible in the distance to the east and west of this area of the landscape but the topography remains generally flat. To the north the Castlecomer Plateau influences a rise in the overall topography of the region. This expanse of terrain stretches along the north-east margins of Kilkenny, crosses the county border into Carlow and stretches northwards into Laois. This plateau consists of a variety of hills and peaks including Mounthugent Upper (334m), Baunreagh (310m), Knockbaun (296m), Brennan's Hill (326m) and Fossy Mountain (330m). These hills contain seams of anthracite coal as a result of millions of years of compression, and consequently Shales and Sandstones were formed which are evident throughout the plateau. Mining in the region began in the 17th century, continued for over 300 years and it is for what Castlecomer is best known. According to the Environmental Protection Agency soil maps of Ireland, the underlying bedrock of the entire region primarily consists of Carboniferous Limestone. However there is also a small amount of surface bedrock, sands, gravels, shales and sandstone Tills present along the route. The soil cover of the region is primarily composed of Grey Brown Podzolics, Renzinas and Lithosols. Additional soil types also present along the route include Brown Earths, surface Water Gleys and Ground Water Gleys.

The prevailing water courses within the landscape of the N9/N10 Phase 4 are the Rivers Nore and Barrow. The River Nore rises on the east slopes of the Devil's Bit in Co. Tipperary and flows eastwards through Borris-in-Ossory and then south through Co. Kilkenny, passing through the towns of Durrow (Laois), Ballyragget, Kilkenny, Bennettsbridge and Thomastown to join the River Barrow upstream of New Ross, Co. Wexford. It is 140km long and drains a total catchment of 1572 square km and runs through the central and southern sections of the route. In the south of the route three main tributaries of the River Nore are evident. The Kings River flows east through Callan and Kells. It is joined by the River Glory which meanders on a north-south axis towards the western margins of the route landscape and the Little Arrigle River flows along the southern fringes. These rivers are flanked by low-lying valleys that are characterised by wet, marshy land. The condition of the soil improves further north beyond the King's River where the influence of these waterways declines. In the northern area of the route the River Dinin is a tributary of the River Nore flowing south-west from Brennan's Hill through the Castlecomer Plateau. The Plateau is the tableland that is the watershed between the Rivers Nore and Barrow (Lyng 1984). The River Barrow is the second longest river (193km) in Ireland after the River Shannon. It rises in the Slieve Bloom Mountains in Co Laois and flows east across bogs and lowlands and then turns south into the lowland immediately east of the

Castlecomer Plateau. It passes through Portarlinton, Athy, Carlow, and Graigueenamanagh and runs through northern section of the route. It is joined by the River Nore at New Ross. The Madlin River is the notable tributary of the River Barrow within the landscape of the route and flows east from Old Leighlin, with minor tributaries of it flowing through Bannagagole. There are also streams and minor watercourses present throughout the entire landscape and these waterways would have been a valuable resource to past communities and would also have had a major influence on settlement and the surrounding land use.

The physical landscape through which the N9/N10 Phase 4 passes can be divided into three principal areas defined by the main rivers and their catchments. The southern area is located in the undulating landscape on the western flanks of the Nore Valley. The central area is dominated by the fertile watershed between the Barrow and Nore systems in the hinterland of Kilkenny City. The northern area is located on the western flanks of the Barrow Valley overlooked by uplands to the north and west. Moanduff 3 is located in the northern landscape area.

### **3.1.2 The Northern Landscape**

The northern landscape of the N9/N10 crosses the border from Kilkenny into Carlow and traverses the western side of the River Barrow. The Blackstairs Mountains, which are of granite formation, are located to the east of the Barrow. It includes 50 sites discovered during the Phase 4 excavations stretching from Rathcash 1 northwards to Tomard Lower 1. This northern landscape is overlooked to the west by the Castlecomer Plateau, and the excavated sites are all situated on contours of 50–100m OD. From the south-west of the Barrow, and encroaching into the northern landscape, the underlying limestone is dolomitized and consequently the permeability has been increased. The glacial drift comprises slightly sandy (20–60%) slightly gravely clays with a moisture content of 10–20%. There is therefore significantly less sand but higher moisture content than in the southern and central landscapes. This moisture occurs in the wetter deposits in the top 1–2m before ground level in localised areas with silty sand and gravel lenses indicating a high water table. To the east of the River Barrow, localised silty, laminated clays and peat occur. Soft ground was noted in the river's floodplain. The area is also classified as a minor aquifer in the Kilkenny Groundwater Protection Scheme (Buckley & Fitzsimmons, 2002) due to these thick sand and gravel deposits. Progressing northwards, the views become more expansive, and the rising high ground of the Castlecomer Plateau (50–300m OD) bounds the distant landscape. This plateau consists of a variety of hills and peaks, which contain seams of anthracite, the focus of coal mining in the region from the 17th century. The Blackstairs Mountains (735m) are visible on the horizon to the south-east, and most obvious of these is the peak of Mount Leinster (795m). There are impressive views from these plateaus and hills especially to the south, east and west over the Barrow and Nore Valleys.

The prevailing watercourse of this region is the River Barrow which travels north-south through the landscape. The Madlin River is a tributary of the River Barrow and flows from the west through Old Leighlin; minor tributaries of this river flow through Bannagagole, directly north of Moanmore, and the River Dinin is a tributary of the River Nore which travels south-west from Brennan's Hill through the Castlecomer Plateau. The suffix 'comer' signifies a meeting of the rivers; it also signifies any deep gripe, such, for instance, as the channel formed by a mountain stream (Carrigan, 1905). From the hinterland of Kilkenny and the confluence of the Nore and Barrow the Monefelim River contributes to the occurrence of wet grassland and broadleaf woodland. The narrow tributaries of the River Barrow, including the Monefelim River, as well as the Madlin River, flow from the higher, steep, escarpment located to the west. Subsoils in this area consist of undifferentiated alluvium and soils of mineral

alluvium. The route crosses into County Carlow where at Moanmore (meaning 'great bog') a variety of archaeological features have been recorded. At the most northerly point of the N9/N10 the land is again characterised by its views; here they include the Barrow Valley, Mount Leinster, Brandon Hill, and the Blackstairs Mountains.

### **3.1.3 Site Specific Landscape**

This site was situated in a generally flat field within the lowlands of the River Barrow Valley. The Madlin River, a tributary of the River Barrow, was located c.100m north of the site. The site measured 20m<sup>2</sup> and was situated immediately north of Moanduff 2; a large prehistoric settlement site where habitation evidence ranged from the late Neolithic to mid-late Bronze Age. Just 25m south of the pit recorded at Moanduff 3, at Moanduff 2, three 'cooking pits', filled with the same material as the pit excavated at this site, were recorded. The low-lying nature of the landscape would make it prone to seasonal flooding which would have been attractive for burnt mound activity in the past. The settlement at Moanduff 2 to the south was located on a slightly elevated ridge making it more attractive for settlement than the seasonally wetter surrounding landscape.

## **3.2 The Archaeological Landscape**

As part of the general research relating to sites along the scheme and the specific research relating to Moanduff 3, the known archaeology within the surrounding landscape was assessed in order to establish the level and type of activity in the surrounding area in the past. This included a review of information from the Record of Monuments and Places, previous excavations and other relevant documentary sources including mapping and other sites excavated as part of the N9/N10 Phase 4 scheme. The excavated archaeology at Moanduff 3 has been identified as being Bronze Age in date.

### **3.2.1 The General Bronze Age Landscape of the Scheme**

The archaeological record implies that the Irish Bronze Age (2500–800BC) population dramatically increased from that of the Neolithic and the evidence for permanent settlements with considerable longevity becomes much more substantial. In addition, a wide range of ritual and funerary activity associated with this settlement is apparent. The overall environmental record for Ireland suggests that there was a general climatic deterioration in the Bronze Age, bringing wetter, colder conditions; during this period there was also accelerated forest clearance with more intensive habitation in the drier lowlands. As a result of extensive development-led projects across the country, understanding of settlement and burial patterns from the early Bronze Age has greatly developed. The distribution of the prehistoric evidence shows that the Rivers Nore and Barrow provided a focus for settlement. In the central part of the current portion of the N9/N10 Phase 4, the fertile Kilkenny lowlands have produced some Bronze Age archaeology, particularly in Danesfort and Ennisnag townlands. In the northern part of the scheme intense settlement is indicated by both burnt mounds and barrows existing on the uplands of the Castlecomer Plateau and the flanking valleys of the Nore and Suir. Hillforts appear to be positioned to overlook the settlement activity, as well as the route of the Nore, the lower saddle to the north of the Slieveardagh Hills, and to the south of the spur surmounted by Clonmantagh. A considerable number of ringditches, cremation and inhumation burials (single and grouped), burnt mound sites, structures and domestic settlement evidence, have been recorded as part of the Bronze Age on the N9/N10 Phase 4.

In the southern landscape the exposure of domestic Bronze Age settlement was less forthcoming than that of the northern landscape. There was little direct evidence for structures in the southern and central landscapes with the exception of a cluster of structures in the Danesfort area. Instead most of the settlement activity that fell within

the roadtake was noted in the northern landscape, further to the north of Kilkenny and in Carlow. Ritual and burial is a dominant feature of the Bronze Age in Kilkenny and Carlow as indicated by the presence of flat cemeteries, burial cairns, ringditches, mounds, barrows and hillforts throughout these counties. Freestone Hill situated in Coolgrange, Co. Kilkenny, in the centre of the present landscape is just one example of these sites. Along the lower part of the Nore Valley, and concentrated in the Foulksrath and Jenkinstown areas, the landscape is dominated by barrows (in this case more specifically ringditches). The contrasting locations of these site types most probably relate to differential landscape exploitation by the same communities with some activities, possibly associated with the seasonal use of upland pasture, confined to higher terrain and settlement and funerary activity taking place in the more sheltered lowlands.

The significant number of burnt mound sites discovered due to the N9/N10 excavations, combined with the previously known examples in the RMP reinforces the concept that Bronze Age activity in Kilkenny and Carlow was considerable. A total of 36 sites with evidence for burnt mound activity were uncovered during the N9/N10 excavations, with an additional example discovered, and preserved outside, the roadtake. The burnt mounds are focussed in the upland area, especially along the river and stream valleys, such as at Clashduff, Coan West and Muckalee on the Dinin and Douglas Rivers, and in the upland hinterland of Freestone Hill.

