N7 Heath-Mayfield Motorway Scheme: Archaeological Resolution

FINAL REPORT

Excavation No.: 03E0461

Site D, Morett Townland

Co. Laois

NGR 253769E, 203368N

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The larger ring-ditch at Morett, from the south

SUMMARY

Site D at Morett was excavated as part of the resolution of archaeological sites on the route of the N7 Heath-Mayfield Motorway Scheme. The site was identified during centreline test trenching as a significant concentration of archaeological features in fields immediately north-west of Morett Castle, a late medieval tower house. It was excavated by the writer under Licence no. 03E0461 in May/June 2003. The site extended south-west/north-east along a c. 180m long section of the road corridor, which was c. 80m wide. It incorporated a variety of archaeological features, of various dates. These included a Late Neolithic four-post structure and possible fence line (2880-2500 BC), three Iron Age smelting furnaces (770-410 BC), two Iron Age ring ditches (*c*. 400-100 BC), an Iron Age charcoal kiln (170 BC – AD 30) four late Iron Age/early Medieval drying kilns (AD 380-560), and four early medieval human burials (AD 420-600).

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1.0 INTRODUCTION

This report details the results of archaeological excavations carried out prior to the construction of the N7 Heath-Mayfield Motorway at Morett townland, on behalf of Kildare County Council and the National Roads Authority. This site was excavated as part of the resolution of archaeological sites on the route of the N7 Heath-Mayfield Motorway scheme, which extended from Mayfield townland westwards to the Heath townland. It had not been previously recorded and was discovered during archaeological test trenching along the road corridor, when several concentrations of archaeological features were noted. The area was designated Site D (Figs. 1 and 2).

This site was situated in Morett townland, at National Grid Ref. 253664, 203326 to 253813,203359 and at an elevation of 96m OD (see Fig. 1).

Excavations were carried out from April 30th – June 19th 2003, under licence number 03E0461, by Eamonn Cotter for Valerie J Keeley Ltd.

2.0 GEOGRAPHIC SETTING

The townland of Morett lies on the north-eastern fringes of an extensive plain known as the Great Heath (Fig. 1). The surrounding land is generally flat, with occasional low hills. The excavation site was partly located on one of these hills. The ring-ditches and the human burials were located on the hilltop overlooking an extensive area of low-lying wet land to the east and northeast, while the remaining features were located on the plateau which extended to the southwest of the hilltop.

3.0 ARCHAEOLOGICAL SETTING

Morett and the surrounding area are rich in archaeological remains. Morett Castle stands immediately to the southeast of the site, while, some two kilometres to the south west there is a dense cluster of ring barrows. Dunamase Castle is visible on a high limestone outcrop some five kilometres to the south. At Ballydavis townland, four kilometres to the south west, an extensive complex of Iron Age sites was excavated in 1995 in association with construction of the M7 Portlaoise By-pass. This complex included four ring-ditches, furnaces and pits (Keeley 1999, 25-34).

Rev. M. Comerford in his book "Collections relating to the Dioceses of Kildare and Leighlin" (1883) records a history of Morett:

'*At the year 976, - but more correctly 978, according to O'Donovan, the Four Masters record the death in battle of the lord of Lea and Morett :- "A.D. 976. The battle of Bithlann (Belan) was gained over the Leinstermen by the foreigners of Ath-cliath (the Danes of Dublin), wherein were slain Augaire, son of Tuathal, King of Leinster; Muireadhach, son of Rian, lord of Ui-Ceinnsealaigh; and Conghalach, son of Flann, lord of Leighe and Rechet (Lea and Morett), with many others along with them." Morett was in the district of Clann-Maoilughra, now Clanmaleire, the territory of the O'Dempseys. The Castle of Morett still exists in ruins; it might more properly be styled a castellated mansion; one of those fortified residences belonging to the 16th and 17th centuries, erected in disturbed times, when it was necessary to provide for defence. It is built upon a slight elevation, and has a stack of chimneys in each wall and gable end. Nothing now remains but the outer walls. A. turret, supported by consoles, is at one angle. This, along with many other adjacent districts, came into the possession of Gerald, Earl of Kildare, by grants of Edward VI., and of Philip and Mary. The Act, 3 and 4 Phil. and Mary, by which the Crown seized upon the territories of Leix, Offaly, Clanmaleire, etc., expressly reserves the rights of the Earl of Kildare: "Provided always that this act or anything conteyned, shall not in any wise be prejudicial or hurtful to any letters pattents made and graunted unto Gerald, now earl of Kildare, and to his heyres, by our said soveraign lady the Queen; or by her Highness late brother King Edward the sixt, of any honours, mannours, lands, tenements, preheminences, dignities, privileges, jurisdictions, and other hereditaments whatsoever within this realm of Ireland, but that the said Gerald earl of Kildare, and his heyres, shall and may enjoy and hold all and singular the said honours, etc., etc., as if this act had not been made, anything herein contained to the contrary notwithstanding." In 1585, this Gerald assigned his lands of Morett, Timogue, etc., containing 2,745 acres to Gerald FitzGerald his natural son. This Gerald appears to have been base by nature as well as by birth. By treachery he compassed the death of O'Kelly, Chief of Farran O'Ceallagh, as detailed in the chapter on Ballyadams; in consequence of which, O'More, to avenge O'Kelly, slew FitzGerald and burned his castle. This is referred to on the FitzGerald monument in the (now) Protestant church of Timogue:- " In this vault and ground lie the remains of Gerald FitzGerald of Morett, Esq., and of his wife, a daughter of John Bowen of Ballyadams, Esq. He was murthered, and his castle burned there in the reign of Queen Elizabeth," etc. This monument gives the succession from father to son, as follows:- 1. Gerald Fitzgerald of Timogue, his only son, married to a daughter of O'Dempsey, Lord of Glanmaleire. This Gerald was one of the Confederate Catholics in 1641, and forfeited his possessions in consequence. 2. FitzGerald of Morett, married to a daughter of John Pigot. 3. FitzGerald of Morett, married to a daughter of Henry Gilbert of Kilminchy. 4. Thomas FitzGerald of Morett, married to a daughter of Sir Gregory Byrne, Bart. In February, 1660, these lands were granted to Robert FitzGerald, grandfather of James, Duke of Leinster, at the yearly rent of £36 6s. About 200 yards from Morett Castle, to the south, are the remains of an old building, probably a church; between it and the castle runs a small river, which here has its source, and falls into the Barrow, opposite the Fort of Dunrally, where it divides the parishes of Lea from Moyanna. This stream is referred to in Excheq. Rolls, No. 12, Edw. VI., as Aquam de Glaishemarrow, and is stated to form the northern boundary of Leyse. In Sir W. Petty's Survey, 1657, it is called the river Glashaevaragh. (Antiquities of Kilenny (and Kilteale, by Rev. J. O'Hanlon, M.R.I.A.) A fine engraving of*

Morett Castle is given in Grose's Antiquities, Vol. I, Plate 72. The list of Dr. MacGeoghegan has "the chapel of St. Brigid of Morett" - Capella Stae. Brigidae de Moyrgath. A virgin Saint, named Findsech, was venerated on the 13th October; the Feliré Aenguis at that date has "Fair Findsech's feast," the commentator on which, in the Leabhar Breac adds, "i.e. a virgin, and Ernaide (Nurney) is the name of her town in Sliab Guairi in Gailenga. Or in Dal Araide, is Findsech's church. Or in Mag Rechet in Leix." (Morett.)

The old parochial church of Ardea was, most probably, situated within the present Emo Park demesne. At the rere of the gardens there is still to be seen a curiously-sculptured baptismal font, octagonal in shape, with interlacings and angels carved on the sides, and pierced in the centre. This font appears to belong to the 13th century. In the Taxation, temp. Henry VIII., the Vicarage of Ardea is valued, "ultra omnes allocationes et deductiones," at £10 3s. 0½ d. (See Vol. 1, p. 238.)'

4.0 THE EXCAVATION

4.1 METHODOLOGY

The site extended south-west/north-east along a c. 180m long section of the road corridor, which was c. 80m wide. Excavation commenced on April 30th 2003. Small areas had already been stripped of topsoil around the groups of features exposed during the centerline test trenching, and, during the course of the excavation, these areas were extended so that three main areas were opened (Fig. 3). Area A, at the south western end of the site, measured 75m x 40m, Area B, at the centre of the site, measured 32m x 10m, and Area C, at the north eastern end of the site, measured 60m x 46m, with a 20m x 20m extension to the south east. Approximately 70m to the north west of Area C, on the line of a slip road crossing the main motorway corridor, another small area, Area D, was excavated where the test trenching had identified a possible Fulacht Fiadh.

Topsoil was removed by machine under archaeological supervision and further excavation was carried out by hand. Upon location all archaeological materials were cleaned and excavated by hand using methods appropriate to their composition, nature and date. All archaeological contexts were photographed and planned (in relation to the site grid) prior to excavation. Sections were excavated through all features to obtain profiles and to expose the stratigraphic sequences and then fully excavated. All sections and cut features were photographed and drawn. The position of all finds and samples were recorded in three-dimensions (where appropriate) in relation to the site-grid. The composition, stratigraphic position and interpretation of all contexts were recorded on a context sheet prior to excavation. Contexts were sampled for palaeobotanical material, radiocarbon dating, micromorphology, petrology and wood identification, where appropriate. Features that proved to be of modern origin were fully investigated and characterised.

Over the course of the excavation the team size averaged twenty people.

4.2 THE FEATURES

4.2.1 Area A (Figs. 3, 4)

This area was excavated at the south western end of the site. The archaeological features in this area generally seem to relate to agricultural and possibly ritual activity rather than having any domestic function (see Section 5.1 below for discussion). A linear ditch, C307, extended south-west/north-east across the full width of the excavated area. It varied in width from 0.75m to 1m and was 0.2m-0.45m deep, and appears to have been one of three early modern field boundary ditches on the site (the others, C136 and C82 were located further to the north east and were aligned NNW-SSE).

Apart from this ditch several distinct concentrations of archaeological activity were noted. One of these comprised a cluster of potholes located to the north of C307. The most substantial of these were four (C66, C72, C145 and C80) which formed a square measuring 2.5m x 2.5m (Pl 1). Three of these postholes averaged 0.7m in diameter, while the fourth was 0.9m. They ranged in depth from 0.5m to 0.75m. The stratigraphy of each of these features is very similar, and suggests that the original posts were pulled out of the ground and the postholes backfilled with redeposited natural, either clay or silty sand. Subsequently, secondary features were cut into this redeposited material. These secondary cuts were each *c.* 0.5m in diameter and *c*. 0.2m deep and their flat base and sloping sides suggests they were pits rather than postholes, which would usually have vertical sides. The fill of these secondary cuts was a charcoal–rich material containing small quantities of burnt stone and cremated bone, and some pieces of flint debitage.

Another group of postholes, located immediately south east of this structure, may represent another structure, possibly an open-sided shelter. These postholes, C123, C124, C144, C115, C454, C162 and C147 form a C-shaped pattern, open to the south, which would have measured 4m x 3m.

To the south of C307 a row of postholes extended SSE for 7m, then curved to the SSW and continued for a further 7m, disappearing under the baulk, beyond the limit of the excavation (Pl 2). These probably represent a post-and-wattle field fence. Another area of activity was located to the east of the post-and-wattle fence, in the south east quadrant of Area A. The main features here were a smelting furnace (C172) and a charcoal production pit (C126) (Pl 3). The charcoal pit measured 1.6m x 1.8m and was 0.53m deep. Its sides and base were intensely burned and the fills consisted of layers of burnt material and charcoal. The furnace, 7m to the north of the charcoal pit, measured 0.65m in diameter and 0.15m deep. Its sides were lined with a yellow clay and the sides and base were intensely burned. It produced a small quantity of iron slag. To the immediate west of C172 a second, shallow pit (C324), contained a mixture of burnt stone, burnt clay and iron slag, which seems to represent the debris from a furnace. It may have been a working hollow into which the slag from C172 was raked.

To the north east of these features another row of substantial postholes C382, C384, C386 and C388) was excavated. The function of these features is unclear and no other features were found in association with them.

Immediately to the west of the post-and-wattle fence another probable structure was represented by two parallel rows of postholes. These were situated c. 1.5m apart, with one row measuring 3.5m long and the other 2.5m. It is unlikely they represent a roofed structure, but they may be the remains of a drying rack for animal hides or fleeces. To the southwest of these features was a random scattering of pits and postholes with no distinct pattern.

4.2.2 Area B (Figs 3, 5; Plates 5, 6)

This area was on the flat ground c. 20m to the north-east of Area A. A group of three smelting furnaces (C140, C141, C142) was excavated here, as well as a pit, C37, which was probably used to produce charcoal for the furnaces. The furnaces were roughly circular in plan and ranged from 0.37m to 0.65m in diameter and from 0.18m to 0.28m in depth. All three showed evidence of intense burning and large quantities of slag were retrieved from them. The charcoal production pit, C37, was roughly circular in plan and measured 1.6m x 1.9m and was 0.45m deep. It too showed evidence of intense burning and its fill contained several dense layers of charcoal. To the immediate south east of C37 another feature, C46, may have been another charcoal production pit, but this had been severely truncated during the test trenching.

To the east of the bowl furnaces a linear ditch, C136, ran NNW-SSE through the excavated area. This was probably contemporary with another parallel ditch, C82, located c. 40m to the east and C307, the ditch running at right angles in Area A. The basal fill of C82 produced a sherd of 18th/19th century glazed red earthenware pottery indicating that the ditches are part of a modern field system.

4.2.3 Area C (Figs 3, 6-8)

This area encompassed the summit and slopes of the low hill which dominates the immediate landscape. The main feature here was a ring ditch, C24, located on the eastern slope of the hill (Pl 7). The ditch was approximately circular in plan. It measured approx 16m in diameter and was enclosed by a U-shaped ditch which varied in width from 0.80m to 1.80m, and in depth from 0.3 to 0.65 (Pl 8). The ditch contained two distinct fills, a primary fill, C14 and an upper fill, C13. The primary fill, C14, was a brown silty clay which contained small quantities of animal bone, mainly jaw bones. The upper fill, C13, was a black, charcoal-rich, sandy clay which contained a high proportion of fire-cracked stone and a considerable quantity of animal bone fragments, as well as small quantities of burnt bone. A number of heavily corroded metal objects, possibly nails, were also recovered from this fill, all at the south-western side.

However, this fill, C13, did not extend fully around the enclosure, but was missing from a 10m long arc on the north-eastern side. It appears that the ditch was originally cut in a full circle, and then became gradually infilled with C14. A secondary ditch was subsequently cut into C14, leaving the north-eastern arc as an uncut causeway. The fill of this secondary cut was C13.

No definite archaeological features were found within the enclosure. A feature (C305) excavated at the centre of the enclosure measured 1.6m x 1.45m and was 0.7m deep. It was irregular in plan and profile and contained a

sterile fill similar to the adjacent natural. This suggests it was either a geological anomaly or a tree-root cavity, though its position at the centre of the ring-ditch would suggest the two were related.

A second, smaller ring ditch, C334, was located approximately 24m to the south west, on the hilltop (Pl 9). It measured c. 7m in diameter and the enclosing ditch was c. 0.51m wide and only 0.12m deep. Small quantities of animal bone were recovered from its one fill. A large iron axehead was found near the centre of the enclosure, where faint traces of an agricultural furrow cut across it, indicating that the axehead could post-date the ring ditch.

Approximately 30m south of the ring ditch four human inhumations were uncovered. Three were located in a single, shallow grave and were aligned approximately northeast-southwest (Figs 6, 7; Pl. 12). They lay immediately below the thin topsoil and had been badly damaged by repeated ploughing. The fourth was located c. 15m to the east and was aligned north-northeast/south-southwest (Figs 6, 8; Pl 11). It too was in a shallow grave, but a setting of small rounded stones had been placed around it.

Four corn-drying kilns, C395, C245, C414 and C391, were found on the eastern slope of the hill (Fig 6, 9; Pl 10). They were sited c. 16m apart along a north-west/south-east line, following the contour of the hill, and each individual kiln lay on the same alignment, i.e. at right angles to the slope. All had a 'figure-of-eight' ground plan and essentially consisted of two circular pits, one deeper than the other, the deeper one containing the hearth. In length the kilns ranged from 2.2m to 2.6m, while the deepest sections were c. 0.8m deep and the shallower sections c. 0.3m. The upper fill of one of the kilns produced quantities of iron slag, and seems to have been reused as a dump for smelting waste.

4.2.3 Area D

This was an area approximately 10m x 10m located 70m to the northwest of Area C, on the line of a local road realignment crossing the main motorway corridor. During centerline testing burnt stone noted in this area was identified as a possible Fulacht Fiadh. When excavated, a thin spread of burnt stone was noted at a depth of C. 1.5m below the surface, in a natural hollow. A sherd of modern pottery was found in this layer of burnt stone. The material forming this layer was similar to the upper fill of the larger ring ditch, and it seems that its presence in this area resulted from modern land clearance, when material from the ring ditch was pushed into this area to fill in a natural hollow.

4.3 ARTEFACTS

4.3.1 Flint artefacts

Thirty-three artefacts were recovered from the site, of which thirteen were flint pieces. It is notable that the entire flint assemblage was recovered in Area A, at the southwestern end of the site, from features which were radiocarbon dated to the Late Neolithic. Ten of the pieces were recovered from postholes C66, C72 and C145,

three of the four postholes which formed a rectangular setting measuring 2.5m x 2.5m. The fill of one of these postholes, C72, yielded a radiocarbon date of 2870-2500 BC. A further two pieces of flint were recovered from posthole C384, one of a row of four closely-spaced postholes at the south-eastern corner of Area A. The fill of this posthole yielded a radiocarbon date of 2880-2570 BC. The final flint piece was recovered from C261, one of a double row of small postholes located to the west of a north-south fence line at the southern end of Area A.

The specialist report on the flint concludes that, while little can be said about the character of lithic use at the site, it does indicate late Prehistoric activity, i.e. from the Early Neolithic onwards (see details in Appendix 3). This conclusion therefore accords well with the radiocarbon dates.

Table 1. 03E0461 Morett, Site D. List of flint artefacts

Find #	Context	Material	Artefact type	Period
03E0461:65:1	Posthole, 4-post structure	Flint	flake core fragment	Late Neolithic
03E0461:65:2	Posthole, 4-post structure	Flint	angular flake;	Late Neolithic
03E0461:77:1	Posthole, 4-post structure	Flint	probably struck from multi platform core	Late Neolithic
03E0461:77: 2	Posthole, 4-post structure	Flint	crushed platform	Late Neolithic
03E0461:77: 4	Posthole, 4-post structure	Flint	small natural rolled quartzite chunk	Late Neolithic
03E0461:77: 3	Posthole, 4-post structure	Flint		Late Neolithic
03E0461:77: 5, 6	Posthole, 4-post structure	Flint	two frags of a heavily burnt medial flake	Late Neolithic
03E0461:77: 7	Posthole, 4-post structure	Flint	hinge termination;	Late Neolithic
03E0461:89: 1	Posthole, 4-post structure	Flint	bipolar chunk/ lateral spall	Late Neolithic
03E0461:89:2	Posthole, 4-post structure	Flint	flake fragment	Late Neolithic
03E0461:289: 1	Posthole 261 in double row	Flint	complete small debitage flake;	Late Neolithic
03E0461:385:1	Posthole 384 in row of 4	Flint	bipolar flake, *piece ecaille*	Late Neolithic
03E0461:385:2	Posthole 384 in row of 4	Flint	weathered chalk cortex.	Late Neolithic

4.3.2 Metal artefacts

Seventeen metal artefacts were recovered (see specialist report Appendix 6). Thirteen of these (8 iron nails, 1 iron knife, 1 piece of iron bar, 1 piece of scrap iron and two copper alloy fragments) were recovered from the fill of the main ring-ditch, radiocarbon dated to 370-110 BC. Of the thirteen one nail came from C14, the lower fill of the ditch and the remaining twelve from C13, the upper fill.

Two fragments of an iron vessel were recovered from a shallow linear ditch of unknown date in Area A at the south-western end of the site. An iron axe head was recovered from a furrow cutting across the small ring-ditch C334. An iron strap hinge was recovered from the fill of C18, a small pit close to the charcoal kiln in Area B.

The vessel fragments (one rim and one body fragment) are identified as belonging to a vessel some 120mm in diameter. Iron cauldrons are known from the Irish Iron Age (Waddell, 284, 323) and fragment of iron vessels were found in the excavations at the Early Medieval ringfort at Garryduff Co. Cork

Of eight iron nails recovered at Morett, one was identified as a horseshoe nail, with a flat rectangular head. The iron knife is identified as of a design occurring from the 9th to the 11th century in York.

Table 2 03E0461 Morett Site D. List of metal artefacts

Find #	Context	Material	Artefact type	Period
03E0461:13:22	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:23	Upper fill of main ring-ditch	Iron	bar	Iron Age
03E0461:13:19	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:21	Upper fill of main ring-ditch	Cu alloy	scrap	Iron Age
03E0461:13:20	Upper fill of main ring-ditch	Cu alloy	sheet	Iron Age
03E0461:13:26	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:24	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:25	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:29	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:58	Upper fill of main ring-ditch	Iron	nail	Iron Age
03E0461:13:59	Upper fill of main ring-ditch	Iron	knife?	Medieval
03E0461:13:30	Upper fill of main ring-ditch	Iron	scrap	Iron Age
03E0461:17:31	Pit C18 near charcoal kiln	Iron	strap hinge	Iron Age
03E0461:14:02	Lower fill of main ring-ditch	Iron	nail	Iron Age
03E0461:373:49	Furrow crossing small ring-ditch	Iron	axe head	Late Medieval
03E0461:381:61	Shallow linear ditch, Area A	Iron	vessel rim	Uncertain
03E0461:381:62	Shallow linear ditch, Area A	Iron	vessel body fragment	Uncertain

4.3.3 Pottery

Three sherds of pottery were recovered. All were Post-Medieval to modern in date and two were found in the topsoil. The third was found in C13, the upper fill of the ring-ditch, clearly indicating modern intrusions in that fill. It was found in the vicinity of :13:59, the iron knife noted above. The metal artefact specialist report (Appendix 6) identifies the knife as dating from the 9th to the 11th centuries AD. Its presence close to a sherd of modern pottery clearly indicates that it too may be an intrusion in the ring-ditch.

