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

Ministerial Direction Scheme Reference No.	A032
Registration No.	E3682
Site Name	AR100, Holdenstown 4
Townland	Holdenstown
County	Kilkenny
Excavation Director	Yvonne Whitty
NGR	256828 152048
Chainage	42400–42500

FINAL REPORT

ON BEHALF OF KILKENNY COUNTY COUNCIL

JUNE 2011

IAC Irish Archaeological Consultancy

PROJECT DETAILS

Project	N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown
Ministerial Direction Reference No.	A032
Excavation Registration Number	E3682
Excavation Director	Yvonne Whitty
Senior Archaeologist	Tim Coughlan
Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Kilkenny County Council
Site Name	AR100
Site Type	Burnt mound complex
Townland(s)	Holdenstown 4
Parish	Dunbell
County	Kilkenny
NGR (easting)	256828
NGR (northing)	152048
Chainage	42400–42500
Height OD (m)	57.928
RMP No.	N/A
Excavation Dates	4–12 September 2007
Project Duration	20 March 200 –18 April 2008
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Report By	Yvonne Whitty and Tim Coughlan
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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 AR100, Holdenstown 4 along the proposed N9/N10 Kilcullen 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 Yvonne Whitty under Ministerial Direction A032 and Excavation Registration Number E3682 issued by the DOEHLG in consultation with the National Museum of Ireland for IAC. The fieldwork took place between the 4 and 12 September 2007.

Holdenstown 4 was a burnt spread which measured 21m x 22m. A trough, which had no evidence of a timber lining, and possible working platform was sealed by the burnt spread. Four pits were located around the trough and probably functioned as a windbreak or as a butchering stand connected with the trough activity. To the east of the main spread were four other pits which were filled with burnt mound material.

The primary activity on the site was located in the north-east corner and consisted of a cluster of 3 pits and small spread of burnt mound type material. While the fills of the pits were not obviously associated with burnt mound type activity a quantity of heat shattered stone was identified within them. The precise function of these pits is unknown. It is possible that these features were associated with a burnt mound that survives outside the limits of the CPO.

The main focus of the site was in the south-west corner where a substantial burnt mound deposit was identified sealing a stepped sub-rectangular trough and a number of associated smaller pits. The trough was not lined.

A total of 2 samples were sent for AMS radiocarbon dating. The results of the analysis dated hazel charcoal from the fill C17 of a pit. The 2 sigma calibrated date was 2018–1881BC or early Bronze Age (UBA 13113). The results of the analysis also dated hazel charcoal from the fill C23 of a trough. The 2 sigma calibrated date was 765–420BC or Iron Age (UBA 13114).

Holdenstown 4 is an important site locally as it has identified two phases of activity for which there has been no prior evidence in the immediate area. This expands our knowledge of the settlement of this area through time. While the site will not add significantly in terms of the nature of its features, the dating of the large burnt mound to the Iron Age will be of wider interest in the study of burnt mound sites, which are generally dated to the Bronze Age. The site is also of particular interest on the basis of the potential archaeological sites that may exist in proximity based on the results of the excavation. An early Bronze Age burnt mound may exist beyond the north-east corner of the site. More significant is the possibility that artefacts identified at the early Iron Age burnt mound may indicate that a domestic settlement site of this date exists nearby.

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1 INTRODUCTION

1.1 General

This report presents the results of the archaeological excavation of Holdenstown 4, AR100 (Figure 1), in the townland of Holdenstown undertaken by Yvonne Whitty 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 462m^2 and was first identified during testing carried out in 2007 by Red Tobin (E3361) for IAC Ltd on behalf of the National Roads Authority. Holdenstown 4 was excavated between the 4 and 12 September 2007 with a team of one director, one supervisor and five 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, charred plant remains, bone (burnt and unburnt) 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

The site lay on flat terrain. The surrounding landscape was rolling and nothing was visible on the horizon. To the north there was a small stream running northeast-southwest. The surrounding landscape was arable. Holdenstown 3 was visible *c.* 80m to the west and Holdenstown 2 was located *c*. 180m to the south. Dunbell Big 1 was located *c.* 400m to the north-east. There was a church and graveyard (KK024-02001, 2) located *c.* 150m to the south 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				Light brownish yellow, sandy silty gravel	Natural geology

The subsoil comprised a silty gravel.

2.2 PHASE 2 Early Bronze Age Activity

The Bronze Age remains on site consisted of a group of features which were located in the north-east of the site.

2.2.1 Pit Cluster

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C12	N/A	1.4	1.25	0.15	Dark greyish to black clayey silt	Spread
C14	C15	1.35	1.3	0.36	Mid-grey to black silty sand	Secondary fill of pit
C15	N/A	1.93	1.35	0.41	Oval cut with steep sides	Cut of pit
C16	N/A	1.9	1.25	0.2	Sub-oval cut with gently sloping sides	Cut of pit
C17	C16	1.9	1.25	0.2	Dark grey to black sandy slightly clayey silt	Primary fill of pit
C21	N/A	1.6	1.5+	0.18	Circular cut with gently sloping sides	Cut of pit
C22	C21	1.6	1.5+	0.18	Grey to black clayey silt	Primary fill of pit
C30	C15	1.93	1.35	0.35	Mid-grey to yellow sandy clay	Primary fill of pit

Finds: None

Three pits (C15, C16 and C21) (Figures 4 and 6; Plate 6) and one deposit (C12; Figures 4 and 6) were located in the north-east of the site within a 15m^2 area. The three pits were orientated in an approximate northeast–southwest line. Deposit C12 consisted of burnt mound material and may have originated from a possible burnt mound spread that may have existed outside the C.P.O. or from the burnt mound located to the south-west. The three pits may represent the remains of a temporary structure but probably represent a small pit cluster. The presence of heat shattered stone within the fills, albeit not in large amounts may indicate that there is a contemporary burnt mound surviving outside the limits of the C.P.O.

Charcoal was recovered from the pit fills C14, C17 and C22 during post excavation soil flotation and subsequently identified to species. Fifty hazel (*Corylus avellana*) charcoal fragments were identified from C14. A majority of hazel (*Corylus avellana*) charcoal fragments were also identified from C17, along with smaller amounts of ash (*Fraxinus excelsior*) and cherry (*Prunus* sp.) charcoal fragments. A majority of hazel (*Corylus avellana*) charcoal were also identified from C22, as well as smaller amounts of ash (*Fraxinus excelsior*), oak (*Quercus* sp.), willow (*Salix* sp.) and cherry (*Prunus* sp.) charcoal fragments. Hazel, was the dominant species from these features and may represent the wood of choice being burnt here. Since all three pits contained a relatively similar wood composition, it is likely that they are contemporary, however their exact function is unclear (Lyons, Appendix 2.2).

A sample taken from the fill of pit C21, C22 produced a small amount of evidence for plant remains. The sample contained small amounts of indeterminate cereal grains.

These plant remains were not well preserved and it was not possible to determine which types of cereals were present (Johnson, Appendix 2.3).

A series of 11 bone fragments (4.14g) representing two possible skeletal elements were identified within C14 the primary fill of pit C15. The species was identified as pig (*Sus*). Small fragment size combined with fragmentation and poor preservation meant it was not possible to identify the species of a single charred diaphysis fragment. None of the recovered pig bone fragments displayed evidence of butchery or gnawing (McCarthy, Appendix 2.4).

Burnt bone was recovered from C22 the primary fill of pit C21 and has been identified as a total of two burnt trabecular bone fragments (0.03g) of indeterminate vertebrate. Calcination of the trabecular bone fragments was recognised by an alteration of the bone texture combined with colour change to grey/white (*ibid.*).

One lithic was recovered from C22 and has been identified as flint debitage and most likely dates to the Neolithic or early Bronze Age (Sternke, Appendix 2.1). The suggested dating of the artefacts means that it may represent a residual find from earlier activity in the area.

Stone retrieved from C12, C14, C17 and C22 was analysed and found to be very course to medium grained, quartz rich, red/yellow sandstone. Course 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. 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 (Mandal, Appendix 2.5).

A small fragment (1g) of ash was chosen for AMS dating from C17 and returned a result of 3578±23 (UBA 13113). The 2 Sigma calibrated result for this was 2018–1881BC (QUB, Appendix 2.6) dating this feature to the early Bronze Age period.

2.3 PHASE 3 Early Iron Age Activity

The Iron Age remains on site consisted of burnt mound activity with a burnt spread and trough with other associated features lying under the spread.

2.3.1 Trough

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C8	C24	3.86	2.8	0.3	Dark greyish to black clayey silt and sand	Uppermost fill of trough
C23	C24	2.84	1.7	0.17	Dark greyish to black, sandy to clayey silt	Secondary fill of trough
C24	N/A	3.86	2.8	0.22	Sub-oval cut, stepped W-side, steep E-side	Cut of trough
C27	C24	1.7	1.5	0.05	Light grey sand	Base fill of trough

Finds

Context	Find Number	Material	Period	Description
C22	E3682:22:1	Flint	Neolithic/EBA	Flint debitage

C24 represented a large, sub-oval-shaped trough which was orientated east-west and was filled with deposits that were similar to burnt mound material (Figures 4 and 6; Plates 2, 3 and 5). There was no evidence that the trough was lined. To the west of the main area of the rectangular trough a step was evident on the west side. This

effectively reduced the ground level of a slightly higher ridge of subsoil. This western edge was not as pronounced as the main cut and was more irregular in plan. Its function may have been to provide better access to the trough or to reduce the depth/step of the cut at this western end where the subsoil was slightly raised.

Charcoal was recovered from the trough fill C23 during post excavation soil flotation and subsequently identified to species. Alder (*Alnus glutinous*), willow (*Salix* sp.) and oak (*Quercus* sp.) charcoal fragments were identified. The presence of water-tolerant species alder and willow from *fulachta fiadh* sites would not be an unusual occurrence, especially since these site types were generally located close to waterlogged or marshy areas. A mixed wood assemblage is common place from these sites and has also been recorded from a number of burnt mound sites (Lyons, Appendix 2.2).

Burnt animal bone fragments were recovered from C8, the uppermost fill of the trough. They have been identified as two charred fragments of poorly preserved rib corpus from a small size mammal along with a single calcined bone fragment. Fragmentation combined with small fragment size and poor preservation meant that these were not identifiable to species (McCarthy, Appendix 2.4).

Stone retrieved from C8 and C23 was analysed and found to be very course to medium grained, quartz rich, red/yellow sandstone. Course 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. 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 (Mandal, Appendix 2.5).

A small fragment (0.1g) of ash charcoal was chosen for AMS dating from trough fill C23 and returned a result of 2477±22 (UBA 13114). The 2 Sigma calibrated result for this was 765–420BC (QUB, Appendix 2.6) dating this feature to the early Iron Age period.

2.3.2 Postholes and Pits

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C9	C10	1.56	0.94	0.48	Grey to brown sandy clay with clayey silt	Primary fill of pit
C10	N/A	1.56	0.94	0.48	Oval cut with steep sides	Cut of Pit
C11	N/A	0.3	0.2	0.04	Orange clayey and silty sand	*In situ* burning
C13	C29	1.5	1.18	0.22	Dark greyish to black sandy clay	Fill of pit
C18	C25	1.05	0.8	0.25	Dark greyish to black sandy clay	Fill of pit
C25	N/A	1.05	0.8	0.25	Oval cut with gently sloping sides	Cut of pit
C26	N/A	1.7	1.6	0.3	Circular cut with gently sloping sides	Cut of pit
C28	N/A	0.58	0.4	0.2	Oval cut with gently sloping to steep sides	Cut of posthole
C29	N/A	1.5	1.18	0.22	Sub-oval cut, gently sloping to steep sides	Cut of pit
C33	C26	1.7	1.6	0.3	Dark greyish to black sandy clay	Fill of pit
C34	C28	0.58	0.4	0.2	Dark greyish to black sandy clay	Fill of posthole

Finds: None

Four pits (C10, C25, C26 and C29) and one possible posthole (C28) were all located underneath the burnt mound spread (Figures 4 and 6; Plates 4–5). All five features were located within an area measuring 10m^2. Pits C25, C26 and C29 were aligned in an approximate northeast–southwest orientation. Posthole C28 was located to the

north of pit C10 and to the immediate north-east of trough C24 (see above). The precise function of the features individually and collectively is unknown. They may have been used for storage for dumping waste mound material or they may have had a structural function although no clear plan or layout could be identified. All of the features were filled with material similar to the overlying burnt mound. No further analysis was carried out on these fills.

2.3.3 Burnt Spread

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C3	N/A	21.5+	18+	0.25	Mid-brownish grey sandy silt	Burnt mound
C4	N/A	15+	12+	0.3+	Dark greyish to black sandy clay	Burnt mound
C7	N/A	2.7+	2.7	0.15	Brown, very sandy silt	Natural siltation/burnt mound

Finds

Context	Find Number	Material	Period	Description
C3	E3682:003:1	Sandstone	LBA	Possible quern stone
C3	E3682:003:2	Metal	Modern	Coin
C4	E3682:004:1	Chert	LBA	Possible spindle whorl
C4	E3682:004:2	Sandstone	LBA	Possible spindle whorl
C4	E3682:004:3	Metal		Iron hook

The spread was located to the western side of the site and consisted of three layers: C3, C4 and C7 and sealed several other features including the troughs and pits outlined above (Figures 4 and 5; Plate 1). The primary layer, C7 (2.7m by 0.15m deep), was made up of a combination of burnt mound material (heat-shattered stones and charcoal-rich material) and silting, indicating a possible period of exposure prior to the deposition of layers C3 and C4 above it.

The secondary layer, C4, measured 15m by 12m and was up to 0.3m deep. Above C4, was C3 which represented the top layer of the burnt mound and measured 21.5m by 18m and was up to 0.25m deep.

A coin of probable modern origins and a quern stone were recovered from the upper layer while C4 (the middle layer) yielded two polished stones – one of which may have been a pendant – and an iron hook. The finds may be intrusive given the high water-table in the southwestern corner of the site and the level of truncation seen by the numerous drainage channels across the site.

The lithic was recovered from C3 and has been identified as a possible sandstone quern stone (E3682:3:1) that probably dates to the late Bronze Age but may not be associated with the burnt mound activity on site. Two lithics were recovered from C4 and have been identified as a possible chert spindle whorl (E3682:4:1) and a possible sandstone spindle whorl (E3682:4:2). They most likely date to the late Bronze Age but again may not be associated with the burnt mound activity on site (Sternke, Appendix 2.1).

Charcoal was recovered from the burnt mound material C4 during post excavation soil flotation and subsequently identified to species. Alder (*Alnus glutinous*) and willow (*Salix* sp.) charcoal fragments were identified. The composition of wood species from C4 and C23 was quite similar, which would suggest that derived from the same source and are therefore contemporary. The presence of water-tolerant species alder and willow from *fulachta fiadh* sites would not be an unusual occurrence, especially since these site types were generally located close to waterlogged or marshy areas. A mixed wood assemblage is common place from

these sites and has also been recorded from a number of burnt mound sites (Lyons, Appendix 2.2).

A sample taken from the burnt mound deposit C4 produced a small amount of evidence for plant remains. The sample contained small amounts of indeterminate cereal grains. These plant remains were not well preserved and it was not possible to determine which types of cereals were present (Johnson, Appendix 2.3).