The distribution of the prehistoric evidence shows that the Rivers Nore and Barrow provided a focus for Bronze Age settlement. The patterning of human activity in the region indicates that these were also the principal route-ways in prehistory; both were navigable by small craft but they, and the major tributaries of the Nore– the Dinin and King's Rivers – were also conspicuous landscape features that facilitated accurate navigation through this landscape. The Barrow and Nore also provided access to wider networks beyond the region.

### **The Northern Landscape: Domestic Settlement**

The domestic settlement evidence from the landscape along the northern sections of Kilkenny and the border with Carlow can be characterised by multi-period sites, such as at Moanduff 2–3, and by clusters of activity represented by multiple burnt mound sites and several, possibly associated, structures. This part of the Barrow is overlooked by the hillforts at Freestone Hill (KK020-018002) (Coolgrange), Ballinkillin (CW019-027) and Killoughternane (CW019-065). However, the distinct clustering of the Paulstown area sites suggests the existence of a community separate to that in the immediate vicinity of Freestone Hill although it is probable that the hillforts reflect a wider landscape control system involving co-operation or alliance between a number of communities in the Kilkenny region. In addition to the indirect evidence in the form of burnt mounds and cultural deposits in pits, several structures, of typical Bronze Age morphology, were recovered. At Garryduff 1 an external ring of 37 postholes and stakeholes was positioned in a shallow, curving slot-trench and enclosed an area 11m in diameter with an inner ring of 10 larger postholes (7m diameter). This structure was located on the edge of a break of slope, which led down to an adjacent river. Other features on site may represent a possible grain stand and pits for food storage/rubbish. In the south-western corner of the site a curving arc (12m long) of 18 postholes and stakeholes was identified which may continue beyond the site. Six km to the north of Garryduff 1 was an oval-shaped structure at Shankill 4. This was most likely a hut (4m x 3m) and consisted of postholes, stakeholes, an internal hearth, and outlying pits. An arc of stakeholes measuring 3m by 2.5m on its north side might have formed an entrance porch. Sherds from at least one domestic cordoned urn came from the site. A roundhouse at

Moanmore 2 consisted of 14 postholes, a central hearth, and up to 50 associated stakeholes and postholes.

As well as two rectangular Neolithic structures at Moanduff 2–3 there were four, or possibly five, separate areas of Bronze Age activity identified. As the features representing this activity were heavily truncated it is impossible to identify their exact function however some may represent Bronze Age structures. A middle-late Bronze Age enclosure (180m x 160m) and late Bronze Age activity in the form of troughs with burnt clay and stone were also excavated on site. At Coneykeare 1 two very tentative structures were identified by the director and a fifth concentration of activity, incorporating burnt mounds and settlement activity; was noted at Coolnakisha 1. A five post, L-shaped possible temporary structure at Coolnakisha 1 was identified along with two pits containing burnt bone and a moderate amount of charcoal and flint. A spread, also containing a moderate amount of charcoal, burnt bone, flint and heat-shattered stones was located to the north-west of the possible structure. It is most likely that the burnt bone deposits within the features on this site are domestic in nature.

### **The Northern Landscape; Funerary and Ritual activity**

Funerary evidence is represented by ringditches at Kellymount 5 and Paulstown 1 and simple pit cremations also at Paulstown 1. Evidence of the Bronze Age is present at Croan (Aghaviller Parish); where a food vessel was discovered, and also at Cruttenclough; where artefacts of amber, gold and bronze were found; there were 14 gold beads discovered with varying decoration together with graduated amber beads (Lyng, 1984). The find circumstances of these artefacts is unknown however similar artefacts in the form of a necklace were discovered at Tara, around the neck of an adolescent male, buried in a pit (Herity and Eogan, 1977) and it is likely that the Cruttenclough finds came from a similar burial context. They indicate trading links with Europe and a bronze sunflower pin was also discovered in this townland, which is of late Bronze Age type (Lyng, 1984; Eogan, 1974a, 87) and originally had a gold foil covering. Other material demonstrating a late Bronze Age presence in the area includes the large hoard from Ballytegan, Co. Laois (Eogan, 1983); this contained three sunflower (two covered in gold foil) and one disc-headed pin, two socketed axes, a bracelet of twisted strands and a variety of both solid and hollow bronze rings. The rings are characteristic of Eogan's (1974b; 1993) midland province and this hoard demonstrates ritual activity in the region. Early Bronze Age activity is also evident in the adjacent area of Co. Carlow on the east side of the River Barrow. A cist burial at Killinane contained cremated bone and an upright tripartite bowl food vessel (Moore 1984). Similar discoveries were also found close by in Sliguff and Wells; both townlands are located in west Carlow along the Kilkenny border close to the landscape of the present scheme. The Sliguff cist contained a crouched inhumation that was accompanied by a bowl while the pit cemetery at Baunogenasraid was inserted into the mound of the earlier Linkardstown tomb (Raftery 1974). A large cemetery mound at Ballon Hill was discovered in the 19th century, which revealed a large assemblage of vases and collared urns in both pit and cist burials (Waddell, 1990, 51–53).

Six of the sites in this northern landscape of the N9/N10 Phase 4 had evidence for prehistoric funerary activity which was represented by barrows, ringditches, cists and cremation deposits at Rathcash East 1, Garryduff 1, Paulstown 1–2, Kellymount 5, and Coolnakisha 1–2. This evidence broadens the funerary landscape of the Bronze Age in this region. A possible ringditch was recorded at Rathcash East 1. It was formed by two very shallow curvilinear cuts creating a circle with a diameter of 6m and potential openings or entrances (1.45m wide) mirroring one another on the south-east and north-west sides. Nearby activity included a hearth and possible

refuse pit. It is possible that this domestic activity was related to funerary practices associated with the ringditch; however, it is perhaps more plausible that, given the lack of associated burial activity (although the enclosed area had been truncated) and the occurrence of two entrances, the ringditch in fact represents a domestic structure.

At Garryduff 1 two unroofed structures, both comprising arcs of post- and stakeholes, may have been associated with a large, northwest-southeast pit (2m x 1.3m x 0.16m) located close to Structure 1. This pit contained a charcoal-rich deposit with burnt bone, heat-cracked stones and charred hazelnuts which had been deliberately deposited. Three postholes also containing similar material in their fills were arranged around the pit and a definite concentration of burnt bone was noted in this area of the site. It is possible that this pit and the adjacent postholes represent the remains of a draught pit for a pyre with the postholes at either side being used to stabilise the pyre structure for the duration of the process. Two cremation pits were located outside the enclosure which contained quite large chunks of human bone and possible pyre material.

The cemetery complex at Paulstown 1 consisted of both pit and cist burials. Three small cists (averaging 0.6m by 0.32m by 0.16m internally) were made expediently with slabs and blocks of local stone. Three other pits were less formally lined with stone. Each contained cremations but one cist included two discrete deposits. Three other grave pits formed part of the cemetery. In one of these pits an unburnt human skull was placed on top of a washed cremation deposit. Several burials were accompanied by ceramic gravegoods. These gravegoods included burnt sherds from bipartite vases, a miniature cordoned urn and a miniature vase. A burnt flint scraper as well as charred seeds and hazelnuts also came from one of the cists. The largest grave at Paulstown consisted of a large pit or pits. This contained a complex sequence of deposition which appears to have begun with a circular pit which contained an inverted vase; this was disturbed by the insertion of Vessel 1, another inverted vase which survived intact. A miniature vase (No. 6) may have accompanied one of these burials. Subsequently, a second larger pit extended the grave to the south. The fragmentary remains of three pots (Nos. 3–5) were deposited on the base of this pit and a large cremation deposit was placed over them. This deposit contained sherds from Vessels 5 and 6 as did a final silty fill. The evidence suggests that the grave was extended to accommodate burials disturbed from other graves. A large circular pit occurred on the edge of the cemetery (1.55m by 1.48m by 0.80m deep). This had originally been maintained as an open feature that filled naturally with water. Subsequently, a complex sequence of layers containing charcoal, burnt and unburnt bone, charred hazelnut shells and seeds, antler and flint (including flakes, blades and debitage), developed or was deposited in the pit. The proximity of this feature, which appears to have been a well, suggests that it was associated with the funerary activity on the site.

A double ringditch was identified at Kellymount 5. The external ringditch (12m diameter x 1.04m deep) was lined with a spread of burnt mound material, possibly relating to the earlier use of the site as a burnt mound complex. The only artefacts in this external ringditch consisted of three Bronze Age pottery sherds. The internal ringditch (5.6m diameter x 0.2m deep) was situated centrally within the external ringditch and also contained heat-shattered stones in its fills. A central pit had burnt bone inclusions. A further two pits were located to the south of the ringditches and both contained burnt bone inclusions. A substantial part of a vase urn came from one of the troughs associated with the burnt mound complex; while this may be derived from the funerary activity it is evident that the vessel had been used in a domestic context and may have been a deliberate deposit in the base of the trough.

Evidence for funerary activity was also excavated at Coolnakisha 2, where one pit (0.33m x 0.26m x 0.13m) contained 25.5g of charcoal, 0.1g of charred seeds and 390.3g of burnt bone. Other pits and possible pits and spreads also contained burnt bone inclusions, although in much smaller quantities. Both sites produced small quantities of probable middle Bronze Age pottery while residual Neolithic material in the form of three flint scrapers were discovered during the excavation of Coolnakisha 1.

It is therefore apparent that the central, northern part of Kilkenny contained the most varied evidence for burial and funerary activity. As the N9/N10 progresses northwards sites with a probable continuity of function and chronology emerge: from the Danesfort complex near the King's River to the varied ringditches and cremations at Templemartin 5 and the amalgamation of ritual and burial at Paulstown 1–2.