Table 3 03E0461 Morett Site D. List of ceramic artefacts				
Find #	Context	Material	Artefact type	Period
03E0461:01:44	Topsoil	Pottery	North Devon Gravel Tempered	Post-Medieval
03E0461:01:45	Topsoil	Pottery	English glazed brownware	Post-Medieval
03E0461:13:60	Fill of ring-ditch	Pottery	Blackware body sherd	Post-Medieval

4.3.4 Stone artefact

A single stone artefact was recovered, from C89, the fill of one of the four postholes forming a rectangular pattern in Area A. The object is described as a "granite water rolled cobble used as hammerstone/anvil; circumference has extensive pecking consistent with use as hammer; upper and lower faces have peck marks in centre, indicating stone was either used as an anvil, or was being perforated" (see specialist report Appendix 8)

Table 4 03E0461 Morett Site D. List of stone artefacts				
Find #	Context	Material	Artefact type	Period
03E0461:89:3	Posthole, 4-post structure	Stone	Hammerstone	Late Neolithic

4.4 METALWORKING EVIDENCE

Evidence for metalworking on the site was found in three areas. In Area A the fills of two conjoined pits C 172 and C324 contained small quantities of slag. Stratigraphic evidence suggested that the fills had either been much disturbed or had been dumped in the pits. This was supported by the specialist analysis of the slag, which concluded that "this assemblage would be best interpreted as secondary dump of smelting-related materials, rather than an in-situ collection of pieces left in a furnace after smelting" (see Appendix 7).

In Area B, near the centre of the site and lying in the shelter of the hill to the northeast, evidence of metalworking comprised three small furnaces, C140, C141 and C142. These are described above in more detail and the specialist analysis of the slag recovered from these features can be found in Appendix 7. The specialist analysis concluded that the slag found in C140 and C141 was *in situ* residue from smelting, but that slag in C142 represented dumped material cleaned from the smelting furnaces.

Slag was also recovered from the upper fill of C395, a corn-drying kiln in Area C. This too is identified as dumped material cleaned from a smelting furnace.

It is suggested in the specialist report on the slag that in Area A the shallow pit C324 may have provided access to a furnace arch, C172, for raking out slag from the furnace. If this was the case then this would be rare evidence for the presence of a furnace arch, part of the superstructure of a non-slag tapping furnace as found in north-west Wales. The evidence from Morett may therefore be significant for Irish metallurgical studies since no evidence yet exists for such a feature in the Irish examples of non-slag tapping furnaces.

4.5 ENVIRONMENTAL EVIDENCE

4.5.1 Animal Bone

Over 800 fragments of animal bone were recovered from the excavation (see Appendix 5 for specialist report). However, over 600 of these were small butchered splinters which were not identifiable to species or element. Of the identifiable fragments 172 were cattle, 18 were sheep and 12 were pig. These represented a minimum of three cattle, two sheep and two pigs. While there was plentiful evidence for butchery on the cattle bones, no butchery was evident on the sheep or pig bones. Butchery indications and body part representation suggested that all stages of carcass processing and consumption are represented by the samples. The presence of neonatal pig bones suggests that breeding may have been carried out on site.

4.5.2 Charcoal

Nine charcoal samples from the excavation were submitted for analysis (see specialist report Appendix 2). Charcoal from two of the four corn-drying kilns (C245 and C391) was all identified as hazel, while that from one of the charcoal kilns, C37, was mostly hazel. The remaining samples, taken from another charcoal kiln, from one of the Neolithic postholes, and from the ring ditches, were entirely oak.

4.6 THE HUMAN BURIALS

Four human inhumations were uncovered in Area C at the northeastern end of the site (see specialist report Appendix 4). They were located near the summit of the low hill in this area, with extensive views over the low land to the north and northeast.

Three of the burials were located in a single, shallow grave and were aligned approximately northeast-southwest, with heads to the southwest. They lay immediately below the thin topsoil and had been badly damaged by repeated ploughing. All lay in an extended supine position. In Burial 3 (C56) the right upper arm lay by the side, with the elbow flexed and the forearm lying across the abdomen; the left upper arm lay by the side, with the elbow sharply flexed and the forearm resting across the chest. In Burial 2 (C55) both arms were by the side with the elbows slightly flexed and the hands resting on the pelvic area. Because of the poor preservation of Burial 1 (C54) it was not possible to identify the position of the arms All three were identified as females. It was not possible to determine their precise age but all had reached adulthood. Though numerous skeletal elements were missing,

there appeared to have been no intercutting of any of the skeletons by later burial. Rather, the evidence indicated that all three were buried at the same time and that the disappearance of some of the bones was caused by subsequent agricultural activity. This is unsurprising given that the skeletons were located directly below the shallow topsoil, within reach of a modern plough.

The fourth burial (C340) was located c. 15m to the east and was aligned north-northeast/south-southwest, with the head to the south-southwest. It too was in a shallow grave, but a setting of small rounded stones had been placed around it. Like the others it was an extended supine burial. The right upper arm lay by the side, with the elbow sharply flexed, the forearm resting across the chest and the hand on the left scapula. Little survived of the left arm but it seemed to have been flexed with the hand lying on the sternum. It was not possible to conclusively determine the sex of the fourth burial, but it is likely that it too was female.

Table 5 03E0461 Morett Site D. Summary of human skeletal analysis

Skeleton #	Sex	Age	Stature	Pathologies
1	Female	Adult; 20+	157cm/5'1"	DEH, indicating stress at an early age caused by illness or inadequate diet
2	Female	Adult; 20+	160cm/5'2"	Dental calculus, carious lesion
3	Female	Adult (?Mature)	156-158cm /5'1"-5'2"	None
4	?Female	?40-50	171-175cm /5'6"-5'7"	Evidence of much physical activity in hands; dental calculus and caries; DEH; loss of teeth; osteoarthritis; evidence of iron deficiency caused by poor diet, disease or illness;

DEH = Dental Enamel Hypoplasia

4.7 DATING EVIDENCE

Table 6 summarises the dating evidence from the site, showing the long span of activity ranging from the late Neolithic to the Early Medieval period. A diagrammatic representation is also provided in Appendix 1 along with the technical data.

Table 6: Site D Morett 03E0461 Radiocarbon dates. Calibration derived from OxCal3.

				Calibrated date range	
Lab. code	Sample material and source	Context/ Sample no.	Years BP	1 sigma (68.2% probability)	2 sigma (95.4% probability)
SUERC-9021	Hazel/oak charcoal from charcoal kiln, Area B	C37, S12	2045 ± 35	110 BC – 10 AD	170 BC – 30 AD
SUERC-9022	Oak charcoal; posthole of 4-post structure, Area A	C77, S28	4105 ± 35	2850-2810 BC 2740-2720 BC 2700-2570 BC	2870-2800 BC 2780-2570 BC 2520-2500 BC
SUERC-9023	Oak charcoal, middle fill of charcoal kiln C128, Area A	C157, S45	2480 ± 35	760-680 BC 670-530 BC	770-480 BC 470-410 BC

SUERC-9024	Oak charcoal, lower fill of main ring-ditch, Area C	C14, S75	2170 ± 35	360-290 BC 240-170 BC	370-110 BC
SUERC-9025	Hazel charcoal, fill of drying kiln C245, Area C	C295, S81	1605 ± 35	AD 410-470 AD 480-540	AD 380-550
SUERC-9029	Oak charcoal, fill of small ring-ditch, Area C	C334, S99	2270 ± 35	400-350 BC 290-230 BC	400-340 BC 320-200 BC
SUERC-9030	Oak charcoal from one of a row of postholes, Area A	C385, S105	4120 ± 35	2860-2800 BC 2760-2720 BC 2700-2610 BC	2880-2570 BC
SUERC-9031	Hazel charcoal, fill of drying kiln C391, Area C	C392, S109	1580 ± 35	AD 430-540	AD 400-560
SUERC-9164	Human bone, Burial 2	C55	1540 ± 35	AD 430-490 AD 500-570	AD 420-600
SUERC-9168	Human bone, Burial 4	C340	1535 ± 35	AD 430-490 AD510-520 AD 530-580	AD 420-600

Radiocarbon dates were obtained from three features in Area A, at the south-western end of the site. Two of these features, one from the rectangular structure near the centre of the area, and one from the row of four postholes at the south-eastern corner, were broadly contemporary, dating to the late Neolithic. The third, a charcoal kiln, dated to the Iron Age. The remaining features in Area A, including the curved row of postholes, the two parallel lines of postholes to the west of it, and the dispersed pits further to the west were not dated. It can be assumed however that they too date to the Late Neolithic, on the basis of the recovery of a piece of worked flint from one of the postholes, C261, since all the remaining flint artefacts from the site were found in Neolithic features.

No evidence of Bronze Age activity was found on the site, with a long gap in activity from the late Neolithic until the Iron Age. The charcoal kiln in Area A was dated to 770-410 BC, and it can be assumed that a nearby kiln and smelting furnace were contemporary. The main body of Iron Age activity is slightly later, with the smaller ring-ditch dating to 400-200 BC, and the main ring ditch to 370-110 BC. The charcoal kiln in Area B, and by extension the nearby smelting furnaces, dated to 170 BC- AD 30. There is therefore a broad contemporaneity between both ring-ditches and the metalworking in Area B. The metalworking in Area A is somewhat earlier but it is uncertain if this reflects the true chronology or is due to the 'old wood effect' of the dating sample.

The next phase of activity on the site was in the Early Medieval period and included the human burials and the corn-drying kilns, all of which dated broadly to the period 400-600 AD.

5.0 DISCUSSION AND INTERPRETATION

Three distinct phases of activity are represented at this site, the late Neolithic, the Iron Age and the Early Medieval period.

5.1 The Neolithic features

The Neolithic activity was concentrated on the plateau at the south-western end of the site. It was comprised of two distinct concentrations of activity separated by a linear ditch, C307, running east-northeast to west-southwest. It is

not clear if the ditch itself is a Neolithic feature or a later intrusion. The features at the northern side of C307 comprised the four-post structure and the C-shaped setting of postholes to the south of it which may represent a structure. The function of the four-post structure is uncertain but the re-use of the postholes and the presence of burnt bone and burnt stone in each of them, and worked flint in three, suggest a function other than agricultural. Furthermore the structure, with dimensions of 2.5m x 2.5m, would have been too small for a domestic structure. A ritual use would therefore seem the most likely. The structure bears comparison with elements of some Late Neolithic timber circles which have been excavated in recent years. These generally comprise a circular setting of postholes enclosing a rectangular setting. One, at Kilbride, Co. Mayo, was excavated by the present author[1]. There the circle enclosed a rectangle measuring 4.6m x 3.6m. At Knowth, Co. Meath, a rectangular structure measuring 4m x 4m was enclosed within a circle (Eogan and Roche 1994, 322-30), while at Balgatheran, Co. Louth a rectangular structure measuring 3.5m x 3m was enclosed by a circle of postholes close to two other unenclosed rectangles measuring 2.5m x 2.4m and 3.7m x 3.3m (Ó Drisceóil 2003, 257). Grooved Ware pottery was recovered at all three of these sites. This, and radiocarbon dating for Kilbride (3010-2470 BC), places them in the Late Neolithic, contemporary with the present features at Morett.

The precise function of these 'four-post' structures is unknown. One excavator has suggested that they were mortuary structures which may have carried a platform on which bodies were left to decay (Hartwell 1994, 13).

The function of the group of postholes to the south-east of the 'four-post' structure is uncertain. They appear to constitute a separate semi-circular structure, open to the south and therefore facing away from the 'four-post' structure and not related to it. They may therefore relate to a different phase of activity.

The remaining evidence for Neolithic activity lies in two concentrations. At the southeastern corner of Area A was row of four postholes. These suggest a short fence line, but there are no other related features in the vicinity. Some 15m to the west was a curving line of small closely-spaced postholes which extended as far as the limit of the excavation, and presumably beyond. The close spacing of these postholes suggests a post-and-wattle fence line. To the west of the fence, within the curve, there were two short rows of postholes which may represent some light structure such as a drying rack.

Other dispersed features in the area do not form any coherent pattern.

5.2 The ring-ditches

Two ring-ditches were located in Area C, 24m apart. The larger of the two (16m in diameter) showed evidence of intensive usage in the form of animal bone fragments, fire-cracked stone, charcoal and metal artefacts. A pit-like feature at its centre showed no evidence of a man-made origin and appears to have been either a geological anomaly or a tree-root cavity. The smaller ring ditch measured only 7m in diameter, with a ditch only 0.12m deep. Small quantities of animal bone were recovered from its fill. A number of similar ring-ditches have previously been

[1] www.excavations.ie. 2005:1115, Cloonbaul/Kilbride

recorded in the vicinity of Morett. A complex of four was excavated in 1995 on the route of the Portlaoise by-pass at Ballydavis townland, *c.* 3Km southwest of the Morett site (Keeley 1996, 51). As at Morett the Ballydavis complex was located on a low hill. Sites 1 and 2 at Ballydavis measured 16m and 8m respectively in diameter, almost identical to those at Morett, while Sites 3 and 4 were 6m in diameter. A central burial deposit comprising cremated bone and numerous artefacts was found in Site 1. Other artefacts were also recovered from Site 1 and from Sites 2 and 3, forming an impressive assemblage of Iron Age artefacts including a bronze box, two bronze fibulae, two iron blades, an iron buckle and numerous glass beads.

Further excavations took place in 2003 at Ballydavis, close to the 1995 site, as part of the same phase of works as the present Morett site. That excavation uncovered what is described as "a complex of burial monuments and ceremonial structures thought to date from the Late Bronze Age through to the Iron Age (*c.* 500 BC to AD 400)" (Fegan 2006, 284). The complex included a large enclosure measuring over 100m in diameter, of which part was excavated revealing three smaller enclosures. The largest of these measured 18.5m in external diameter and enclosed the inhumation burial of an adult male. The second enclosure measured 12.3m in external diameter and enclosed a central pit containing the disarticulated remains of an adult female. This enclosure had truncated an earlier ring-ditch. The latter was not fully excavated as part of it lay outside the limit of excavation. A cremation deposit was found at the base of the ditch.

Two further relevant sites were excavated in 2003 in the vicinity of the Morett site. Some 700m to the southwest, also in Morett townland, a sub-oval enclosure with internal dimensions of 15.4m x 11m was identified by the excavator as a "possible" ring-ditch (Dempsey 2006, 296), while an enclosure at Cappakeel townland 1.5Km northeast of Morett was identified as a ring-ditch. This measured 3.5m in diameter. Cremated bone and iron nails were recovered from the ditch fill (O Maolduin 2006, 289).

5.3 The Metalworking

Two distinct metalworking areas were identified on the site, one in Area A and the second in Area B. The features in Area A comprised two pits C126 and C128, located close together and presumed to be charcoal production kilns, and two conjoined pits C172 and C324, located c. 6m to the north and identified as a possible smelting furnace. The latter features have been highlighted in the specialist evaluation as potentially representing a hearth or furnace and associated working hollow, or a pit in front of a furnace arch providing access to the furnace for clearing out slag. Examples of the latter features have been found in non-slag tapping furnaces in Wales, but have not yet been recorded in Ireland.

In Area B three furnaces, C140, C141 and C142 were located close together, with at least one, possibly two, charcoal production kilns located *c.* 20 m to the southwest. Two of the furnaces C140 and C141 contained *in-situ* smelting residue.

Extensive evidence for metalworking has been recorded in excavations in Ballydavis townland, close to the Iron Age enclosures described in Section 5.3 above. In addition a separate excavation in Ballydavis townland in 2003 revealed further metalworking evidence in the form of furnaces/smithing hearths (O Maolduin 2006, 285).

5.4 The corn-drying kilns

Four corn-drying kilns were found to the east of the ring ditch and the burials, on the eastern slope of the hill. They were sited c. 16m apart along a north-west/south-east line, following the contour of the hill, and each individual kiln lay on the same alignment, i.e. at right angles to the slope. All had a 'figure-of-eight' ground plan and essentially consisted of two circular pits, one deeper than the other, the deeper one containing the hearth. Two of the kilns were radiocarbon dated to AD 380-560, placing them in the Early Medieval period, approximately contemporary with the nearby burials.

5.5 The burials

Stratigraphic evidence from the excavation shows that Burials 1, 2 and 3 together comprised a single burial episode. Radiocarbon dates obtained from Burials 2 and 4 (Table 6 below) shows that they were broadly contemporary. While acknowledging the broad time span of the radiocarbon determination (180 years), it is nevertheless tempting to see the four burials as a family unit. If this was the case it raises questions as to why one member should be buried separately and why the burial should be treated differently by having stones placed around it. On the latter question it must be noted that, given the shallowness of the multiple burials and the extent of damage they had suffered from agricultural activity, it is possible that stones placed around them would have been ploughed out. Burial 4 on the other hand had not suffered as much damage as the others. On the question of why Burial 4 should have been buried separately it can be noted that this individual was noticeably taller than the others (see Table 5 below), and that it was the only skeleton of the four to exhibit evidence of a great deal of physical activity. Both of these features might suggest that this was a male individual. However, the specialist report shows that, of nine skeletal elements assessed for sex determination only two suggested this was a male, and both of those elements are subject to morphological change due to intensive use of the upper limb. Of the remaining seven elements four indicated female and three were indeterminate. While not conclusive, therefore, the evidence suggests it was a female. The evidence for greater physical activity might simply be attributable to greater age rather than a different type of lifestyle or work to the others. The fact that she was buried separately from the others and that the burial was treated differently by the addition of a stone setting suggests that she was a person of high status or held in high esteem by her community, something which may also be related to her anatomically taller stature. The skeletal evidence that she had endured a great deal of physical activity perhaps runs counter to our normal conception of people of high status not engaging in physical labour. It could be postulated therefore that the remains here are those of members of a working, agricultural community and that the

special treatment afforded in burial to one was due to a special respect among the community gained by wisdom and age rather than wealth or social class.

Subsequent to the excavation described in this report, during the construction phase of the Heath-Mayfield motorway project further excavations uncovered another four inhumations in Morett townland.[2] All were single dispersed burials. Three were radiocarbon dated to the Medieval period with a date range of AD 1045-1275. One of these was located *c.* 200m south-southeast of the burials described in this report; the second was located *c.* 200m to the southwest and the third *c.* 340m to the southwest. The fourth burial was dated to AD 409-533, making it contemporary with the burials in this report, and was located *c.* 400m to the southwest of them. It was a poorly preserved burial lying extended and prone (face down), and orientated east-west. It was identified as an adult, but its age could not be determined.

It is believed that the rite of inhumation burial was introduced into Ireland from Britain in the first century AD (O Brien 1992, 131) and gradually replaced the native Iron Age tradition of cremation. Archaeological and historical evidence indicates that during the Late Iron Age/Early Medieval period burials could be either in community or familial enclosures or occur as individual dispersed burials. Despite the increasing tendency towards burial in formal Christian cemeteries isolated inhumations are common in the archaeological record and there is evidence that such isolated burials did not seem unusual to seventh-century writers (O Brien 1992, 134).

6.0 CONCLUSION

The site at Morett was excavated as part of the programme of resolution of archaeological sites along the route of the N7 Heath-Mayfield Motorway Scheme. It provided evidence for activity in the area during the Neolithic, the Iron Age and the Early Medieval period. The Neolithic activity comprised a possible ritual 'four-post' structure and evidence for fence lines possibly representing agricultural activity. No other comparable site is known in the area. The Iron Age is represented by two ring-ditches and two discrete areas of metalworking including furnaces and charcoal burning kilns. Similar evidence has been found in nearby Ballydavis townland and another possible ring-ditch has been excavated in Morett townland. Early Medieval activity on the site includes four human burials and four corn-drying kilns. Other dispersed burials have been found in the vicinity including one which was contemporary with those on the present site and three which date to the Medieval period.

[2] Information on Morett 15 courtesy of Archaeological Consultancy Services Ltd. Other details taken from www.archaeology.ie and http://archaeology.nra.ie/Default.aspx

7.0 BIBLIOGRAPHY

Comerford, Rev. M, 1883, Collections relating to the Dioceses of Kildare and Leighlin

Fegan, G 2006, 'Ballydavis' in I Bennett (ed), *Excavations 2003*, 284. Wordwell, Bray.

Keeley, V J 1996, 'Ballydavis' in I Bennett (ed), *Excavations 1995*, 51. Wordwell, Bray.

Keeley, V J 1999, 'Iron Age discoveries at Ballydavis', in P G Lane, and W Nolan (ed.), *Laois – History and Society*, 25-34. Geography Publications, Dublin.

O Brien, E 1992, 'Pagan and Christian burial in Ireland during the first millennium AD: continuity and change' *in* N Edwards and A Lane (eds), *The Early Church in Wales and the West*, 130-137. Oxbow Monograph 16. Oxbow, Oxford.

O Maolduin, R 2006, 'Ballydavis' in I Bennett (ed), *Excavations 2003*, 285. Wordwell, Bray.

O Maolduin, R 2006, 'Cappakeel in I Bennett (ed), *Excavations 2003*, 289. Wordwell, Bray.

Waddell, J 1998, *The prehistoric archaeology of Ireland*. Galway University Press, Galway.