Stone retrieved from C4 was analysed and found to be very course to medium grained, quartz rich, red/yellow sandstone. Course 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. 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 (Mandal, Appendix 2.5).

2.4 PHASE 4 Post-medieval Activity

2.4.1 Field drains

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C5	C6	50+	0.8	0.52+	Yellowish grey, clayey silt	Field drain
C6	N/A	50+	0.8	0.52+	Linear cut with steep sides	Field drain
C19	N/A	20+	1.4	0.5	Linear cut with steep sides	Field drain
C20	C19	20+	1.4	0.5	Grey, sandy gravel	Field drain
C31	C32	0.17+	0.8	0.5	Yellowish grey clay	Field drain
C32	N/A	0.17+	0.8	0.5	Linear cut with steep sides	Field drain

Finds: None

Three modern field drains overlay the archaeological layers of the site: C19, C6 and C32 (Figures 4–6). Drains C19 and C6 were aligned northeast–southwest while C32 was east–west orientated. Drain C19 cut the western edge of pit C21 and drains C6 and C32 cut the burnt mound C3/C4/C7. No finds were retrieved from the excavated sections of any of these features. Portions of other drains were identified within the excavation cutting but were not allocated specific context numbers

2.5 PHASE 5 Topsoil and Ploughsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C1	N/A			0.4	Mid to dark brown sandy clay	Topsoil

Finds: None

The topsoil comprised a sandy clay which was slightly peaty and organic in the southwestern area where the site was wetter.

3 SYNTHESIS

The synthesis presents the combined results of all of the archaeological analysis carried out at Holdenstown 4. 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 Mountnugent 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 140 kilometres long and drains a total catchment of 1572 square kilometers 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 southwest 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 (193 kilometres) 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

Portarlington, Athy, Carlow, and Graiguenamanagh and runs through northern section of the route. It is joined by the River Nore at New Ross. The Maudlin 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 Banagagole. 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. Holdenstown 4 is located in the central landscape area.

3.1.2 The Central Landscape

The central landscape of the route encompasses the environs of the Nore Valley and the hinterland of Kilkenny City. It includes 35 sites discovered during the Phase 4 excavations stretching from Danesfort 1 northeast to Dunbell Big 1 and along the Kilkenny Link Road from Rathgarvan or Clifden 1 west to Leggetsrath East 1. The underlying bedrock of the region is made up of Carboniferous Limestone sands and gravels, Carboniferous Limestone Tills, Shale's and Sandstone Tills. According to the EPA the natural soils of the region consist of Renzinas and Lithosols in areas dominated by underlying bedrock of Carboniferous Limestone sands and gravels. Soil cover consisting of Grey Brown Podzolics and Brown Earths is present in areas of underlying Carboniferous Limestone Tills and Surface Water Gleys and Ground Water Gleys are the soils present where the underlying bedrock is made up of Shale's and Sandstone Tills. This landscape is underlain not only by the Butlersgrove geological formation but also by the Ballyadams formation (thick-bedded calcarenitic wackestone on erosional surfaces). A large number of quarries in the area, some of which produced the distinctive blue 'Kilkenny limestone' that was used to construct the medieval and later city, occur around the city itself and extend southward into the dolomite formations along the Nore around Dunbell (Tietzsch-Tyler, 1994).

The glacial drift around the Kilkenny City hinterland, along the Kilkenny Link Road, comprises sandy (50–60%), gravely clay with a noticeably higher sand content than along the southern plain of the River Nore. As this section crosses existing watercourses, areas of granular deposits and several isolated sand and gravel lenses were noted. The floodplain of the Nore extends *c.* 80m on the western side and *c.* 50m on the eastern side, creating marsh and wet grassland within the immediate area. The nature of the glacial drift and geology, combined with the water sources and floodplains in the area, has resulted in the high quality of the local pastoral and arable agricultural landscape. The topography in this section remains between 50m and 80m OD creating open and expansive views over the confluence of the Nore and Kings Rivers. Mountains are visible on the horizon to the north, east and south–east. Freestone Hill (130m) is located directly to the North and Knocknaguppoge beyond this rises to 334m. Outside the parameters of this landscape lies Brandon Hill (513m) to the south–east and further to the east are the Blackstairs Mountains (735m) and Mount Leinster (795m). The River Nore is the prevailing water course of the region and the River Barrow flows along the margins to the east. The Kings River is located to the south and would have influenced activity in and around this area.

3.1.3 Site Specific Landscape

The site lay on flat terrain. The surrounding landscape was rolling and nothing was visible on the horizon. To the north there was a small stream running northeast-southwest. The surrounding landscape was arable. Holdenstown 3 was visible *c.* 80m to the west and Holdenstown 2 was located *c*. 180m to the south. Dunbell Big 1 was located *c.* 400m to the north-east. There was a church and graveyard (KK024-02001, 2) located *c.* 150m to the south of this site.

3.2 The Archaeological Landscape

As part of the general research relating to sites along the scheme and the specific research relating to Holdenstown 4, 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 Holdenstown 4 has been identified as being Bronze Age and Iron Age in date.

3.2.1 The General Bronze Age Landscape of the Scheme – compiled by Michelle Brick

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 of 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 Central Landscape: Domestic Settlement

The characteristics of the prehistoric settlement landscape change from the peripheral activity located alongside the River Nore floodplains of the southern landscape to a slightly more permanent and defined settlement in the central landscape. The direct domestic settlement evidence, albeit limited, indicates the presence of a Bronze Age community in the locality. As the evidence for peripheral settlement activity including burnt mounds and funeral monuments was also limited, this area may have been dominated by small-scale settlement. The area contained soils amenable to farming and perhaps the area was cultivated, rather than settled. The majority of the evidence was centred upon the Danesfort area which may consequently represent an important focus of activity, perhaps with considerable longevity.

Danesfort 5 was located upslope from a burnt mound site in Croan (unexcavated and not a Recorded Monument) and contained three post-built, circular houses with south-east-facing porches and internal hearths. Structure 1 overlay the remains of postholes, stakeholes and a possible fireplace, which may have represented an earlier structure or shelter. The morphology of these houses, with their regularly spaced postholes, would indicate a middle–late Bronze Age date, as also suggested by middle to late Bronze Age pottery. At Dunbell Big 2 there was a shallow, circular gully with internal postholes, an east-facing entrance (representing a possible structure) and a pit containing middle Bronze Age domestic pottery. A small lithic assemblage, including a convex end scraper, flake and debitage, came from Holdenstown 1. Holdenstown 3 also produced sherds from two fine middle Bronze Age domestic vessels.

A major prehistoric complex was identified at Templemartin 5 where settlement, industry and burial continued episodically until the late Bronze Age. The site was situated on the top of a northwest–southeast ridge and overlooked the surrounding countryside of rolling pasture land. At this site a series of six ringditches were recorded, two of which extended beyond the area of excavation and are therefore preserved *in situ*. One of the ringditches (5.2m external diameter) was penannular with a gap of 0.8m in the south-east and an almost-centrally located hearth. The presence of a hearth, with evidence for *in situ* burning, suggests that this 'ringditch'

was the foundation trench for the wall of a structure, rather than a funerary monument. It was post-dated by another ringditch which cut through its western side. Other peripheral and possible settlement activity, in the form of pits, Bronze Age pottery and postholes, was noted at Danesfort 7, 8 and 9, as well as Ennisnag 1.

The Central Landscape; Funerary and Ritual activity

The previously known Bronze Age burial record of this landscape included two prehistoric burials excavated by Cassidy in 1991 at Dunbell Big (Cassidy 1991a and b). There at Ringfort No. 5, a pit containing a badly damaged Bronze Age food vessel was found and the second burial was discovered within a cist. The cist fill was mainly a reddish loam and on its side at its base was an intact food vessel containing and surrounded by burnt bone (*ibid*.). Other significant funerary activity includes the single grave sites of Garrincreen to the west and Grange Lower (Waddell 1990, 103) to the south-east. Bowl burials have also been discovered at Wells, Slyguff and Kilgraney, Co. Carlow, sites that border the eastern margins of this study area.

Ten sites produced evidence for funerary activity in this section of the N9/N10, primarily in the form of ringditches: Danesfort 1, 12 and 13, Kilree 4, Holdenstown 1 and Templemartin 5. However, the Danesfort 12 and 13 ringditches have produced Iron Age dates. The Danesfort 1 ringditch had cremated bone in the middle of its three fills, at opposite sides of the ditch. At Danesfort 6 a deep, flat-bottomed, straight-sided circular pit containing sherds of at least three vase urns and a cremation pit with a marker post were identified. At Danesfort 7 a middle–late Bronze Age flat cemetery was characterised by eight circular pits associated with token cremations. There are also some previously recorded finds from the Danesfort area, in particular a lidded vase that was found in the 19th century. Graves (1860) refers to the discovery of three ‘sepulchral urns’ found in Danesfort by Lady Elizabeth and Captain Wemyss, in the proceedings of the September meeting of the Kilkenny and South East of Ireland Archaeological Society in 1860; two of these are described as rare and highly ornamented. The exact location of these finds has been questioned but excavated evidence of Bronze Age funerary activity in this townland, as a result of the N9/N10, supports the authenticity of the discovery.

At Kilree 4 a double ringditch was located on the edge of the Nore floodplain overlooking a potential crossing point. The fills of both the external and internal ringditch contained charcoal, animal bone and burnt bone. A possible cremation pit was identified and contained a single piece of copper in the middle fill; charcoal, burnt bone and burnt clay were also found in the fills. A funerary complex was identified at Holdenstown 1 and consisted of three ringditches, one of which was badly truncated. The primary phase of one of the small ringditches contained cremated material; this ringditch was later re-used to enclose a small inhumation cemetery. The activity at Holdenstown 1 fits into a wider landscape as the adjacent site of Dunbell Big 2 contained evidence for Bronze Age settlement and Holdenstown 2 also had evidence of prehistoric activity.

Two pits from the multi-phased site Templemartin 5 contained cremations in Grooved Ware vessels. In addition there were six ringditches, at least five of which were later in date than the two cremation pits. These ringditches formed the main concentration of activity probably during the Bronze Age and focused the funerary action on a rise to the north-east of the site, at the edge of a north-south gravel ridge overlooked by Freestone Hill. One was penannular, and its entrance faced the south-east, typical of the Bronze Age period and it pre-dated the other ringditches. It is possible that this represents the slot trench of a structure rather than a funerary monument. Fifteen cremation pits were identified on the site: two of these dated to the late Neolithic. The main focal point of the cemetery was also the highest point of the site and was on the

edge of a ridge overlooking the surrounding countryside, and two of the ringditches and a concentration of Bronze Age cremation pits were located here. Five of the cremation pits had evidence for marker posts/stones and two others had been formally capped or sealed with sterile material. The amount of bone contained in any of the above cremations could only be considered as a token deposit of any individual. Two cremations, Cremations 9 and 11, display evidence of structured deposition and have larger chunks of bone than the others, suggesting these two might be slightly earlier, perhaps middle Bronze Age in date. The rest of the cremations had only very small pieces of bone which suggests that they were more intensely processed: perhaps more indicative of a late Bronze Age date. Possible pyre remains were represented by deposits located to the south of the main concentration of cremations

The Central Landscape; Burnt mounds

Only seven sites with evidence of burnt mound activity were uncovered within the central landscape. Two of the three Danesfort sites were located close together (Danesfort 10 and 11) and a further two sites were also located in proximity to each other (Rathgarvan or Clifden 1 and Maddockstown 1). Burnt mound activity discovered at Danesfort 2 was situated on the southern slopes of a small valley near the Ennisnag tributary of the King's River in the southern end of this landscape. Holdenstown 4 was not located close to any other burnt mounds however it was situated on flat terrain with good visibility southwards to Holdenstown 3. Rathgarvan or Clifden 1 and Maddockstown 1 were located on flat, wet grassland. Rathgarvan or Clifden 1 had evidence for natural springs and a waterhole which would have supplied water on-site. The River Nore meanders NNW–SSE to the south-east of both these sites. Burnt mound activity was also excavated at Leggetsrath East 1 which was located on the eastern edge of the floodplain of a small river/stream. This site was also on marginal land but was surrounded to the north and south by well-drained pastureland. Other burnt mound sites recorded in the vicinity include those at Bishopslough West (KK024-037, 38), Maddockstown (KK020-052), Rathcash West (KK020-077, 78) and Cloghoge (KK020-039, 075, 76).

The Central Landscape; Route-ways and Communications

It is evident that the Nore, Dinin (and its tributary the Douglas) provided the landscape links within the extensive late Bronze Age settlement distribution to the north of Kilkenny extending from the lowlands up into the uplands of the Castlecomer Plateau. However, beyond this the Nore also leads to the lowland zone in mid-Laois with its core of prehistoric activity, as well as to the sources of the Suir and contact with other major settlement cores at, for example, Cahir and Cashel. To the south the King's River, rising in the Slieveardagh Hills, also provides access to the Suir Valley.

While it is clear that the rivers and streams are a major feature of the settlement networks, the distribution of prehistoric activity shows that other route-ways were functioning at both a local and regional scale. 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 on the eastern side of the Barrow in the Goresbridge area that 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. Additionally 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 Central Landscape; Conclusions

While the central part of the N9/N10 Scheme through the fertile Kilkenny lowlands has produced some Bronze Age archaeology, particularly in the Danesfort and Ennisnag areas, this low level of activity reflects the known site distribution patterns.

This picture provides an interesting contrast with the dense settlement in the early medieval and medieval periods but it is probably significant that the two nodes of Bronze Age settlement identified are in slightly more elevated terrain overlooking the Nore and King's Rivers. More significant in this study area is the rich array of Bronze Age funerary activity uncovered along this portion of the N9/N10 route.

3.2.2 The General Iron Age Landscape of the Scheme – compiled by Michelle Brick

As with wider settlement patterns in Ireland, direct evidence for Iron Age (800BC–AD400) domestic habitation was not identified, although several furnaces, kilns and ringditches date to this period and attest to an Iron Age presence in the area. It is possible that some smaller Iron Age ringditches were in fact structural, rather than funerary. Evidence for Iron Age domestic settlement activity remains indirect and peripheral in Kilkenny and Carlow, and in Ireland as a whole.