### **The Northern Landscape; Burnt Mound Activity**

The evidence from the northern landscape was dominated by clusters of burnt mounds and reinforces the patterning already indicated by the previously known archaeological record. Several previously identified burnt mounds were recorded in Cloghoge (KK020-039, KK020-075–076), Rathcash West (KK020-077–078), Shankill (KK016-003, KK016-010) and at Moanmore (meaning 'great bog') (CW015-007, CW015-014). Twenty seven sites with evidence of burnt mound activity were uncovered as part of the N9/N10 Phase 4 excavations within the northern landscape. The underlying limestone geology/glacial drift consisted of sandy/gravel-clays which have a higher moisture content than the southern and central landscapes resulting in a high water table in localised areas. This helps explain the presence of the considerably sized waterholes at these burnt mound sites, notably within the Jordanstown and Kellymount cluster (Jordanstown 2&3 and Kellymount 1-3, 5&6). Other clusters of burnt mound activity in the northern landscape occurred at Ballyquirk 1,2&4, Moanmore 1&3, Moanduff 1,2&3, Rathcash 1&2, Blanchvillespark 2,3&4 and Cranavonane 1&2. Other sites exhibiting burnt mound activity include Shankill 6, Bannagagole 1, Rathcash East 2, Tomard Lower 1 and Ballinvally 1. Due to poor on-site conditions, the sites at Cranavonane 2 and Blanchvillespark 2 were not fully resolved but were identified as burnt mounds. Burnt mounds were not excavated at Kellymount 1, Moanduff 2&3, Ballyquirk 1 and Ballinvally 1; however features associated with burnt mound activity were excavated at these sites indicating a clear association with this type of activity.

### **The Northern Landscape; Route-ways and communications**

While it is clear that the rivers and streams are a major feature of the settlement networks, the distribution of prehistoric activity, for example on the lowland fringes to the south of the Castlecomer Plateau, shows that other route-ways were functioning at both a local and regional scale. Within these network systems it is possible to identify particular concentrations of human activity. Some of these were already important in the early Neolithic while others became prominent only in the Bronze Age. Among the most significant of these are those in the area around Carlow, on the upper Barrow and its tributary the Burren River, which the archaeological work on the Carlow Bypass has highlighted (Dunne, 2007). To the south of this, the eastern side of the Barrow in the Goresbridge area formed the core of a settlement zone that in the Bronze Age extended westwards across the river into the Paulstown area of Co. Kilkenny. The immediate environs of Kilkenny City also appear in the Bronze Age as a settlement focus, underlined as a result of the N9/N10 excavations, while the southern end of the Castlecomer Plateau, with the major focal site on Freestone Hill, has been highlighted by the discovery of new sites on the lowlands immediately to the south around Rathcash.



### **The Northern Landscape; Conclusions**

In the northern part of the region, focussed on the uplands of the Castlecomer Plateau and the flanking valleys of the Nore and Suir, intense settlement is indicated by both burnt mounds and barrows. The burnt mounds are focussed in the upland area and especially along the river and stream valleys, such as at Clashduff, Coan West and Muckalee on the Dinin and Douglas Rivers, and in the upland hinterland of Freestone Hill. Along the lower part of the Nore Valley, and concentrated in the Foulksrath and Jenkinstown areas, the landscape is dominated by barrows (in this case more specifically ringditches). The contrasting locations of these site types most probably relate to differential landscape exploitation by the same communities with some activities, possibly associated with the seasonal use of upland pasture, confined to higher terrain and settlement and funerary activity taking place in the more sheltered lowlands. The large number of burnt mounds discovered on the lowland fringe to the east of the plateau, along the Barrow Valley, shows the development of intensive settlement throughout the northern part of the region. In this area the hillforts appear to be positioned to overlook the settlement landscape.

#### **3.2.2 The Site Specific Archaeological Landscape of Moanduff 3**

There are no recorded monuments in the immediate vicinity of Moanduff 3. An enclosure site (CW15-003) is located c. 300m to the south-east of Moanduff 3.

At Moanduff 3 a late Bronze Age oval pit filled with burnt material, and eight stakeholes were excavated. This pit was truncated by a later pit. A number of sites were excavated to the NNE of Moanduff 3, as part of the N9/N10 Phase 4: Knocktopher to Powerstown works. At Ballynolan 1, located c. 620m away, post medieval/modern activity was recorded in the form of ditches and a large area of burning were excavated. Coneykeare 1 was located c. 1.25km to the NNE and two structures, a portion of a ringfort, two kilns and associated features were excavated at this site. A late Iron Age/early medieval date has been returned for the ditch of the ringfort and early medieval dates have been returned for the remaining features excavated. Beyond Coneykeare 1, Coolnakisha was located c. 2.35km to the NNE, and a possible truncated structure with associated pits was excavated. The possible structure has been dated to the late Neolithic/early Bronze Age and a late Bronze Age date has been returned for one of the pits indicating the site had more than one phase of occupation.

A number of sites were also excavated to the SSW of Moanduff 3, as part of the N9/N10 Phase 4: Knocktopher to Powerstown works. Moanduff 2 was located directly to the south of Moanduff 3 and a considerable number of postholes, stakeholes, pits and linear features were excavated, some of which dated to the early/ middle Neolithic, some of which dated to the late Neolithic/ early Bronze Age period, some of which were middle-late Bronze Age, and some of which were Iron Age. Possible structures were also excavated and it is apparent that this site was re-used throughout prehistory. Moanduff 1 was located c. 550m to the SSW and burnt mound activity and associated features, and a stake built sub rectangular palisade structure were excavated. The burnt mound activity has been dated to the early Bronze Age period and the structure has been dated to the late Iron Age period. A pit associated with drainage channels also excavated at the site has returned an early medieval date and a possible trough has been dated to the medieval period; suggesting this site had a number of occupation phases. At Bannagagole 1, located c. 1.4km to the SSW, a burnt mound and associated features dating to the middle Bronze Age were excavated.

### 3.3 Typological Background of Burnt Mound Activity

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

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

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

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

The site was heavily truncated by modern agricultural activity, one main archaeological feature survived (Figures 4–5). An oval pit with eight associated stakeholes that was cut by a slightly later pit was recorded. The stakeholes were

recorded within the sides of the pit and may have supported a spit or other such apparatus. Both pits were filled with burnt mound type material containing heat-shattered stones (Plates 1–2). The inclusion of heat-shattered stones and charcoal-rich material in the fills is characteristic of burnt mound sites. Moanduff 3 was also situated in a wet, flat area with access to a water source, all typical features of burnt mound sites.

### **3.5 Summary of the Specialist Analysis**

A number of specialists provided analysis of samples and artefacts recovered from the site as part of the post-excavation works. This work in part formed the basis for the dating evidence for the site. The detailed reports on the results of all analysis are in Appendix 2.

#### ***Charcoal and Wood Species identification***

Charcoal was identified from three contexts at Moanduff 3. Hazel, pomaceous fruitwood and oak were identified from the samples. The results are dominated by hazel.

#### ***Petrographical analysis***

A single sample of coarse grained sandstone from C31 was submitted for analysis. Whilst it was not possible to determine a definitive source for this stone sample based on macroscopic examination alone, it can be stated that these rock types are available locally in outcrop and within the glacial tills/ sub-soils. It is therefore probable that the material in this sample was sourced in the vicinity of the site.

#### ***Radiocarbon Dating***

Two samples were sent for AMS radiocarbon dating.

A sample of hazel charcoal from pit fill C8 was radiocarbon dated. The 2 sigma calibrated result was 1260–1020BC (UB 12261).

A sample of young oak charcoal from stakehole fill C37 was radiocarbon dated. The 2 sigma calibrated result was 1259–1016BC (UB 12262).

## 4 DISCUSSION AND CONCLUSIONS

### 4.1 Discussion

The excavation of Moanduff 3 has identified burnt mound activity dating to the late Bronze Age. The site is located in the lowlands of the River Barrow Valley, c. 100m to the south of the Madlin River, a tributary of the Barrow. This landscape would be prone to seasonal flooding and these wetter marginal landscapes are often the location for burnt mound activity due to the easily available water supply for troughs. The marginal nature of the landscape is also evident in the environmental analysis of charcoal from the site with hazel, which is generally suited to wetter environments, being the dominant species recorded. The identification of burnt mound related activity in this general landscape would have been expected although there was no surviving above ground evidence of the site.

It is likely that pit C9 represented the truncated remains of a trough or cooking pit, sometimes referred to as a pot boiler. Its fill comprised heat-shattered stones and charcoal-rich inclusions suggesting that it may have been associated with a burnt mound (Figures 4–5). The pit had eight stakeholes cutting its eastern and northern edges. These stakeholes may relate to a type of spit or similar cooking apparatus or a possible windbreak, all features that are typically associated with burnt mounds. A later pit C28, cut the southern side of C9, representing two phases of probably broadly contemporary activity. Two similar possible troughs were recorded at the northern end of the adjacent site of Moanduff 2 and were located c. 25m south of pits C9 and C28. The Moanduff 2 features have been dated from the early Neolithic through to the mid-late Bronze Age and as such may be related to those at Moanduff 3. No overlying burnt mound deposit were identified at either site and any mound may have been destroyed as result of the intensive modern agricultural activity carried out in the 1950s in the area, or they may represent the locations of pot-boilers with no significant associated deposit of mound material. No archaeological artefacts were recovered from Moanduff 3.

Typologically, the activity identified at Moanduff 3 can be associated with burnt mound sites and shows evidence of hot-stone technology. As has been previously outlined, relatively small, shallow, round-bottomed pits, generally referred to as pot boiler pits or roasting pits, are often associated with burnt mound sites. The pit at Moanduff 3 may represent a pot-boiler or roasting pit although it would be may have been anticipated that some scorching of the base and sides of the pits were identified. The lack of scorching could suggest that the pit either functioned as a trough containing water or as a waste pit into which the burnt material was dumped once cooled, possibly from an activity located outside the limits of the excavated site. With the exception of the fill in features excavated at Moanduff 3 there was no evidence for a definitive burnt mound spread. This is not unusual for sites which have been subject to intensive agricultural activity in modern times.