APPENDIX 1 – RADIOCARBON DATES

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RADIOCARBON DATING CERTIFICATE

28 February 2006

Laboratory Code	SUERC-9021 (GU-13734)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer *Co. Kilkenny*, Republic of Ireland
Site Reference **Sample Reference**	Morett 03E0461 Context 37 Sample 12
Material	Charcoal : Hazel / oak
$\delta^{13}C$ relative to VPDB	-28.1 ‰
Radiocarbon Age BP	2045 ± 35

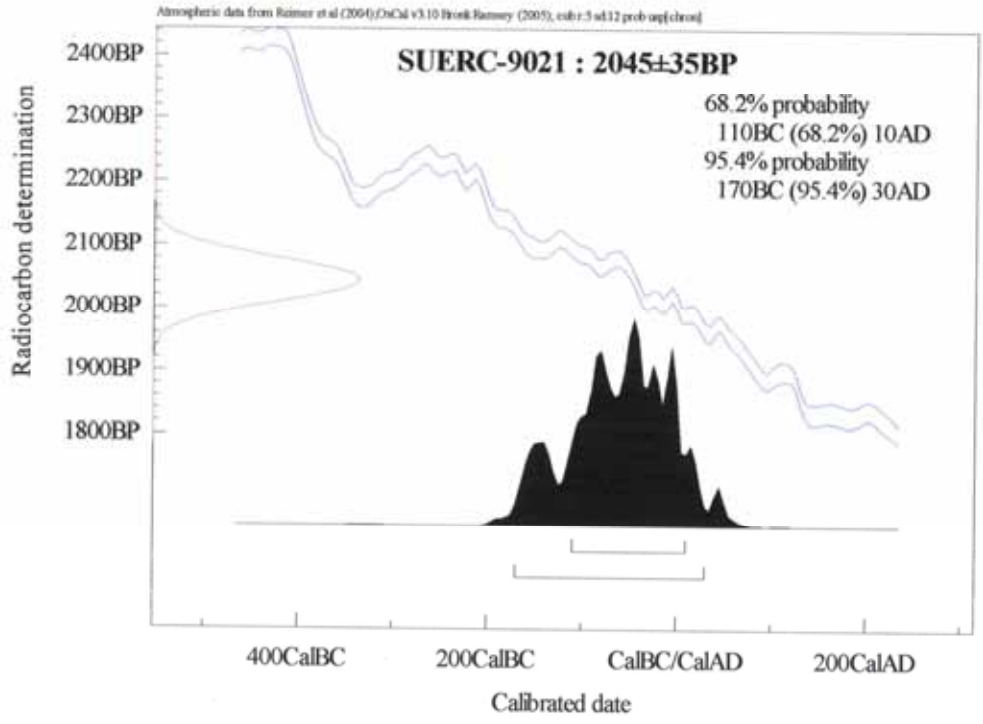
N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3-3-06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

28 February 2006

Laboratory Code	SUERC-9022 (GU-13735)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 77 Sample 28
Material	Charcoal : Oak
$\delta^{13}C$ relative to VPDB	-25.5 ‰
Radiocarbon Age BP	4105 ± 35

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
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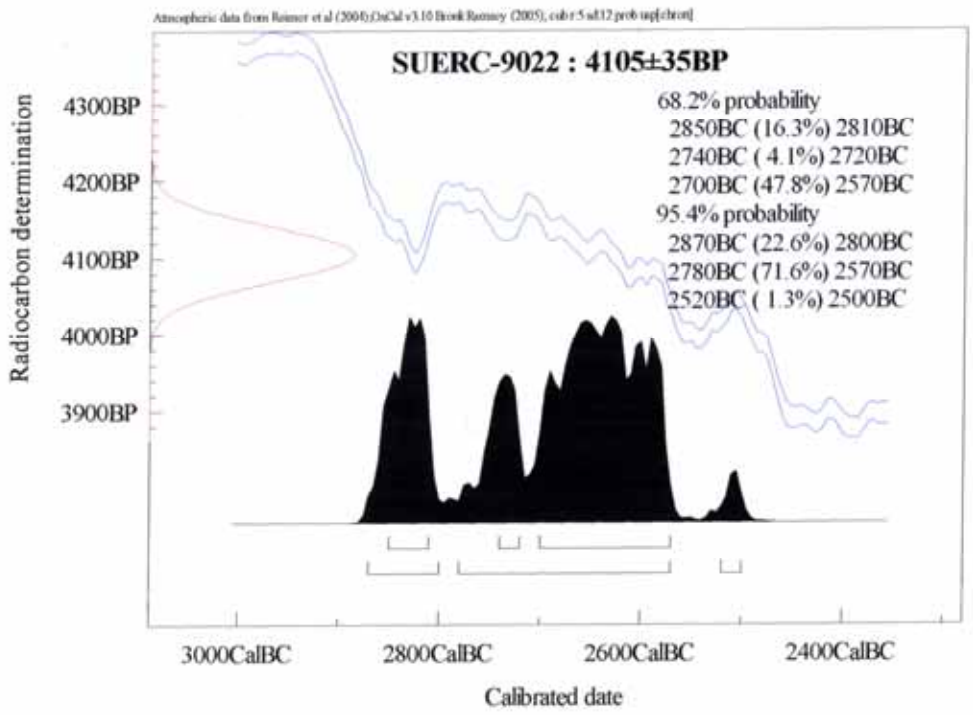
Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3-3-06

Calibration Plot



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28 February 2006

Laboratory Code	SUERC-9023 (GU-13736)
Submitter	Eamonn Cotter *Valerie J. Keeley Ltd.* Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 157 Sample 45
Material	Charcoal : Oak
$\delta^{13}C$ relative to VPDB	-26.3 ‰
Radiocarbon Age BP	2480 ± 35

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
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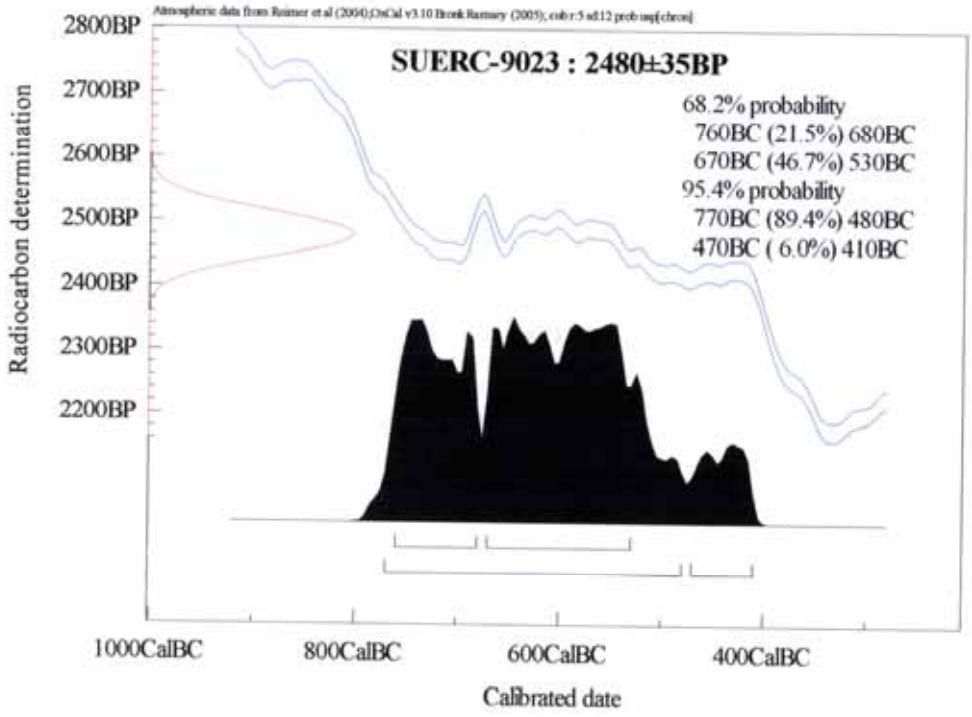
Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3·3·06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

28 February 2006

Laboratory Code	SUERC-9024 (GU-13737)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 14 Sample 75
Material	Charcoal : Oak
$\delta^{13}C$ relative to VPDB	-26.4 ‰
Radiocarbon Age BP	2170 ± 35

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
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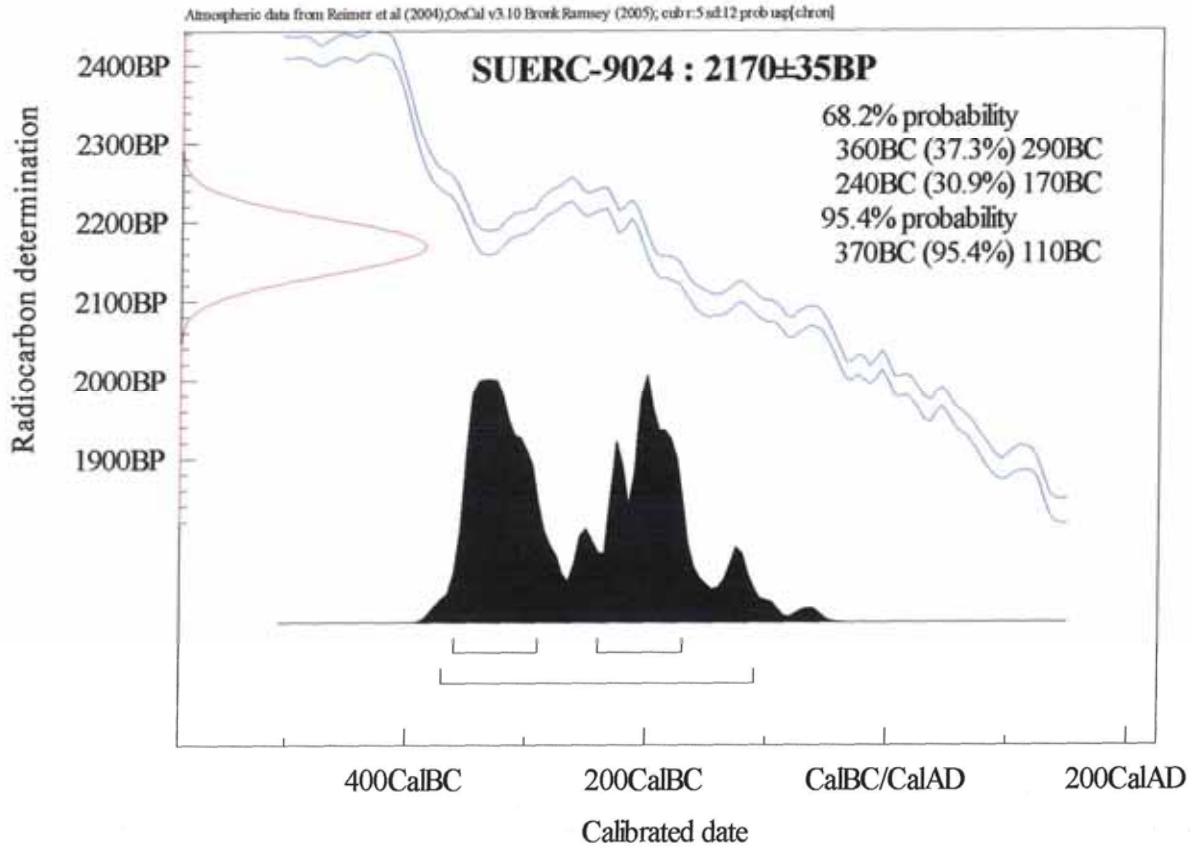
Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3-3-06

Calibration Plot



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28 February 2006

Laboratory Code	SUERC-9025 (GU-13738)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 295 Sample 81
Material	Charcoal : Hazel
$\delta^{13}C$ relative to VPDB	-28.1 ‰
Radiocarbon Age BP	1605 ± 35

N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
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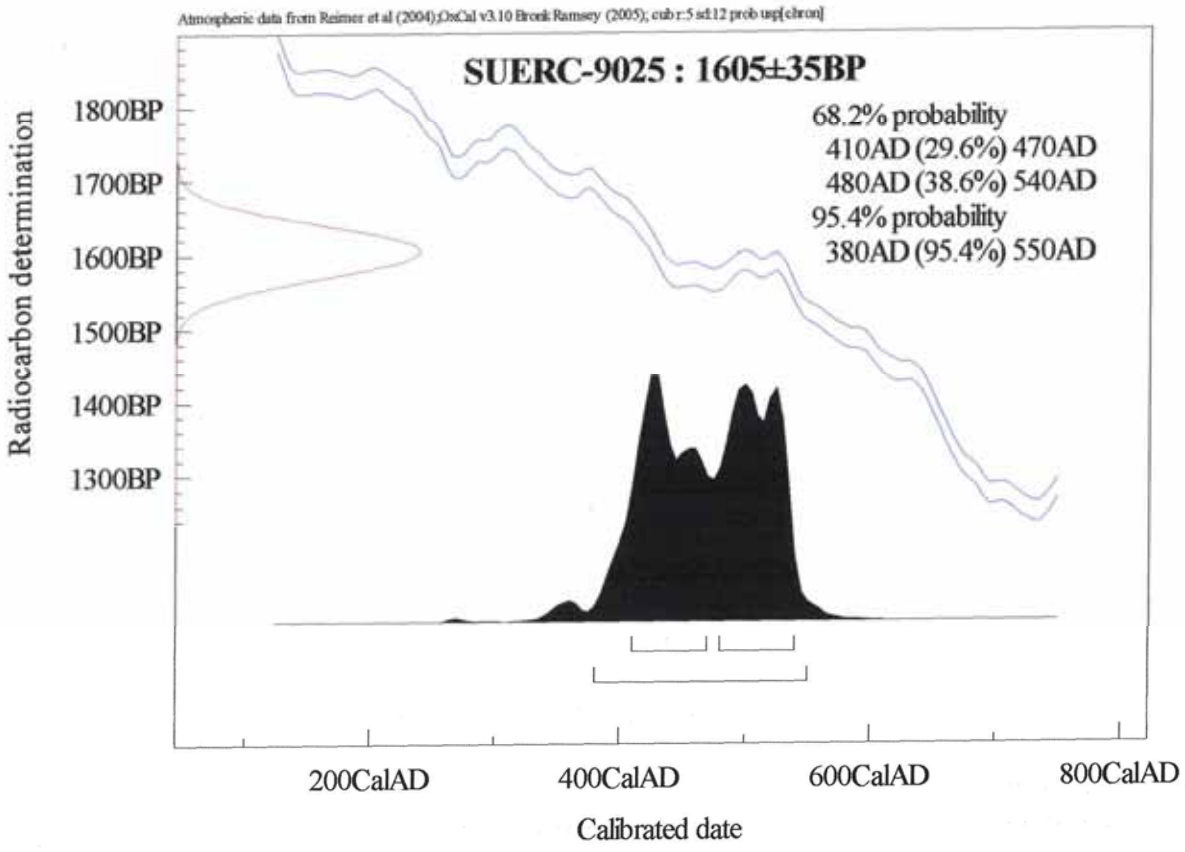
Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3·3·06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

28 February 2006

Laboratory Code	SUERC-9029 (GU-13739)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 334 Sample 99
Material	Charcoal : Oak
$\delta^{13}C$ relative to VPDB	-26.6 ‰
Radiocarbon Age BP	2270 ± 35

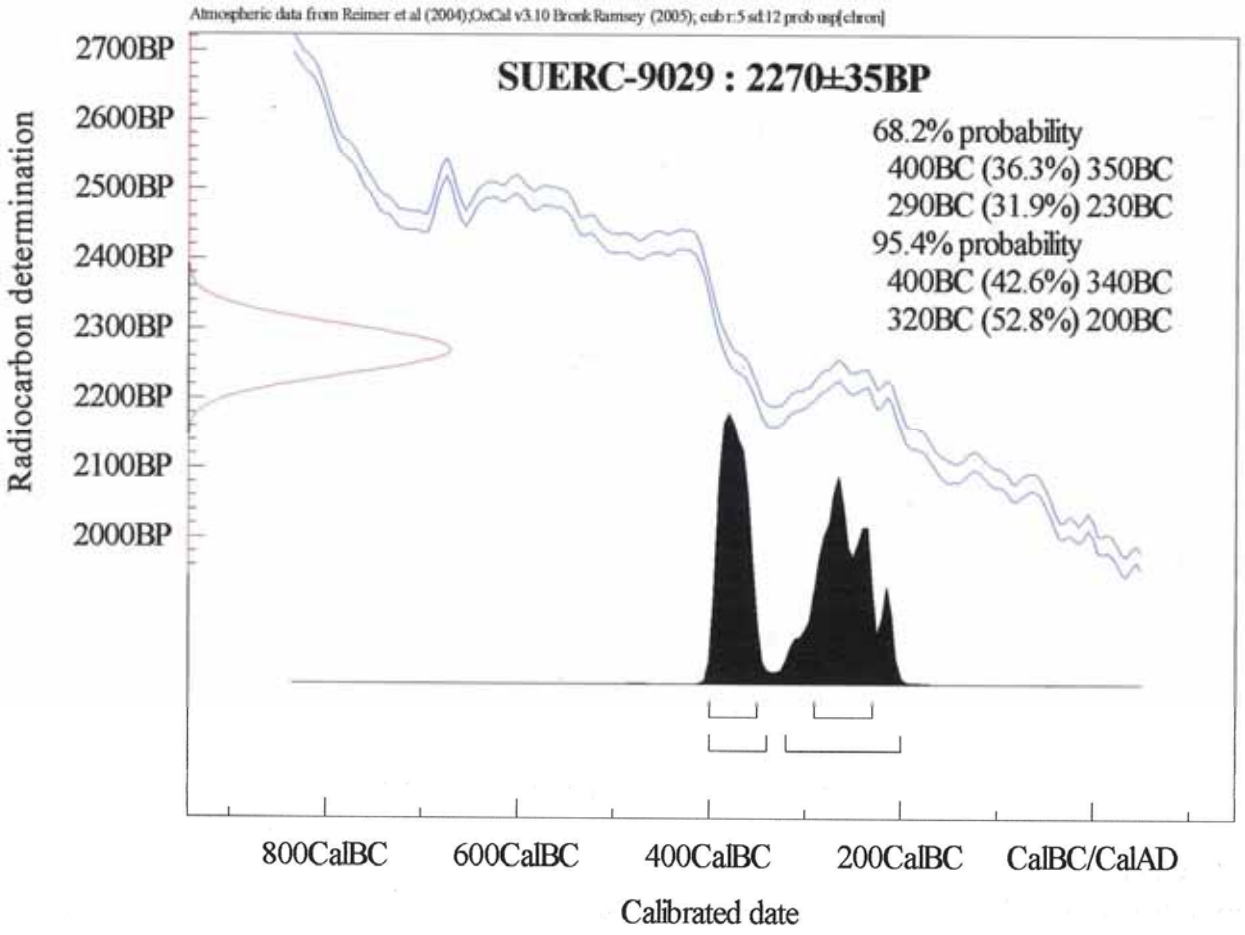
N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3-3-06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

28 February 2006

Laboratory Code	SUERC-9030 (GU-13740)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 385 Sample 105
Material	Charcoal : Oak
$\delta^{13}C$ relative to VPDB	-28.4 ‰
Radiocarbon Age BP	4120 ± 35

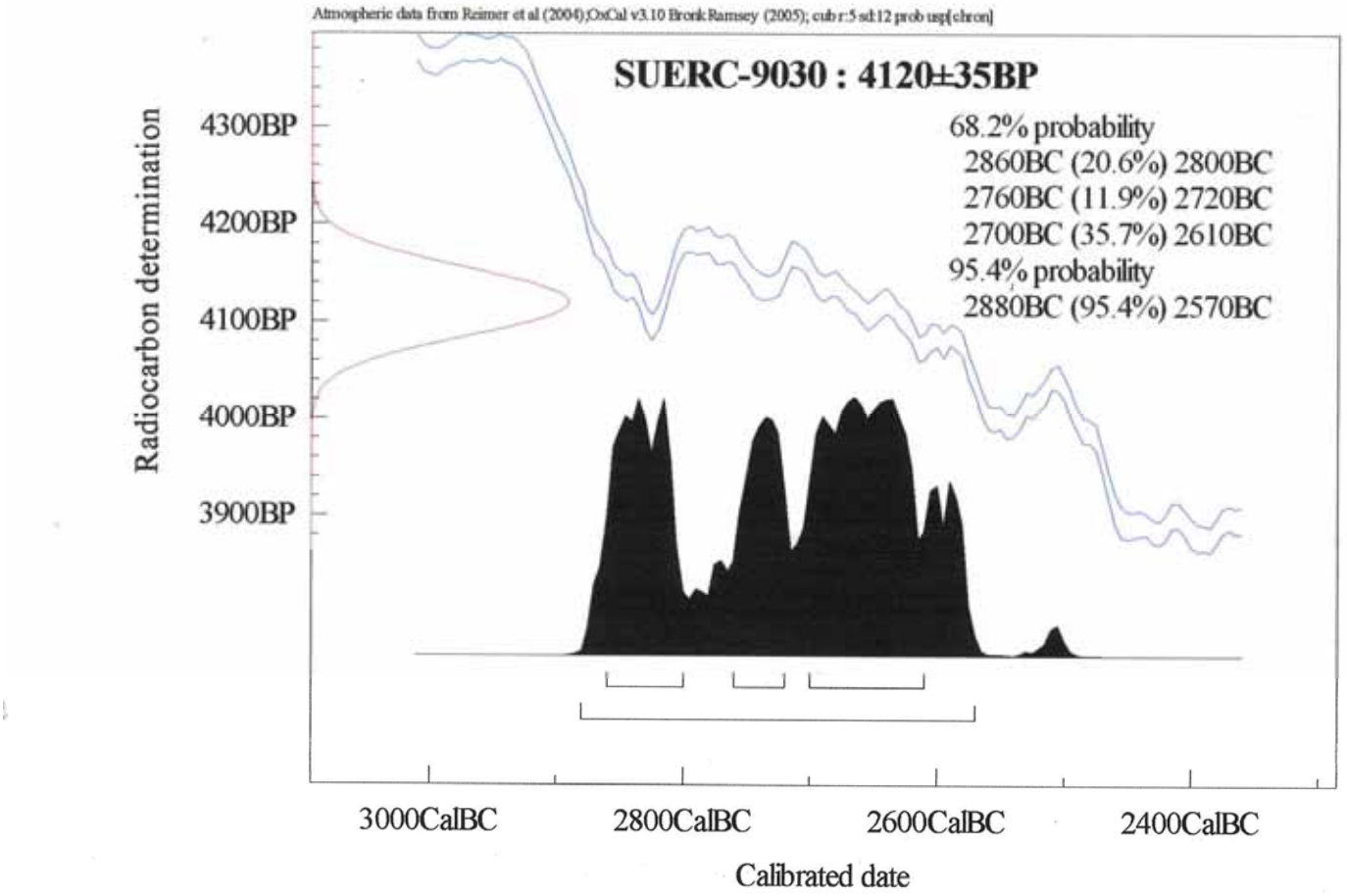
N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3·3·06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

28 February 2006

Laboratory Code	SUERC-9031 (GU-13741)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461 Context 392 Sample 109
Material	Charcoal : Hazel
$\delta^{13}C$ relative to VPDB	-27.4 ‰
Radiocarbon Age BP	1580 ± 35