The Southern Landscape

Direct evidence of Iron Age activity in the southern landscape of the N9/N10 Phase 4 is limited. There is a marked absence of hillforts from south Kilkenny but this does not necessarily infer absence of settlement (Gibbons 1990, 20). A small number of features produced Iron Age dates in this landscape as a result of the N9/N10 Phase 4 excavations. A posthole dating to this period (165BC–AD16; UBA 10984) was excavated at Baysrath 2, and belongs to a possible structure indicating potential domestic settlement in the region. At Tinvaun 2 a possible hut structure was identified which consisted of four truncated slot-trench-like pits, a posthole and a shallow, roughly central pit in the interior of the area. Dates returned for this possible structure have indicated that it was in use during the Iron Age period (AD5–124; UBA 12169). There was also some metalworking activity on site and this structure may have been associated with it. Further to this, a posthole and a hearth excavated at Danganbeg 1 also dated to the Iron Age (762–416BC and 41BC–AD55; UBA 14025 and UBA 14024 respectively). No funerary features belonging to the Iron Age were excavated as part of the present Phase 4 in the southern landscape. However, some metal working activity in the form of slag pits/furnaces and funerary activity in the form of a ringditch has been excavated at Baysrath directly to the south of the present excavations and have been dated to the Iron Age period (Channing 2007). Three circular structures excavated at this site have also been dated to this period (AD60–131, AD25–128 and 88BC–AD53; UBA 10684, UBA 10685 and UBA 10691 respectively) indicating a strong Iron Age presence in this area (*ibid.).* A ditch dating to the Iron Age (39BC–AD74; UBA 10993) was excavated at Tinvaun 1; burnt mound activity associated with the Bronze Age was also excavated at this site and this ditch relates to a later phase of activity at the site. At Knockadrina 2 (51BC–AD78; UBA 12178) an Iron Age furnace was excavated and at Stonecarthy West 1 a possible trough also yielded an Iron Age date (771–539BC; UBA 12174), however other features associated with a burnt mound on the site returned Bronze Age dates.

The Central Landscape

As with the southern landscape there is no direct evidence for Iron Age settlement although there are many early medieval RMP sites in this area, the majority of which are ringforts and enclosure sites, such as the ringforts recorded at Woolengrange (KK024-079 and KK024-082) and the enclosures at Carran (KK024-021001 and 2) . Iron Age activity in the county is represented by the Hillfort at Freestone Hill where a defensive hillfort and inner enclosure (KK020-018002) was built encircling the hill-top (Gibbons 1990, 18), re-using the site of an earlier burial cairn (KK020-018001). The site was then re-occupied *c.* AD300 (Raftery 1969). Another possible Iron Age hillfort is located at Cotterallsrath located to the west of the southern end of this central landscape. Directly to the north-east of this site and located four miles south of

Kilkenny City are the remains of a linear earthwork at Grevine West (Gibbons 1990, 20), also indicating an Iron Age presence in the region. Additionally, excavations were carried out at two ringforts in the townland of Dunbell; Dunbell 6 in 1972 and Dunbell 5 (KK024-010) in 1990 (Foley 1974; 2006; Cassidy 1991). The ringfort settlement at Dunbell 5 in particular produced dates from the Bronze Age to the eighth–10th centuries AD including evidence of Iron Age occupation.

Two clusters of Iron Age activity were noted from the N9/N10 excavations within the central landscape, at Danesfort and at Kilree and Holdenstown. These sites exhibited evidence for funerary activity and no evidence for domestic settlement was uncovered within this central landscape. At Danesfort 13 the primary fill of a ringditch returned a radiocarbon date of 503–384BC (UBA 10999) and was considered to be associated with two similar ringditches excavated at the neighbouring site of Danesfort 12. A fine glass bead found within a pit at Danesfort 13 also indicated that Iron Age activity continued in the Danesfort area, confirming the longevity of Danesfort as a focus for prehistoric funerary activity and although the area continued to be occupied in the early medieval period the focus then shifted towards settlement. Iron Age activity was excavated at Kilree 4, a site which contained a probable token cremation burial within a double ringditch (171BC–AD4; UBA 15563), which was located on flat, gravely ground that overlooked the River Nore and its floodplain. At Holdenstown 1, three ringditches of Iron Age date were excavated. The largest was penannular in plan and had an undug, east-facing causeway. The two best preserved ringditches had evidence of re-cutting which may have been a symbolic act of redefining the burial monument. The primary phase has been interpreted as representing funerary feasting while the secondary phase consisted of burial dating to the early medieval period. Both ringditches were subsequently re-cut and were backfilled with material which included burnt bone, charcoal, seeds, and animal bone. The quantity of cremated bone is indicative of token cremation mixed with pyre debris. Although Ringditch 3 was heavily truncated, it also contained evidence of token cremation. The evidence thus far is indicative of burial potentially in the Iron Age and the site was later re-used as an inhumation cemetery known as a *ferta*, during the early medieval period. A shallow, northeast-southwest linear ditch spanned the entire width of the site at Holdenstown 1. The precise function of this ditch is unknown; however, its length and the fact that no return was identified suggest that it may have been a boundary ditch. It is possible that it is broadly contemporary with the burials within Ringditch 2, as these burials followed the same alignment of this ditch and there was no truncation. The ditch has been dated to the Iron Age period (160BC–18AD; UBA 15403). It is then possible that the burials associated with Ringditch 2 and with this ditch were placed either inside or outside the boundary; both of which suggests significant symbolism.

In Danesfort 12 a furnace had evidence of reddened sides and a burnt and blackened rim but the base was not scorched. The fills contained large quantities of charcoal and slag. It is possible that this activity was contemporary with the Iron Age funerary activity recorded on site. Metallurgical activity was also recorded at Danesfort 13 and included two smelting furnace pits, a metalled surface, three waste pits, and an occupation deposit. This activity may also have been contemporary with Iron Age funerary activity also recorded on site. At the multi-period site of Danesfort 5 a metalworking area was identified and included several pits and deposits. Of these pits one returned an Iron Age date of 786–543BC (UBA 12192). A kiln excavated at Danesfort 5 also produced Iron Age dates ranging between 169BC and AD50, (UBA 12189–91). Other features at this site were dated to the late Bronze Age period and the Iron Age activity may indicate a continuity of settlement at the site. At Holdenstown 2 a total of five kilns were identified with one dating to AD21–203 (UBA 13111). Both Danesfort 2 and Holdenstown 4 returned Iron Age dates from features

associated with burnt mound activity (744–407BC; UBA 11000, 765–420BC; UBA 13114).

The Northern Landscape

The northern landscape of the N9/N10 Phase 4 also contained Iron Age evidence. The aforementioned Freestone Hill (KK020-018) is located directly to the south of this landscape and two additional hillforts can also be located in the north of the county. Clomantagh (KK008-124002) overlooks Johnstown in north-west Kilkenny and similar to Freestone Hill, the site was originally used in the Bronze Age as a funerary complex (Gibbons 1990, 18). A linear earthwork has also been recorded at Woodsgift (Gibbons 1990, 20) and is located directly to the south of this site. The other possible hillfort in the region is recorded at Tooremore or Carndubh to the east (*ibid*.). This hillfort which is not shown on the Ordnance Survey maps is situated on Corrandhu Hill, two miles east of Ballyragget, straddling the townland boundary between Toore More and Donaghmore (Condit and Gibbons 1988, 49). Further to these, located along the Kilkenny-Carlow border is a linear earthwork known as the Rathduff Trench (KK026-006). It ran for over three miles from the River Barrow at Duninga, in a north westerly direction to the foothills of the Castlecomer plateau above Shankill (Gibbons 1990, 20). A portion of this linear earthwork was excavated at Shankill 1 and consisted of a U shaped bank with a ditch.

Excavations in the northern landscape of the N9/N10 produced a small amount of domestic settlement evidence. The fill of a stakehole associated with a possible structure at Moanduff 1 produced an Iron Age date of AD215–376 (UBA 13124); the site also had evidence of occupation in the Bronze Age which implies that the site may have been used throughout both periods. Radiocarbon dating for Rathcash East 1 also indicates use of the site during the Iron Age period. The excavated features included a possible structure that may be inferred as a ringditch as a result of the middle Iron Age date retrieved from its fill (38BC–AD73; UBA 12221) and an associated rubbish pit (37BC–AD123; UBA 12220). Excavations in the northern landscape of the N9/N10 did not produce any evidence for Iron Age funerary activity. However ephemeral Iron Age activity was discovered at a number of sites in the form of metal working and burnt mound activity. At Rathcash East 3 a large keyhole-shaped furnace that dated to the Iron Age (160BC–AD0; UBA 14032), aligned northeast-southwest was excavated along with seven bowl furnaces, aligned north-south in two adjacent rows. The furnace had 18 fills, with the majority containing significant amounts of charcoal and frequent slag. Many of the bowl furnaces contained charcoal, burnt clay and slag. The smaller furnaces were arranged in two parallel lines; aligned north-south and one has been dated to 362–200BC (UBA 14033). A kiln and pit excavated at Cranavonane 3 have been dated to AD104–AD50 (UBA 12251) and 341–54BC (UBA 12252) respectively. In addition to these features a pit excavated at Jordanstown 1 returned a date of 382–206BC (UBA 12233) and a pit at the multi-period site of Moanduff 2 retrieved a date of AD140–385 (UBA 12260). Features associated with burnt mound activity dating to this period were excavated at Rathcash 2 where the fill of a trough dated to 344–55BC (UBA 12219) and at Kellymount 2, where a waterhole has been dated to AD236–380 (UBA 14041). The fill of a trough at Kellymount 3 also returned a date of 751–409BC (UBA 14043).

Conclusion

The presence of the Iron Age ringditches along the N9/N10 Phase 4 and the number of sites displaying industrial activity dating to this period confirm the presence of an Iron Age community in the region. The possible structure at Rathcash East 1 may also be indicative of an Iron Age settlement site, further demonstrating Iron Age activity in the locality. The presence of three hillforts in north Kilkenny suggests that it was an area of considerable importance during this period (Condit and Gibbons 1988,

52). The lack of excavated domestic settlements along the route is not indicative of a sparse population at the time rather they were not located along the corridor of the N9/N10 route-way and have yet to be discovered.

3.2.3 The Site Specific Archaeological Landscape of Holdenstown 4

A number of recorded monuments are located in the vicinity of Holdenstown 4. A church site and graveyard (KK024-020) are located 100m to the south and an enclosure site (KK020-053) is located 400m to the north-west. Further to the north, (750m away) a ringfort (KK020-054) is recorded. Three additional enclosure sites are also recorded; 800m to the north-west (KK020-051), 620m to the north-east (KK024-013) and 700m to the east (KK024-012) of Holdenstown 4. A ringfort (KK024-014) is also recorded 850m to the south-west.

Burnt mound activity was excavated at Holdenstown 4 and dates returned for this activity indicate the site was in use in the early Bronze Age period and the early Iron Age period, suggesting the site experienced multiple phases of use throughout prehistory. Some sites were excavated in close proximity to Holdenstown 4, as part of the N9/N10 Phase 4: Knocktopher to Powerstown works. To the east Holdenstown 3 is located 100m away, where late Neolithic/early Bronze Age activity in the form of eight pits/postholes was excavated. The next excavated site of archaeological significance was located *c*. 2km to the north at Rathgarvan or Clifden 1. A burnt mound complex containing two burnt mounds and associated features dating to the early Bronze Age period were excavated at this site.

There were a number of sites excavated to the south of Holdenstown 4, as part of the N9/N10 Phase 4: Knocktopher to Powerstown works. At Holdenstown 2, located 200m to the south, a multi phased site was identified where prehistoric working areas, an early medieval burial ground, five kilns, pits and associated features were excavated. At Holdenstown 1, located 700m to the south, an Iron Age and early medieval funerary complex was uncovered consisting of ringditches, linear boundaries and enclosures. Further to the south, a possible structure and associated activity dating to the middle Bronze Age was also recorded at Dunbell Big 2, located 950m away.

3.3 Typological Background of Burnt Mounds

Burnt mound sites (also commonly referred to as *fulacht 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 mounds sites were used as cooking sites. O'Kelly (1954) and Lawless (1990) have demonstrated how joints of meat could be efficiently cooked in trough of boiling water. The use of burnt mound sites for bathing or as saunas has been suggested as an alternative function (Lucas 1965, Barfield and Hodder 1987, O' Drisceoil 1988). This proposal is largely influenced by references in the early Irish literature to sites of a similar character and is very difficult to prove, or disprove. Others, such as Jeffrey (1991), argue that they may have been centres of textile production for the fulling or dyeing of cloth. More recent demonstrations by Quinn and Moore (2007) have shown that troughs could have been used for brewing, however, this theory has been criticised by leading Irish environmentalists due to the absence of cereal remains from most burnt mound sites (McClatchie *et al*. 2007).

3.4 Summary of the Excavation Results

The primary activity on the site was located in the north-east corner and consisted of a cluster of 3 pits and small spread of burnt mound type material. While the fills of the pits were not obviously associated with burnt mound type activity a quantity of heat shattered stone was identified within them. The precise function of these pits is unknown. It is possible that these features were associated with a burnt mound that survives outside the limits of the CPO.

The main focus of the site was in the south-west corner where a substantial burnt mound deposit was identified sealing a stepped sub-rectangular trough and a number of associated smaller pits. The trough was not lined.

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.

Lithics analysis

The lithic finds from the archaeological investigations at Holdenstown 4, Co. Kilkenny are a piece of flint debitage, a possible quern stone and two possible spindle whorls.
The macro tools in the assemblage are typologically diagnostic and most likely date to the late Bronze Age. The piece of flint debitage probably dates to the final Neolithic or early Bronze Age and is the only artefact associated directly with the use of the *fulacht fiadh* at this site.

Charcoal and Wood Species identification
The charcoal fragments from C4 (fill of burnt mound), C14 (fill of pit C15), C17 (fill of pit C16), C22 (fill of pit C21) and C23 (fill of trough C24) were selected for charcoal analysis.

The mixed charcoal assemblage of alder, willow and oak from burnt mound deposits C4 and C23 are not uncommon taxa recorded from these site types. The composition of wood species (hazel, oak, cherry-type, ash and alder) from pits C15, C16 an C21 is quite similar, which suggests that these features may have been contemporary and may even contain some re-deposited charred fuel debris from the nearby burnt mound deposits.

Analysis of Plant Remains
A total of two samples from this site contained plant remains: C4 (S1) and C22 (S6). The plant remains were cereals, but these were not well preserved and it was not possible to determine which types of cereals were present.

One of the samples was from the burnt mound (C4) and the find of a cereal grain from this deposit is quite significant, as cereal grains are not often retrieved from burnt mound sites. The second sample, C22, also contained indeterminate cereal grains. This was from the fill of a pit that was located 10.5m north-east of the burnt mound. Because of the distance between deposits, the cereals in this sample may not necessarily be related to the activity at the main burnt mound.

Animal Bone Analysis
A total of 16 animal bone and burnt bone fragments recovered from archaeological contexts on Holdenstown 4 were submitted for examination. The bone samples were assessed and identified to species where possible; a total of 10 bone fragments recovered were identified to the species of pig. Due to size, poor preservation and fragmented nature of the individual bone pieces it was not possible to identify six bone fragments of bone to species. No definite or statistically detailed conclusions could be drawn from the faunal remains and burnt bone assemblage retrieved from Site AR100 Holdenstown 4 due to its limited size and poor degree of bone preservation.

Petrographical analysis
Samples of stone from the burnt mound material identified course grained red sandstone that was quartz rich. Coarse grained sandstone does not occur in bedrock in the immediate vicinity of the site. The dominant rock type in the area is limestone. 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.

Coarse grained sandstone is typical of *fulacht fiadh* material (e.g. see Mandal 2004).
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.

Radiocarbon Dating
A total of two samples were sent for AMS radiocarbon dating.

The results of the analysis dated hazel charcoal from the fill C17 of a pit. The 2 sigma calibrated date was 2018–1881BC (UBA 13113).

The results of the analysis dated hazel charcoal from the fill C23 of a trough. The 2 sigma calibrated date was 765–420BC (UBA 13114).