No previously known monuments or sites of contemporary date were recorded in the vicinity of Moanduff 3 prior to the scheme excavations. Excavations associated with the N9/N10 Phase 4 identified a number of prehistoric sites in the vicinity to the south but none to the north, the nearest prehistoric site is located at Coolnakisha, 2.35km to the north-east. To the south, the most notable site was Moanduff 2 where multi-period activity was identified dating from the early/middle Neolithic to the middle-late Bronze Age, and some evidence of activity in the Iron Age. Curiously, no definitive late Bronze Age activity, contemporary with Moanduff 3, was recorded, although mid-late Bronze Age pottery was recorded in a number of features. Despite the lack of a direct dating link, it seems likely that Moanduff 3 represents activity peripheral to the Moanduff 2 settlement. Further burnt mound activity was recorded at Moanduff 1

and Bannagagole 1 (550m and 1.4km to the SSW respectively), although neither was contemporary with Moanduff 3.

#### **4.2 Conclusions**

Two pits were identified on the site, one with associated stakeholes which was truncated by the second pit. The pit may represent a trough or pot boiler associated with late Bronze Age burnt mound activity. The site probably represents peripheral activity to a larger multi-period settlement site located immediately to the south at Moanduff 2, although no directly contemporary activity was recorded. The site is important locally as it confirms late Bronze Age activity in the immediate proximity of the larger Moanduff 2 site and as such is an important addition to the multi-period evidence from Moanduff 2.

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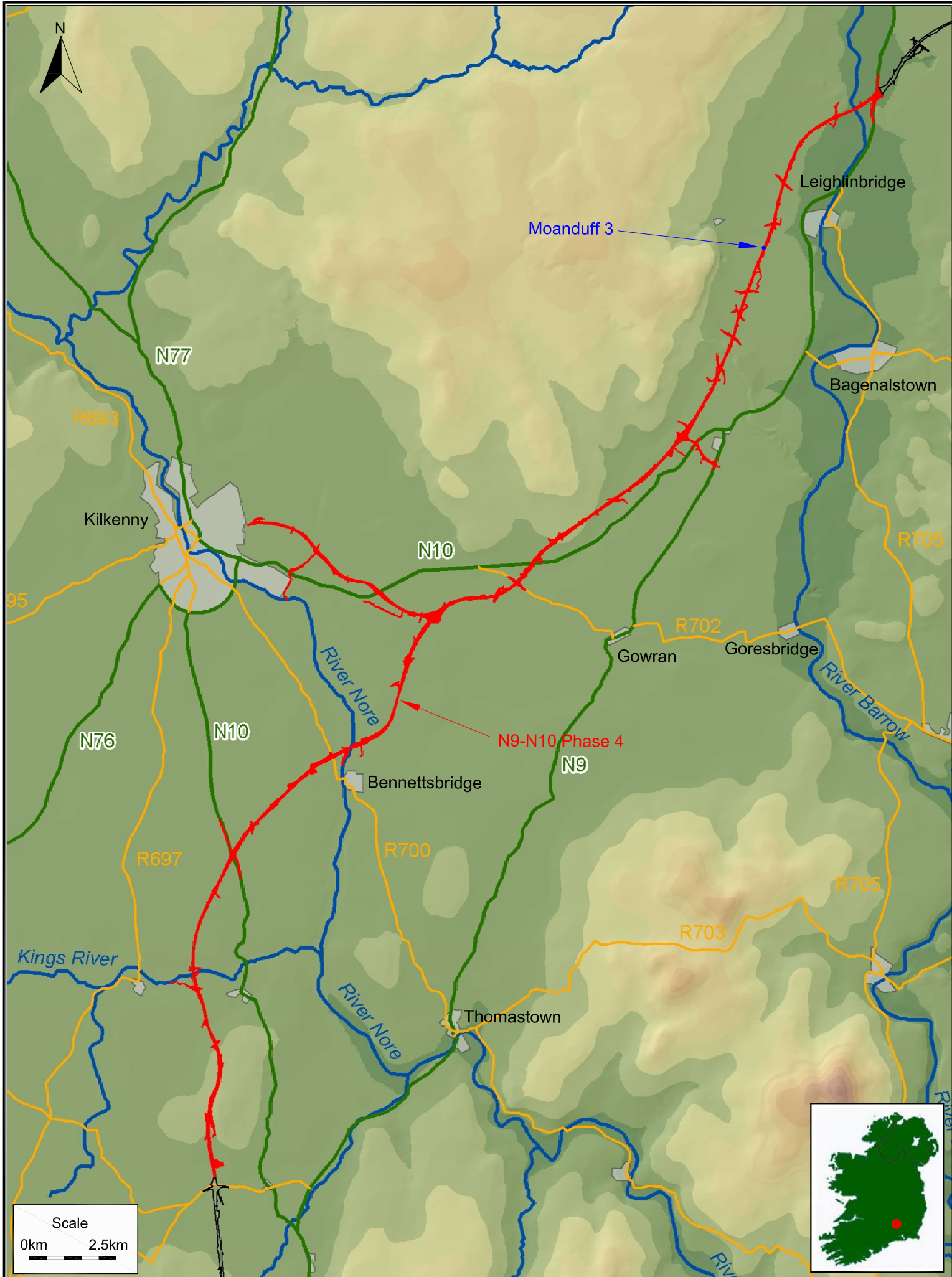
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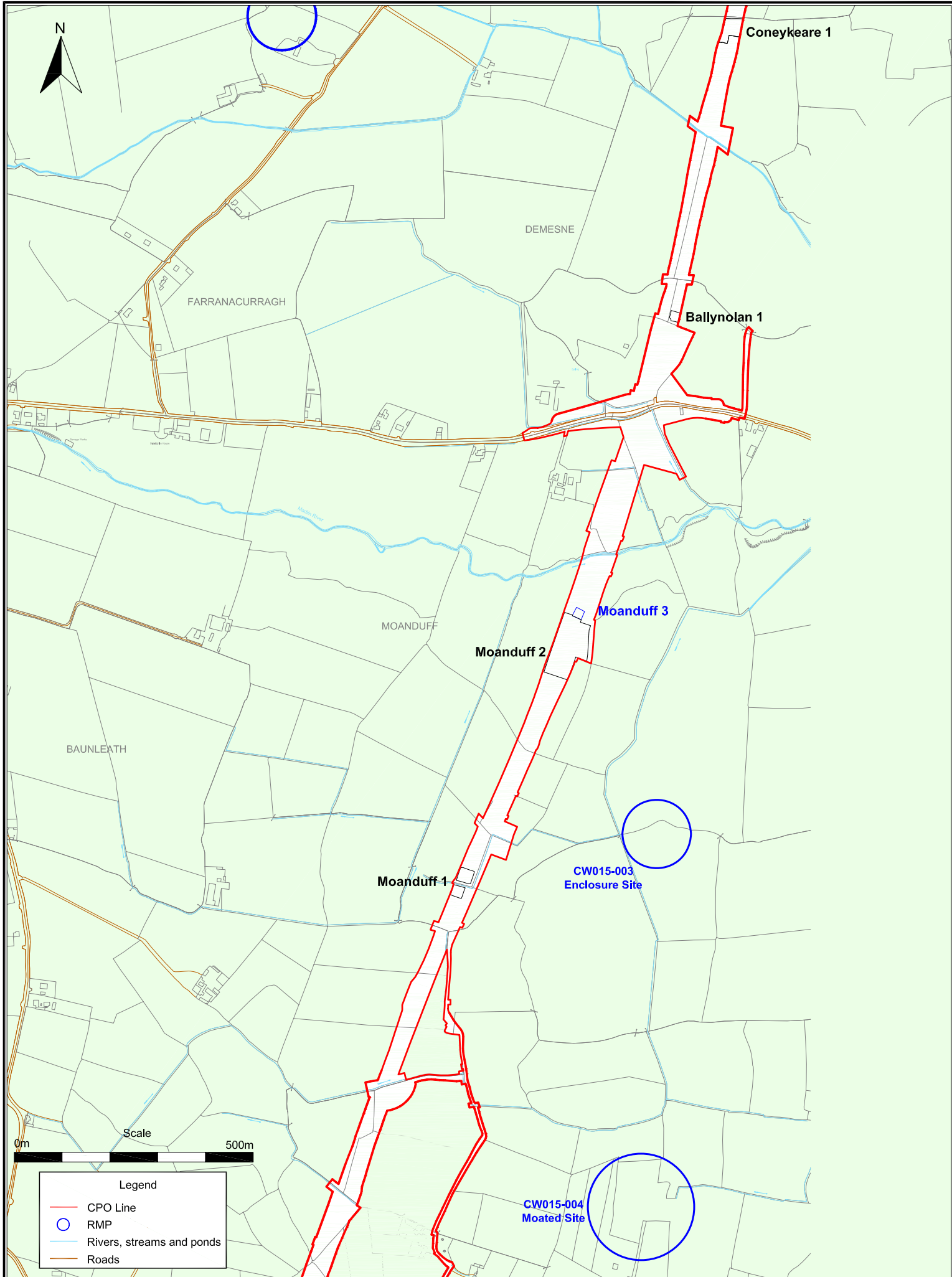
## Electronic references

ENVision; *Environmental Protection Agency* Soil maps of Ireland  
<http://www.epa.ie/InternetMapView/mapviewer.aspx>











**Moanduff 3**

**Moanduff 2**

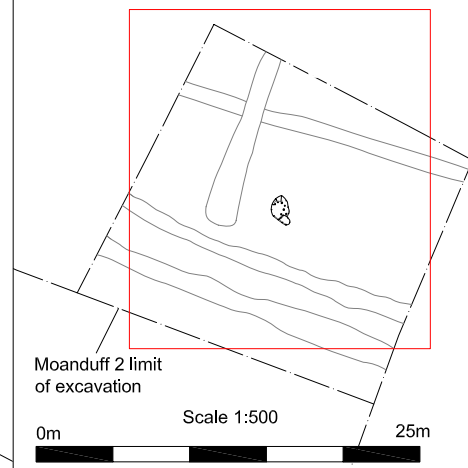
Scale  
0m 25m

Legend

- Waterways and ponds
- Roads
- Site Extents
- Field Boundary
- CPO



Location of Plan



Limit of excavation

53,425

+267516,  
+164987

C13

C12

53,398

1260 - 1020 BC

C2

53,241

C16  
C18  
C20  
Trough/  
Cooking pit  
C9  
C36  
C30  
C34  
C34  
C28  
C38  
1259 - 1016 BC