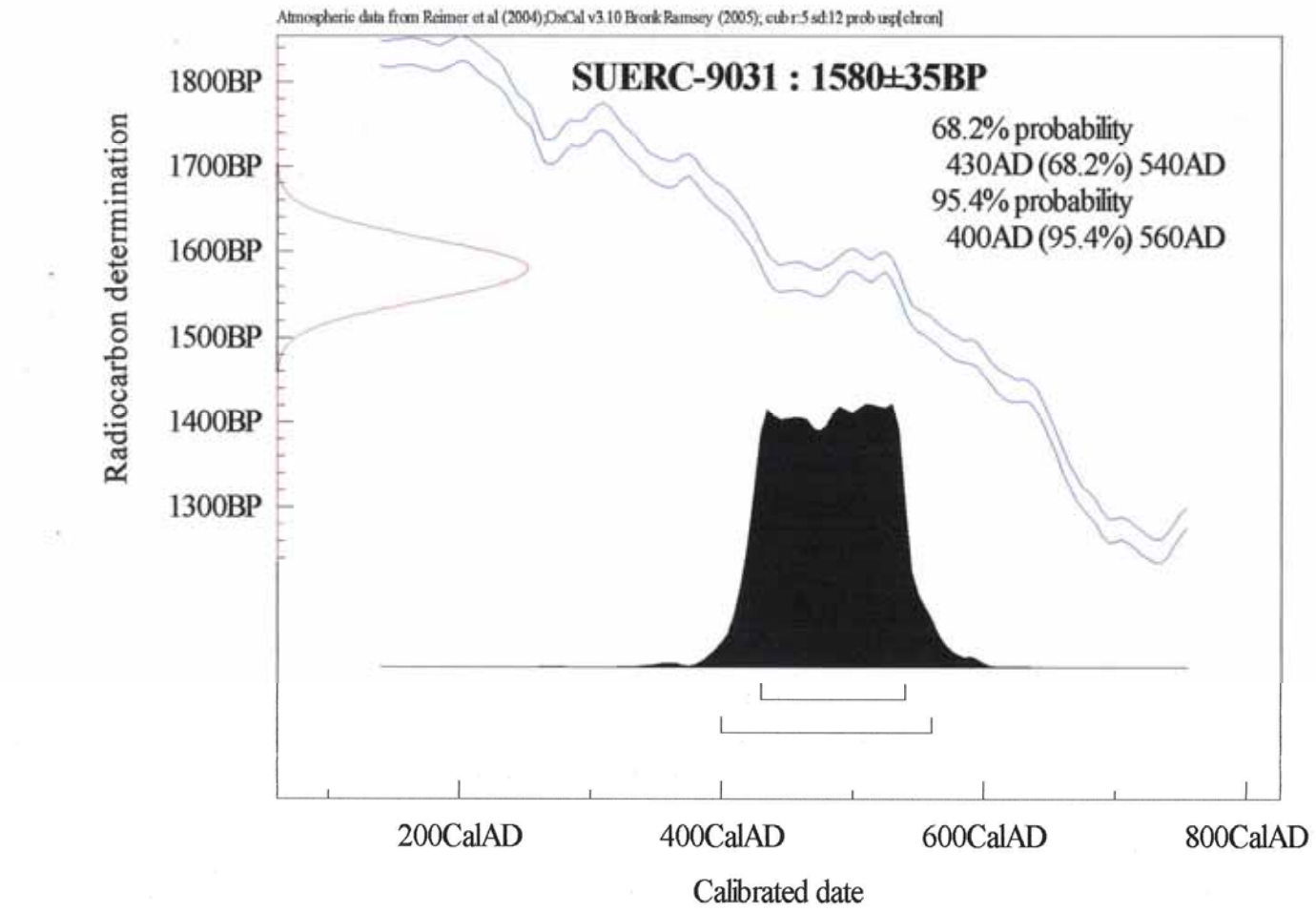
N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- Elaine Dunbar Date :- 03/03/06

Checked and signed off by :- P. Naysmith Date :- 3-3-06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

14 March 2006

Laboratory Code	SUERC-9164 (GU-13833)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House, Kilkenny Road Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461, Burial 2, C55
Material	Human Bone : Rib, femur
$\delta^{13}C$ relative to VPDB	-20.7 ‰
Radiocarbon Age BP	1540 ± 35

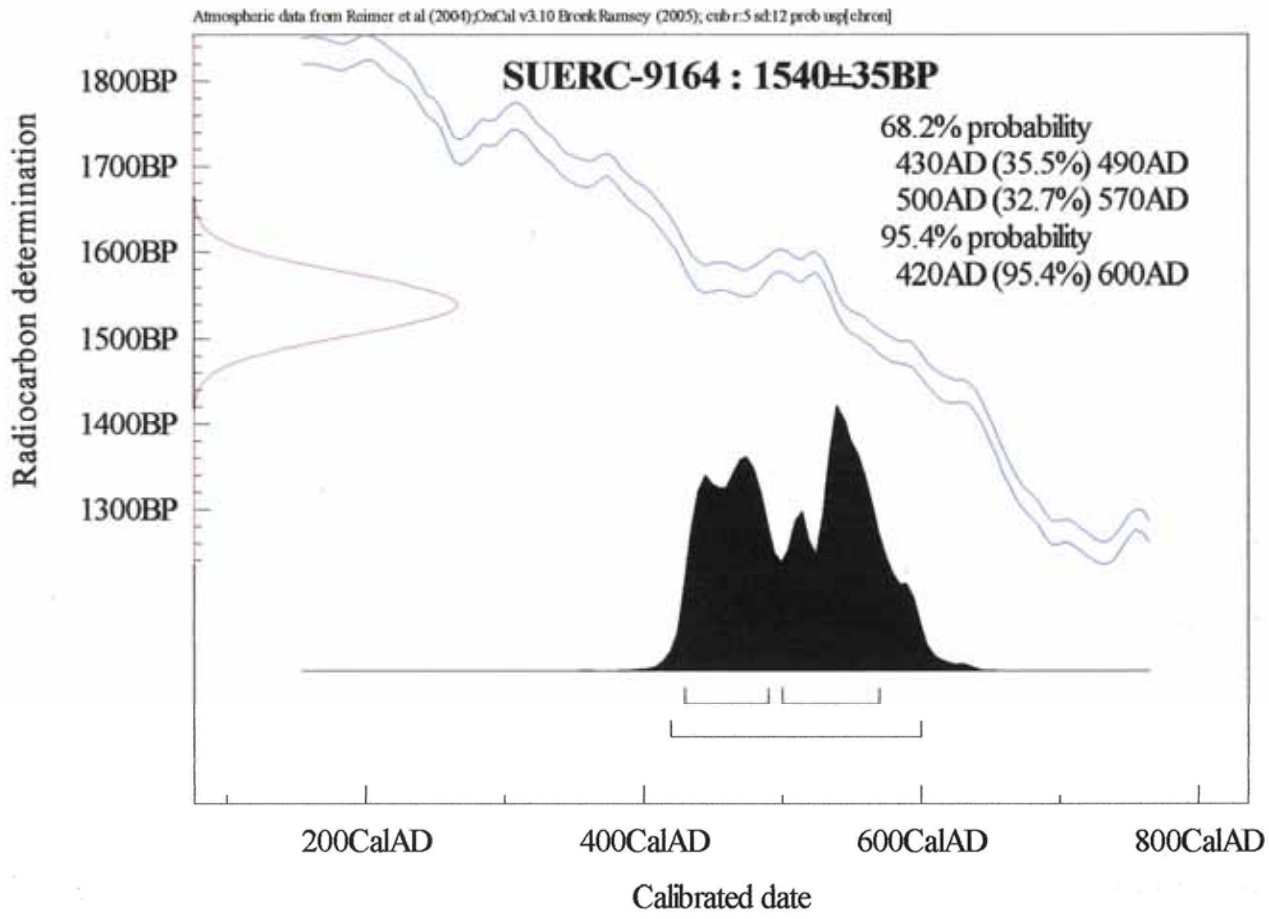
N.B.

1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- R. Anderson Date :- 14-3-06

Checked and signed off by :- P. Naysmith Date :- 14-3-06

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

14 March 2006

Laboratory Code	SUERC-9168 (GU-13834)
Submitter	Eamonn Cotter Valerie J. Keeley Ltd. Brehon House, Kilkenny Road Castlecomer Co. Kilkenny, Republic of Ireland
Site Reference	Morett
Sample Reference	03E0461, Burial 4, C340
Material	Human Bone : Femur, rib
$\delta^{13}C$ relative to VPDB	-21.1 ‰
Radiocarbon Age BP	1535 ± 35

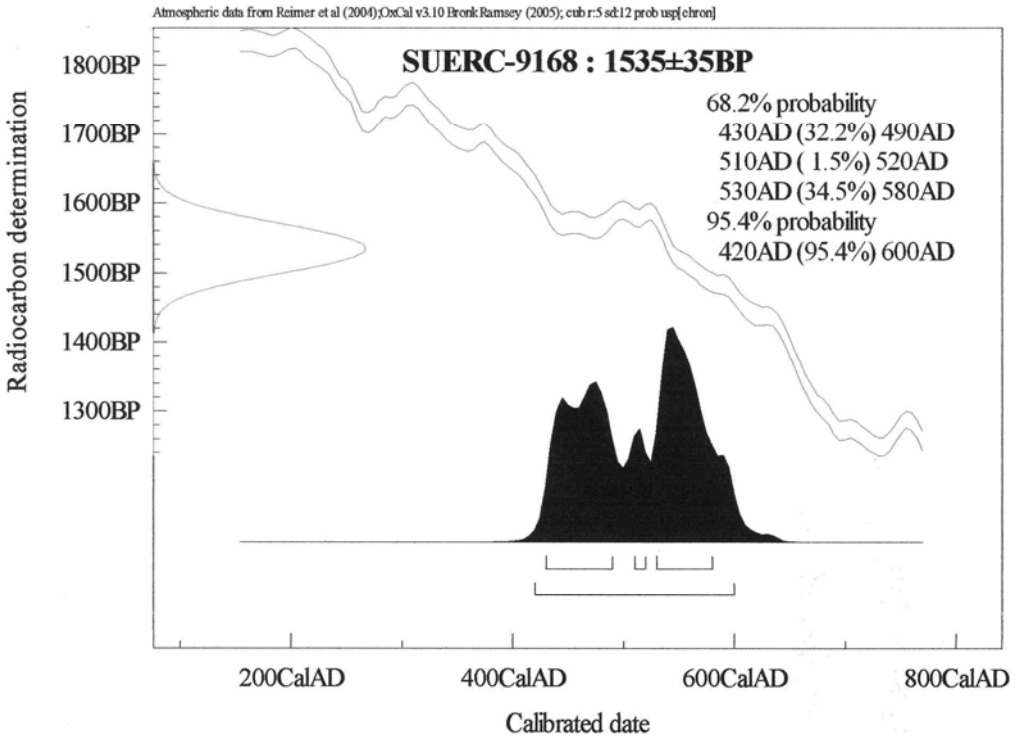
N.B.

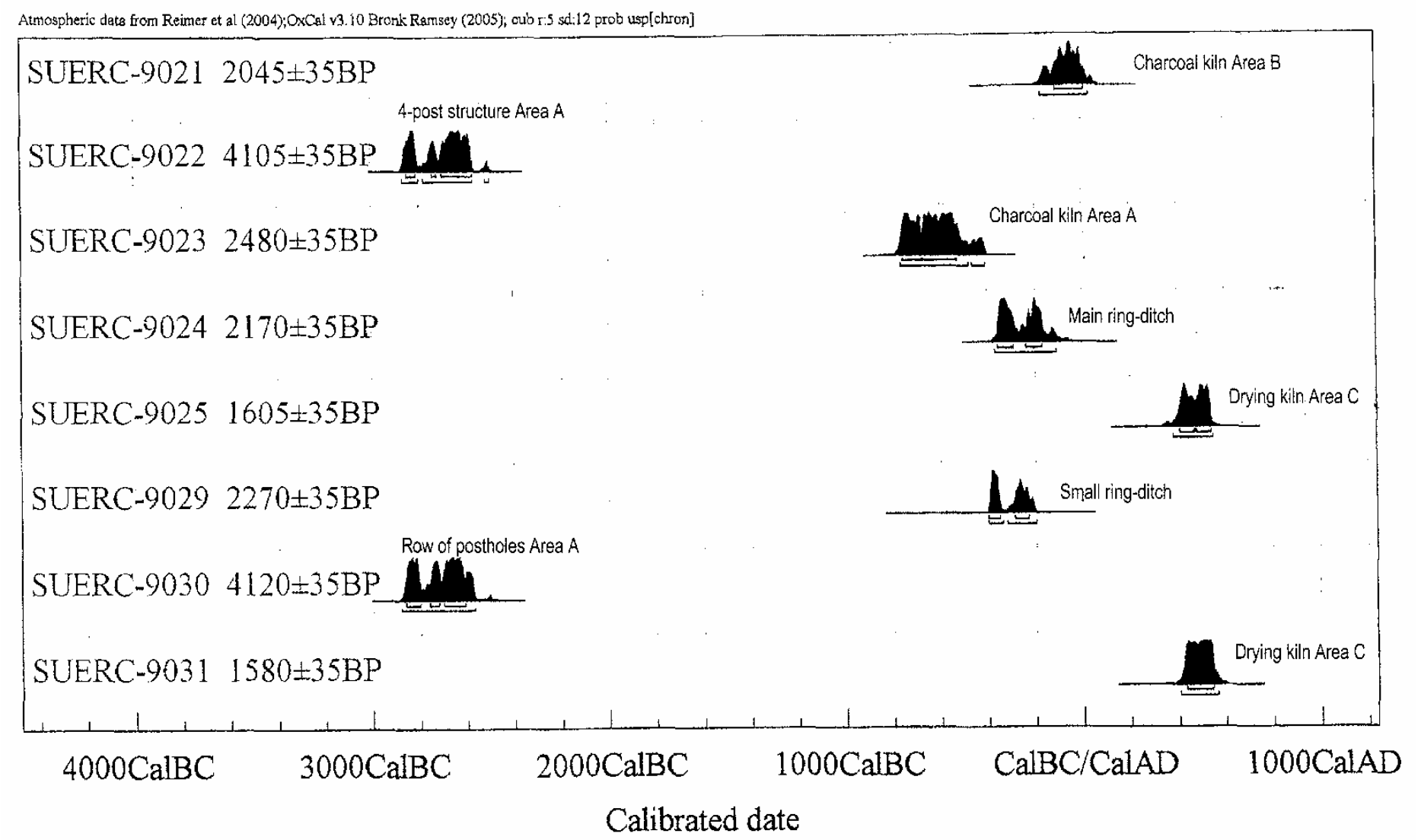
1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code.

Conventional age and calibration age ranges calculated by :- R. Anderson Date :- 14-3-06

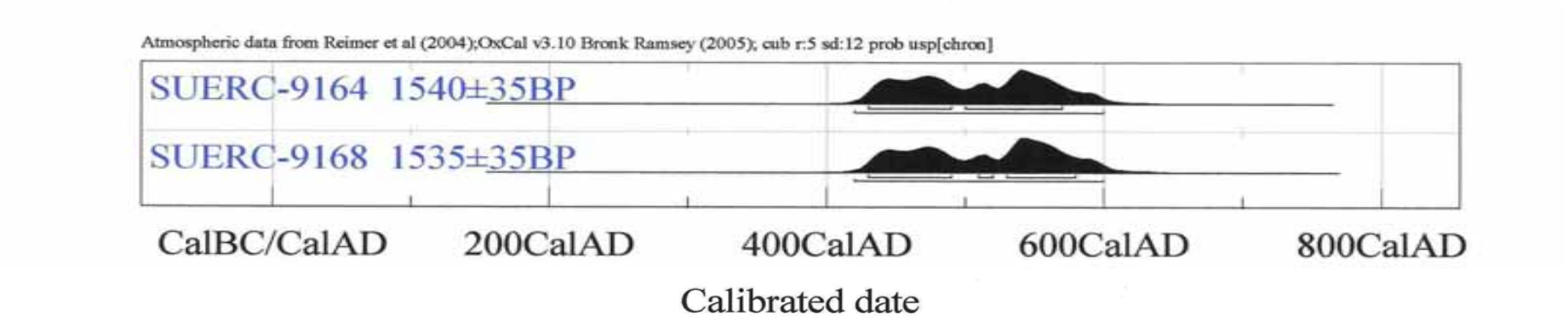
Checked and signed off by :- P. Naysmith Date :- 14-3-06

Calibration Plot





Graph showing C14 dates from charcoal samples



Graph showing C14 dates from human burials

APPENDIX 2 - CHARCOAL IDENTIFICATION

SPECIES IDENTIFICATION
OF CHARCOAL SAMPLES FROM
EXCAVATIONS AT SITE D, MORETT, CO. LAOIS. 03E0461
N7 HEATH-MAYFIELD MOTORWAY SCHEME

ELLEN OCARROLL
January 2006

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3. RESULTS..... 3

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1. INTRODUCTION

Nine charcoal samples were submitted for analysis from excavations carried out at Site D, Morett (03E0461) on the route of the N7 Heath-Mayfield Motorway Scheme. The excavations included a number of site types and features of varying dates. The samples submitted were retrieved from two charcoal production pits (C36 & C157), post holes (C77 & C385), a ring ditch (C334), a ditch fill (C14) and two corn-drying kilns (C295 & C392). The ring ditchs may date to the Iron Age while the corn drying kilns and charcoal production pits probably date to the later Early Christian period and later.

The charcoal was sent for species identification prior to ^{14}C dating and also to give an indication of the range of tree species, which grew in the area, as well as the utilization of these species for various functions. Wood used for fuel at prehistoric sites would generally have been obtained at locations close to the site. Therefore charcoal identifications may, but do not necessarily, reflect the composition of the local woodlands. Larger pieces of charcoal, when identified, can provide information regarding the use of a species.

2. METHODS

The process for identifying wood, whether it is charred, dried or waterlogged is carried out by comparing the anatomical structure of wood samples with known comparative material or keys (Schweingruber 1990). The identification of charcoal material involves breaking the charcoal piece so that a clean section of the wood can be obtained. This charcoal is then identified to species under an Olympus SZ3060 zoom stereomicroscope. By close examination of the microanatomical features of the samples the species were determined. The diagnostic features used for the identification of charcoal are micro-structural characteristics such as the vessels and their arrangement, the size and arrangement of rays, vessel pit arrangement and also the type of perforation plates. It is important to note that only in some cases were all the characteristic features described above present in the archaeological samples.

3. RESULTS

Table 1: Results from site D, 03E0461

Locational info. & Context No.	Sample no.	Species	Weight and comment
C36, charcoal production pit	12	Mostly hazel rods and some oak which has been bagged separately	200g +
C77. post hole	28	All oak	5g
C157, charcoal production pit	45	All oak	100g
C14, ditch fill	75	All oak	7g
C295, corn drying kiln	81	All hazel	35g (A sample was dried and bagged for dating)
C334, ring ditch	93	All oak	1g
C334, ring ditch	99	All oak	200g
C385, post hole	105	All oak	5g
C392, corn drying kiln	109	All hazel	5g

4. DISCUSSION

Two species were identified from the excavations carried out at Side D, Morett, Co. Laois. Hazel (*Corylus avellana*) was identified from the charcoal production pit C36 and the two corn drying kilns C295 & C392. Oak was exclusively identified from the ring ditch C334, the two post holes (C385 and C77) and the ditch fill C14 and from the charcoal production pit C157. A small amount of oak charcoal was also identified from the charcoal production pit C36.

From the analysis above it is clear that hazel and oak were specifically selected for use at the sites excavated at Morett, Co. Laois. All of the charcoal appeared quite fresh which suggests it was selected specifically for a structural use rather than collected from fallen branches for kindling. Oak appears to have been used in great quantities in the ring ditches, the post holes and in the charcoal production pits. The oak identified from the ring ditches may be from some structural posts or planks which lay in the ring ditches during their time of use. The oak was also selected and preferred for use as posts as it has unique durability and strength and is commonly used for structural requirements throughout the pre-historic and into the historic period. The oak identified suggests that there was a plentiful supply of oak in the

surrounding environment particularly around the Iron Age when the ring ditch may have been in use. Sessile oak (*Quercus petraea*) and pedunculate oak (*Quercus robur*) are both native and common to Ireland. The wood of these species cannot be differentiated based on its microstructure. Pendunculate oak is found on heavy clays and loams particularly where the soil is of alkaline pH. Sessile oak is found on acid soils often in pure stands and although it thrives on well-drained soils it is also tolerant of flooding (Beckett 1979, 40-41). Both species of oak grow to be very large trees (30-40m) and can live to an age of 400 years.

Hazel was used more frequently in the later dated sites particularly in association with the corn drying kilns and the charcoal production pit C36. The hazel identified from the charcoal production pit was small brushwood and may have been selected from coppiced woodland. In early Irish law hazel was classified as a noble of the wood *Airig feo* as its nuts would have been a good food source and its long straight rods from the coppiced stump would have been used for kindling, wattlework and furniture. Hazel is a native species and was very common up to the end of the 17th century. McCracken (1971, 19) points out that "it was once widespread to a degree that is hard to imagine today". With the introduction of brick, steel and slate the crafts associated with hazel became obsolete, and today the woods that supplied hazel have diminished rapidly. During the industrial revolution the practice of coppicing became a widespread means of making charcoal, a pure source of fuel suitable for firing the furnaces to smelt metal ores.

Hazel is normally only about 3-5m in height and is often found as an understory tree in deciduous woods dominated by oak. It also occurs as pure copses on shallow soils over limestone as today like The Burren in Co. Clare and survives for 30 to 50 years. Its main advantage is seen in the production of long flexible straight rods through the process known as coppicing. The hazel wood/charcoal selected for use in the charcoal production pit and the corn drying kiln was probably taken from coppice woodlands where a readily supply of young hazel rods would have been available. This practice of coppicing hazel was prevalent in the early historic period as the demand for hazel rods would have been high as they were versatile and used for many different functions.

5. CONCLUSIONS

There is no doubt that oak was consciously selected for use as post material and may have also been associated with some structural requirement in the ring ditches. The oak would have grown in free-draining soils and nutrient rich clays although it will grow on peaty soils during drier conditions. Hazel was also the preferred species for use in the charcoal production pit and

the corn-drying kiln. The hazel was probably selected from nearby coppice woodland, which may have been managed on a rotational basis to produce a readily available supply of rods. This in turn may suggest an organised society whereby people were living and interacting with the environment in a structured manner.