4 DISCUSSION AND CONCLUSIONS

4.1 Discussion

Two phases of activity were identified at Holdenstown 4 which consisted of a small cluster of pits and a small spread in the north-eastern corner dated to the early Bronze Age and a large burnt mound deposit which sealed a trough and other pits which was dated to the early Iron Age. The physical environment of the site was located adjacent a small stream in a marginal area of an otherwise dry field. This type of marginal location is typical for burnt mound sites which usually require a supply of water to fill a trough. As such, identification of this site type would be expected within this environment.

The identification of two phases of activity on the site was not expected in advance of post-excavation analysis. It was expected that the main mound and the small cluster of pits would be broadly contemporary. The fact that the pit cluster has been dated to the early Bronze Age indicates that it had no direct association with the larger mound, dated to the Iron Age. The presence of heat shattered stone within the fills of the pits in the cluster can not be attributed to ephemeral activity to the main excavated burnt mound site and therefore it must be considered that they could be associated with an as yet undiscovered mound that may survive outside the limits of the CPO at the north-eastern corner of the site. The pits themselves contained little that can be used to interpret any specific function.

The Iron Age burnt mound displayed most of the features traditionally associated with this site type – a trough, smaller pits, a large deposit of heat shattered stone, charcoal and blackened soil. However the dating of this area of the excavation to the Iron Age was not expected as this site type is generally dated to the Bronze Age, although later examples are known. The surrounding archaeological environment shows evidence of activity in the wider area throughout prehistory from the Neolithic onwards however the majority of the surrounding evidence dates to the later Iron Age and early medieval period. There were no sites that were contemporary with either of the dates recorded at Holdenstown 4, and the site therefore has expanded our knowledge of the occupation of the area.

The artefacts identified from the site consist of two possible spindle whorls, a saddle quern, a flint debitage, a modern coin and part of an iron hook. Sternke in her analysis of the assemblage suggests that the piece of flint debitage probably dates to the final Neolithic or early Bronze Age and is the only artefact associated directly with the use of the *fulacht fiadh* at this site. This assessment was written in advance of radiocarbon dates being returned but ironically the pit cluster has been dated to the early Bronze Age and while the flint is not from one of these contexts there is confirmation of contemporary activity on the site. It is suggested that the macro tools (spindle whorls and quern) may date to the late Bronze Age so it could be expected that these may continue into the early Iron Age. However, the suggestion that these artefacts would not be directly associated with burnt mound sites would imply that they are more likely to be found within a domestic settlement site. Their presence at Holdenstown 4 may therefore indicate that there is an early Iron Age domestic settlement in the vicinity, which would be very significant if identified.

4.2 Conclusions

Holdenstown 4 is an important site locally as it has identified two phases of activity for which there has been no prior evidence in the immediate area. This expands our knowledge of the settlement of this area through time. While the site will not add significantly in terms of the nature of its features, the dating of the large burnt mound to the Iron Age will be of wider interest in the study of burnt mound sites, which are

generally dated to the Bronze Age. The site is also of particular interest on the basis of the potential archaeological sites that may exist in proximity based on the results of the excavation. An early Bronze Age burnt mound may exist beyond the north-east corner of the site. More significant is the possibility that artefacts identified at the early Iron Age burnt mound may indicate that a domestic settlement site of this date exists nearby.

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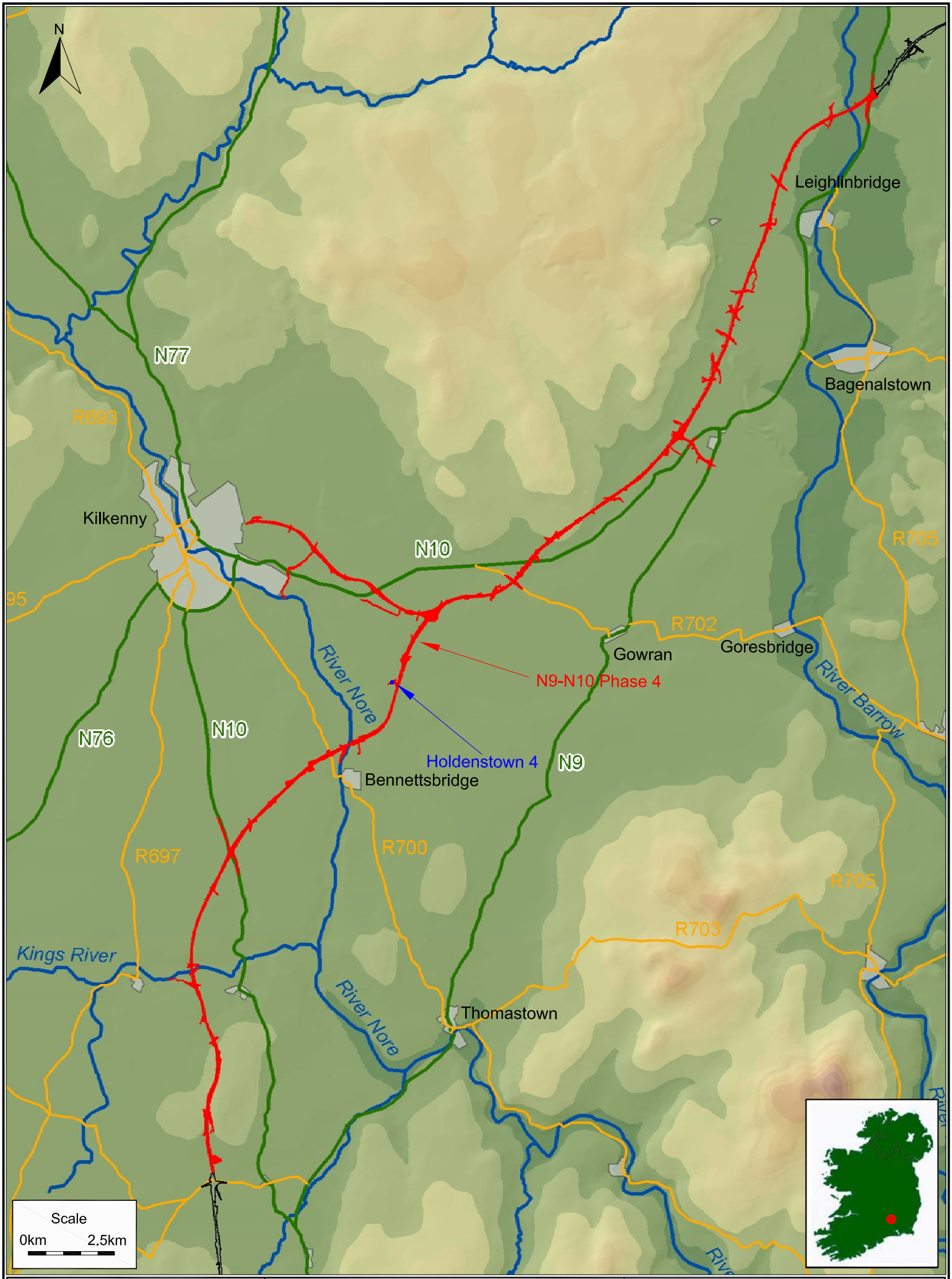

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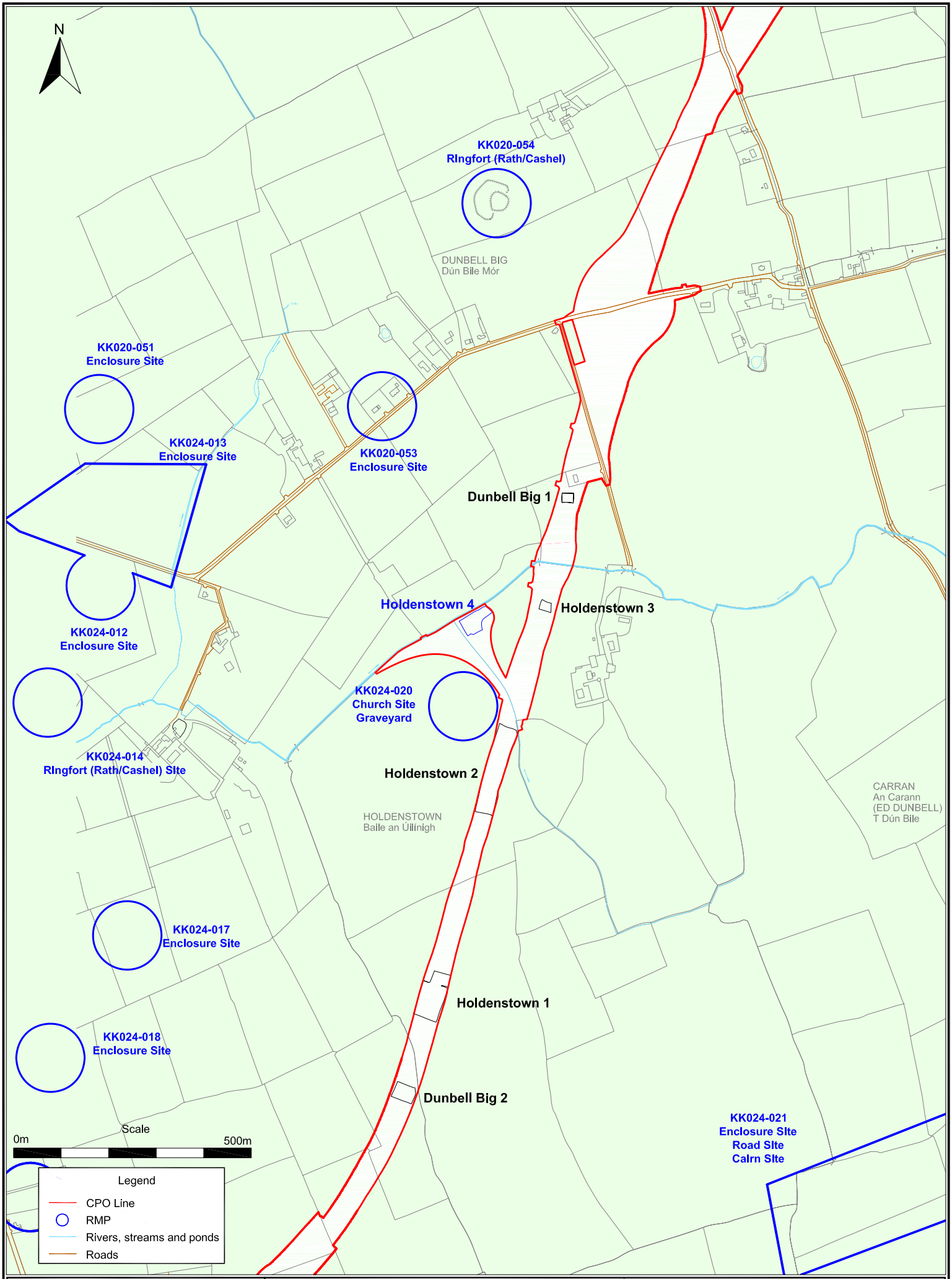

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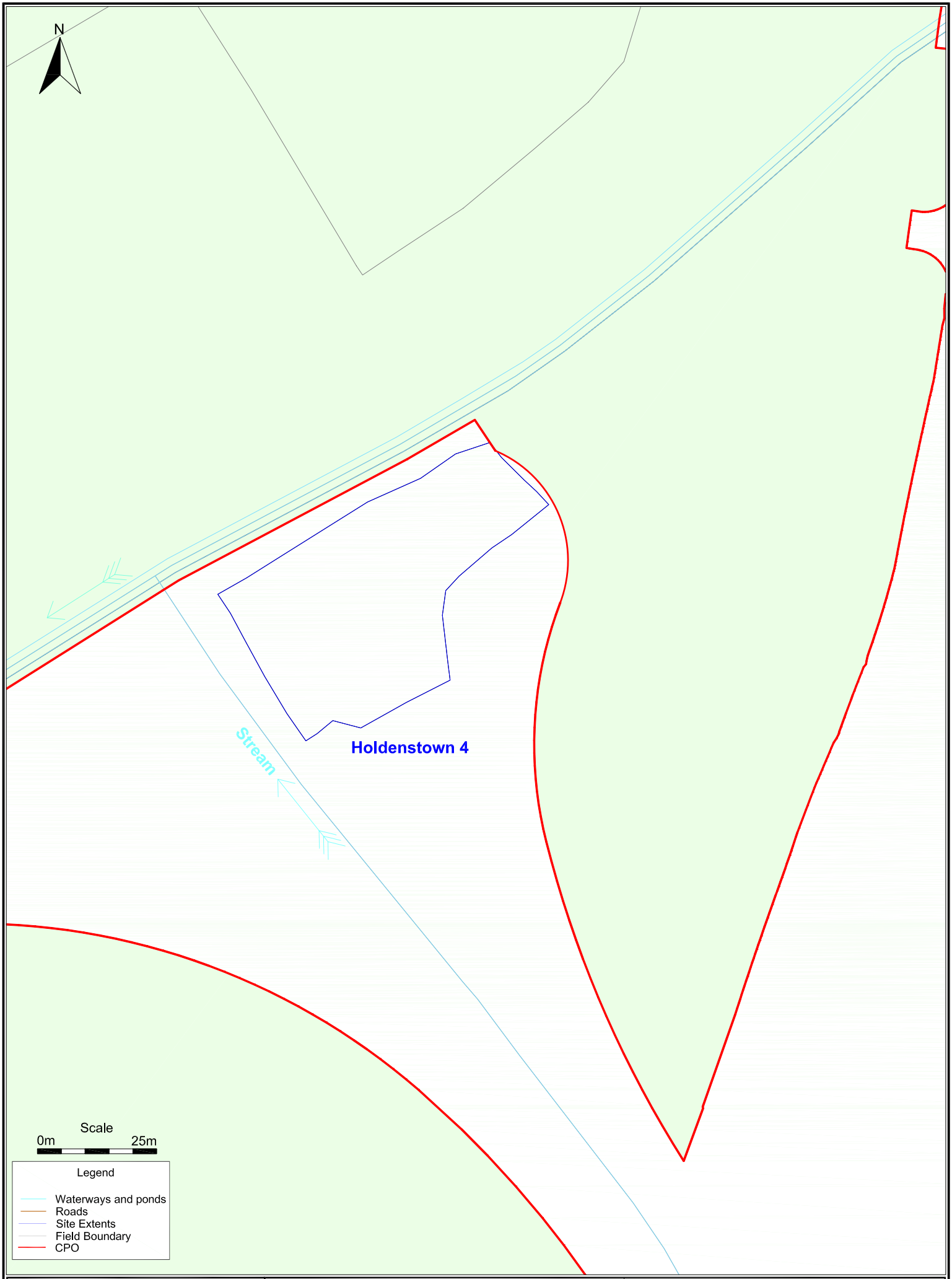