1259 - 1016 BC

+267506,  
+164977

+267516,  
+164977

53,359

53,275

C10

C11

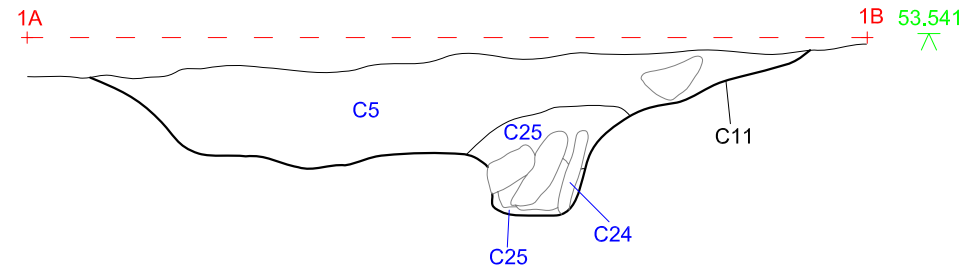
53,455

0m 5m

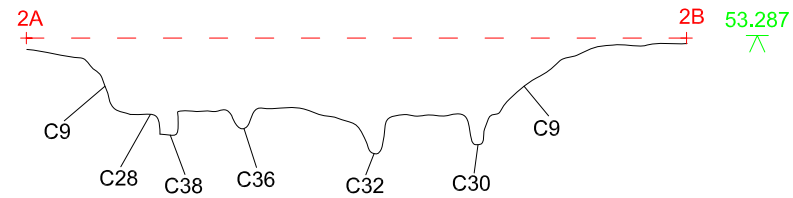
Legend

- Break of slope
- - - Sections
- Cxx Cut numbers
- xxxxxxE National Grid Reference
- xxxxxxN National Grid Reference
- Postholes
- xx.xx Levels - metres OD

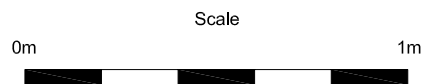
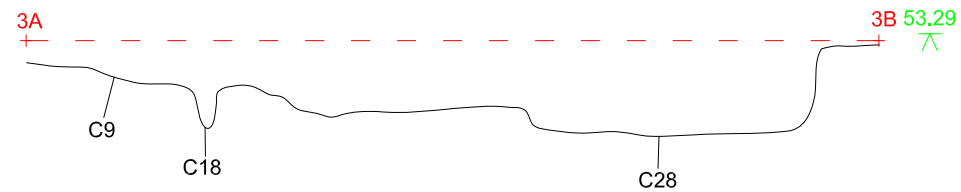
Northwest facing section of C11



East facing section of C9, C28, C30, C32, C36, C38



West facing section of C9, C18, C28



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

**IAC** Irish Archaeological Consultancy

Title:	Moanduff 3 - Sections 1-3	Scale:	1:20 @ A4
Project:	N9/N10 Phase 4: Knocktopher to Powerstown	Date:	30/06/10
Client:	Kilkenny County Council	Produced by:	G Kearney
		Job No:	J2432.1
		Figure No:	5



## PLATES



Plate 1: Pits C9 and C28, mid-excavation, facing south



Plate 2: C9 with associated remains of stakehole cuts, post-excavation, facing south



## APPENDIX 1 CATALOGUE OF PRIMARY DATA

### Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C1	N/A	N/A	N/A	0.10	Topsoil	Loose friable brown soil	N/A	C2
C2	N/A	N/A	N/A	N/A	Subsoil	Dark yellow brown silty clay with occasional stones	C1	N/A
C3	C9	0.74	0.90	0.09	Top fill of trough	Sub-oval, loose, mid ash grey silty clay with occasional charcoal and small stones	C1	C8
C4	C10	20.0	2.25	0.25	Fill of field boundary	Linear, loose ash grey silty sand with yellow/red iron inclusions	C14	C10
C5	C11	20.0	1.75	0.25	Fill of drain	Linear, moderate compaction, brown sandy clay with small stones	C1	C25
C6	C12	20.0	2.15	0.44	Fill of ditch	Linear, loose mid brown grey silty clay with stones	C1, C13	C26, C23
C7	C13	20.0	0.90	0.15	Top fill of pipeline ditch	Moderately compacted yellow brown clay with occasional stone inclusions	C1	C21
C8	C9	1.40	1.12	0.18	Fill of trough	Loose black grey clay silt with frequent quantity charcoal and broken stones	C1, C3	C9
C9	N/A	1.40	1.12	0.18	Cut of through	Sub-oval N-S orientated with flat base, break of slope-top E-W is sharp, N-S is gradual, break of slope-base is gradual	C3, C8	C2
C10	N/A	20.0	2.25	0.25	Cut of field boundary	Linear shaped, NW-SE orientated with gradual break of slope top and base, sides are concave, shape of base is rounded	C14, C4	C2
C11	N/A	20.0	1.75	0.46	Cut of drain	Linear in plan, break of slope-top is sharp, break of slope-base is gradual, sides-gradual on the south side, shape of base is concave	C5, C25, C24	C2
C12	N/A	20.0	2.15	0.70	Cut of ditch	Linear shaped with gradual break of slope top and base, sides are sloping and shape of base is concave, cut by C13	C6, C26, C23	C2
C13	N/A	20.0	0.90	0.70	Cut of pipeline ditch	Linear shaped with sharp break of slope top and base, sides are straight, shape of base is flat, cutting C12	C7, C21, C22	C2
C14	C10	20.0	1.10	0.05	Fill of field boundary	Linear, moderately compact, grey brown sandy clay with small sub-angular stones (occasional)	C1	C4
C15	C16	0.07	0.06	0.08	Fill of stakehole	Oval, loose black grey silty clay with charcoal (frequent)	C8	C16
C16	N/A	0.07	0.06	0.08	Cut of stakehole	Oval shaped with straight sides, break of slope-top is sharp, break of slope-base is gradual, shape of base is concave	C15	C2
C17	C18	0.08	0.07	0.10	Fill of stakehole	Circular, loose black grey silty clay with flecks of charcoal (frequent)	C8	C18
C18	N/A	0.08	0.07	0.10	Cut of stakehole	Circular shaped with concave shape of base and straight sides, break of slope-top is sharp, break of slope-base is gradual	C17	C2
C19	C20	0.08	0.08	0.10	Fill of stakehole	Loose, black grey silty clay with charcoal flecks	C8	C20
C20	N/A	0.08	0.08	0.10	Cut of stakehole	Circular shaped with concave shape of base and straight sides, break of slope-top is sharp, break of slope-base is gradual	C19	C2



Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C21	C13	20.0	0.90	0.55	Fill of pipeline ditch	Loose, dark grey brown silt	C7	C22
C22	C13	20.0	0.15	0.15	Fill of pipeline ditch	Modern drainage pipe with 15cm in diameter, placed at the bottom of ditch on depth 70cm	C21	C13
C23	C12	20.0	0.75	0.25	Fill of ditch	Moderately compact mid grey silt	C6, C26	C12
C24	C11	20.0	0.08	0.29	Fill of drain	A stone drain lined with flat limestone and flag stones tightly packed together	C25	C11
C25	C11	20.0	0.10	0.27	Fill of drain	Compact, grey brown sand with occasional pebbles	C5	C24
C26	C12	20.0	0.25	0.20	Fill of ditch	Linear strong compacted light yellow brown clay with stones - backfill (redeposit of natural)	C6	C23
C27	C28	0.65	0.50	0.23	Fill of pit	Loose, dark grey silt with occasional small stones and charcoal flecks	C8	C28
C28	N/A	0.65	0.50	0.23	Cut of pit	Oval shaped, NW-SE orientated with rounded corners, flat shape of base, straight sides and sharp break of slope top and base	C27	C2
C29	C30	0.05	0.04	0.08	Fill of stakehole	Loose, grey silt with occasional charcoal flecks	C8	C30
C30	N/A	0.05	0.04	0.08	Cut of stakehole	Circular in plan with straight sides, flat shape of base and sharp break of slop top and base	C29	C2
C31	C32	0.06	0.05	0.10	Fill of stakehole	Loose, black grey silty clay with charcoal flecks	C8	C32
C32	N/A	0.06	0.05	0.10	Cut of stakehole	Circular in plan with straight sides, flat shape of base and sharp break of slop top and base	C31	C2
C33	C34	0.07	0.06	0.09	Fill of stakehole	Loose, black grey silty clay with charcoal flecks (occasional)	C8	C34
C34	N/A	0.07	0.06	0.09	Cut of stakehole	Circular with concave shape of base and straight sides, break of slope-top is sharp, break of slope-base is gradual	C33	C2
C35	C36	0.06	0.05	0.06	Fill of stakehole	Loose, grey silt with occasional charcoal flecks	C8	C36
C36	N/A	0.06	0.05	0.06	Cut of stakehole	Circular with concave shape of base and straight sides, break of slope-top is sharp, break of slope-base is gradual	C35	C2
C37	C38	0.10	0.08	0.07	Fill of stakehole	Loose, black grey silty clay with charcoal flecks (frequent)	C8, C28	C38
C38	N/A	0.10	0.08	0.07	Cut of stakehole	Circular with concave/flat shape of base and straight sides, break of slope-top is sharp, break of slope-base is gradual	C37	C2

## Appendix 1.2 Catalogue of Artefacts


There were no artefacts associated with the excavations at Moanduff 3.

## Appendix 1.3 Catalogue of Ecofacts

During post excavation works specific samples were processed with a view to further analysis. A total of 9 soil samples were taken from features at Moanduff 3 and were processed by flotation and sieving through a 250µm mesh.