6. RADIOCARBON DATING

As oak can grow to be a very old tree it is generally unsuitable for ^{14}C dating. The oak samples represent the inner part of a tree of unknown age and it was not possible to tell from the identifications how much larger, if at all, the whole piece was. As a result «The old-wood effect» may need to be taken into consideration when ^{14}C dates are returned (Warner 1979, 159-172). The samples identified could be of a more recent date than the rings represented on the sample. The old wood effect is particularly important in relation to later dated sites such as the transition from Early Christian to Viking to Medieval. Since the time span of prehistoric periods are wider and less transparent it is my belief that the old wood effect is not as significant when the ^{14}C dates are returned for the prehistoric period.

6. REFERENCES

Beckett, J.K., 1979, *Planting Native Trees and Shrubs*. Jarrold & Sons Ltd, Norwich.

Nelson E.C., 1993 *Trees of Ireland.* The Lilliput Press, Dublin.

Warner, R.B., 1987, "A proposed adjustment for the « Old-Wood Effect »", in Mook, W. & Waterbolk, H. (eds) *Proc. 2nd Symp of 14C & Archaeology, Groningen 1987,* 29, 159-172.

Webb, D.A., 1977, *An Irish Flora*. Dundalgan Press Ltd, Dundalk.

Schweingruber, F.H. 1990. Microscopic Wood Anatomy. 3rd edition.Birmensdorf: Swiss Federal Institute for Forest, Snow and Landscape Research

APPENDIX 3 - LITHICS REPORT

Lithic Report Morett townland, Co. Laois, Site D, 03E0461:

Dr Nyree Finlay, Department of Archaeology, University of Glasgow

8 July 2005 (revised find numbers 18 June 2007)

The worked assemblage from Morett Site D comprises 12 pieces of flint debitage. For specific details see the archive catalogue presented in Table 1 below. Given the small size of the assemblage it is considered as a single entity for discussion.

The flint is grey in colour, although most of the pieces are either patinated or burnt. Where present on three pieces, surviving cortex is of a weathered chalk variety which may derive from secondary rather than *in situ* sources. The assemblage comprises a single flake core fragment, a bipolar chunk and eight debitage flakes. One of the flakes is a bipolar piece also termed a piece escaille in conventional literature (03E0461:385:1, length 22mm). There has been some debate about whether such pieces functioned as tools such as wedges or whether these are simply a by-product of the knapping process (Knight 1991). Bipolar reduction is indicated for around half of the assemblage.

The technology represented indicates the use of multi-platform and bipolar reduction. One flake has a dihedral platform, although most are crushed. With the exception of two flakes, all are irregular in form and flake lengths range from 12-50 mm. No formally retouched pieces are present, however two heavily burnt fragments of a single flake may be invasively retouched, although this is equally likely to simply be the remnants of bipolar removals. Another small flake derives from the retouching of an invasively flaked implement and indicates secondary modification, although no retouched pieces were recovered.

The character of the assemblage documents a later prehistoric presence, which on our current understanding of Irish lithic technology could date from the Early Neolithic onwards (Woodman 1994). A range of primary reduction techniques are represented in which bipolar techniques are well evidenced, while one piece at least is suggestive of secondary retouching. Little more can be said about the character of lithic use at the site.

Recommendations for illustration

Unless specific contexts are significant, I would not recommend illustration with the possible exception of :385:1, 289:1 but these are not necessary.

Bibliography

Knight, J. 1991. Technological Analysis of the Anvil (Bipolar) Technique. Lithics 12: 57-87.

Woodman, P.C. 1994. Towards a Definition of Irish Early Neolithic Lithic Assemblages. In: Ashton, N. and David, A. (eds.), Stories in Stone. Lithic Studies Society Occasional Paper, No. 4, 221-218. London. Lithic Studies Society.

Table 1. 03E0461,Site D Morett. Catalogue of the lithic artefacts

Site Find No	Mat	Colour	Blank	psi	i/r	Cond	Ret	L	B	Th	Notes	N
03E0461:65:1	f		c	i		p	n	46	29	15	partially patinated worked chunk with remnant of simple scrub preparation; flake core fragment	1
03E0461:65:2	f	grey	f	i	r	f	n	14	28	6	angular flake; crushed platform	1
03E0461:77:1	f		f	i	i	b	n	28	20	8	heavily burnt and fragmented piece, probably struck from a multi-platform core	1
03E0461:77: 2	f		f	i	r	b	n	22	24	4	crushed platform	1
03E0461:77: 2	qz		x				n	13			small natural rolled quartzite chunk	1
03E0461:77: 2	f		ch	s		p	n	15	6	5		1
03E0461:77: 2	f		f	i	i	b	n	23	11	3	two frags of a heavily burnt medial flake segment with truncated invasive scars, probably bipolar but difficult to fully determine	2
03E0461:77: 7	f	grey	f	i	r	f	n	29	34	10	hinge termination; dihedral platform; some edge damage lateral right	1
03E0461:89: 1		grey	ch	s		p	n	18	9	5	bipolar chunk/ lateral spall	1
03E0461:89:2	f		f	i	i	p	n	10	14	3	flake fragment; lateral snap possibly bipolar	1
03E0461:289:1	f		f	i	i	p	n	12	13	1	complete small debitage flake; retouching flake with invasive dorsal scars	1
03E0461:385:1	f	grey	f	i	r	p	n	22	20	5	bipolar flake, *piece ecaille*	1
03E0461:385:2	f	grey	f	s	r	p	n	50	26	4	weathered chalk cortex, flat platform; flake previous removal	1

APPENDIX 4 – HUMAN BONE REPORT

AN ANALYSIS OF THE HUMAN SKELETAL REMAINS

FROM MORETT CO. LAOIS. 03E0461

MATERIALS AND METHODS

Materials

The graves of four individuals were excavated and their remains collected for analysis of age, sex, stature, bilateral asymmetry and the manifestation of pathological processes.

Recording the remains

Standardised recording forms were used to record the remains ensuring that each individual was recorded in the same manner. The Calvin Wells laboratory dental inventory forms and Buikstra & Ubelaker's (1994) visual recording forms were used. Standardised recording forms were completed for sections on sex determination, age and stature estimation, bilateral asymmetry and non-metrical variation. The expression of pathological processes was sought and recorded. The presence or absence of any associated material, human, faunal or inorganic was also recorded and the minimum number of individuals (M.N.I.) was calculated for each burial and for the group as a whole. The levels of preservation were also recorded.

Methods

Sex

Sex was assigned to the adults of this group using a number of analytical techniques, which are detailed below. Due to fragmentation not all of these could be employed. Those that were sought are, nonetheless, detailed below in the interest of standardisation.

A section for metric measurements was included on the recording forms. (Brothwell, 1981; Bass, 1987;Stewart, 1979). Also listed was number of sexually dimorphic traits of the pelvis (White, 2000; Schwartz, 1995; Rogers & Saunders, 1994; Iscan & Derrick, 1984) and cranium (White, 2000; Schwartz, 1995; Ubelaker, 1989; Angel, 1982).

Sex was divided into a number of categories. The categories of “male” and “female” are often insufficient, especially when dealing with fragmentary remains. For this reason categories of “?male” and “?female” were also included for individuals whose level of preservation would not allow for a definitive interpretation of sex but, by those elements remaining, it could be deemed more likely than not that they were either male or female.

Age

Recording forms for the Morett group included a number of techniques for estimation of age at death, all of which were based on diagnostic, age-related features of the cranial and post-cranial human skeleton. As was the case when sexing these individuals, it was found not all methods for ascertaining age could be applied to the group.

These include the Lovejoy *et al* (1985) ageing technique from the auricular surface of the pelvis and the Suchey & Brooks (1990) pubic symphysis technique, also based on the pelvis. It is often the case that fragments of ribs survive, even from poorly preserved assemblages. Among these one can expect to find a number of fragments of the sternal end of the rib whose surface can be used for attribution of age (Iscan, Loth & Wright, 1984). However, such was the fragmentary condition of this group that rib ends were not preserved.

It was possible to use the age-specific stages of epiphyseal fusion. Fusion sites, which complete as late as 25-28 years, were listed on the forms and were ticked according to the level of fusion apparent in each individual. The attritional ageing schemes of both Miles (1962) and Brothwell (1981) for the mandibular molars were also used.

Adult age ranges are defined by named age categories. The term “young adult” denotes individuals aged between 17 and 25, “middle adult” denotes those aged between 26 and 35, “late adult” denotes ages 36-45 and “mature adult” denotes individuals whose age is deemed to be in excess of 45 years.

Stature

Methods for calculation of living stature included Feldesmans (1990) femur/stature ratio and Trotters (1970) stature estimation for white males and females from longbone lengths. The Byers *et al* (1989) foot length formulae for metatarsals were provided as it often found by this observer to be useful for fragmentary collections.

Bilateral Asymmetry

A list of 11 skeletal elements was entered into recording forms for the detection of bilateral asymmetry between the right and left sides. Such variation is often due to a number of predetermined environmental factors such as handedness or the habitual performance of a certain range of movements by the subject. All elements have had formulae (Mays *et al*, 1999; Knusel n.d.; Bass 1987) applied to them in order to allow comparison between sides.

Unfortunately, there were no individuals from the Morett group whose remains had been preserved to a sufficient level that detection of bilateral asymmetry was possible. The indexes, which were sought for testing, can be seen in recording forms in the appendices of adult skeletons.

Non-Metrics

Non-metrical variation was recorded in this group for the skeleton. They were recorded as is standard (Turner, Nichol & Scott, 1991) by noting them present, absent or unobservable. The latter denotes the absence or poor preservation of the bone on which the trait is sought.

Pathology

Pathologies were recorded for each individual where they presented themselves. Detailed descriptions of the affected element were made. Where non-specific infection and calculus was apparent, the classification methods of Ortner & Maher (n.d.) and Brothwell (1981) respectively were used.

Associated Material & MNI

The presence of any associated material included with the remains of an individual was recorded. These may constitute the remains of animals or humans. As regards the latter, there are obvious implications for MNI. The "minimum number of individuals" for the grave cut from which the individual issued is calculated and the bone element is noted and placed in the associated material section of the recording form so that the minimum number of individuals can be calculated for the site as a whole.

If present, any inorganic remains that are found with the skeleton were also noted. Where a find was recorded on-site as having occurred with the individual concerned, it is recorded together with their results.

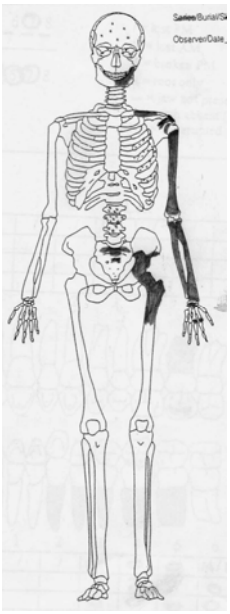
Preservation & Taphonomy

Preservation deals with, not just the amount of bone that was recovered, but with the condition of the bone. For example a bone can be recovered intact but be so badly abraded that it looses its cortical bone and characteristic morphological features.

Taphonomy deals with the processes that affect the skeleton after deposition. That includes those processes that cause abrasion, erosion and fragmentation as well as other
exogenous factors such as animal activity.

RESULTS

Burial I



Sex

Just two elements were available for determination of sex. The greater sciatic notch (pelvis) and goneal angle (mandible) both scored 1 (female). Although it should be remembered that sex determination was based on just these two traits, it would seem a reliable result as both derived from two of the most sexually dimorphic features of the skeleton.

Age

The only reliable evidence that was preserved in the remains of this individual was that of epiphyseal fusion. It was apparent, from the full fusion of the ante-brachium, that this individual had reached anatomical adulthood.

The mandibular molars were examined though not strictly applied to the attritional ageing schemes. It was not appropriate to do this as the left side only survived. Compounding this problem was the congenital absence of the third molar on this side. The first molar presented the type of wear that could be expected of a young adult. However, without the evidence of a complete dental set, it would perhaps be more appropriate to simply refer to this individual as “adult”.

Stature

The radius was the sole element that could be utilised to estimate stature. It was applied to the Trotter (1970) technique. The suggested living height of the individual was 157cm or 5.1"

Non-Metric Traits

Six of the post-cranial traits were observable in the remains of this individual, all on the left side. Five of these were absent. A septal aperture was noted as present in the left arm. It was not possible to score for cranial non-metric traits due to the fragmentary nature of this element.

Pathology

This individual exhibited evidence of dental enamel hypoplasia (DEH), suggesting a period of anatomical stress earlier in life caused either by illness or inadequacies in the diet.

"Slight" (Brothwell, 1981) dental calculus was also noted on some of the remaining teeth.

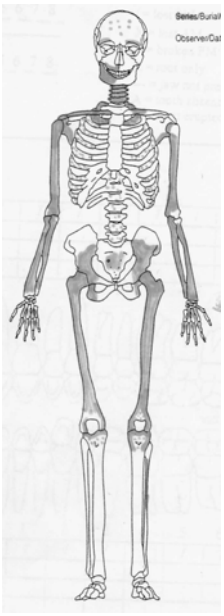
Preservation & Taphonomy

Preservation in this case was poor. The right side of the body had been disturbed. There were no elements from the right side retrieved. Few of the bones were retrieved even from the left side where taphonomic processes had caused fragmentation and slight abrasion of the cortical surfaces. Preservation was particularly poor from below the midshaft of the femur. Neither the left tibia nor the fibula was preserved though a number of foot elements were retrieved.

Associated Material

This individual was found in association with the remains of individuals from burials II and III. It was also noted that a left-sided fragment of distal humerus and one of the proximal portion of the ulna were found with these remains. They were of greater proportions that any of the burial I remains.

Burial II



Sex

Four elements were available for determination of sex. The greater sciatic notch and mastoid processes both scored 1 (female). The goneal angle scored 2 (?female). The clavicle and femoral head were available for application to known sexually dimorphic metric standards. Both fell within the female range.

Age

Due to poor preservation, epiphyseal fusion was found to be the sole reliable method of age determination. It was apparent that the individual had attained full anatomical adulthood (18 + years) and may have reached the 19th or 20th year. As was the case with burial I, the teeth were examined for evidence of age-related wear. Dentition from the right side only had survived. Unfortunately, the third molar was absent in this case making the dental set an inappropriate one for application to attritional ageing schemes. The mandibular teeth presented a pattern expected in an individual of 30 to 45 years. The maxillary teeth, being somewhat more worn, further confused the pattern. It was not possible to assign any age range in this case.

Stature

The femur was the only element that could be used for stature estimation. When applied to the Feldesman *et al.* (1990) technique, a height of 150cm (4.9") was produced. The Trotter (1970) method gave a greater height of 160cm (5.2").

Non-Metric Traits

Six of the post-cranial traits were available for scoring. All but one of these, the presence of exostosis on the trochanteric fossa, were found to be absent. Just one trait could be scored in the remains of the skull. The maxillary torus was found to be absent.

Pathology

The only evidence of pathology that was apparent was found in the dentition. Some slight dental calculus (Brothwell, 1981) was noted as well as an occlusal carious lesion on the right first mandibular molar.

Preservation & Taphonomy

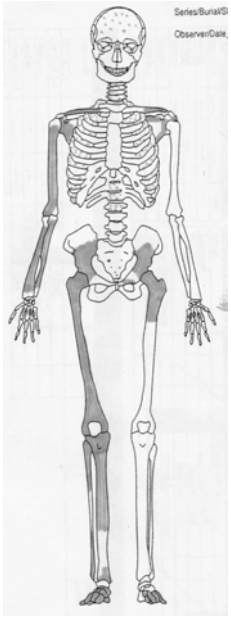
Preservation was fair with a good deal of elements being present. However, fragmentation was common among elements. It was noted that, apart from some fragmented remnants, the lower limb was badly represented below the level of the tibial plateau. It is possible that the activity that caused damage to burial I is also responsible for this.

Associated Material

There were a number of teeth found with this individual. Attempts at application of the centra incisor to the right maxillary socket were unsuccessful. It may have been the case that these teeth did not belong to the individual. Rather than assume they did and record them as such they are noted here as being associated material.

It is also worthy of note that the left humerus was very much smaller in scale than any of the other bones. It may be the case that it appears this way due to non-use and atrophy. However, there is no indication of a preceding trauma that may have caused this. While other factors such as handedness are also to be stated, it is appropriate to suggest that this limb is not part of the burial II skeleton. Indeed, the “extra” left humerus and ulna in burial I may belong here. The problem with this is that the burial II form suggests that the left arm was fully intact in the ground. The extra left arm from burial I was only partially intact. It may have been broken later.

Burial III



Sex

Four elements presented evidence of anatomical sex. The greater sciatic notch scored 1 (female). Where bone elements were applied to known sex-specific size ranges, three of the four elements suggested that these were the remains of a female. One, the glenoid cavity suggested that the individual was male.

Age

It was possible, in this case, only to state that the individual had reached full adulthood (18 + years). Epiphyseal fusion suggested that the individual may have reached some 20 years.

Stature

The Feldesman *et al*. (1990) femur/stature ratio suggested a standing height for this individual as 143cm (4.6”). The Trotter (1970) technique provided a figure of 156cm (5.1”) when the same femur was applied to the tables. When the metatarsals were applied to the Byres *et al* (1989) formulae for females, the heights ranged from 157cm to 160cm, the average being 158 (5.2”).

Non-Metrics

Four postcranial non-metric traits were available for scoring. None were present. Due to the fragmentary nature of the skull, no non-metrics could be scored.

Pathology

No evidence of pathology was apparent

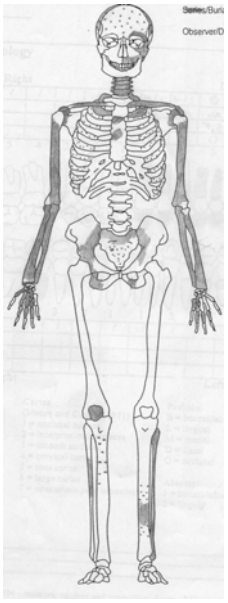
Preservation & Taphonomy

Preservation of these remains was poor. A large degree of fragmentation was noted. Many of the elements from the left side of the body were missing

Associated Material

It was noted in the on-site recording form that this individual was in possession of the left arm. On inspection of the remains, this was found not to be the case. Judging on size alone, it would seem possible that that the left arm elements that appeared incompatible with the rest of the skeleton in burial II may belong here.

Burial IV



Sex

Nine elements were available for sex determination. Both pelvic elements (greater sciatic notch & pre-auricular surface) scored 1 (female). Five cranial features were also scored. The zygomatic arch and suprameatal crests scored 1 (female), the occipital bone and its nuchal crest scored 2 (?female) and the mastoid processes scored 3 (indeterminate).

Both of the elements that were applied to known size ranges of males and females suggested that the individual was male. The glenoid cavity and clavicle are both subject to change in morphology due to intensive use of the upper limb. The reliable evidence from the pelvis and skull suggesting the individual was female may be retained under the assumption that morphological change was the explanation for the metric anomaly. It is worthy of note that these remains have most certainly seen a great deal of physical activity.

Age

Epiphyseal fusion confirmed that this individual had reached at least the age of 21. The morphology of the auricular surfaces were examined and found to fall into the range of 40 to 50+ years. Though the pubic symphysis was somewhat damaged, the left symphyseal face was examined. The mean age that it represented was 48.1 years with a standard deviation of +/- 14.6years. At 95% accuracy the range produced was 25-83 years.

Stature

Estimation of stature was gleaned from the total length of the ulnae using the Trotter (1970) method. One measured 261mm, the other 274mm. The differing stature results reflect the disparity in ulnar lengths. The first gave a result of 171cm (5.6”), the second 175cm (5.7”).

Non-Metrics

Nine of the post-cranial non-metric traits were available for scoring. Two of these were expressed. The acromial articular facet occurred bilaterally and the fourth cervical vertebra had bipartite transverse foramina bilaterally.

The remains from the skull provided seven sites which could be scored. One, the parietal foramen was present bilaterally.

Pathology

This individual displayed a number of pathological processes. “Slight” and “medium” calculus (Brothwell, 1981) was present as were dental caries, loss of teeth and enamel hyoplasia.

Osteoarthritis was noted in the vertebrae and cribra orbitalia, apparently in the process of healing, appeared in the remains of the left orbit. The hands displayed evidence of a great deal of activity during life. The flexor sheaths of the phalanges were greatly accentuated and one proximal phalanx appears to have sustained some damage to one of its condyles. This may be evidence of a break or a sort of small fracture which caused the condyle to lie out of pace.

Preservation & Taphonomy

Preservation, in this case was fair. The upper limbs were the best preserved elements whereas the lower limbs were badly represented. Fortunately, the vertebrae were well represented, though fragmented, which allowed examination of the osteoarthritis they expressed. The individual as a whole expressed a significant amount of fragmentation.

Associated Material

There were a number of disarticulated human skeletal remains associated with these remains. All derived from the lower limb. Though none could be made to fit together with any of the burial IV bones, it is likely that they belong to the individual.

CONCLUSION

Sex

Each of the burials gave evidence of anatomical sex. The Morett group produced three females, all of whom appeared to have been buried together and one ?female from a separate context.

Age

The level of preservation existing in burials I to III was not good. For each of the individuals it was possible only to state that they had attained full adulthood (18+ years). In the case of burials I and II, it was possible to state that, possessing completion of late-fusing epiphyses, the individual was likely to have reached the early part of the third decade of life. Burial III displayed tooth wear that would be expected of the middle or late adult stage. However, this cannot be definitively stated as the complete dental-set was not available for analysis. The final individual was also found to be anatomically adult. The auricular surface of the pelvis suggested that the individual was in fact a mature adult.

Stature

It was possible to estimate the stature of each of these individuals. It has been noted by this observer that the figures produced by the Feldesman et al (1990) technique commonly fall below that of the other techniques. Temporarily disregarding this technique, it becomes apparent that all of these females ranged between 156cm and 175cm (5.1" –5.7"). The femur/stature ratio suggested somewhat lower heights for the two individuals to which they were applied (143-150cm/ 4.6"-4.9").

It is commonly believed that past populations are of a more diminutive stature that that which is seen today. However, the range of heights for individuals from this group shows that the average modern height of females of 158cm (5.2") is not so far removed from that seen in archaeological populations.