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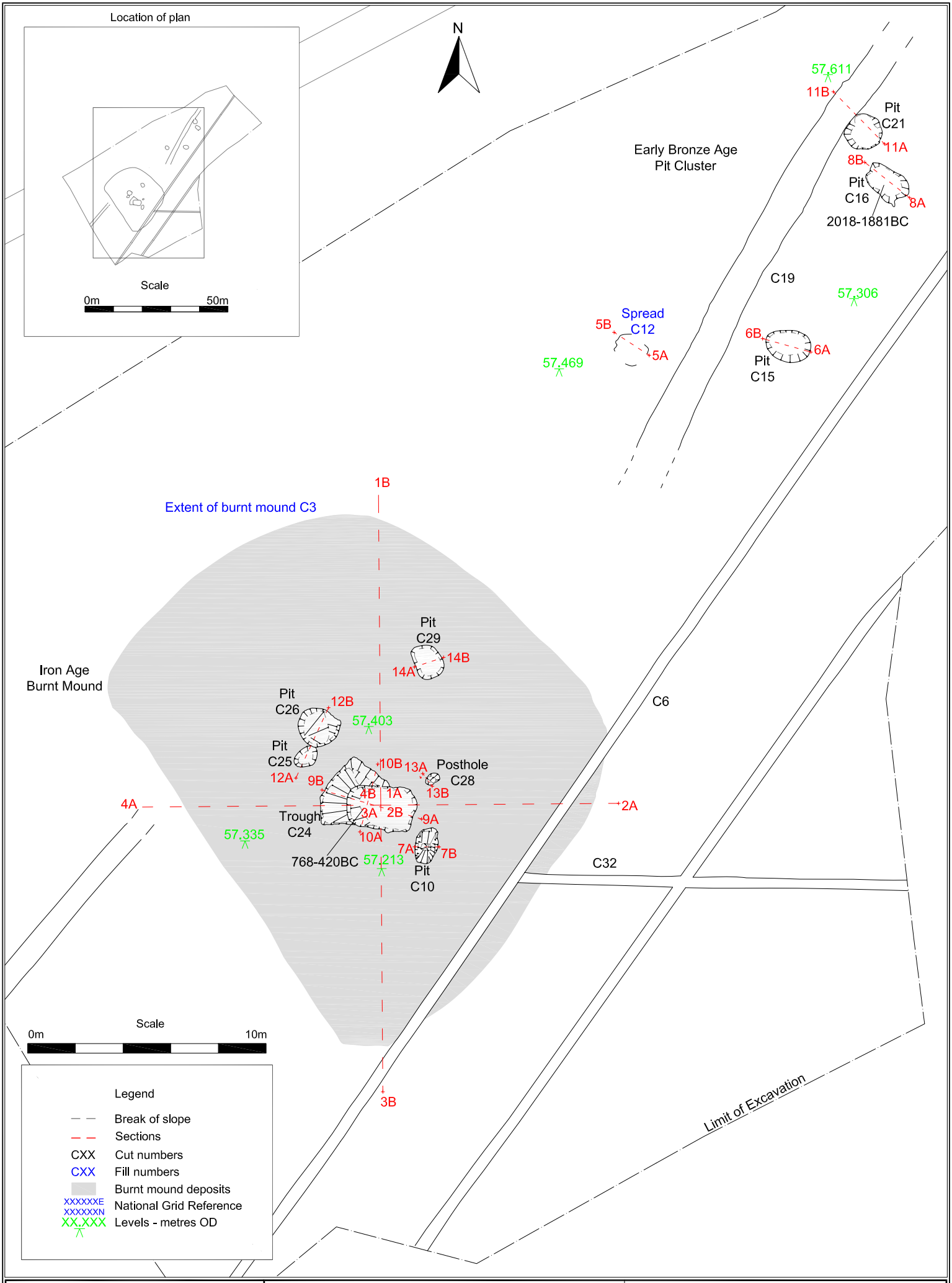

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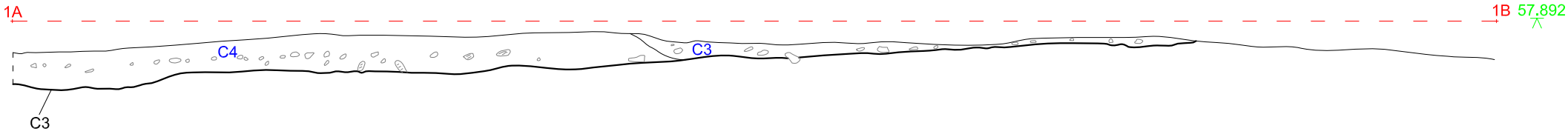
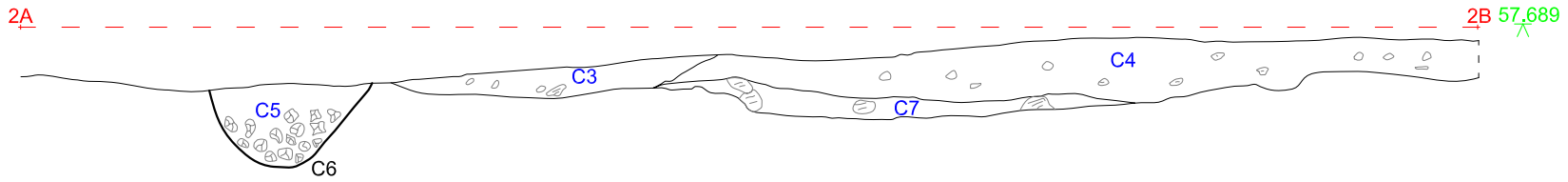
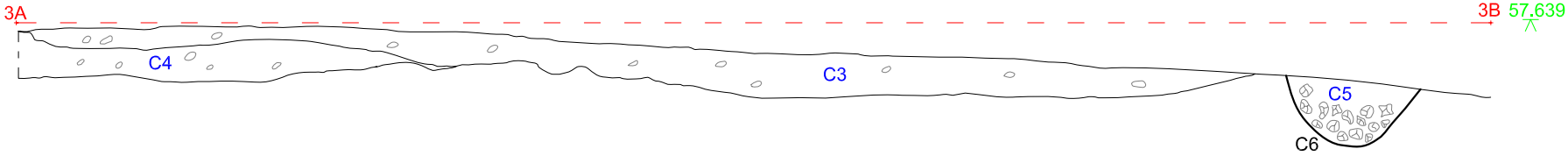


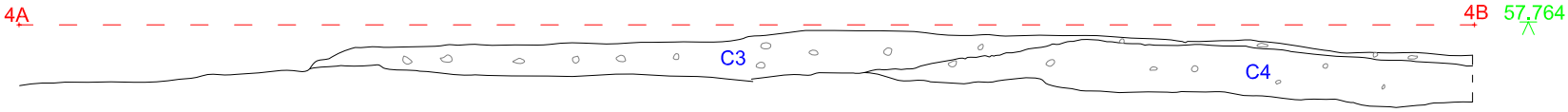
North facing section of C3, C4, C5, C6, C7



West facing section of C3, C4



South facing section of C3, C4



Scale

Legend

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Project:	N9-N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

Scale:	As shown
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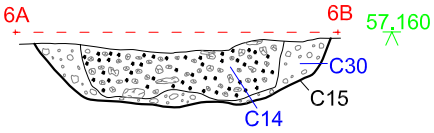
North-east facing section of C12

North-east facing section of C15



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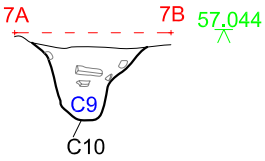

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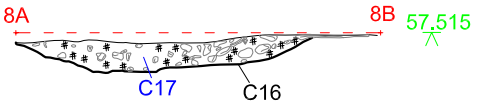

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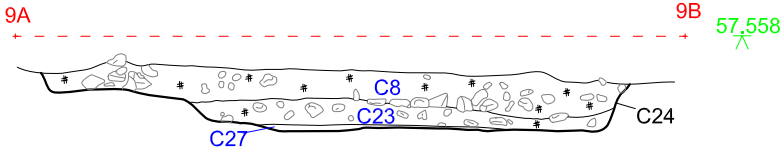

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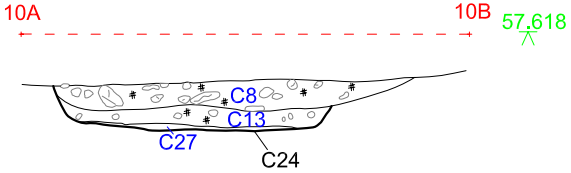
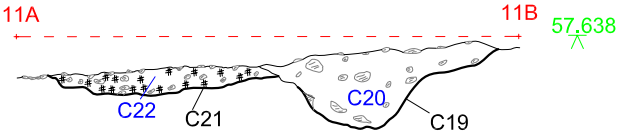
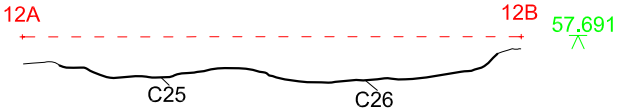


Northeast facing section of C19, C21



Southwest-Northeast profile of C25, C26



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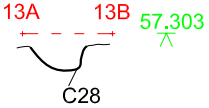

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Scale

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Client:	Kilkenny County Council

Scale:	As shown
Date:	25/06/10
Produced by:	P Higgins
Job No:	J2432
Figure No:	6

PLATES

Plate 1: Burnt mound C3/C4/C7, pre-excavation, facing west

Plate 2: Trough C24, mid-excavation, facing north-east

Plate 3: Trough C24, mid-excavation, facing NNE

Plate 4: Pit C10, mid-excavation, facing NNE

Plate 5: Pits C10, C25, C26, trough C24 and posthole C28, post-excavation, facing south

Plate 6: Pit C16, mid-excavation, facing south-west

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				0.4	Topsoil	C1 was a loose, mid to dark brown sandy clay, which contained occasional stones and rare occurring modern objects.		
C2					Natural geology	C2 was a firm, light brownish yellow sandy silty gravel which contained occasional large stones and frequent amount of medium to small stones.		
C3		21.5+	18+	0.25	Burnt mound	C3 was sub-circular in plan and was a loose, mid brownish grey banded to C4 sandy silt mottled with patches of clay. C3 contained occasional large heat-shattered stones, frequent medium to small heat-shattered stones and charcoal flecks. C3 was cut by C6 and C32.	C6, C19 C32	C4
C4		15+	12+	0.3+	Burnt mound	C4 was sub-circular in plan and a loose, dark greyish to black sandy and slightly silty clay. C4 contained occasional large heat-shattered stones, frequent medium and small heat-shattered stones and frequent flecks of charcoal.	C3	C7, C8, C9, C11, C25, C26, C28, C29
C5	C6	50+	0.8	0.52+	Field drain	C5 was linear in plan and NE-SW oriented. The fill was a firm, mid-yellowish grey clayey silt apart from the base which consisted of stone and silt.	C1	C6
C6		50+	0.8	0.52+	Field drain	C6 was linear in plan and northeast-southwest oriented. The break of slope at the top was sharp. The sides were steep and the break of slope at the base was gentle. The base was concave and linear in plan. C6 was cutting C3.	C5	C3, C22
C7		2.7+	2.7	0.15	Natural siltation/burnt mound	C7 was oval in plan and northeast-southwest oriented. The fill was loose, mid-brown very sandy almost gravely silt which contained frequent medium and small stones.	C4	C2
C8	C24	3.86	2.8	0.3	Uppermost fill of trough	C8 was sub-oval in plan and northwest-southeast oriented The fill was a loose, dark greyish to black clayey silt mottled with sand which contained frequent medium sized, angular shaped, heat-shattered stones.	C4	C23
C9	C10	1.56	0.94	0.48	Primary fill of pit	C9 was oval in plan and north-south oriented. The fill was a quite loose, mottled greenish mid-grey to dark greyish brown sandy clay with clayey silt which contained occasional heat-shattered medium stones, moderate small heat-shattered stones and occasional flecks of charcoal.	C4	C10
C10		1.56	0.94	0.48	Cut of Pit	C10 was oval in plan and north-south oriented without corners. The break of slope at the top of the cut was sharp, the sides were concave and steeply sloped, especially in the northwest-side of the cut where they were very steeply sloped. Seen from the south the break of slope at the base was gentle and the shape of the base was concave. Seen fro the east the shape of the shape of the base was pointed. The shape of the base in plan was sub-oval.	C9	C2
C11		0.3	0.2	0.04	*In situ* burning	C11 was sub-circular in plan. The fill was a firm dark orange clayey and silty sand which contained occasional small stones, flecks and charcoal flecks.	C4	C2

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C12		1.4	1.25	0.15	Spread	C12 was circular in plan. The fill was a loose, dark greyish to black sandy to clayey silt which contained occasional large heat-shattered stones, frequent medium to small heat-shattered stones, rare chunks of charcoal and frequent charcoal flecks.	C1	C2
C13	C29	1.5	1.18	0.22	Fill of pit	C13 was sub-circular in plan and a loose, dark greyish to black sandy and slightly silty clay. C4 contained occasional large heat-shattered stones, frequent medium and small heat-shattered stones and frequent flecks of charcoal.	C1	C29
C14	C15	1.35	1.3	0.36	Primary fill of pit	C14 was sub-circular in plan and north-south oriented. The fill was a loose, mid grey to black silty sand which contained frequent inclusions of medium to small heat-shattered stones and flecks of charcoal.	C1	C30
C15		1.93	1.35	0.41	Cut of pit	C15 was oval in plan. The break of slope at the top was sharp, the south side was steep and the north side was near vertical. The break of slope at the base was gentle. The shape of the base was uneven and circular in plan.	C30	C2
C16		1.9	1.25	0.2	Cut of pit	C16 was sub-oval in plan and northwest-southeast oriented. C16 had rounded corners, the break of slope at the top was gentle, the sides were gently sloping and concave. The break of slope at the base was imperceptible, the base was flat and sub-oval in plan.	C17	C2
C17	C16	1.9	1.25	0.2	Primary fill of pit	C17 was sub-oval in plan and northwest-southeast oriented. The fill was a loose, dark grey to black sandy slightly clayey silt which contained frequent medium sized heat-shattered stones and occasional flecks of charcoal.	C1	C16
C18	C25	1.05	0.8	0.25	Fill of pit	C18 was sub-circular in plan and a loose, dark greyish to black sandy and slightly silty clay. C4 contained occasional large heat-shattered stones, frequent medium and small heat-shattered stones and frequent flecks of charcoal.	C1	C25
C19		20+	1.4	0.5	Field drain	C19 was linear in plan and north-south oriented without corners. The break of slope at the top was sharp in the east-side and gentle in the west-side. The sides were concave and steep, the break of slope at the base was sharp. The base was flat and linear in plan. C19 was cutting C21 and C22.	C20	C3, C22
C20	C19	20+	1.4	0.5	Field drain	C20 was linear in plan and north-south oriented. The fill was a loose, grey sandy gravel which contained occasional small to medium stones and bone fragments.	C1	C19
C21		1.6	1.5+	0.18	Cut of pit	C21 was circular in plan, the break of slope at the top was gentle, the sides were gently sloping and the break of slope at the base was gentle. The base was flat and circular in plan. C21 was cut by C19.	C22	C2
C22	C21	1.6	1.5+	0.18	Primary fill of pit	C22 was circular in plan and was a firm, grey to black clayey silt which contained a frequent amount of medium sized heat-shattered stones and charcoal flecks. C22 was cut by C19.	C19	C21
C23	C24	2.84	1.7	0.17	Secondary fill of trough	C23 was sub oval in plan and northwest-southeast oriented. The fill was a loose, dark greyish to black sandy to clayey silt which contained frequent medium sized stones.	C8	C27
C24		3.86	2.8	0.22	Cut of trough	C24 was sub-oval in plan and northwest-southeast oriented. C24 had rounded corners, the break of slope at the top was sharp, the west-side was gently sloping and stepped. The east-side was steep. The break of slope at the base was gentle, the base was flat and sub-oval in plan.	C27	C2