Context #	Sample #	Feature Type	Charcoal	Heat Affected Stones
C3	1	pit C9	2.1g	
C8	2	pit C9	47.1g	
C15	8	stakehole C16	0.4g	
C17	9	stakehole C18	<0.1g	
C19	6	stakehole C20	0.1g	
C27	3	pit C28	1.0g	
C31	7	stakehole C32	0.5g	0.02l
C33	4	stakehole C34	0.6g	
C37	5	stakehole C38	1.6g	

## Appendix 1.4 Archive Index

<b>Project:</b> N9/N10 Phase 4 Knocktopher to Powerstown		
<b>Site Name:</b> AR156 Moanduff 3		
<b>Excavation Registration Number:</b> E3736		
<b>Site director:</b> Sinead Phelan		
<b>Date:</b> 01.09		
<b>Field Records</b>	<b>Items (quantity)</b>	<b>Comments</b>
Site drawings (plans)	4	
Site sections, profiles, elevations	3	
Other plans, sketches, etc.	0	
Timber drawings	0	
Stone structural drawings	0	
Site diary/note books	0	
Site registers (folders)	1	
Survey/levels data (origin information)	130	
Context sheets	38	
Wood Sheets	0	
Skeleton Sheets	0	
Worked stone sheets	0	
Digital photographs	18	
Photographs (print)	0	
Photographs (slide)	0	
Security copy of archive	Yes	Digital copy

## **APPENDIX 2    SPECIALIST REPORTS**

Appendix 2.1    Charcoal and Wood ID Report – Lorna O’ Donnell

Appendix 2.2    Petrographical Report – Dr Stephen Mandal

Appendix 2.3    Radiocarbon Dating Results – QUB Laboratory

## **Appendix 2.1 Charcoal and Wood ID Report – Lorna O’ Donnell**

**Client – Irish Archaeological Consultancy Ltd**

**Site Name- Moanduff 3**

**Excavation number –E3736 AR156**

**County – Kilkenny**

**Author- Lorna O’Donnell**

**Date –16/10/09**

**Summary Charcoal Report**

## 1 Introduction

This report describes the charcoal analysis of samples from Moanduff 3, Co. Carlow, excavated by Sinéad Phelan. The site was excavated as part of the N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown (Phelan 2009). The site probably represents burnt mound activity, a charcoal rich pit with stakeholes was excavated. The aim of the work is to identify enough suitable material for radiocarbon dating, and to provide a floristic background to the site. It can also identify any species selection patterns at Moanduff 3. This report is summary in nature only, further analysis, discussions and comparisons of results will be incorporated into a final integrated charcoal and wood report for all sites along the N9/N10 (Lyons *et al* forthcoming). Radiocarbon dates have been received from C8 (1260–1020BC) and C37 (1259–1016BC).

## 2 Methodology (After IAC Ltd)

### 2.1 Processing

- A mechanical flotation tank using a pump and water recycling system is used for soil flotation
- The soil is washed using a 1mm mesh in the flotation tank and a 300 micron and 1mm sieve is used to catch floated material.
- The volume of all soil samples are recorded in litres using a measuring jug.
- The sample is then placed into the 1mm mesh in the flotation tank, the tank is then filled with water and the sample washed. Any large lumps of soil can be carefully broken down by hand, but the jets of water in the flotation tank gently clean the rest of the sample.
- Once the sample is clean (just stones, charcoal, artefacts remaining in the mesh) the tank is fill up with water and at this stage any floating material (charcoal, seeds etc) should flow over the spout and into the sieves.
- The retent is then gently poured into a labelled tray (containing site code, site name, sample number and context number) and place on a shelf to dry.
- The flots are securely packaged in tissue, labelled and hung up to dry. This prevents any loss of light material (seeds) which could result once the flots are dry and being moved (if they are dried on trays).
- Before washing a new sample all equipment used (measuring jugs, 1mm mesh, sieves etc) are thoroughly washed using clean water.
- The large black settling tanks (and water) are cleaned between every site, or if a large site is being processed, every 1-2 weeks.
- Any samples containing a high clay content will be soaked in water for 1-2 days to aid the sieving process.

### 2.2 Charcoal identification

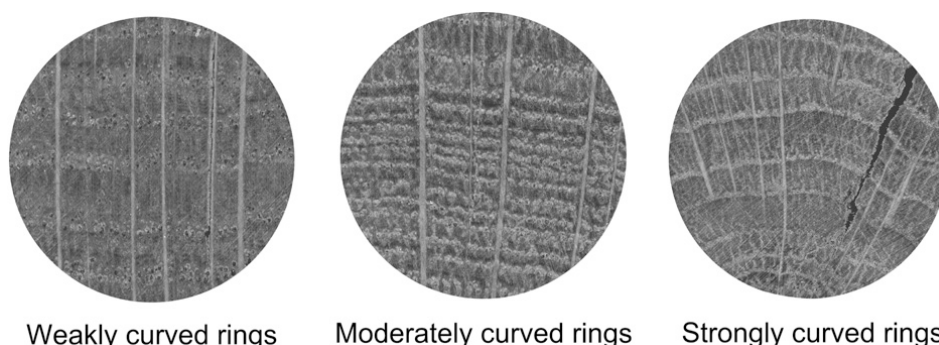
Each piece of charcoal was examined and orientated first under low magnification (10x-40x). They were then broken to reveal their transverse, tangential and longitudinal surfaces. Pieces were mounted in plasticine, and examined under a binocular microscope with dark ground light and magnifications generally of 200x and 400x. Each taxon or species will have anatomical characteristics that are particular to them, and these are identified by comparing their relevant characteristics to keys (Schweingruber 1978; Hather 2000 and Wheeler *et al* 1989) and a reference collection supplied by the National Botanical Gardens of Ireland, Glasnevin. It was aimed to identify fifty fragments per sample.

### 2.3 Details of charcoal recording

The general age group of each taxa per sample was recorded, and the growth rates were classified as slow, medium, fast or mixed. It was not within the scope of this project to measure all the ring widths from the charcoal, however, some measurements

were taken with a graticule in the microscope in order to make the scale of slow, medium and fast growth less subjective. Slow growth within the charcoal from this site was considered to be approximately 0.4mm per annum, medium approximately 1mm per annum and fast approximately 2.2mm per annum.

The ring curvature of the pieces was also noted – for example weakly curved annual rings suggest the use of trunks or larger branches, while strongly curved annual rings indicate the burning of smaller branches or trees (Fig. 1). Tyloses in vessels in species such as oak can denote the presence of heartwood. These occur when adjacent parenchyma cells penetrate the vessel walls (via the pitting) effectively blocking the vessels (Gale 2003, 37). Insect infestation is usually recognised by round holes, and is considered to be caused by burrowing insects. Their presence normally suggests the use of decayed degraded wood, which may have been gathered from the woodland floor or may have been stockpiled.



Weakly curved rings

Moderately curved rings

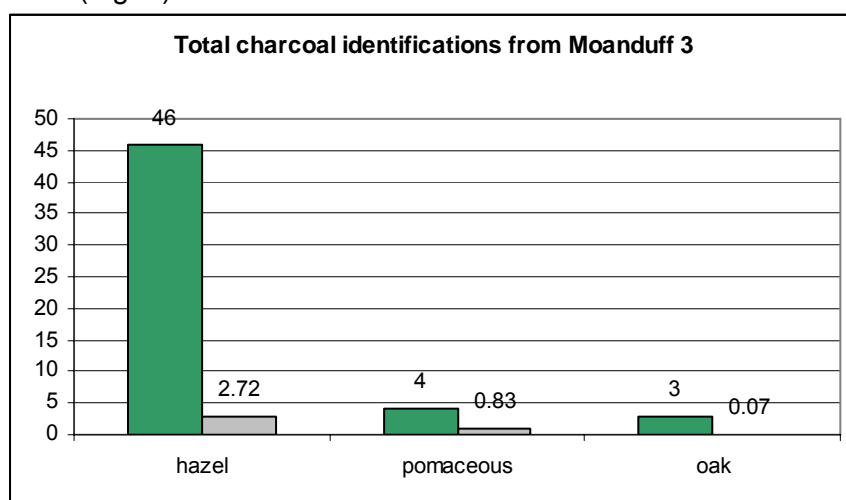
Strongly curved rings

**Fig. 1 Ring curvature. Weakly curved rings indicate the use of trunks or large branches.**

(After Marguerie and Hunot 2007 1421, Fig. 3).

### 3 Results

Three wood types were identified from Moanduff 3, hazel (*Corylus avellana*), oak (*Quercus* sp.) and pomaceous fruitwood (Maloideae), the results are dominated by hazel (Fig. 2).



**Fig. 2**

The site consisted mainly of a large pit (C9) which was cut by another pit (C28). The charcoal in pit C28 (Fill C27) was badly preserved and difficult to identify. One fragment of hazel only was identified from here. In contrast, good preservation

prevailed in pit C9 (Fill C8), where hazel and pomaceous fruitwood were identified. The charcoal level in the stakehole C38 (Fill C37) is low - oak and pomaceous fruitwood were noted in this sample. The low level of charcoal and presence of two tree types makes it difficult to conclude what species the original stake may have been made from.

#### 4 Discussion

It is presumed that while people may have managed trees during prehistory in Ireland, that they did not plant them, and therefore that the trees would grow in optimum soil conditions. A consideration of the preferred growth conditions of the trees from Moanduff 3 should provide a background to the type of soil conditions close to the site.

The charcoal results are dominated by hazel. It is a very tolerant tree; it can grow from wet to dry conditions (but not waterlogged ones) (Orme and Coles 1985, 9). It was once very common in Ireland, Mc Cracken writes that it was once widespread to an extent that is hard to imagine today (1971, 19). It can grow as a tree or can form hazel scrub.

Oak is frequently identified from Irish archaeological sites. It is a strong, robust timber, which burns well at high temperatures. The oak present could be either our native sessile oak (*Quercus petraea*) or our native pedunculate (*Quercus robur*) which prefers more wet, heavier clays than the sessile oak. (Beckett 1979, 40-41).

The Maloideae group (pomaceous fruitwood), a sub family of the Rosaceae includes crab apple, wild pear, rowan/whitebeam and hawthorn. Crab apple (*Malus sylvestris*) is a tree of hedges, copses and oak woodland, thriving in fertile and heavy soils. It often grows singly, with large distances between individual trees (Lipscombe and Stokes 200, 78). Wild pear (*Pyrus pyraster*) can grow on woodland edges and also can be found growing in a solitary situation (Lipscombe and Stokes 2008, 114 ; Stuijts 2005, 142). Rowan (*Sorbus aucuparia*) is a tough colonizer which can tolerate peaty soils and exposed conditions. It needs plenty of light to thrive (Hickie 2002, 65). It is a tree of mountains, woodlands and valleys, growing on a wide range of soils, including chalks, acid soils and even peat (Lipscombe and Stokes 2008, 120). Whitebeam (*Sorbus aria*) grows up to 20m high and has a preference for limestone soils (Orme and Coles 1985, 11). Hawthorn (*Crataegus monogyna*) can thrive in all but the most acid of soils (Gale and Cutler 2000). As wild pear is not a native Irish species, it is likely that the charcoal represents other types encompassed in the Pomoideae group.