Non-Metrics

It was possible to identify just three types of non-metrical variation. The septal aperture, acromial articular facet and exostosis (of the trochanteric fossa) were scored. A number of further traits were available for scoring though found to be absent. These can be found identified in the non-metric section in each of the recording forms.

Pathology

Dental Enamel Hypoplasia & *Cribra Orbitalia:*

Dental Enamel Hypoplasia (DEH) presents as a visible defect on the surface of the tooth crown. It is scored by its expression: as pits lines or grooves (Lukacs, 1989). Hypoplasias occur during youth when the tooth is still forming. When the individual experiences a period of developmental stress, the body lays down less of the organic matrix of which the tooth is composed, causing a narrowing of the tooth crown. When normal growth recommences, a depression can be seen where enamel deposits were lessened. Once formed teeth, unlike bone, do not remodel and therefore the defect is preserved permanently.

The precise cause of enamel hypoplasia is unknown. It is generally agreed that the period of developmental stress can arise from a period of nutritional deficiency or a childhood illness. The type of illness cannot be identified. However, one can state that if it was indeed illness that caused the defects that burials I and IV exhibit, it is likely to have been one such as measles, pneumonia, diarrhoea or gut parasites or, indeed, any condition which causes fever. Both recurring and isolated periods of dietary insufficiencies can also be the cause (Dobney & Goodman, 1991). In particular the dietary change that ensues from weaning has been proffered as a causative factor (Wright & Chew, 1999). It has been suggested that DEH can indicate the presence of differential socio-economic status within a society though little convincing material has derived from the relevant studies (Mays, 1998).

Teeth are highly canalised and erupt at a regular pace. Attempts have been made, in the past, to pinpoint the age at which the individual experienced developmental insult. However, such attempts have been found to be somewhat inaccurate (Mays, 1998). One cannot be certain that the teeth of all individuals, in all populations progressed at the same developmental rate. Genetics, geographical and temporal locations all have bearings on eruption times. It is also the case that the middle section of the tooth crown is more susceptible to defect formation. (Goodman & Armelagos, 1985).

It is appropriate to say, however, that the defect occurred between the age of 9 months and 6 years in the case of burial I (Ubelaker, 1989). Burial IV exhibited DEH in the left central incisor, where insult is likely to have occurred between 6 months and 4 years of age. The mandibular first molar was also affected some time between 9 months and 3 years and the third molar was affected between 4 and 7 years of age. It is possible that the two of these insults, those seen on the incisor and first molar, were a result of a common anatomical disturbance. The final defect, however, is likely to have occurred as part of a subsequent developmental stressor.

Burial IV also exhibited evidence of porotic hyperostosis in the roofs of the orbits. *Cribra Orbitalia* is the physical manifestation of iron deficiency (Wright & Chew, 1999). Many of the agents, which are said to cause iron deficiency anaemia, are the same as those suggested to be responsible for dental enamel hypoplasia.

One of the main hypotheses for the lack of iron that causes anaemia is an insufficiency in the diet. However, it has also been suggested that disease and injury may also play a role in that they inhibit the absorption of iron into the body (Roberts & Manchester, 1995)

The lesions observed in the remains of this individual show signs of active healing. This would indicate that nutritional deficiency, if indeed it were to blame, may not have been still ongoing at the time of death. Conversely, the possibility exists that if disease or injury had caused the defects, the body had begun to adapt before death.

Calculus:

Calculus is formed as a result of the mineralisation of dental plaque. Micro-organisms, together with proteins in the saliva, combine to create plaque deposits. Failure to remove these deposits through activities such as regular brushing, results in their eventual mineralisation and the subsequent build-up of calculus. The calculus exhibited by this group was primarily Grade 1 (slight) to Grade 2 (medium) (Brothwell, 1981). It is worthy of note that calculus was noted in each of the individual with the exception of burial III where no teeth were found.

Caries & Loss of Teeth:

Two individuals from the Morett group exhibited a carious cavity. One lesion (burial II) was on the occlusal surface of the mandibular first molar. The other (burial IV) was located on the interproximal surfaces of the first and second maxillary premolars. White (2000:401) describes this type of dental defect. “Dental caries is a disease process characterised by the progressive decalcification of enamel or dentine”. It is caused as a result of the fermentation of food sugars in the mouth by bacteria. This is well illustrated in the case of the premolars where trapped food between the two teeth would have given rise to the shared carious lesion which they exhibit.

Non-Carious Pulp Exposure:

There were three instances of non-carious pulp exposure in the Morett assemblage. All were observed in the dentition of burial IV.

Non-carious pulp exposure occurs through extreme wear. The pulp becomes exposed after both the enamel and the underlying dentine has been worn through. Reference to the condition as non-carious indicates that the cause of pulp exposure was not through bacterial invasion of the tooth but through wear, which increases with the advancement of age.

Although it appeared that this individual was a "mature adult" it is worthy of note that greater age is not the sole causative factor for non-carious pulp exposure. Significant wear such as this can also point to the existence of a rough diet such as that exhibited by groups where grain is processed on stone mortars (Roberts & Manchester 1995). Small particles of the mortar itself can become incorporated into foodstuffs and contribute to a higher degree of wear on the teeth. Bruxism, or the habitual grinding of the teeth, can also be a causative factor.

Osteophytosis:

Osteophytes serve as indicators of both age and activity related degeneration (Buikstra & Ubelaker, 1994). These are bony spicules, which, in the case of this individual, appeared at the margins of the phalanges. The longitudinal margins of the hand serve as attachment points for the *fibrous flexor sheaths,* which are tissues that prevent the flexor tendons of the hand from "bow-stringing" while the fingers are flexed (White, 2000). When soft tissue experiences a certain degree of stress, the surrounding bone will react by forming extra bone to secure the anchoring position for the soft tissues. The exaggerated nature of the flexor sheath ridges in burial IV would seem to suggest that they were made to function regularly as would be the case in one involved in physical labour for an extended period of time. They are also often associated with degenerative conditions such as osteoarthritis. (Roberts and Manchester, 19945).

Osteoarthritis:

Osteoarthritis is a non-inflammatory condition, affecting the synovial joints. It involves narrowing of the joint spaces to a point where the opposing bones come into contact with one another, damaging the cartilage. In the clinical specimen, the element may develop subchondral cysts with ensuing sclerosis of the bone surface. These elements are visible radiographically only. However, eburnation can follow and this can be identified in the hand specimen. Eburnation causes the joint surface to appear smooth and polished as it was in the distal articular facet of a proximal phalanx in burial IV. Osteophytic growth also accompanied this defect. This is another idiosyncratic feature of osteoarthritis. Proliferative reaction takes place where fibrocartilage at the joint rim transforms into new bone.

The causes of osteoarthritis are many and varied. They involve such factors as increasing age, genetic predisposition, obesity (in the case of load-bearing joints) activities and lifestyle and environmental factors (Roberts & Manchester, 1995). Hand arthritis, as seen in burial IV has been commonly found in modern populations, with a predominance in post-menopausal women. Its occurrence is thought to be related to occupation and it has been suggested that a similar pattern may be apparent in the archaeological record (Roberts and Manchester, 1995). It would seem appropriate to identify the osteoarthritis of the hand in burial IV as having been related to physical activity. It and its accompanying phalanges, as mentioned above, exhibited raised flexor sheath ridges

Osteophytosis of the margins of the superior and inferior surfaces of the vertebral bodies was also present in these remains. This was accompanied by porousness of the surfaces.

In this burial, it was noted that the proliferative reaction was most marked in the cervical vertebrae with a much smaller degree of involvement in the thoracic and lumbar vertebrae. A study by Lovell (1994) where the cervical vertebrae showed high levels of involvement concluded that that this pattern may have been caused by the activity of carrying heavy loads on the head. While it remains impossible to say that this was the case at Morett, it is possible to suggest that a particular activity is likely to have been the causative factor.

Preservation & Taphonomy

Preservation ranged from poor to fair among this group. Burials I to III had suffered worst at the hands of taphonomic processes. This is thought to have been a result of the apparent shallowness of the burial. Fragmentation and abrasion of the cortical surfaces was present in all cases and each individual had suffered loss of elements.

BIBLIOGRAPHY

Angel, J.L. (1982) A new measure of growth efficiency: Skull base height. *American Journal of Physical Anthropology*. 58: 297-306

Bass, W.M. (1987) *Human Osteology : A Laboratory and Field Manual.* 3rd Ed. Missouri Archaeological society, Columbia, Missouri.

Brothwell, D.R. (1981) *Digging up Bones*. 3rd ed. Cornell University Press, Ithaca, New York.

Buikstra, J.E & Ubelaker, D.H..(1994) *Standards for Data Collection from Human Skeletal Remains.* Arkansas Archaeological Survey Research Series No.44. Fayetteville, Arkansas Archaeological Survey.

Byers, S., Akoshima, K. & Curran, B. (1989) Determination of adult stature from metatarsal length. *American Journal of Physical Anthropology* 79: 275-279. Dental Anthropology. New York, Wiley-Liss, pp. 13-31.

Dobney, K & Goodman, A.H. (1991) Epidemiological studies of dental enamel hypoplasias in Mexico and Bradford: their relevance to archaeological skeletal material. In Bush H. & Zvelebil, M. (eds.) *Health in*

Past Societies: Biocultural Interpretations of Human Skeletal Remains in Archaeological Contexts: 81-100. British Archaeological Reports International Series 567. Oxford, Tempus Reparatum.

Feldesman, M.R. (1990) Femur /Stature Ratio and estimates of stature in mid- and late Pleistocene fossil hominids. *American Journal of Physical Anthropology*. 83: 359-372.

Goodman A.H .& Armelagos, G.J. (1985) Factors Affecting the Distribution of Enamel Hypoplasias within the Human Permanent Dentition. *American Journal of Physical Anthropology* 68:479-493

Iscan, M.Y. and Derrick,K, (1984) Determination of sex from the sacroiliac joint: A visual assessment technique. *Florida Scientist*. 47: 94-98

Iscan, M.Y; Loth, S.R. & Wright, R.K. (1984) Age estimation from the rib by phase analysis: White Males. *Journal of Forensic sciences,* 29: 1094-1104

Lovejoy, C.O., Meindl, R.S., Pryzbeck, T.R. & Mensforth, R.P. (1985) Chronological metamorphosis of the auricular surface of the ilium: a new method for determination of adult skeletal age at death. *American Journal of Physical Anthropology* 68: 15-28.

Lovell, N.C. (1994) Spinal arthritis and physical stress at Bronze Age Harappa. *American Journal of Physical Anthropology.* 93: 140-64

Lukacs, J.R, (1989) Dental palaeopathology: methods: methods for reconstructing dietary patterns, pp.261-86 in M.Y. Iscan & K.A.R. Kennedy (eds) *Reconstruction of Life from the Skeleton.* New York, Alan Liss

Mays, S. (1998) *The Archaeology of Human bones.* Routledge, London

Mays, S, Steele, J. & Ford, M. (1999) Directional asymmetry in the human clavicle. IJO : 9(1): 18-28

Miles, A.E.W. (1962) Assessment of the ages of a population of Anglo-Saxons from their dentitions. *Proceedings of the Royal Society of Medecine.* 55: 881-886

Nathan, H. (1962) Osteophytes of the vertebral column. *Journal of Bone Joint Surgery.* 44A(2): 243-268

Roberts, C & Manchester, K (1995) *The Archaeology of Disease*. Cornell University Press.

Rogers, T & Saunders, S. (1994) Accuracy of sex determination using morphological traits of the human pelvis. *Journal of Forensic Sciences* 39: 1047-1056.

Schwartz, J.H. (1995) Skeleton Keys: An Introduction to Human Skeletal Morphology, Development& Analysis. Oxford University Press.

Stewart, T.D. (1979) *Essentials of Forensic Anthropology.* Springfield, Illinois: Thomas

Suchey, J.M. & Brooks, S.T. (1990) Skeletal age determination based on the *Os Pubis*:A comparison of the Askadi-Nemenskeri and Suchey Brooks methods. *Human Evolution* 5:227-238

Trotter, M. (1970) Estimation of stature from intact long limb bones. In Stewwart, T.D.,(ed) *Personal Identification in Mass Disasters.* Washington, Smithsonian Institute.

Turner, C.G. Nichol, C.R. & Scott, G.R. (1991) Scoring procedures for key morphological traits of the permanent dentition. In Kelley, M.A. & Larsen, C.S. (eds.) *Advances in Dental Anthropology.* New York, Wiley-Liss, 13-31.

Ubelaker,D.H. (1989) *Human skeletal Remains*. 2nd ed. Taraxacum Press, Washington D.C.

White, T & Folkens, P. (2000) *Human Osteology*. Academic Press, San Francisco.

Wright, L.E. & Chew, F (1999) Porotic hyperostosis and palaeoepidemiology: a forensic perspective on anemia among the ancient maya. In *American Anthropologist* 100(4): 924-939.

APPENDIX 5 – ANIMAL BONE REPORT

A Report on the Animal Bones from Site D 03E0461, Morett, Co. Laois

N7 Heath Mayfield Motorway Scheme

Tanya O'Sullivan

August 2007

Introduction and Methodology

The bones submitted for examination came predominantly from the broadly contemporary, possibly Iron Age ditches in Area C. The largest sample came from the upper fill of the main ring ditch (C13), and a smaller sample was recovered from the one fill of the second smaller ring ditch (C 334). Further fragments came from (C 23). The bones were individually examined and information relating to species, element, age, taphonomy, zonation and evidence of butchery was recorded (see Appendix 1). The zoning method used was that outlined by Dobney and Reilly (1988), and the few possible measurements were taken according to the guidelines of von den Dreisch (1976).

Discussion

Species present

The samples from Site D, Morett were small and heavily butchered and the combined samples represented no more than three cows, two pigs and two sheep.

Cattle predominated with a total of 172 fragments identifiable to element. An analysis of the MNI (minimum number of individuals) resulted in a minimum of two individuals from the first ditch and one from the second. Pig fragments totalled 12, with a minimum of one individual represented from each ditch and sheep fragments totalled 18, again with a minimum of one individual from each ditch. Over 600 small butchered splinters were not identifiable to species or element.

Body part representation

Cattle, sheep and pig were represented by broken long bones and cranial bones which were present in abundance, with loose teeth, broken mandibles and skull fragments occurring in both ditches. The relative proportion of isolated teeth can be used to gauge the degree of fragmentation of the material as these are

particularly durable elements and survive when other bone has disintegrated. In this assemblage the proportion is high, suggesting a highly fragmented assemblage. The predominance of bones such as mandibles, distal humerii, radii, distal tibia and metatarsals, as is the case at site D Morett, is generally accepted as being the result of a preservation bias in favour of the more robust skeletal elements rather than the result of human activity.

Biometry

One complete cattle metatarsal was available for measurement. Using Fock's conversion factor of 5.45 for the metacarpal (von den Dreisch and Boessneck 1974) it was calculated that this animal would have had a shoulder height of around 1.09m. This is in keeping with the range noted on other later prehistoric sites in Ireland (Crabtree 1985, 181) (McCormick 1991, 1997a, 1997b) and indicates that this individual was within the size range of the short horned variety. The general dimensions of the horn core fragments recovered would seem to back this up, although erosion and breakage prevented accurate measurement.

Butchery

As stated, the samples from both ditches consisted of many heavily butchered cattle long bones, most of these were missing their articular ends and were represented only by shaft fragments. A number of long bone fragments from C13 displayed deliberate splitting for marrow extraction. One scapula neck fragment was split medially (C334) which may be an indication of primary sectioning, while a scapula fragment from C13 displayed knife marks under the glenoid cavity which could suggest the separation of the scapula from the humerus, also a feature of primary butchery. No butchery marks were noted on the pig or sheep bones.

Ageing

None of the cattle mandibles were intact with teeth still in situ, and the majority of the long bones were missing their proximal and distal ephiphyses. It was therefore not possible to provide any information on cattle age slaughter patterns. This was also the case for sheep. The eruption data from the two available pig mandibles implied that both individuals were between 17 and 23 months, i.e., just reaching maturity at time of death. This pattern has been observed on other Irish late prehistoric and early Christian sites (McCormick 1997a, 119).

Two neonatal pig bones were recovered from C334, indicating that breeding of pigs may have taken place on or near the site. These bones may have been deliberately buried as they are unlikely to have survived otherwise. Although rare, piglet burials have been recorded in middle Iron Age and Romano British contexts in England at Mingies Ditch (Allen and Robinson 1993) and early Romano British Yarnton (Mulville et al forthcoming). The Morett example consisted of an unarticulated ulna and radius. Four loose pig canines recovered from the site were all found to be female.

Despite the small size and fragmented nature of the sample, a number of observations may be made about the bone assemblage. The cows represented at site D, Morett were most likely to have been of the smaller short horned variety common on Irish prehistoric and early historic sites. An examination of the evidence for butchery and body part representation reveals that despite the preservational bias for robust elements all stages of carcass processing and consumption are represented by the samples. The presence of neonatal pig bones suggests that breeding may have been carried out on site. Also, as this type of bone rarely survives without purposeful burial, it would imply that the sample may have contained a mixture of discarded food waste and elements of deliberate burial.

References

Allen T and Robinson M 1993 'The prehistoric landscape and Iron Age enclosed settlement at Mingies ditch, Hardwick with Yelford, Oxon.' *Thames Valley Landscapes: The Windmarsh Valley Vol.2.* Oxford

Crabtree P 1985 'The mammalian Fauna from Dun Ailinne Co Kildare, Ireland'
MASCA journal 3(6) 178-181. University of Pennsylvania Museum

Dobney K and Reilly K 1988 'A method for recording archaeological animal bones: the use of diagnostic zones'. Circaea vol 5 no. 2 79-96.

Mc Cormick F1991 'The animal bones from Haugheys Fort: second report' Emania 8, 27-33

Mc Cormick F 1997a 'The animal bones from site B' in Lynn CJ Excavations at Navan Fort 1961-71 by DM Waterman 117-20. Belfast

McCormick F 1997b 'The Animal Bones from Tara' Discovery Programme Reports 6 Appendix 2, 103-117. Dublin: Royal Irish Academy

Mulville J, Ayers K and Smith P forthcoming 'The Animal Bone' in Hey G and Timby J 'Yarton :Iron age and Roman settlement and landscape' Thames Valley Landscapes Monograph, Oxford

Von den Dreisch A 1976 *A guide to the measurement of animal bones from archaeological sites*. Peabody Museum Bulletin, Harvard

Von den Dreisch A and Boessneck J A 1974 Kritische Anmerkungen zur Widerristhoherberechnung aus Langermassen vor und fruhgeschtlicher Tierknochen. *Saugetierkundliche Mitteilungen* 22 325-46.

Key to Catalogue Headings

Ctxt - context
S.No - sample number
SP - species
E - element
NF - number of fragments
LR - left or right
A - age
Z>50% - greater than 50% of zone present (after Dobney and Reilly 1988)
Z<50% - less than 50% of zone present (ibid)
PT - pathology/taphonomy
B - butchery
S - size range of small unidentified fragments.

Further coding within columns

Species
C - cattle
P - pig
S - sheep
D - dog
H - Horse
B - Bird
RD - red deer
U - unidentified.

Element
Fem –femur
Tib-Tibia
Hum-humerus
Rad-radius
UL-ulna
Mand.-Mandible
Max-maxilla
Sk-Skull
V- vertebra
Ph1,2,3 - Phalanx 1, 2, 3
Calc-calcaneus
Scap-scapula
Pel-pelvis
MC-metacarpa
MT-metatarsal.

Pathology/Taphonomy
ER - bone eroded
ERP- prox eroded
B - burnt black
W- burnt white

G - burnt grey
BR - burnt brown
GN - gnawed
CTF - curricular fragments only
CNF- cancellous fragments only

Butchery
X - butchery marks in evidence on zones indicated by zonation column (Z)
C - chop marks noted

Size range
1- fragments less than 20mm
2- fragments between 20 and 50mm in length
3- fragments between 50 and 100mm in length
4- fragments greater than 100mm in length

CATALOGUE: Site D 03E0461, Morett

Ctxt	S.no	SP	E	NF	LR	A	Z>50%	Z<50%	PT	B	S
13	131	C	skull	36							
13	131	C	vert	3						X	
13	131	C	lt	35							
13	131	C	max	2							
13	131	C	mand	15				13456			
13	131	C	pel	1				67			
13	131	C	pel	1				7			
13	131	C	rib	8			2			X	
13	131	C	scap	4			123			X	
13	131	C	scap	2			4				
13	131	C	rad	1							
13	131	C	tib	2			789				
13	131	C	rad	1			89				
13	131	C	rad	1			34910		eroded		
13	131	C	mt	1							
13	131	C	mt	1			1256			X	
13	131	C	hum	1							
13	131	C	ph3	1							
13	131	C	ulna	1			ABC				
13	131	C	ulna	1	puf		ABCEF		eroded		
13	131	C	mc	1			5678				

Ctxt	S.no	SP	E	NF	LR	A	Z>50%	Z<50%	PT	B	S
13	131	C	ph1	1							
13	131	C	tarsals	1							
13	131	U	lb	318						X	4-6mm
13	131	U	lb	222					2 burnt	X	<4mm
13	131	P	mand	1							
13	131	P	mand	1		M3 IN					
13	131	P	mand	1		M1&2					
13	131	P	canine	4							
13	131	P	lt	1							
13	131	P	calc	1					eroded		
13	131	P	scap	1			1234				
13	131	S	pel	1			111012				
13	131	S	mand	1				1			
13	131	S	tib	2			89				
13	131	S	rad	1			78				
13	131	S	rib	11			23				
13	131	S	ulna	1			BC				
13	131	S	calc	1			12				
334	131	C	hc	1					eroded		
334	131	C	scap	1			12			X	
334	131	C	scap	1			1234				
334	131	C	pel	1			13				
334	131	C	skull	13							
334	131	C	tarsal	1							
334	131	C	lt	9							
334	131	C	ph2	1						X	
334	131	C	mand				54				
334	131	C	rib	4							
334	131	P	max	2							
334	131	P	ulna	1							
334	131	P	u	1							
334	131	U		140							<4mm

Ctxt	S.no	SP	E	NF	LR	A	Z>50%	Z<50%	PT	B	S
334	131	S	ribs								
334	131	S	pel								
424	124	C	hc								
424	124	C	skull	15							

APPENDIX 6 – METAL ARTEFACTS REPORT

Report on the Metal Artefacts (Ferrous & Non-Ferrous)
From Site D Morett, 03E0461
on the N7 Heath-Mayfield Motorway Scheme.
For Valerie J. Keeley Ltd
By Órla Scully, MA MIAI

Site D Morett , 03E0461

The curved iron rim of a vessel which may have belonged to a vessel some 120mm in diameter was recovered from C381. A body sherd of the same vessel was recovered from the same context. In Garryfuff, Co. Cork, O Kelly found several iron vessel escutcheons, from an early Christian ringfort where, like Morett, evidence for metal working was plentiful. [1] Also found on that site were two iron ladles, with diameters of c. 100mm.