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C25		1.05	0.8	0.25	Cut of pit	C25 was oval in plan and northeast-southwest oriented without corners. The break of slope at the top was sharp to gentle, the sides were concave and gently sloping. The break of slope at the base was gentle to imperceptible. The base was quite flat and oval in plan.	C4	C2
C26		1.7	1.6	0.3	Cut of pit	C26 was circular in plan, the break of slope at the top was gentle, the sides were concave and gently sloped. The break of slope at the base was gentle to imperceptible. The base was flat and circular in plan.	C4	C2
C27	C24	1.7	1.5	0.05	Base fill of trough	C27 was sub-oval in plan and northeast-southeast oriented. The fill was a loose, light grey sand.	C23	C24
C28		0.58	0.4	0.2	Cut of posthole	C28 was oval in plan and southwest-northeast oriented without corners. The break of slope at the top was sharp except in north-east corner where It was imperceptible, the sides were steep apart from north-east-side which was gently sloping. The break of slope at the base was gentle except in north-east corner where It was imperceptible. The base was flat and circular in plan.	C4	C2
C29		1.5	1.18	0.22	Cut of pit	C29 was sub-oval in plan and was northwest-southeast oriented. The corners were rounded, the break of slope at the top was sharp, the sides were gently sloping to steep and the break of slope at the base was gentle. The base was flat and sub-oval.	C4	C2
C30	C15	1.93	1.35	0.35	Fill of pit	C30 was oval in plan and northwest-southeast oriented. The fill was a mottled loose to compact, mottled mid-grey to yellow sandy clay which contained moderate medium and small stones.	C14	C15
C31	C32	0.17+	0.8	0.5	Field drain	C31 was linear in plan and west-east oriented. The fill was a firm mid-yellowish grey clay apart from the bottom which consisted of stones and silt. C31 contained moderate amount of stones in the bottom and rare flecks of stones at the top.	C1	C32
C32		0.17+	0.8	0.5	Field drain	C32 was linear in plan and west-east oriented. The break of slope at the top was sharp, the sides were steeply sloped and concave. The break of slope at the base was gentle. The base was concave and linear in plan. C32 was cutting C3.	C31	C3, C22
C33	C26	1.7	1.6	0.3	Fill of pit	C33 was sub-circular in plan and a loose, dark greyish to black sandy and slightly silty clay. C4 contained occasional large heat-shattered stones, frequent medium and small heat-shattered stones and frequent flecks of charcoal.	C1	C26
C34	C28	0.58	0.4	0.2	Fill of posthole	C34 was sub-circular in plan and a loose, dark greyish to black sandy and slightly silty clay. C4 contained occasional large heat-shattered stones, frequent medium and small heat-shattered stones and frequent flecks of charcoal.	C1	C28

Appendix 1.2 Catalogue of Artefacts

Registration Number	Context	Item No.	Simple Name	Full Name	Material	Description	No. of Parts
E3682:003:1	3	1	Quern stone	Sandstone quern stone	Sandstone	A possible sandstone quern stone which has a utilised natural (frost-fractured) round depression and a smoothened underside (from movement while the stone rests and is used) and smoothened edges	N/A
E3682:003:2	3	2	Coin	Copper coin	Copper	Modern copper coin	N/A
E3682:004:1	4	1	Spindle whorl	Chert spindle whorl	Chert	A possible half of a spindle whorl which has been knapped into shape but appears to be unfinished. It has a central perforation.	N/A
E3682:004:2	4	2	Spindle whorl	Sandstone spindle whorl	Sandstone	A possible spindle whorl produced on a sandstone pebble which has one polished side and a central round depression. It may either be an unfinished spindle whorl or a netsinker	N/A
E3682:004:3	4	3	Hook	Iron hook	Iron	A large corroded iron hook, both ends of which taper. Section of piece is square in plan	N/A
E3682:22:1	22	1	Debitage	Flint debitage	Flint	Flint debitage	N/A

Appendix 1.3 Catalogue of Ecofacts

During post excavation works specific samples were processed with a view to further analysis. Seven soil samples were taken from features at Holdenstown 4 and were processed by flotation and sieving through a 250µm mesh. The following are the ecofacts recovered from these samples

Context #	Sample #	Feature type i.e. Structure A, hearth C45	charcoal	Seeds & Hazelnut	Animal bone	Burnt animal bone	human bone	Shell	Heat-affected Stone
4	1	Burnt mound	19.4g	0.2g					0.01l
8	5	Upper trough	35.9g		0.1g	<0.1g		0.1g	0.01l
12	2	Spread	45.1g	0.1g					0.01l
14	3	Small pit	220.0g		4.1g				0.01l
17	4	Small pit	268.3g						0.01l
22	6	Small pit	62.0g	0.1g		<0.1g			0.01l
23	7	Lower trough	122.8g					1.0g	0.01l

Appendix 1.4 Archive Index

Project: N9/N10 Phase 4 Knocktopher to Powerstown		
Site Name: AR100 Holdenstown 4		
Excavation Registration Number: E3682		
Site director: Yvonne Whitty		
Date: 09.02.08		
Field Records	**Items (quantity)**	**Comments**
Site drawings (plans)	6	1 pre-ex, 1 mid-ex and 4 post-ex
Site sections, profiles, elevations	3	3 section sheets
Other plans, sketches, etc.	0	
Timber drawings	0	
Stone structural drawings	0	
Site diary/note books	1	
Site registers (folders)	0	
Survey/levels data (origin information)	0	
Context sheets	32	
Wood Sheets	0	
Skeleton Sheets	0	
Worked stone sheets	0	
Digital photographs	44	
Photographs (print)	0	
Photographs (slide)	0	
Security copy of archive	yes	digital

APPENDIX 2 SPECIALIST REPORTS

Appendix 2.1 Lithics Report – Farina Sternke

Lithics Finds Report for E3682 Holdenstown 4 (A032/101), Co. Kilkenny
N9/N10 Road Scheme – Phase 4B
Farina Sternke MA, PHD

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Introduction

A total of four lithic finds from the archaeological investigations of a prehistoric site at Holdenstown 4, Co. Kilkenny were presented for analysis (Table 1). The finds are associated with a *fulacht fiadh* with associated pits.

Find Number	Context	Material	Type	Condition	Cortex	Length (mm)	Width (mm)	Thickness (mm)	Complete	Retouch
E3682:003:1	3	Sandstone	Quern Stone?	Weathered	n/a	246	184	78	Yes	No
E3682:004:1	4	Chert	Spindle Whorl?	Slightly rolled	No	35	21	11	No	No
E3682:004:2	4	Sandstone	Spindle Whorl?	Weathered	n/a	66	34	56	Yes	No
E3682:022:1	22	Flint	Debitage							

Table 1 Composition of the Lithic Assemblage from Holdenstown 4 (E3682)

Methodology

All lithic artefacts are examined visually and catalogued using Microsoft Excel. The following details are recorded for each artefact which measures at least 20mm in length or width: context information, raw material type, artefact type, the presence of cortex, artefact condition, length, with and thickness measurements, fragmentation and the type of retouch (where applicable). The technological criteria recorded are based on the terminology and technology presented in Inizan *et al.* 1999. The general typological and morphological classifications are based on Woodman *et al.* 2006. Struck lithics smaller than 20mm are classed as debitage and not analysed further. The same is done with natural chunks.

Quantification

The lithics are one worked piece of flint, one worked piece of chert and two utilised pieces of sandstone. The chert artefact and the two utilised pieces of stone are larger than 20mm in length and width and were therefore recorded in detail.

Provenance

The lithics were recovered from contexts C3, C4 and C22 (Table 1).

Condition:

The lithics survive in weathered (E3682:003:1 and E3682:004:2) or slightly rolled (E3682:004:1) condition. With the exception of artefact E3682:004:1, all artefacts are complete.

Technology/Morphology:

The assemblage comprises two types of macro tools and one piece of flint debitage (E3682:022:1).

Macro Tools:

The assemblage contains three macro tools which are a possible quern stone (E3682:003:1) and two possible spindle whorls (E3682:004:1 and E3682:004:2).

The possible sandstone quern stone measures 246mm long, 184mm wide and 78mm thick. It has an utilised natural (frost-fractured) round depression and a smoothened underside (from movement while the stone rests and is used) and smoothened edges.

Artefacts E3682:004:1 is a possible half of a spindle whorl made of chert. It measures 35mm in length, 21mm in width and 11mm in thickness. It has been knapped into shape, but appears to be unfinished. It has a central perforation which measures 10mm in diameter.

Macro tool E3682:004:2 also appears to be a spindle whorl. It measures 66mm long, 34mm wide and 56mm thick. It was produced on a sandstone pebble half which one polished side and a central round depression which measure 17mm in diameter. It may either be an unfinished spindle whorl or a netsinker.

Dating:
The assemblage from Holdenstown 4 is typologically diagnostic. The small piece of flint debitage most likely dates to the late Neolithic or early Bronze Age and is associated with the use of the *fulacht fiadh* (O'Hare 2005; Woodman *et al.* 2006).
The possible quern stone and spindle whorls probably date to the late Bronze Age (O'Brien 1993), but may not be directly associated with the *fulacht fiadh* (see Woodman 2006).

Conservation
Lithics do not require specific conservation, but should be stored in a dry, stable environment. Preferably, each lithic should be bagged separately and contact with other lithics should be avoided, so as to prevent damage and breakage, in particular edge damage which could later be misinterpreted as retouch. Larger and heavier items are best kept in individual boxes to avoid crushing of smaller assemblage pieces.

Discussion
The size and composition of the flaked flint assemblage is typical for Irish burnt mounds. Recent excavations in the south-east of Ireland revealed a similar pattern of very small assemblages found in associated *fulachta fiadh*, e.g. the N25 Waterford By-Pass (Woodman 2006). These assemblages are dominated by the use of local remanié or imported nodules of beach pebble flint which is often worked using the bipolar method (see also O'Hare 2005).

Conclusion
The lithic finds from the archaeological investigations at Holdenstown 4, Co. Kilkenny are a piece of flint debitage, a possible quern stone and two possible spindle whorls.
The macro tools in the assemblage are typologically diagnostic and most likely date to the late Bronze Age. The piece of flint debitage probably dates to the final Neolithic or early Bronze Age and is the only artefact associated directly with the use of the *fulacht fiadh* at this site.

This site makes a minor contribution to the evidence for prehistoric settlement in Co. Kilkenny.

References
Inizan, M-L, M Reduron-Ballinger, Roche, H. and Tixier, J. 1999 *Technology and Terminology of Knapped Stone* 5. CREP, Nanterre.

O'Brien, R. 1993 A Study of Irish perforated/unperforated stone discs. Unpublished MA thesis. Department of Archaeology, University College Cork.

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Woodman, P. C. 2006 The significance of the lithic assemblages from the archaeological excavations on the Waterford By-Pass. Unpublished Report for Headland Archaeology (Ireland) Ltd.

Woodman, P. C., Finlay, N. & Anderson, E. 2006 *The Archaeology of a Collection: The Keiller-Knowles Collection of the National Museum of Ireland*. National Museum of Ireland Monograph Series 2. Wordwell, Bray.

Appendix 2.2 Charcoal and Wood Report – Susan Lyons

Site Name- Holdenstown 4
Excavation number –E3682 AR100
County – Kilkenny
Author- Susan Lyons

Date –20/10/10

CHARCOAL IDENTIFICATION SUMMARY REPORT

Illustrations

Figures

Tables

1 Introduction

Five charcoal samples were identified and analysed from excavations associated with a number of pits and postholes recorded at Holdenstown 4, Co. Kilkenny as part of the resolution of the N9/N10 Kilcullen to Waterford Scheme, Phase 4B – Rathclogh to Powerstown. The site located just *c.* 40m west of Holdenstown 3. Holdenstown 4 was a burnt spread. A trough, which had no evidence of a timber lining, and possible working platform was sealed by the burnt spread. Four pits were located around the trough and probably functioned as a windbreak or as a butchering stand connected with the trough activity. To the east of the main spread were four other pits which were filled with burnt mound material (Whitty, 2009).

Two charcoal samples returned the following radiocarbon dates: ash charcoal from C17 and C23 returned dates of Cal 2018–1881BC (2 sigma) and Cal 765–420BC (2 sigma) respectively.

It is generally considered that the principle reason for charcoal analysis is the hypothesis that wood used as firewood will be collected from as close to a site as possible and as such can help to reflect the local wooded environment in the area. It is also likely that abandoned structural timbers or wood brought to the site for uses in construction works or other activities are also reused as firewood. The primary would represent the collected woods used as fuel at the site and go some way to interpreting the local woodland that grew in the vicinity of the site and possible changes to that woodland over time. This report serves as a summary report only for Holdenstown 4 and will later form part of an overall scheme-wide charcoal study for the N9/N10 (Lyons, *et al, forthcoming).*

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 high clay content will be soaked in water for 1–2 days to aid the sieving process.

2.2 Charcoal identifications

Five charcoal samples from C4 (fill of burnt mound), C14 (fill of pit C15), C17 (fill of pit C16), C22 (fill of pit C21) and C23 (fill of trough C24) were selected for charcoal analysis.

The larger sized charcoal fragments (>3mm in width) are fractured to view the three planes [transverse, radial and tangential sections] necessary for microscopic wood identification. The wood species identifications are conducted under a binocular microscope using a trancident light and viewed at magnifications of 100x, 200x and 400x where applicable. Where possible the age and growth pattern of the wood fragments is also recorded by studying the transverse section at a magnification of up to 40x.

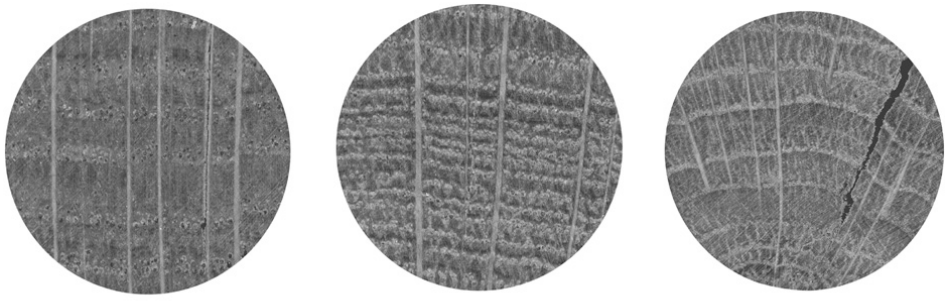
Wood species identifications are made using wood reference slides and wood keys devised by Franklin and Brazier (1961), Schweingruber (1978), Hather (2000) and the International Association of Wood Anatomists (IAWA) wood identification manuals and (www.lib.ncsu/edu/insidewood) by Wheeler, Bass and Gasson (1989).