#### 5 Summary

Charcoal was identified from three contexts at Moanduff 3. Hazel, pomaceous fruitwood and oak were identified from the samples. The results are dominated by hazel.



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**Table 1 Charcoal identification details from Moanduff 3**

Context number	Cut number	Sample number	Flot weight (g)	Context description	Wood taxon	No. of fragments	Charcoal weight (grams)	Size of fragments (mm)	No. of growth rings	Growth	Weakly or strongly curved rings	Insect holes	Tyloses	Comment
8	9	2	47.1	Pit fill	Corylus avellana (hazel)	45	2.46	5-10	5-8	medium	strongly curved			
8	9	2	47.1	Pit fill	Maloideae spp. (pomaceous)	3	0.82	5-10	5-6					
27	28	3	1	Pit fill	Corylus avellana (hazel)	1	0.26	5	4	medium				Bad preservation
37	38	5	1.6	Stakehole fill	Maloideae spp. (pomaceous)	1	0.01	3						
37	38	5	1.6	Stakehole fill	Quercus sp. (oak)	3	0.07	4-6	4					



## **Appendix 2.2 Petrographical Report – Dr Stephen Mandal**

### **Petrographical Report on Stone Samples taken during Archaeological Excavations at Moanduff 3 (E3736), Co. Kilkenny**

**EurGeol Dr Stephen Mandal MIAI PGeo**

## Introduction

This report is based on the macroscopic (hand specimen) examination of stone samples taken during archaeological excavations in advance of the N9/N10 Phase 4b Knocktopher to Powerstown Road Scheme. The purpose of the study was to identify the rock types from which the stone objects were made, to highlight potential sources for them, and to comment on their possible function. It is important to note that macroscopic petrographical studies have been considered of limited value in comparison to microscopic (thin section and geochemical analysis) studies. On the other hand, macroscopic studies provide an excellent preliminary assessment tool and have proven to be of considerable value in petrographical studies (e.g. see Mandal 1997; Cooney and Mandal 1998).

## Solid Geology and Soils of the Site (see Figure 1; McConnell 1994)

The bedrock under the site consists of crinoidal wackestone/ packstone limestone belonging to the Ballyadams Formation (shown on Figure 1 as BM).

The stratigraphical sequence in the area consists of the following. Gaps in the stratigraphically sequence are represented by line breaks.

### **Carboniferous (Silesian)**

Coolbaun Formation (CQ) – Shale and mudstone with this coals

Moyadd Coal Formation (MC) – Shale, siltstone and minor sandstone

Bregaun Flagstone Formation (BE) – Thick flaggy sandstone and siltstone

Killeshin Silstone Formation (KN) – Muddy siltstone and silty mudstone

Luggacurren Shale Formation (LS) – Mudstone and shale with chert and limestone

### **Carboniferous (Dinantian)**

Clogrenan Formation (CL) – Cherty, muddy calcarenite limestone

Ballyadams Formation (BM) – Crinoidal wackestone/ packstone limestone

Milford Formation (MI) – Peloidal calcarenite limestone

Butlersgrove Formation (BU) – Very dark grey argillaceous limestones

Ballysteen Formation (BA) – Fossiliferous dark-grey muddy limestone

Ballymartin Formation (BT) – Limestone and dark grey calcareous shales

Quinagh Formation (QU) – Lenticular mudstone and coarse siltstone

Porter's Gate Formation (PG) – Sandstones, shales and thin limestones

### **Devonian**

Kiltorean Formation (KT) – Yellow and red sandstones, green mudstones

Carrigmaclea Formation (CI) – Red, brown conglomerates and sandstones

### **Ordovician**

Oaklands Formation (OA) – Green, red-purple, buff shale, siltstone

Maulin Formation (MN) – Dark blue-grey slate, phyllite, schist

### **Igneous Intrusions**

The Tullow Pluton (Tw) – Fine to coarse granites dating to c. 405Ma

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

To the south of the study area occur Ordovician-Devonian Age rocks. The Devonian Age rocks consist of coarse sandstone and conglomerates representing terrestrial sediments resulting from a period of tectonic uplift.

The older, Ordovician Age rocks represent tectonic activity, relating to the closure of the Iapetus Ocean, a major ocean which at its widest was probably greater than 3000km across. These rocks have been metamorphosed to slates, phyllites and schists by the intrusion of the Tullow granite pluton c. 405 million years ago.

Bedrock is not exposed at surface at the site; instead the overburden consists of boulder clay; surface drift from early glaciations. The area is part of a physical region known as the Caledonian province of the south-east. The soils of the area consist of acid brown earths (Aalen et al. 1997).

## Results

Site	Ministerial Direction		NMS Reg.	Sample	Context	Notes		
Moanduff 3	A032/120	AR156	E3736	7	31	Not altered;	Sub-angular to sub-rounded; includes broken pebbles	Sandstone, coarse grained, quartz rich, red/yellow

## Potential Sources

Coarse grained sandstone does not occur in bedrock in the immediate vicinity of the site. The dominant rock type in the area is limestone. Whilst there are minor sandstones within some of the limestone formations, the closest bedrock source for coarse grained yellow / red sandstone is within the Devonian Age Kiltorean Formation (yellow and red sandstones, green mudstones) and Carrigmaclea Formation (red, brown conglomerates and sandstones) (see Figure 1, shown as KT and CI respectively). It is important to note that these rock types were not necessarily sourced from bedrock. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally.

## Discussion

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

A total of 159 samples were examined from the scheme across 33 sites (see Table 2). The samples showed a remarkable consistency across the scheme in terms of the principal rock type utilised; very coarse to medium grained sandstone, typically red to yellow in colour. All samples contained a variation of this type of rock as their principal component. Just under half (73) of the samples are clearly burnt / altered, but this does not rule out the possibility that the stone from other samples had been burnt. All bar one (a sample from Kellymount 5 (E3858:43:156)) contained angular pieces of stone, and 122 (77%) also contained sub-rounded to rounded pieces. A total of 63 of the samples contained pebbles and / or cobbles, in most cases broken. Five of the samples contained minor amounts of limestone as a secondary rock type to sandstone.

Site	Licence			No.	Burnt	Angular	Rounded	Pebbles	Limestone
Kilree 1	A032/107	AR091	E3728	1	0	1	0	0	0
Dunbell Big 2	A032/130	AR095	E3853	1	1	1	1	0	0
Holdenstown 4	A032/101	AR100	E3682	7	7	7	7	0	0
Rathcash 1	A032/133	AR102	E3859	3	0	3	3	3	0
Rathcash 2	A032/134	AR103	E3860	12	12	12	12	12	0
Rathcash East 2	A032/136	AR105	E3893	3	0	3	3	0	0
Blanchvillespark 3	A032/140	AR109	E3913	3	0	3	3	3	0
Blanchvillespark 4	A032/141	AR110	E3914	3	3	3	0	0	0
Ballyquirk 1	A032/143	AR112	E3863	1	1	1	1	0	0
Ballyquirk 2	A032/144	AR113	E3864	5	5	5	1	0	0
Ballinvally 1	A032/146	AR115	E3836	1	0	1	1	0	0
Garryduff 1	A032/147	AR116	E3852	4	0	4	0	0	0
Jordanstown 2	A032/151	AR120	E3851	4	4	4	0	0	0
Kellymount 6	A032/122	AR121	E3758	3	3	3	3	0	0
Jordanstown 3	A032/152	AR122	E3916	2	2	2	2	2	0
Kellymount 2	A032/111	AR124	E3757	11	4	11	11	9	1
Kellymount 3	A032/112	AR125	E3856	13	2	13	2	0	1
Kellymount 5	A032/114	AR127	E3858	27	10	26	24	21	3
Shankill 4	A032/153	AR130	E3838	5	1	5	4	0	0
Shankill 5	A032/154	AR131	E3850	2	1	2	1	0	0
Moanmore 1	A032/156	AR133	E3835	6	1	6	1	0	0
Moanmore 2	A032/157	AR134	E3843	2	0	2	2	0	0
Bannagagole 1	A032/159	AR136	E3844	3	2	3	3	3	0
Moanduff 1	A032/160	AR137	E3839	7	1	7	7	3	0
Coolnakisha 1	A032/128	AR139	E3768	1	0	1	1	1	0
Cranavonane 1	A032/164	AR141	E3842	2	2	2	2	2	0
Tomard Lower 1	A032/117	AR144	E3733	1	0	1	1	1	0
Paulstown 1	A032/093	AR145	E3642	3	1	3	3	2	0
Rathgarvan or Clifden 1	A032/125	AR147	E3760	1	0	1	1	0	0
Maddockstown 1	A032/126	AR148	E3759	3	3	3	3	0	0
Leggetsra East 1	A032/118	AR154	E3734	1	1	1	1	0	0
Moanduff 3	A032/120	AR156	E3736	1	0	1	1	1	0
Ballyquirk 4	A032/167	AR157	E3848	17	6	17	17	0	0
<b>Grand Total :</b>				<b>159</b>	<b>73</b>	<b>158</b>	<b>122</b>	<b>63</b>	<b>5</b>

Table 2. Results of petrographical analysis of stone samples from the N9/N10 Phase 4b Road Scheme

Coarse grained sandstone is typical of *fulacht fiadh* material (e.g. see Mandal 2004). The use of angular and rounded pieces is interesting. Rounded pieces and / or the use of pebbles / cobbles is clear evidence of the use of secondary sources. Angular pieces are more indicative of the use of bedrock sources, but it is important to note that they could also represent angular blocks occurring in tills.

It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area.

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## Appendix 2.3 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 two-sigma (95.4% probability) level of confidence.