The only evidence for horse was a single nail, with a flat rectangular head. An incomplete knife consisted of a whittle tang and part of the blade surviving. The blade back is on line with the tang. Such a design is recognised from 9th to 11th century in York.[2] Several miscellaneous scraps of metal are too small or incomplete to identify. Structural evidence was provided by seven nail fragments and the eye of a strap hinge. A large wood-cutters axe, from a context which most probably post dates the ring ditch feature in which it was found is likely to be late medieval. 'As a general rule it would seem that the medieval axe is a larger tool than its predecessors, and that it normally had a simple socket…..in another form the axe hammer is a known medieval tool'.[3] The butt-end of the axe from Morett shows signs of having been used for hammering.

Ó. Scully 2006.

Bibliography

Biddle, M., (1995), 'Crossbow Boltheads' in Object and Economy in Medieval Winchester, part 2,
Biddle, M. and Barclay, K., (1990) 'Sewing Pins and Wire' in Object and Economy in Medieval Winchester, part 2,

[1] O Kelly, 1962, 63

[2] Ottaway, 1992,568

[3] Ward Perkins, 1940, 56

Edwards, N., (2005) 'The Archaeology of Early Medieval Ireland, c. 400-1169: Settlement and Economy' in A New History of Ireland, vol. 1 Prehistoric and early Ireland, ed. D. Ó Cróinín

Egan, G., & Pritchard, F., (1991), Medieval Finds From Excavations In London: 3

Dress Accessories c. 1150 – c. 1450

Hencken, H. O'N. 1942, Ballinderry Crannóg No. 2. Proceedings of the Royal Irish Academy

Keeley, V.J. Ltd, (Unpublished) Preliminary Report Archaeological Excavation, Kill, Co. Kildare.

Mallory, J. P. & McNeill, T.E. (1991) 'The archaeology of Ulster from Colonization to Plantation'

Newman, C. (2002) 'Ballinderry Crannóg No. 2, Co. Offaly: Pre-Crannóg Early Medieval Horizon' in Journal of Irish Archaeology, X1

O Kelly, M. J., (1962) 'Two Ring-Forts At Garryduff, Co. Cork' in P.R.I.A, vol 63, section c, no. 2.

Ottaway, P., (1992) 'Anglo-Scandinavian Ironwork from Coppergate,' The Archaeology of York vol. 17 The Small Finds. Ed P.V. Addyman

Raftery, B., (1969) 'Freestone Hill, County Kilkenny: An Iron Age Hillfort and Bronze Age Cairn' in Proceedings of the Royal Irish Academy, vol 68 Section C no 1

Raftery, B., (2005), 'Iron-age Ireland' in A New History of Ireland, vol. 1 Prehistoric and early Ireland, ed. D. Ó Cróinín

Ramsey, G., (1995), 'Guaranteed Irish' in Archaeology Ireland, vol.9, no. 1, Issue no. 31, (Spring).

Sharples, N., (1991), 'English Heritage Book of Maiden Castle'.

Waddell, (1998) The Prehistoric Archaeology of Ireland.

Ward Perkins, (1940), London Museum Medieval Catalogue

03E0461,Site D Morett. Catalogue of the metal artefacts					
Find no	Metal	object	Function	Dimensions (mm)	Description
03E0461:13:22	Fe	nail	Structural	48x8x7	gently tapered rectangular sectioned shaft with flattened top where head would have been,
03E0461:13:23	Fe	bar	Misc	59x6x5	corroded flat strip or bar, thin with one end slightly thickened with little upturn
03E0461:13:19	Fe	nail	Structural	42x9x8	rectangular-sectioned shaft, widens towards head end, point missing
03E0461:13:21	Cu alloy	scrap	Misc	9x7x6	tiny green coloured fragment, roughly rectangular, broken
03E0461:13:20	Cu alloy	sheet	Misc	15x15x1	roughly square, flat piece of sheet metal, no features
03E0461:13:26	Fe	nail	Structural	74x6x4	rectangular tapered shaft, terminates in point, no head
03E0461:13:24	Fe	nail	Structural	37x5	circular sectioned short bar, possible nail

					shaft, modern?
03E0461:13:25	Fe	nail	Structural	45x7x5	circular sectioned bar, possible nail shaft, modern?
03E0461:13:29	Fe	nail	Structural	65x11x6	shaft of nail, rectangular in section, tapered, head missing
03E0461:13:58	Fe	nail	Horse	33x8x6	small, curved apparently complete, tapered rectangular shaft widening to rectangular flat head
03E0461:13:59	Fe	knife?	Knives	63x17x4	possible whittle tang and part of blade,the back of which is on line with the tang, incomplete
03E0461:13:30	Fe	scrap	Misc	19x10x4	small flat scrap of iron, with smaller corrosion debris associated
03E0461:17:31	Fe	strap hinge	Structural	49x19x2	perforated eye of strap hinge
03E0461:14:02	Fe	nail	Structural	42x9x7	head sub round, damaged, tapered rectangular-sectioned shapt
03E0461:373:49	Fe	axe head	Tools	222x168x53	socketed axe with shaped socket and splayed blade with curved edge
03E0461:381:61	Fe	vessel rim	Domestic	80x11x3	part of rim of vessel, curve indicates an original vesssel diameter of 120mm
03E0461:381:62	Fe	vessel body fragment	Domestic	30x14x3	piece of the vessel whose rim is listed above. Small bumps on one side may be decorational as opposed to corroded adhesions stabalised during conservation.

APPENDIX 7 – SLAG EVALUATION REPORT

Evaluation of Archaeometallurgical Residues from the N7 Heath-Mayfield Motorway Scheme

(03E0151, 03E0966, 03E0461, 03E0603, 03E0633, 03E0679, 03E0602, 03E0635)

Dr T.P. Young

Abstract

This report evaluates the metallurgical residues from eight sites on the N7 Heath–Mayfield Motorway Scheme. Seven of the eight sites provided evidence for iron-smelting, with a wide range of provisional dates from Iron Age to Medieval. Two of those sites also provided evidence for iron-working (smithing), as did the eighth site. The slags indicate an essentially similar iron-smelting technology across these sites and periods, employing a slag-pit shaft furnace, but subtle differences emerge and these are explored as possibly representing temporal variation in technology. The wide distribution of iron smelting sites across the landscape suggests a dispersed "industry". The iron smelting slags have great potential for advancing understanding of these sites and of the smelting technology and should be the subject of further detailed analysis.

This report also discusses the structural evidence for metallurgical processes, including smelting furnaces and charcoal-production pits. Two sites have produced slight evidence that the Irish slag-pit shaft furnaces may have had furnace arches, as recorded for somewhat similar non-slag tapping shaft furnaces elsewhere and the primary field evidence for this should be re-examined in detail. It is tentatively suggested that both the size of smelting furnaces and the size/shape of the charcoal pits may have some temporal significance.

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Jamestown, Site I, 03E0679
Lughil, Site L, 03E0602
Kill, Site O, 03E0635
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Residue assemblage types
Charcoal Production
Smithing
Organisation of the industry
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Background

This report is an evaluation of archaeometallurgical residues, mainly slags, from sites on the N7 Heath–Mayfield Motorway Scheme excavated by various directors for Valerie J Keeley Ltd (VJK). In addition to the evaluation of the residues, comment is also made here on the significance of the associated structures.

The archaeometallurgical residues have been evaluated by brief visual inspection and the use of a lower-powered binocular microscope. Descriptions and interpretations of material are necessarily limited by this approach.

Site information is based on copies of interim reports supplied by VJK.

This report should not to be taken as a final interpretation of the materials described herein, but is a brief catalogue, description and interpretation of the materials, together with an evaluation of their potential for further post-ex investigation with recommendations for the form those investigations should take.

This report makes extensive reference to a previous report written for VJK summarising the evidence for the nature of early Irish iron smelting furnaces (Young 2003c) based on finds from four sites evaluated for VJK (Young 2003a, 2203b, 2003d). It is recommended that this report be read alongside that earlier summary report.

Morett, Site D, 03E0461

Description

The catalogue for this site is presented in Appendix 1

This site produced abundant evidence for iron smelting with features interpreted during excavation as "bowl furnaces" and charcoal pits in Areas A and B, and a further possible furnace in Area C.

Area A

Two adjoining features (C324 and C172) were described as "bowl furnaces", although the supplied documentation was contradictory on which was the earlier. C324 is described as being 0.9m in diameter and 0.02m deep; C 172 as 0.60m diameter and 0.18m deep.

C324 with its fills C323/327 yielded approximately 1kg of a rather derived-looking assemblage of smelting materials, including various types of slag and lining fragments.

C172 with its fills c174/175 contained 1.1kg of a mixed assemblage of larger pieces of slags, including burr fragments, pieces with a prilly texture, lining fragment and some dense slags bearing moulds of very large charcoal fragments. As with the fills of c324, this assemblage would be best interpreted as secondary dump of smelting-related materials, rather than an in-situ collection of pieces left in a furnace after smelting.

Area B

This area contained three "bowl furnaces" clustered closely together. In each case the excavator notes that most of the slag was on the floor of the furnace and against one side.

C140 was a circular feature 0.37m in diameter and 0.19m deep. The fill of the feature also appears to be assigned to C140, apart from a basal charcoal-rich layer. The main fill contained 1.5kg of isolated prills and sintery material, slags consistent with an origin on the base of a basal pit for a smelting furnace.

C141 was recorded as a larger feature, 0.56m diameter and 0.28m deep, but C193 appears to be a burnt lining to the feature, so the functional pit would have been slightly smaller (no section or details are available to the author to confirm the dimensions). Slag was archived against the cut number (C141) as well as two fills (C164 & C177; an upper clay fill and a lower charcoal-rich deposit respectively). Material from C141 and C164 includes a variety of material types commonly encountered at the base of smelting furnaces, including sintery-appearing slags, prills, moulds of charcoal fragments and “coffee bean” morphology droplets. The slag from C177 however appears to be pieces of a single broken prilly slag cake with coarse charcoal moulds, of which further fragments appear in C164, giving a total weight of this material of approximately 5.6kg. This material closely resembles the textures seen in the large slag cakes found in the upper part of the basal pits of iron smelting furnaces elsewhere (e.g. Young 2003c, 2003d). Such a slag cake might be termed a “furnace bottom” *sensu* Crew 1986. However, it seems clear from the evidence available from the Irish furnaces that the block does not form in the bottom of the furnace, but slightly higher in the shaft, immediately below the bloom.

C142 was another large feature, 0.67m in diameter and 0.18m deep. It is recorded as having a single fill, c163. C163 contains 2.2kg of residues comprising large slag pieces, including burr fragments, a piece of slag accumulation from the foot of the pit wall on the blowing side and a block with very large charcoal moulds, together with a large proportion of wall and lining debris. This is not likely to be an in-situ assemblage, but comprises the coarse debris from clearing out a furnace and the demolition or repair of its superstructure.

Area C

C397, an upper fill of C335, a corn drying kiln, yielded 5.5kg of smelting related debris (dense slags with very large charcoal moulds, down-wall flows, prills, stalagmitic slag accumulations), but also has a possible large tuyère fragment, much vitrified lining, and slags with a flow-lobed base overlain by an inclined body of granular slag. This is not an in-situ deposit. The possibility exists that some of the residues from this context (particularly the dense slag pieces with smooth, blown tops and the possible tuyère material) might have been produced during iron-working rather than smelting.

Interpretation

The material divides into assemblages of two types:

1. material from “furnaces” C140 and C141 only includes residues likely to be found in the lower part of the basal pit of an iron smelting furnace and it is very likely, therefore, that these assemblages are *in situ*.

2. The assemblages from “furnaces” C324, C172 and C142, together with that from the corn drier (C335) in Area C all contain mixed assemblages which represent material cleared from the smelting furnaces during cleaning and repair. That does not preclude these features from being furnaces themselves, for disused furnaces were commonly employed as dumps during subsequent activities. The description of C335, in the Area C corn drier, seems to imply that this is not a furnace, but is a dump or spread of material.

The description of C324 indicates a larger size than normal for a smelting furnace (the description states 0.9m diameter, although the plan suggests that this may be the long-axis of a pit of a rather narrower width) and a shallower than normal depth (only 0.02m depth preserved). Nor does the description explicitly state there was in-situ burning. It is possible that C324 is a working hollow associated with furnace C172 rather than being a separate hearth/furnace. It is even possible that it is an example of the sort of pit in front of the furnace arch recorded by Crew (1989, 1998) in some examples of his non-slag tapping furnaces in north-west Wales. This shallow pit provided access to a furnace arch for the clearance of slag from the furnace by raking, or by breaking-out when cold. No evidence yet exists for such a feature in the Irish examples of non-slag tapping furnaces, which have a much more substantial basal pit than Crew’s furnaces, but this arch/pit arrangement is possible. A similar situation may exist with C341 and C345 at Cappakeel West which are linked by a channel (C347), and which is discussed further below.

Features C172 and C142 are both large (0.60 and 0.67m diameter respectively), but both may be smelting furnaces. The large diameters may indicate the pits were originally lined, but this is not reflected in the recorded stratigraphy. Alternatively, these large diameter features may not be smelting furnaces but other features, perhaps smithing hearths (although there is no evidence for this) or ore-roasting pits, that were filled with smelting debris on abandonment. Finally, one possibility worth considering is that when the material in which the basal pit of a smelting furnace is cut becomes heated, it may show a strong change of colour and texture, which sometimes induces excavators to interpret it as part of the fill of the feature, with the consequence that the true pit becomes substantially over-dug.

Discussion

The collection of iron smelting residues from Site D Morett is a very significant assemblage.

Much of the material recovered from the site appears to be residues dumped into pre-existing features for disposal. Two furnaces (C140 and C141) have apparently in-situ residues. In the case of C140 these are similar to the basal residues found in several other furnaces during this project, but the material in C141 includes a substantial part (approximately 5.6kg) of a charcoal-rich slag cake. This material does not include all the features expected of a "furnace bottom", and although fragmented, appears to represent just the distal and lower parts. It would appear likely therefore that the furnace was partially cleared after the smelt producing this slag. This likelihood is strengthened by the slag assemblage from C164, which apparently overlay the deposit, C177, containing the slag cake debris. The residue assemblage from C164 is similar to that from the basal deposit of furnace C140, in including prills, spheroids and sintery-appearing residues. This suggests that the furnace may have been used again, despite having the only partially cleared slag cake within the pit.

The archaeometallurgical resides and features from Morett appear slightly different from those of other sites in the project. The nature and implications of these differences are discussed further below (see Summary).

Smelting

Technology

All the seven smelting sites reported herein employed essentially similar furnaces, which fall within the category of non-slag tapping furnaces commonly known as slag-pit furnaces. The terminology and typology of these furnaces is muddled and obscured by local usage (see discussion in Pleiner, 2000), but a widespread use of this spectrum of furnace types seems to have occurred across Europe in the first millennium BC. However, it is clear that these slag-pit furnaces have given rise to many local interpretations of bowl furnaces, mainly because of poor-or non-preservation of evidence for superstructure. The persistent myth of bowl furnaces for smelting in Ireland has been attacked by Crew & Rehren (2002) and Young (2003c). These Irish furnaces are actually a type of shaft furnace, as so elegantly demonstrated by Crew for Iron Age examples from North Wales (1987, 1989, 1991) and argued for several Irish examples by Young (2003c).

The sites described in this report change little in the basic understanding of the operation of the slag-pit smelting furnace as previously described (Young 2003c), but do add several significant details.

Furnace morphology

Finds of intensely vitrified furnace wall material (particularly those from Cappakeel West Site F, C291) indicate the existence of a substantial clay superstructure to the furnaces as previously proposed.

One of the most significant differences suggested by Young (2003c) between the non-slag tapping furnaces of the Iron Age of North Wales, studied by Crew, and the examples merging in Ireland, was the absence of evidence for a furnace arch in the Irish examples. The present study includes two examples which may provide evidence for such an arch in the Irish furnaces:

1. At Morett Site D, it is possible that C324 is a working hollow associated with furnace C172 rather than being a separate hearth/furnace. C324 is a shallow (0.02m feature) described as being 0.9m in diameter, but shown on the supplied plan as a pear-shaped feature, approximately 0.9m wide distally, narrowing to 0.3m near to C172, with a length of 1.3m. The contact between C324 and C172 was clearly difficult to interpret as two different accounts of their stratigraphic relationship were given. C324 is described as a pit, and does not appear to have evidence for in-situ burning, unlike C172.

2. A similar situation may exist with C341 and C345 at Cappakeel (west) which are linked by a channel (C347). No plan was provided of these features, but the narrative in the interim report states “feature [341] was sub-circular in plan with a maximum diameter of 0.5m and it was excavated to maximum depth of 0.13m”...”this feature did not exhibit signs of in-situ burning”; “feature [345] was sub-circular in plan with a maximum diameter of 0.35m and a maximum depth of 0.09m”...”subsoil in the immediate area surrounding the cut was oxidised to a reddish orange colour indicating probable burning in-situ. The features [341] and [345] were linked by the shallow cut [347] which was a maximum of 0.3m long and 0.22m wide and was excavated to a maximum depth of 0.1m”.

Crew’s (1991) reconstruction of the North Welsh furnaces includes an arch 0.10-0.13 wide through the 0.20m thick furnace wall, with the floor of the channel in the arch sloping down into the furnace. It is possible that in the examples from this project, Morett c172 and Cappakeel West C345 are the bases of smelting furnaces, outside which are working hollows (C324 and C341 respectively), into which slag could be raked, and access to the furnace gained, through an arch, the position of the floor of which is represented by the narrow elongation of C324 and channel C347 respectively.

The new data from the N7 Heath Mayfield Motorway Scheme certainly do not prove the existence of arches in the Irish furnaces, but do provide some circumstantial evidence, which should mean that presence/absence of such evidence in future excavations should be actively sought.

The recorded diameter of the furnace pits is highly variable between, and within, sites. Although, as noted above, it is possible that part of this variation may be variations in the way furnaces are dug (whether excavators over dig

and remove baked natural...) and in the way they are built (whether the internal furnace lining is carried down to line the pit, as described by Crew (1987), particularly in unconsolidated subsoils), there appears to be genuine variation in the volume of the slag pit. Some sites, such as Ballydavis Site B of this project and Celbridge 5 (Young 2003b) have small furnaces with diameters of 0.30m, whereas the largest furnaces (such as Morett Site D, Jamestown Site I and Tullyallen 6 (Young 2003d)) have diameters of approximately 0.50m or slightly more. There is reasonable expectation that the Ballydavis B furnaces are Iron Age, whereas some of the larger furnaces are interpreted as being medieval, but whether there is a general trend in the size of furnaces will not be revealed until all these sites are properly dated by C14.

Site	Feature	Diameter	Depth
This project			
Ballydavis 2, Site A, 03E0151	1031	none	given
	1062	none	given
	298	none	given
	257	none	given
Ballydavis, Site B, 03E0966	15	0.34	0.2
	17	0.28	0.1
		0.31	
Morett, Site D, 03E0461	172	0.6	0.18
	140	0.37	0.19
	141	0.56	0.28
	142	0.67	0.18
		0.55	
Cappakeel, Site F (west), 03E0603	239	0.36	0.21
	240	0.45	0.25
	299	0.41	0.25
	334	0.34	0.11
	342	0.26	0.22
	345	0.35	0.09
		0.36	
Jamestown, Site I, 03E0679	F8	0.55x0.60	0.2
	F12	0.70x0.45	0.1
Lughil, Site L, 03E0602	F7	none	given
	F22	none	given
	F18	none	given
After Young 2003c			
Celbridge 5 01E0306	furnace 1	0.29	0.25

Site	Feature	Diameter	Depth
	furnace 2	0.29	0.16
	furnace 3	0.29	0.26
Carrickmines Great 02E0272		0.37	0.09
Tullyallen 6 00E0944		0.50	0.18

Table 1. Comparison of smelting furnace dimensions with previous examples. Figures in grey boxes are site average.

In parallel with the apparent variation in furnace size, there is a variation in the morphology of the slags retrieved from the basal deposits of the furnaces (the Type 1 assemblages, see below). In general, a comparison of the data in Tables 1 and 2, suggests that those assemblages from the smaller furnaces contain the smaller particle size of slag. This relationship is borne out in a simple way by the larger size of prills and basal flows from Morett compared with material from Ballydavis or Cappakeel. This adds further circumstantial evidence for a genuine difference in the scale of process between sites.

Residue assemblage types

One interesting aspect of the smelting residue assemblages described herein, is that there appear to be a limited number of styles (composition and preservation) of assemblages. There are three broad categories of smelting slag assemblage recognised in this material:

1. Dominantly (average usually less than 10g) small pieces of slag in various morphologies:
-slag spheroids of 4-8mm diameter
-sintery-appearing fine slags, with ash, charcoal debris and admixed sediment.
-vertically descending prills
-stalagmitic slag accumulations formed on the furnace floor beneath persistent slag drips
-small cross-floor flows

2. Large blocks of coalesced prilly slags with abundant charcoal inclusions, often rather friable. The proximal (blowing wall) side may show development of one of more burrs, down-wall flow, and accumulation of stacked flow lobes at the wall foot. Massive slags developing near the wall foot may enclose large moulds of wood/charcoal

often of sizes up to 40x60x200mm. These massive slags may grade laterally into cross-floor flow lobes. These slags blocks may be termed “furnace bottoms”.

3. Fragments derived from the more massive, less friable parts of the “furnace bottoms” described above, particularly the dense slags associated with the blowing wall (burr, down-wall flows, stacked flow lobes, massive slags with very large wood/charcoal inclusions). Typically these assemblages also include large blocks of vitrified furnace lining.