Quantifying charcoal samples can be difficult as many wood species can be affected by heat is different ways and hence become fragmented into an arbitrary number of fragments. Due to the potential for a very high number of charcoal fragments from the samples, a representative sample of 50 charcoal fragments (Keepax, 1988) are randomly chosen from larger samples for identification and analysis. In the case of smaller samples all charcoal fragments within are identified. The charcoal fragments of each species identified are counted, weighted (grams) and bagged according to species.

2.3 Details of charcoal recording

The general age group of each taxa per sample is recorded, and the growth rates are 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 are 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 is considered to be approximately 0.4mm per annum, medium approximately 1mm per annum and fast approximately 2.2mm per annum.

The ring curvature is also noted where applicable from each charcoal fragment. Weakly curved annual rings suggest the use of trunks or larger branches, while strongly curved annual rings indicate the burning of smaller branches or twigs **Fig. 1.** Tyloses within the vessels of species such as oak can denote the presence of heartwood. These are balloon-like outgrowths of adjacent parenchyma cells of xylem vessels (vascular tissue used to transport water and minerals). When the plant is subjected to stressful conditions, tyloses will develop and block the vascular tissue to prevent further damage to the plant.



Weakly curved rings Moderately curved rings Strongly curved rings

Fig. 1. Ring curvature (after Marguerie and Hunot 2007 1421, Fig. 3)

3 Results

The results of the charcoal identifications are summarized in **Table 1.**

Six wood species totaling 250 identifications were recorded from the samples associated with Holdenstown 4. *Corylus avellana* (hazel) was the dominant species recorded, especially from pit deposits (**C14, C17** and **C22**). *Alnus glutinous* (alder) was the most dominant species recorded from the burnt mound deposits (**C4** and **C23**). Lower incidences of *Salix* sp. (willow), *Quercus* sp. (oak), *Fraxinus excelsior* (ash) and *Prunus* sp. (cherry-type) were also identified from the samples **(Fig. 2)**.

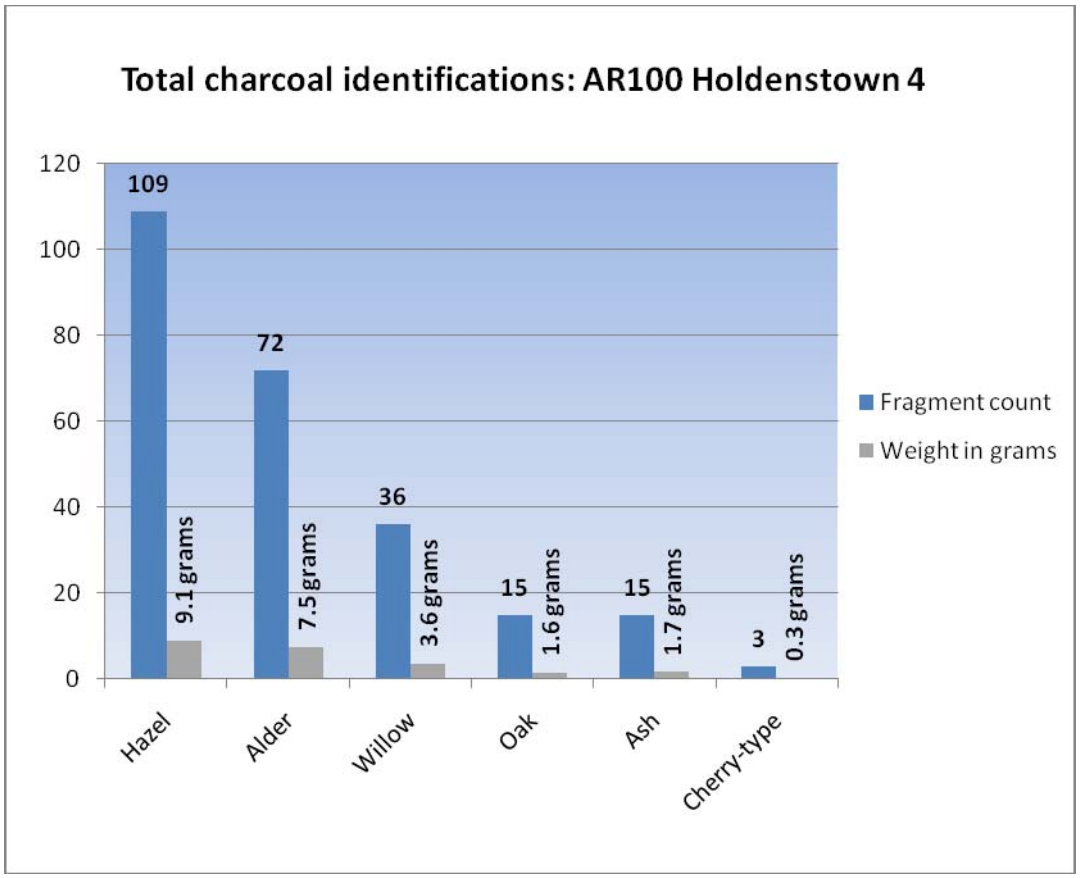


Fig. 2

4 Discussion

4.1 Background and origin of wood species

Corylus avellana L. (hazel)

Hazel woodlands replaced birch in the early post-glacial forests and remains on some shallow limestone soils to the present day (Pilcher & Hall, 2001). The species can tolerate most soil types, but not waterlogged conditions and forms a small deciduous tree or shrub. It commonly occurs in understorey of oak and/or ash woodlands, where it may grow to a height of 10m or more. In open areas or woodland glades hazel grows as a shrub. Hazel is a common species recorded from Irish archaeological sites and its widespread presence is highlighted in pollen diagrams from the Neolithic to the medieval period (Caseldine, 1996). It produces good firewood and is a suitable wood for kindling. The wood is soft enough to be split yet flexible and strong enough

to be used in rope making and basketry. It has also proved a useful resource in the construction of hurdles, wattling, palisades and trackways from prehistoric times (Pilcher & Hall, 2001).

Alnus glutinous L. Gärtner (alder or black alder)
Alder is usually found growing close to running water, rivers or in damp woodland, in the latter often with oak (Orme and Coles, 1985; Rackham, 1995). In marshland alder grows as a shrub frequently mixed with willow and alder buckthorn to form alder carr (Cutler and Gale, 2000). It can also grow well in and on fen peat. Germination and early growth of alders requires a constant supply of water, however once the tree reaches maturity its root system makes the tree less dependent on high water levels (Stuijts, 2005). Alders commonly produce root nodules which contain nitrogen-fixing bacteria, known as *Schinzia alni* which enables alder to enrich soils through its fallen leaves hence allowing the tree to survive in poorer soil conditions (Milner cited in Culter and Gale, 2000; van der Meiden cited in Stuijts, 2005). In suitable conditions alder growth is fast, usually reaching a height of 25m with a maximum girth of 1m and can grow to an age of sixty to one hundred years (Strotelder cited in Stuijts, 2005). While alder makes for poor fuel, it produces good quality charcoal (Edlin, 1951). The wood can quickly turn a reddish colour after cutting and once dry it is water resistant and does not split easily. Once in a waterlogged state, alder is very durable and is often used in the construction of underwater bridge piles, houses and scaffolding (Culter and Gale, 2000). Alder is traditionally used in the making of smaller objects such as bowls, handles and broomsticks and its bark can be used in the tanning of leather (Rackham, 1980).

Salix spp. (willows).
There are a number of different species of willow which cannot be differentiated through wood anatomy. They grow rapidly, and can be easily propagated from cuttings. General comments only about the genus can be made, as there are different varieties of it. They are not naturally a woodland species, although shrubby growth may occur under light woodland cover. All willows appear to favour wet conditions, and it may be a pioneer species on wet soils. The use of willow depends on the species concerned, for some grow as shrubs and others as trees, and a species may be particularly suited to some purpose. In general, the flexibility of willow shoots has led to coppicing or pollarding to produce the raw materials for baskets, frames, hurdling etc. (Orme & Coles, 1985). The main Irish native willows are grey willow (*Salix cinera*), goat willow (*Salix caprea*) and eared willow (*Salix aurita*).

Quercus sp. (oak)
Oak is a tall deciduous woodland tree, often growing in association with hazel and ash. Most species prefer damp, non-calcareous soils on lowland or montane sites. Of the 27 European species, pedunculate oak (*Quercus robur)* and sessile oak (*Quercus petraea)* are native to Ireland. Pedunculate oak is common on heavy clay lowland soils whereas sessile oak thrives on the lighter loams characteristic of higher ground (Culter & Gale, 2000). The wood is easy to cleave both radially and tangentially and has provided one of the most important building materials since the prehistoric period (Gale & Culter, 2000). The heartwood timber is renowned for its durability but the paler sapwood is susceptible to beetle and fungal attack. The strength of the timber depends on the species and is influenced by climatic and edaphic factors (Edlin, 1951). When burnt, oak charcoal, particularly the dense heartwood, has higher calorific values than most European woods and this can make for good long-lasting fuel (Culter & Gale, 2000).

Fraxinus excelsior (ash)
Ash thrives well on nutrient-rich soils but is also a common woodland species and grows in mixed woodland with oak on damp, slightly acidic soils (Gale & Culter, 2000). Pollen analysis indicates that ash became more common in the pollen record from the Neolithic period onwards (Mitchell, 1953/4). This could be as a result of more clearance due to agricultural practices at the time, where ash was able to germinate and grow more vigorously as secondary woodland and in marginal areas and hedges (Kelly, 1976). Ash is also abundant in native hedgerows and was quite common in the later historic period.

Prunus sp. (cherry-type)
The cherry species can be difficult to distinguish in the absence of bark, buds and leaves. Wild cherry (*P. avium)* is a medium to tall tree, common to woodlands and hedges on light, well-drained soils. It produces inferior firewood. The timber is a red colour and although tough and hard is unsuitable for outdoor use as it decayed easily (Culter and Gale, 2000). Bird cherry (*P. padus)* is a smaller tree and less common than wild cherry. It grows in marginal woodland as a solitary tree and can live for up to eighty years (Rackham, 1980). The wood has no real economical value, although has been used in barrel production (Culter and Gale, 2000). Both species are used in the production of ornamental or culinary objects (Culter and Gale, 2000).

4.2 Distribution of charcoal from Holdenstown 4

The number of identifiable charcoal fragments recovered from Holdenstown 4 were localised to five features; C4 (fill of burnt mound), C14 (fill of pit C15), C17 (fill of pit C16), C22 (fill of pit C21) and C23 (fill of trough C24) While this assemblage may not reflect the woodland local woodland environment, it represents the species selected to use as fuel at the site which can help to understand what species potentially grew in the nearby area.

The composition of wood species from C4 and C23 was quite similar, which would suggest that derived from the same source and are therefore contemporary. The presence of water-tolerant species alder and willow from *fulachta fiadh* sites would not be an unusual occurrence, especially since these site types were generally located close to waterlogged or marshy areas (Waddell, 1998, 174). A mixed wood assemblage is common place from these sites and has also been recorded from a number of burnt mound sites excavated along the routeway of the Gas Pipeline, which ran through Counties Dublin, Meath, Westmeath, Galway and Clare (O'Donnell, 2007). A comprehensive study of charcoal undertaken from the majority of these sites also contained evidence for alder, ash, oak, hazel, willow, cherry and pomaceous woods (O'Donnell, 2007, 38/39). The periodic dumping of charred remains associated with *fulachta fiadh/*burnt mound activity would inevitably result in the mixing of wood species from different sources representing one or more burning events. It is also possible that many of these species were brought to the site for other purposes such as building materials and may reflect the re-distributed remains of such materials that were burnt or re-used as fuel.

Pits C15, C16 and C21 also contained a mixed wood assemblage. Hazel, however was the dominant species from these features and may represent the wood of choice being burnt here. Since these pits were located some 10m north-east of the burnt mound activity (Whitty, 2009, 4) it is possible that they also contain some burnt mound debris. The charred fuel debris associated with burnt mound activity would have become distributed across the site to enter open features or become mixed with sealing deposits and infills. Since all three pits contained a relatively similar wood composition, it is likely that they are contemporary, however their exact function is unclear or whether they were associated with the nearby burnt mound activity.

While the charcoal identified represents the wood types that was burnt accidentally or as fuel at the site, it may also reflect some of the flora that grew in the nearby hedges, scrub and woodland. Based on a relatively small charcoal assemblage it is difficult to distinguish whether the wood species identified were chosen purposely for specific actions or if they are the result of a random selection process. The presence of oak, ash and hazel are typical woodland species that grow in close proximity to each other and suggest that the site was located relatively close to dense woodland. Cherry-type woods and hazel thrive in open clearances where there is an abundant of light. Alder and willow are water-tolerant species and implies that the site was close to a river/stream or damper woodland.

5 Summary

The charcoal fragments from C4 (fill of burnt mound), C14 (fill of pit C15), C17 (fill of pit C16), C22 (fill of pit C21) and C23 (fill of trough C24) were selected for charcoal analysis.

The mixed charcoal assemblage of alder, willow and oak from burnt mound deposits C4 and C23 are not uncommon taxa recorded from these site types. The composition of wood species (hazel, oak, cherry-type, ash and alder) from pits C15, C16 an C21 is quite similar, which suggests that these features may have been contemporary and may even contain some re-deposited charred fuel debris from the nearby burnt mound deposits.

The results from this site will be later merged and discussed with similar sites also excavated along the N9/N10 scheme.

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Table 1 Charcoal identification details from AR100 Holdenstown 4 (E3682)

Feature type	Context number	Sample number	Flot volume (grams)	Context description	Wood Species Identifications	No. of fragments	Charcoal weights (grams)	Size of fragments (mm)	No. of growth rings	Growth ring curvature	Comments
Burnt mound/Trough	04	01	19.4 grams	Burnt Mound material- Phase 2	Alnus glutinous (alder)	28	3.7 grams	3mm – 20mm	3 – 5 rings	Weak	
					Salix sp. (willow)	22	2.2 grams	4mm – 15mm	3 – 6 rings	Weak	
	23	7	31.4 grams	Secondary fill of trough C24- Phase 2	Alnus glutinous (alder)	30	2.8 grams	3mm – 8mm	3 – 4 rings	Weak	
					Salix sp. (willow)	12	1 grams	4mm – 10mm	4 rings		
					Quercus sp. (oak)	8	0.6 grams	3mm – 8mm	3 rings		
Pits	14	03	96.6 grams	Primary fill of pit C15 of possible temporary structure- Phase 2	Corylus avellana (hazel)	50	3 grams	4mm – 18mm	2 – 5 rings	Weak	
	17	4	71.8 grams	Primary fill of pit C16 of possible temporary structure- Phase 2	Corylus avellana (hazel)	42	2.6 grams	3mm – 6mm	3 – 4 rings	Weak	
					Fraxinus excelsior (ash)	6	0.5 grams	4mm	3 – 5 rings		
					Prunus sp. (cherry-type)	2	0.1 grams	3mm			
	22	06	62.0 grams	Primary fill of pit C21 of possible temporary structure- Phase 2	Corylus avellana (hazel)	31	3.5 grams	3mm – 10mm	3 – 5 rings	30% strong	
					Fraxinus excelsior (ash)	9	2.5 grams	4mm – 16mm	3 rings		
					Quercus sp. (oak)	7	1 gram	4mm – 8mm	2 – 4 rings		
					Salix sp. (willow)	2	0.4 grams	5mm			
					Prunus sp. (cherry-type)	1	0.2 grams	3mm			

Appendix 2.3 Plant Remains Analysis Report – Penny Johnston

Plant Remains Analysis Report for
E3682 Holdenstown 4 (A032/101), Co. Kilkenny
N9/N10 Road Scheme – Phase 4b

Penny Johnston, Eachtra

Introduction

This report details the analysis of plant remains recovered from excavations in advance of the construction of the N9/N10 Knocktopher to Powerstown Road (Phase 4b). The excavation was directed by Yvonne Whitty on behalf of Irish Archaeological Consultancy Ltd. The archaeological site was located in the townland of Holdenstown 4 (E3682).