Calibration data set: intcal04.14c

Context	Sample No	Material	Species id/ Weight	Lab	Lab Code	Date Type	Calibrated date ranges	Measured radiocarbon age (BP)	13C/12C Ratio ‰
C8, fill of pit	2	Charcoal	<i>Corylus avellana</i> / 0.31g	QUB	UB 12261	AMS (Std)	1209–1056BC (1 sigma), 1260–1020BC (2 sigma)	2931± 34	- 27.4
C37, fill of stakehole	5	Charcoal	<i>Quercus</i> sp. / 0.1g	QUB	UB 12262	AMS (Std)	1206–1055BC (1 sigma), 1259–1016BC (2 sigma)	2927± 34	-29.3

References for calibration datasets:

PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, PG Blackwell, C Bronk Ramsey, CE Buck, GS Burr, RL Edwards, M Friedrich, PM Grootes, TP Guilderson, I Hajdas, TJ Heaton, AG Hogg, KA Hughen, KF Kaiser, B Kromer, FG McCormac, SW Manning, RW Reimer, DA Richards, JR Southon, S Talamo, CSM Turney, J van der Plicht, CE Weyhenmeyer (2009) Radiocarbon 51:1111–1150.

Comments:

\* This standard deviation (error) includes a lab error multiplier.

\*\* 1 sigma = square root of (sample std. dev.<sup>2</sup> + curve std. dev.<sup>2</sup>)

\*\* 2 sigma = 2 x square root of (sample std. dev.<sup>2</sup> + curve std. dev.<sup>2</sup>)

where <sup>2</sup> = 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.

### APPENDIX 3 LIST OF RMP IN AREA

RMP No	Description
CW011-014	Enclosure
CW015-003	Enclosure
CW015-004	Moated Site

See Figure 2 for location.

## APPENDIX 4 LIST OF SITE NAMES

Site Name	Site Code	E Number	Director	NGR
Baysrath 2	AR055	E3627	Fintan Walsh	251593/137855
Baysrath 3	AR056	E3628	Fintan Walsh	251672/138000
Baysrath 4	AR057	E3629	Fintan Walsh	251515/138280
Danganbeg 1	AR058	E3606	Emma Devine	251462/138754
Danganbeg 2	AR059	E3607	Emma Devine	251397/138939
Danganbeg 3	AR060	E3671	Emma Devine	251430/139245
Danganbeg 4	AR061	E3676	Emma Devine	251401/139372
Knockadrina 1	AR062	E3677	Ed Lyne	251422/139420
Tinvaun 1	AR063	E3678	Ed Lyne	251482/139625
Tinvaun 2	AR064	E3680	James Kyle	251445/139736
Tinvaun 3	AR065	E3608	James Kyle	251501/139832
Tinvaun 4	AR066	E3609	James Kyle	251508/139917
Stonecarthy West 1	AR067	E3610	James Kyle	251538/140023
Knockadrina 2	AR068	E3611	James Kyle	251647/140237
Rathduff 1	AR069	E3612	Ed Lyne	251286/142167
Rathduff Upper 1	AR070	E3613	Ed Lyne	251280/142559
Kellsgrange 1	AR071	E3575	James Kyle	250911/143732
Kellsgrange 2	AR072	E3577	James Kyle	250967/143861
Kellsgrange 3	AR073	E3576	James Kyle	250948/144003
Ennisnag 1	AR074	E3614	Richard Jennings	251416/145690
Ennisnag 2	AR075	E3615	Richard Jennings	251638/146068
Danesfort 12	AR076	E3616	Richard Jennings	251669/146186
Danesfort 13	AR077	E3617	Richard Jennings	251765/146384
Danesfort 2	AR078	E3540	Richard Jennings	251953/146745
Danesfort 4	AR079	E3539	Richard Jennings	251880/147579
Danesfort 3	AR080A	E3542	Richard Jennings	252221/146845
Danesfort 1	AR080B	E3541	Richard Jennings	252267/146707
Croan 1	AR081	E3543	Emma Devine	252280/147332
Danesfort 5	AR082	E3456	Emma Devine	252567/147767
Danesfort 6	AR083	E3538	Emma Devine	252764/147995
Danesfort 7	AR084	E3537	Emma Devine	252878/148099
Danesfort 8	AR085	E3461	Richard Jennings	253020/148246
Danesfort 9	AR086	E3458	Richard Jennings	253089/148345
Danesfort 10	AR087	E3459	Richard Jennings	253229/148414
Danesfort 11	AR088	E3460	Richard Jennings	253245/148462
Rathclogh 1	AR089	E3726	Patricia Lynch	253365/145515
Rathclogh 2	AR090	E3727	Patricia Lynch	253650/148848
Kilree 1	AR091	E3728	Patricia Lynch	254088/149310
Kilree 2	AR092	E3729	Patricia Lynch	254320/149500
Kilree 3	AR093	E3643	Patricia Lynch	254449, 149639
Kilree 4	AR094	E3730	Patricia Lynch	255330/150084
Dunbell Big 2	AR095	E3853	Yvonne Whitty	256684/151066
Holdenstown 1	AR096	E3681	Yvonne Whitty	256737/151253
Holdenstown 2	AR097/98	E3630	Yvonne Whitty	256891/151781
Holdenstown 3	AR099	E3854	Yvonne Whitty	256990/152085
Holdenstown 4	AR100	E3682	Yvonne Whitty	256828/152048
Dunbell Big 1	AR101	E3855	Yvonne Whitty	257034/152315
Rathcash 1	AR102	E3859	Tim Coughlan	258178/154199
Rathcash 2	AR103	E3860	Tim Coughlan	258294/154293
Rathcash East 1	AR104	E3892	Tim Coughlan	259419/154546
Rathcash East 2	AR105	E3893	Tim Coughlan	259555/154566
Rathcash East 3	AR106	E3861	Tim Coughlan	259821/154653
Blanchvillespark 1	AR107	E3894	Richard Jennings	260535/155212
Blanchvillespark 2	AR108	E3895	Tim Coughlan	260637/155449

Site Name	Site Code	E Number	Director	NGR
Blanchvillespark 3	AR109	E3913	Tim Coughlan	260785/155653
Blanchvillespark 4	AR110	E3914	Tim Coughlan	261442/156269
Blanchvillespark / Ballyquirk 1	AR111	E3862	Ruth Elliott	261531/156323
Ballyquirk 1	AR112	E3863	Ruth Elliott	261531/156323
Ballyquirk 2	AR113	E3864	Ruth Elliott	261811/156508
Ballyquirk 3	AR114	E3865	Ruth Elliott	261875/156559
Ballinvally 1	AR115	E3836	Emma Devine	263258/157521
Garryduff 1	AR116	E3852	Emma Devine	263933/157991
Kilmacahill 1	AR117	E3915	Tim Coughlan	264267/158369
Kilmacahill 2	AR118	E3833	Tim Coughlan	264380/158453
Jordanstown 1	AR119	E3834	James Kyle	264546/158643
Jordanstown 2	AR120	E3851	James Kyle	264893/159038
Kellymount 6	AR121	E3758	Przemaslaw Wierbicki	265130,159277
Jordanstown 3	AR122	E3916	Przemaslaw Wierbicki	265103/159227
Kellymount 1	AR123	E3756	Przemaslaw Wierbicki	265250/159397
Kellymount 2	AR124	E3757	Przemaslaw Wierbicki	265164/159463
Kellymount 3	AR125	E3856	Przemaslaw Wierbicki	265338/159597
Kellymount 4	AR126	E3857	Przemaslaw Wierbicki	265412/159803
Kellymount 5	AR127	E3858	Przemaslaw Wierbicki	265530,159977
Shankill 2	AR128	E3738	Richard Jennings	265924/160651.
Shankill 3	AR129	E3737	Richard Jennings	266052/161141
Shankill 4	AR130	E3838	Richard Jennings	266286/161526
Shankill 5	AR131	E3850	Richard Jennings	266374/161730
Shankill 6	AR132	E3840	Richard Jennings	266403/161836
Moanmore 1	AR133	E3835	Richard Jennings	266476/162016
Moanmore 2	AR134	E3843	Sinead Phelan	266756/162866
Moanmore 3	AR135	E3837	Sinead Phelan	266856/163259
Bannagagole 1	AR136	E3844	Sinead Phelan	266942/163569
Moanduff 1	AR137	E3839	Robert Lynch	267261/164397
Coneykeare 1	AR138	E3683	Sinead Phelan	267836/166209
Coolnakisha 1	AR139	E3768	Ellen O'Carroll	268175/167274
Coolnakisha 2	AR140	E3767	Ellen O'Carroll	268306/167559
Cranavonane 1	AR141	E3842	Tim Coughlan	268554/167895
Cranavonane 2	AR142	E3732	Ellen O'Carroll	268830/168154
Cranavonane 3	AR143	E3731	Ellen O'Carroll	269123/168362
Tomard Lower 1	AR144	E3733	Ellen O'Carroll	269349/168496
Paulstown 1	AR145	E3642	Ruth Elliot	265889/158499
Paulstown 2	AR146	E3632	Ruth Elliot	265664/158651
Rathgarvan or Clifden 1	AR147	E3760	Przemaslaw Wierbicki	257026/154123
Maddockstown 1	AR148	E3759	Przemaslaw Wierbicki	256886/154199
Templemartin 3	AR149	E3845	Emma Devine	255095/155200
Templemartin 4	AR150	E3841	Emma Devine	254920/155427
Templemartin 5	AR151	E3846	Emma Devine	254706/155636
Templemartin 1	AR152	E3849	Emma Devine	254504/155826
Templemartin 2	AR153	E3847	Emma Devine	254173/156236
Leggetsraeth East 1	AR154	E3734	Emma Devine	253793/156484
Moanduff 2	AR155	E3735	Sinead Phelan	267470/164887
Moanduff 3	AR156	E3736	Sinead Phelan	267515/164979
Ballyquirk 4	AR157	E3848	Richard Jennings	262596/157025
Shankill 1	AR158	E3766	Przemaslaw Wierbicki	265707/160269
Rathgarvan or Clifden 2	AR159	E3921	Tim Coughlan	257095/154119
Ballynolan 1	AR160	E3755	Sinead Phelan	267714/165597
Rathduff Upper 3	UA2	E3974	Tim Coughlan	250991/143565
Rathduff Bayley	UA4	E4011	Tim Coughlan	251005/143564