The excavated remains included evidence for Bronze Age activity.

Methodology

The samples were processed by the client, who also carried out a preliminary sorting of the samples. This pre-selection of the plant remains may bias the final plant records from these sites, as it is possible that many small items, such as weed seeds and chaff, were not picked out.

The selected material was sent to Eachtra Archaeological Projects where it was examined under a low-powered binocular microscope (X6 –X45). Suitable plant material was identified and the results of analysis are presented.

Holdenstown 4 AR100 E3682

Excavation at Holdenstown E3682 revealed a *fulacht fiadh*/burnt mound with a trough, pits and a possible working platform. The radiocarbon dates from the site indicated early and late Bronze Age activity.

A total of two samples from this site contained plant remains: C.4 (S.1) and C.22 (S.6). The plant remains were cereals (Table 10), but these were not well preserved and it was not possible to determine which types of cereals were present.

One of the samples was from the burnt mound (C.4) and the find of a cereal grain from this deposit is quite significant, as cereal grains are not often retrieved from burnt mound sites (IADG 2007).

The second sample, C.22 (S.6), also contained indeterminate cereal grains. This was from the fill of a pit, associated with a possible temporary structure, that was located 10.5 m north-east of the burnt mound. Because of the distance between deposits, the cereals in this sample may not necessarily be related to the activity at the burnt mound.

Another sample from this site, C.12 (S.2), was also examined, but it contained only modern seeds. No charred or ancient seeds were recovered from this sample.

Table: Identified plant remains from Holdenstown 4

Context	**4**	**22**
Sample	**1**	**6**
Indeterminate cereal grains	2	3

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Appendix 2.4 Animal Bone and Burnt Bone Report – Aoife McCarthy

Osteoarchaeological Report of Faunal Remains and Burnt Bone from
E3682 Holdenstown 4 AR100, Co. Kilkenny
N9/N10 Kilcullen to Waterford Scheme
Phase 4b: Knocktopher to Powerstown
Aoife McCarthy MA BA
March 2010

1. Introduction

This report details the osteological analysis of faunal remains and burnt bone samples recovered during excavations at Holdenstown 4 in the townland of Holdenstown, Co. Kilkenny as part of the archaeological mitigation programme of the N9/N10 Kilcullen to Waterford Road Scheme. Aoife McCarthy MA (Osteoarchaeology University of Southampton 2006) undertook the analysis on behalf of Irish Archaeological Consultancy Ltd in March 2010. At the time of writing this report, background archaeological information was obtained from a draft interim excavation report (Whitty, Y. 2009) and from consulting the original site register documents.

General Osteological Information

The osteological analysis of both hand retrieved faunal remains and burnt bone fragments recovered during sieving of bulk soil samples was undertaken to provide an overview of the osteoarchaeological aspect of the site and determine if the material could provide further interpretation of site activity.

A total of 16 fragments from 7 possible skeletal elements and weighing 4.34g were recorded within the assemblage. The degree of preservation of the animal and burnt bone assemblage recovered varied from moderate to poor preservation. A moderate rate of fragmentation was noted within the combined assemblage.

A portion of the bone assemblage recovered at Holdenstown 4 originated from C14 the silty-sand secondary fill of pit feature C15; which accounted for 11 bone fragments or 68.8% of the total. Two charcoal samples retrieved from archaeological contexts C17 and C23 were classified to species and issued for AMS dating. A sample of ash charcoal from small pit fill C17 returned a two sigma calibrated date of Cal. 2018–1881BC; whilst ash charcoal identified within lower trough fill C23 returned a two sigma calibrated radiocarbon date of Cal. 765–420BC, placing both features within the Bronze Age and Iron Age periods.

A total of 10 bone fragments (62.5%) of the faunal remains assemblage were classified to species. Due to fragmentation combined with poor preservation and small size of the individual bone fragments it was not possible to identify 6 fragments (37.5%) these were classed as indeterminate vertebrate of small, medium or large size. Bone elements were identified where possible.

The bone remains assemblage recovered from Holdenstown 4 contained bones from a single recognisable species of pig; accounting for 10 fragments (62.5%) of recovered material.

2. Methodology

Species Identification: Identification of the bones involved reference to Schmid (1972) and Hillson (1992) as well as comparison with the author's own reference material. The closely related taxa of sheep and goat are difficult to distinguish and where grouped under the term '*caprinae*'

NISP: Number of Identified Specimens Indicates the total number of fragments found.

MNI: Minimum Number of Individuals. Indicates the minimum number of individuals from every species that were present in the material. Estimating MNI is calculated on the specimen of the most abundant skeletal element present; whilst taking age, sex, size and archaeological context into account.

In order to calculate accurate MNI and MNE figures for each species, bird as well as mammal, a method of zoning was implemented when recording (Serjeantson, 2000).

This method was used so as to compensate for any possible biases due to fragmentation; siding was also taken into account at this point.

MNE: Minimum Number of Elements. Indicates the minimum number of anatomical units that are present and what side they are from. To avoid getting a higher MNE all loose epiphyses have to be paired with all un-fused diaphysis.

Ageing: Two main methods are used to determine the age of faunal remains; tooth eruption and degree of Epiphysial fusion (a less reliable method). Tooth eruption and wear stages were recorded for the following teeth where possible; dP4 (deciduous fourth premolar), P4 (fourth premolar), M1 (first molar), M2 (second molar) and M3 (third molar) of cattle, sheep/goat and pig (Grant 1982). The analysis of tooth wear patterns refers to the alteration of the enamel surface and exposure of inner dentine through use.

Biometrical Data: Due to the high degree of fragmentation, small size and the nature of material recovered from Site AR100 bone measurements and biometrical analysis were not possible.

Sex Determination: Sex determination of animal remains is possible by analysis of certain sexually dimorphic elements. For example goat horncores may be classified as male or female based on their morphology and cattle metacarpals can be defined as male or female through calculation of the slenderness index (McCormick 1992). Sexual determination of species was not possible due to the degree of fragmentation and nature of bone material recovered from Site AR100 Holdenstown 4.

Butchery/Gnawing/Burning: Evidence for butchery was recorded under the categories of cut, chopped, chopped and cut. All specimens were analysed for evidence of rodent or carnivorous gnawing as well as evidence of burning. Burnt bones were recorded in accordance with colour changes resulting from differing heat levels e.g. calcined bones acquire a bluish-whitish hue through exposure to high temperatures.

Pathology: The discovery of any injury and/or pathology was recorded for all specimens, where present.

3. Results

Context 8 Sample 5
A series of 2 charred fragments of poorly preserved rib corpus from a small size mammal along with a single calcined bone fragment were recovered within C8 the uppermost fill of trough feature C24.

Indeterminate Vertebrate
Fragmentation combined with small fragment size and poor preservation meant that the 2 rib corpus and single calcined bone fragment recovered from trough fill C8 were not identifiable to species. The two rib corpus fragments retrieved displayed evidence of exposure to a low level of heat resulting in blackening or charring of the bone surface; a single tiny white calcined fragment was also recovered. Contact of bone with heat diminishes its moisture content and results in the combustion of the organic or collagen component; the remaining structure of the bone after this process is mineral. As Devlin J.P. & Herrmann N. P (2008, 109) state "*increasing exposure to heat bone progresses through a sequence of colours from unburned tan, to shades of dark brown to black, progressing to blue and grey and finally to white*."

Context 14 Sample 3
A series of 11 bone fragments (4.14g) representing 2 possible skeletal elements were identified within C14 the primary fill of pit feature C15. The species of pig was identified within material recovered from C14. Small fragment size combined with fragmentation and poor preservation meant it was not possible to identify the species of a single charred diaphysis fragment.

Sus/Pig
A series of 10 moderately preserved rib corpus fragments were recovered within primary pit fill C14. All 10 fragments of pig bone displayed evidence of exposure to a low level of heat resulting in singeing of the bone surface. Contact of bone with heat diminishes its moisture content and results in the combustion of the organic or collagen component. Such distortion to the bone structure reduces its size and as detailed alters bone colour (Luff R. & Pearce J. 1994). None of the recovered pig bone fragments displayed evidence of butchery or gnawing.

Indeterminate Vertebrate
A single moderately preserved metacarpal/metatarsal diaphysis fragment from a medium sized indeterminate vertebrate was recovered from primary pit fill C14. Fragmentation combined with fragment size and poor preservation meant that species could not be discerned. The diaphysis fragment displayed evidence of singeing; manifested as a blackening of the bone margins.

Context 22 Sample 6
A total of 2 burnt trabecular bone fragments (0.03g) of indeterminate vertebrate were recovered within C22 the primary fill of pit feature C21. Calcination of the trabecular bone fragments was recognised by an alteration of the bone texture combined with colour change to grey/white. Contact of bone with heat diminishes its moisture content and results in the combustion of the organic or collagen component; the remaining structure of the bone after this process is mineral.

4. Summary
A total of 16 animal bone and burnt bone fragments recovered from archaeological contexts C8, C14 and C22 on Holdenstown 4 were submitted for examination. The bone samples were assessed and identified to species where possible; a total of 10 bone fragments recovered were identified to the species of pig. Due to size, poor preservation and fragmented nature of the individual bone pieces it was not possible to identify 6 bone fragments of bone to species. No definite or statistically detailed conclusions could be drawn from the faunal remains and burnt bone assemblage retrieved from Holdenstown 4 due to its limited size and poor degree of bone preservation. A single fragment of early Bronze Age debitage was also recovered within C22.

Bone Database:

Spec	C	S	Taxa	Anat	Side	Prox	Dist	1	2	3	4	5	6	7	8	But	Bu	G	Q	W (g)	Comments
1	C8	5	Unid Sm Sz	Rib						1							B		2	0.15	Poorly preserved charred corpus fragments. Trabecular bone exposed
2	C14	3	Pig Sz	Rib					1	1	1						B		10	1.55	Series of moderately preserved proximal rib corpus fragments. Trabecular bone exposed. Singeing of surface noted.
3	C14	3	Unid Med Sz	MC/MT						1	1	1					B	R	1	2.59	Moderately preserved diaphysis fragment, singed. Metrics not possible. Diaphysis split, trabecular bone exposed
4	C22	6	Unid	Unid													G W		2	0.03	Poorly preserved calcined trabecular bone fragments
5	C8	5	Unid	Unid													W		1	0.02	

Key:

C= Context But=Butchery N=No W=White S=Sample Bu=Burnt
Unid=Unidentifiable R=Rodent Anat=Anatomical Element G=Gnaw Cn=Carnivore Taxa=Taxon
Prox=Proximal Q=Quantity of Pieces B=Black Dist=Distal G=Grey

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GLOSSARY OF TERMS:
BOS: Latin term for Cow
SUS: Latin term for Pig
CERVUS: Latin term for Deer
EQUUS: Latin term for Horse
OVIS: Latin term for Sheep
CAPRINAE: Latin term for Sheep/Goat
CANIS: Latin term for Dog
LEPUS: Latin term for Hare
AVES: Latin term for Bird
TAPHONOMY: The study of the processes affecting an organism after death from the time of burial until collection.
TRABECULAR BONE: Osseous tissues that fill the interior cavity of bones and resemble a sponge or honeycomb.
DIAPHYSIS: Bone shaft
CORPUS COSTAE: Body of Rib Bone

Appendix 2.5 Petrographical Report – Stephen Mandal

Petrographical Report on Stone Samples
Taken During Archaeological Excavations at
Holdenstown 4 (E3682)
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 very dark grey argillaceous limestones belonging to the Butlersgrove Formation (shown on Figure 1 as BU).

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 Iaepetus 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		NMS Reg.	Sample	Context	Notes		
Holdenstown 4	AR100	E3682	1	4	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium grained, quartz rich, red/yellow
Holdenstown 4	AR100	E3682	2	12	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium grained, quartz rich, red/yellow
Holdenstown 4	AR100	E3682	3	14	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium grained, quartz rich, red/yellow
Holdenstown 4	AR100	E3682	4	17	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium grained, quartz rich, red/yellow
Holdenstown 4	AR100	E3682	5	8	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium grained, quartz rich, red/yellow
Holdenstown 4	AR100	E3682	6	22	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium grained, quartz rich, red/yellow
Holdenstown 4	AR100	E3682	7	23	Burnt;	Sub-rounded to sub-rounded	Sandstone, very coarse to medium 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 were 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
Leggetsrath 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
Grand Total :				**159**	**73**	**158**	**122**	**63**	**5**

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 are 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.

References

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

Mandal, S. 2004 Petrographical Report on Stone Samples found during Archaeological Investigations relating to the Sligo Inner Relief Road (Licence No. 03E0535). *Unpublished report commissioned by ACS Ltd for the NRA.*

McConnell, B. (ed.), 1994 *Geology of Carlow-Wexford: A Geological Description to Accompany the Bedrock Geology 1:100,000 Map Series, Sheet 19, Carlow-Wexford*. Geological Survey of Ireland Publications. Westprint: Sligo.

Appendix 2.6 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 ‰
C17, Fill of a pit	4	Charcoal	*Fraxinus excelsior* / 1g	QUB	UBA 13113	AMS (Std)	1950–1893BC (1 sigma), 2018–1881BC (2 sigma)	3578±23	-28.3
C23, Fill of a trough	7	Charcoal	*Fraxinus excelsior* / 0.1g	QUB	UBA 13114	AMS (Std)	753–539BC (1 sigma), 765–420BC (2 sigma)	2477±22	-26.3

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.^2 + curve std. dev.^2)
** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2)
where ^2 = quantity squared.
[ ] = calibrated range impinges on end of calibration data set
0* represents a "negative" age BP
1955* or 1960* denote influence of nuclear testing C-14
NOTE: Cal ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr.

APPENDIX 3 LIST OF RMP IN AREA

RMP No	Description
KK020-051	Enclosure
KK020-053	Enclosure
KK020-054	Ringfort
KK024-012	Enclosure
KK024-014	Ringfort
KK024-017	Enclosure
KK024-018	Enclosure
KK024-019	Enclosure
KK024-020001	Church
KK024-020002	Graveyard
KK024-021001	Enclosure
KK024-021002	Enclosure
KK024-021003	Road / trackway
KK024-021004	Cairn

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 1	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	E3546	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

Site Name	Site Code	E Number	Director	NGR
Blanchvillespark 2	AR108	E3895	Tim Coughlan	260637/155449
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
Leggetsrath 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
Stonecarthy West 2	UA2	E3974	Tim Coughlan	251372/142037
Rathduff Bayley 1	UA4	E4011	Tim Coughlan	251005/143564