During normal operation of the smelting furnace the basal pit would be cleared of slag after each smelt. The more distal parts of the “furnace bottom” are rather friable and would be likely to become very degraded during extraction and disposal. The dense slags associated with the proximal side of the furnace will become broken-up during extraction, but are physically strong and have a much higher preservation potential. Disposal of this material, together with disposal of material created during repair of the superstructure would create a type 3 assemblage.

The very basal part of the furnace would accumulate deposits of ash and unburnt fuel fragments, but would also contain the fine residues described as Type 1 above. If the basal part of the furnace was thoroughly cleaned then these would need disposal, but this might be undertaken separately from the large blocks of Ballydavis B 12 1.30 1.10 0.10 1.2 “furnace bottom” which could be carried by hand. If the furnace was not thoroughly cleaned, then some of this material might accumulate in the basal pit, giving rise to the apparently in-situ deposits recorded from most smelting furnaces recorded on sites in this study (Ballydavis2, Site A; Ballydavis, Site B; Morett, Site D; Cappakeel Site F West; Jamestown, Site I; Lughil, Site L).

Type 2 assemblages, in which the furnace bottom is intact or largely so, have only been recorded so far in instances where the furnace bottom has been left *in situ*, and not cleared from the furnace. In this study only furnace c141 at Morett, Site D, yielded a substantial part of a “furnace bottom” (approximately 5.6kg). But even here the denser, stronger, parts of the FB seemed to have been extracted. In this instance the finds of Type 1 from above the partial FB hint that it may have been left in the furnace base of an operational furnace. In contrast, the FB encountered at Tullyallen 6, Co. Louth (Young 2003c, 2003d) appears to have survived intact; presumably the furnace was simply abandoned after that smelt.

Site/context	Weight	No of pieces	Average weight	Assemblage type
Cappakeel W, Site F				
Furnace 239	532	70	7.6	1
Furnace 240	1562	71	22	1

Furnace 299	262	43	6.1	1
Furnace 334	2747	260	10.6	1
Furnace 342	2	1	2	1
Pit 268	19238	177	108.7	3
Morrett, Site D				
Furnace 140	1544	165	9.4	1
Furnace 141	6307	380	16.6	2 & 1
Furnace 172	1090	29	37.6	3
Pit? 324	1015	31	32.7	3
Furnace 142	2155	9	239.4	3
Spread 335	5561	84	66.2	3
Ballydavis2, Site A				
1056	604	>242	<2.5	1

Table 2. Comparison of average fragment weight and L/l assemblage type for residues recovered from smelting furnaces.

Charcoal Production

A close association between the location of iron smelting furnaces and of charcoal production pits has 0.5 been noted for several sites, particularly Cappakeel and Morett.

The charcoal production pits at Morett may be distinguished from those of the other three sites on the basis of both dimensions and shape (Table 3 and Figure 1). The main body of pits from Ballydavis and Cappakeel forms a trend from small pits (L from 1.2 to 1.4m) with relatively equant shapes (L/l of 1.2 to 1.3) through to large (L from 3 to 3.5m) and elongate shape (L/l of 2.1 to 2.3). These pits are almost all rectangular with rounded corners.

Site	Context	L	l	d	L/l
Ballydavis B	12	1.3	1.1	0.1	1.2
Cappakeel E	82	2.4	1.6	0.41	1.5
	95	1.9	1.1	0.08	1.7
	5	1.8	0.8	0.07	2.3
	93	1.17	0.86	0.08	1.4
	296	1.34	1.08	0.15	1.2
Cappakeel W	267	1.25	0.95	1	1.3
	60	1.3	0.75	0.22	1.7
	115	1.35	0.83	0.25	1.6

Site	Context	L	l	d	L/l
	220	1.25	0.7	0.33	1.8
	205	2.3	1.39	0.4	1.7
	207	3.05	1.3	0.22	2.3
	234	1.45	1.09	0.39	1.3
	16	3.23	1.55	0.19	2.1
Morett	126	1.8	1.6	0.53	1.1
	37	1.9	1.6	0.45	1.2

Table 3. Long axes (L), short axes (l) and depths (d) recorded for charcoal production pits.

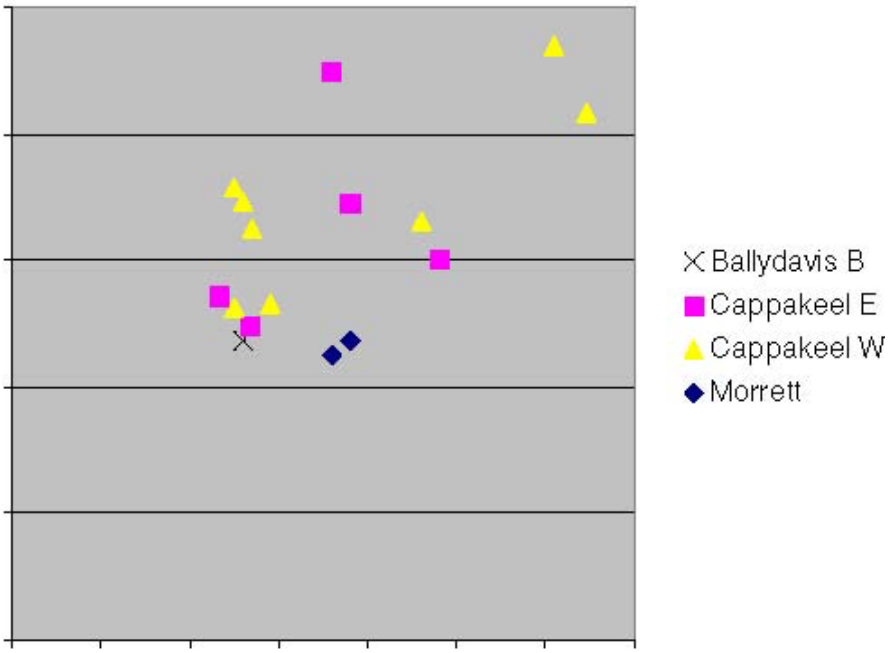

Figure 1. Graph of the ratio of the long to short axis of charcoal pits, plotted against the long axis dimension.

In contrast the pits at Morett are much more irregular in shape, more equant (L/l of 1.1 to 1.2) and medium sized (L of 1.8 to 1.9m).

The graph of the long/short axis ratio against the depth of the pits (Figure 2) also shows a segregation (with some overlap) between sites. Ballydavis B and Cappakeel E show depths (with a single outlier) of 0.07 to 0.15m, Cappakeel W (with one outlier) shows depths of 0.19 to 0.40m and Morett has depths of 0.45 to 0.53m. There is some suggestion that the more equant pits on each site are deeper.

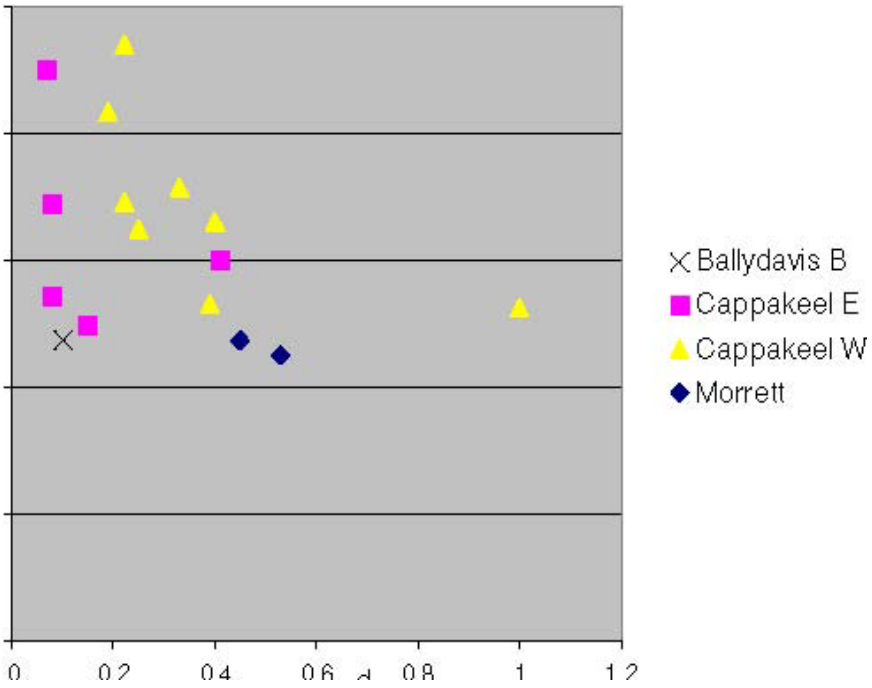

Figure 2. Graph of the ratio of the long to short axis of charcoal pits, plotted against their depth.

These data for charcoal pit morphology should be compared with data from other comparable sites. They appear to emphasise that Morett is slightly different in character from the Cappakeel and Ballydavis sites; a feature also noted in the characteristics of the iron smelting. It remains to be seen whether this has significance in terms of age of the site.

Smithing

This project produced surprisingly little residue from iron-working. Out of a total collection of some 54kg of slag, only 7kg was attributable to smithing.

A small amount of material (approximately 1kg), presumably Iron Age in date, came from Ballydavis 2, Site A. This material is rather fragmentary, but includes one piece of probable SHC weighing 484g, suggesting the presence of a cake size which might possibly be attributable to bloomsmithing in the Iron Age (Crew & Rehren 2002).

Cappakeel East, Site F produced a small amount of smithing debris (approximately 4kg) from a ditch which is likely to be earlier Medieval in date. The fragmentary SHC's included some material indicative of large examples (greater than 3kg), which seem likely to be indicative of bloomsmithing on early medieval sites.

Kill Site O, produced just under 2kg of smithing slag from a ditch, which also seems likely to be Medieval. This material was very fragmentary, but appeared to contain a spread of SHC size, ranging up from a small 290g example (presumably from blacksmithing), up to small pieces of much larger cakes (possibly from bloomsmithing).

Organisation of the industry

The archaeometallurgical assemblages from this project are unusual. A large number of iron smelting furnaces were located, but in most cases these only contained a small assemblage of smaller slag pieces which had escaped the cleaning of the furnace. In some cases dumps of coarse slag material from the main "furnace bottoms" were found, within abandoned furnaces or other features. However, it is clear that the main slag output of the located furnaces was not seen.

In a British Iron Age example of a similar smelting technology in East Yorkshire, large dumps of "furnace bottoms" survived as mounded landscape features (Halkon 1997). It is possible that a similar mode of disposal occurred with these sites, and subsequent agricultural activity has either degraded the mounds, or they became cleared into the field boundaries.

Equally striking is the relative lack of evidence for the working of the blooms produced in the furnaces. It is apparent that those locations where iron-working slags were retrieved are features associated with settlements (including the "ceremonial" enclosure at Ballydavis 2 and the Medieval boundary/defensive ditches at Cappakeel East and Kill).

Such a differentiation between dispersed smelting and focused bloomsmithing/smithing is a frequent feature of early iron making in the British Isles. It becomes strongly enhanced in the later medieval period when the bloomsmithy often became water-powered, but this functional differentiation is also seen earlier. In part it may have its origins in the large quantities of charcoal required for smelting. The smelting furnace tended to be a clay-built ephemeral structure, so it was relatively straightforward to locate the smelting activity at the point of manufacture of the charcoal. Such ephemeral smelting, following the coppicing or even clear-felling of timber has been described for Coed y brenin, North Wales, for the fourteenth century (Smith 1995). It may lie behind the use of the term "fabricam arrantem" in the thirteenth century in the Forest of Dean.

Assessment of Potential

The material described in this report has great potential for both increasing the understanding of the individual sites and as an enormous contribution to Irish archaeometallurgy.

The post-ex investigative programme should try to address the unresolved questions raised in this report concerning some of local details of stratigraphy and furnace morphology, establishing for instance the size of the true furnace pit, and examining further the primary field evidence for the presence of a furnace arch.

Detailed compositional studies of the smelting slags should be undertaken to improve understanding of the technology of the slag-pit furnaces and their yield. The examples of iron smelting all derive from fairly small area (16km separates sites A and O) and are therefore likely to be exploiting very similar resources of bog iron ore (Co. Laois has outcrops of rock ores, but these are some distance from the sites in question). They thus may well form a suitable database on which to model chemical composition and mass balance, in order to determine iron yields (following the approach of Thomas and Young, 1999a and 1999b). Production of mass balance models for the various sites will require a substantial number of chemical analyses from as many different slag types within each site as possible. Understanding mass balance variation between sites will help to illuminate changing technology through time. Although the fundamental technology of the smelting furnace appears not to vary greatly between sites, it appears that the scale of each smelt did vary, best on variations of the slag-pit diameter and of the size of slag prills and flows found within them.

The residues from iron-working encountered in this project are rather less significant, and are less likely to add further to present understanding.

One key factor in the potential of this material is the spread of likely dates for the assemblages. It is absolutely crucial therefore, that before publication all the metallurgical data should be reviewed in the light of C14 dating results.

References

CLOGG, P. 1999. The Welham Bridge Slag. pp 81-96 In P. Halkon and M. Millett, Rural settlement and Industry: Studies in the Iron Age and Roman Archaeology of Lowland East Yorkshire. Yorkshire Archaeological Society.

CREW, P. 1987. Bryn y Castell Hillfort – a Late Prehistoric Iron Working settlement in northwest Wales. In: SCOTT, B.G. & CLEERE, H. (eds) The Crafts of the Blacksmith. 91-100.

CREW, P. 1989. Crawcwellt West excavations 19861989. A late prehistoric ironworking settlement. Archaeology in Wales, 29, 11-16.

CREW, P. 1991. The Experimental Production of Prehistoric Bar Iron, Historical Metallurgy, 25, 21-36

CREW, P. 1995. Bloomery iron smelting, slags and other residues. Historical Metallurgy Society, Archaeology Datasheet No. 5.

CREW, P. 1996. Bloom refining and smithing, slags and other residues. Historical Metallurgy Society, Archaeology Datasheet No. 6.

CREW, P. 1998. Excavations at Crawcwellt West, Merioneth, 1990-98: A late prehistoric upland iron-working settlement. Archaeology in Wales, 38, 22-35.

CREW, P. & REHREN, T. 2002. Appendix 1: High-temperature workshop residues from Tara: iron, bronze and glass. Pp. 83-102 In: ROCHE, H. Excavations at Ráith na Ríg, Tara, Co. Meath, 1997. Discovery Programme Reports, 6, 19-165.

HALKON, P. 1997. Fieldwork on early iron working sites in East Yorkshire. Historical Metallurgy, 31, 12-16

PLEINER, R. 2000. Iron in Archaeology: The European bloomery smelters, Prague.

SCOTT, B.G. 1990. Early Irish Ironworking. Ulster Museum Publication 266, Belfast, 238pp.

SMITH, K. 1995. Iron-working in North-West Wales in the Late Fourteenth Century. Archaeological Journal, 152, 246-290.

THOMAS, G.R. & YOUNG, T.P. 1999a. A graphical method to determine furnace efficiency and lining contribution to Romano-British bloomery iron-making slags (Bristol Channel Orefield, UK). In: YOUNG, S.M.M., BUDD, P.D., IXER, R.A. and POLLARD, A.M. (eds). Metals in Antiquity, British Archaeological Reports International Series, 792, 223-226. Archaeopress, Oxford.

THOMAS G.R. & YOUNG, T.P. 1999b. Bloomery furnace mass balance and efficiency. In: POLLARD, A.M. (ed) Geoarchaeology: exploration, environments, resources, Geological Society of London, Special Publication, 165, 155-164.

TYLECOTE, R.F. 1986. The Prehistory of Metallurgy in the British Isles. The Institute of Metals. 257pp.

YOUNG, T.P. 2003a. Evaluation of slag from the SE Motorway, Co. Dublin (02E0428, 02E0272, 02E0074 and 02E0076). Geoarch Report 2003/02. 3pp.

YOUNG, T.P. 2003b. Evaluation of slag from Celbridge Site 5, County Kildare (01E0306). Geoarch Report 2003/07. 5pp.

YOUNG, T.P. 2003c. Is the Irish iron-smelting bowl furnace a myth? A discussion of new evidence for Irish bloomery iron making. Geoarch Report 2003/09. 4pp.

YOUNG, T.P. 2003d. Evaluation of slag from Tullyallen 6, Co. Louth (00E00944). Geoarch Report 2003/10. 2pp. + 2 figs.

YOUNG, T.P. 2005. Metallurgical Residues from Clonmacnoise, Part 1: Evaluation of material from the waste water treatment works (02E1407). GeoArch Report 2005/06. 29pp.

APPENDIX 8 – PETROLOGY REPORT

PETROGRAPHICAL REPORT
On Stone Object from Archaeological Excavations

at Morett Site D, 03E0461

on the

N7 Heath – Mayfield Motorway Scheme

by

EurGeol Dr Stephen Mandal MIAI PGeo

Aug 2005

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1. Introduction

This report is based on the macroscopic (hand specimen) examination of a stone artefact found during archaeological excavations in advance of the construction of the N7 Heath-Mayfield Motorway Scheme.

The purpose of the study was to identify the rock type from which the object was made, to highlight potential sources for the stone, and to comment on its 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).

2. Solid Geology and Soils of the Site (see McConnell and Phillcox 1994)

The Heath-Mayfield Motorway Scheme is located in an area of Carboniferous Age rocks. The bedrock under the site consists of Upper Carboniferous Age Limestone, a fine grained grey/blue calcareous fossiliferous rock. These rocks, which make up much of the Midlands of Ireland, represent the northward return of the sea at the end of the Devonian, *c.* 360 million years ago, owing to the opening of a new ocean to the south called the Palaeo-Tethys in what is now central Europe.

Inliers of older (Lower Carboniferous – Devonian) rocks occur to the northwest of Portlaoise, comprising Silurian Age quartzite, Devonian Age sandstone (The Old Red Sandstone) and Lower Carboniferous shales, sandstones and slates.

East of Monasterevin occurs older, Ordovician Age sediments, which represent a period of uplift and erosion due to the closure of the Iaepetus Ocean, a major ocean which at it's widest was probably greater than 3000km across. These are metamorphosed close to the contact with the Leinster Granite to the east.

The overburden in the area of the site consists of boulder clay, with some kames, deposited during the last episode of ice activity of the Pleistocene Glaciation. The soils consist of grey brown podzolics (see Aalen *et al*. 1997).

3. Results

Find no	Object	Lithology	Notes
03E0461:89:03	Hammerstone/anvil	Granite	Granite water rolled cobble used as hammerstone/anvil; circumference has extensive pecking consistent with use as hammer; upper and lower faces have peck marks in centre, indicating stone was either used as an anvil, or was being perforated

4. Conclusions

It was not possible to determine a definitive source for this object based on macroscopic examination alone. Furthermore detailed microscopic analysis would also be unlikely to identify exact sources. On the other hand, it can be stated that the materials from which the object was manufactured are available locally in outcrop and within the glacial tills. Thus it is probable that it were derived from local sources.

5. Bibliography

Aalen, F.H.A., Whelan, K. and Stout, M., 1997. *Atlas of the Irish Rural Landscape*. Cork University Press: Cork.

Cooney, G. and Mandal, S., 1998. *The Irish Stone Axe Project: Monograph I*. Wordwell: Wicklow.

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

APPENDIX 9 – THE POST-MEDIEVAL POTTERY

Post-Medieval Pottery Report

For N7 Heath-Mayfield Motorway Scheme

INTRODUCTION

The general cut off date used to separate the medieval from the post-medieval, is normally set at AD1500. This date is significant because it corresponds to a certain degree with the shift towards different centres of production and export, as exploitation and settlement of the Americas was developed (Meenan 1990). The date for this assemblage ranges from the late 17th century to the early 20th century. Due to the lack of rim sherds it was difficult to carry out minimum vessel counts. A description of the different wares and their origins is provided. Where post-medieval pottery is evident, it is possible to give a likely date, due to the circulation and rapid changes in styles, during this period, both of English and imported wares.

CATALOGUE:

03E0461 Morett Site D. Catalogue of the Post-Medieval pottery				
Find #	Context	Material	Artefact type	Period
03E0461:01:44	Topsoil	Pottery	North Devon Gravel Tempered	Post-Medieval
03E0461:01:45	Topsoil	Pottery	English glazed brownware	Post-Medieval
03E0461:13:60	Fill of ring-ditch	Pottery	Blackware body sherd	Post-Medieval

BLACKWARE

Traditional blackwares were transformed into Black Basalt a superlative black stoneware. Wedgwood's success led his competitors to develop similar wares and by the end of the18th century durable earthenwares and stonewares were gaining new mass markets. Black ware production centres were located in Buckley in Wales and in Lancashire. From Irish contexts North Devon wares, which outnumber all other groups but blackware from

Buckley Wales and Lancashire, was exported to Ireland in vast quantities and English tinglazed earthenware and stoneware has also been discovered.

NORTH DEVON

According to Meenan imports to Ireland increased dramatically from the middle of the seventeenth century. This can be partly explained by a close interconnection between North Devon merchants, the pottery industry there, the production of butter and its export from Ireland particularly the south. Very coarse highly fired glaze grey and green occur frequently at Waterford, Dublin Cork. Waterford imported a lot of ND due to the butter importation.

CONCLUSION

The greatest source of imported pottery comes from England, this can be explained by market trends and popular fashions. The date for these finds falls into the late 17th century to the early 20th century.

REFERENCES

Barton, K.J. 1975 Pottery in England from 3500BC-AD1700

Dunlevy, M. 1988 Ceramics in Ireland, National Museum of Ireland

Gaimster, D. 1997 German Stoneware 1200-1900 London

Hurst, Neal and Van Beuningen 1986, Pottery produced and traded in north-west Europe 1350-1650 Rotterdam

Mellor M. 1997 Pots and People – that have shaped the heritage of medieval and later England. Oxford

Meenan, R. 1997 'The post-medieval pottery' in Hurley, Scully and McCutcheon Late Viking Age and Medieval Waterford: Excavations 1986-1992. Waterford.

Plate 1 'Four-post structure' from the north-west.

Plate 2 Fence line from the north

Plate 3 Smelting furnace C172, Area A, from the south.

Plate 4 Charcoal production kiln C126, Area A, from the south.

Plate 5 Smelting furnaces C140, C141 and C142, Area B

Plate 6 Charcoal production kiln C37, Area B, from the southwest.

Plate 7 The larger ring-ditch, Area C, from the south

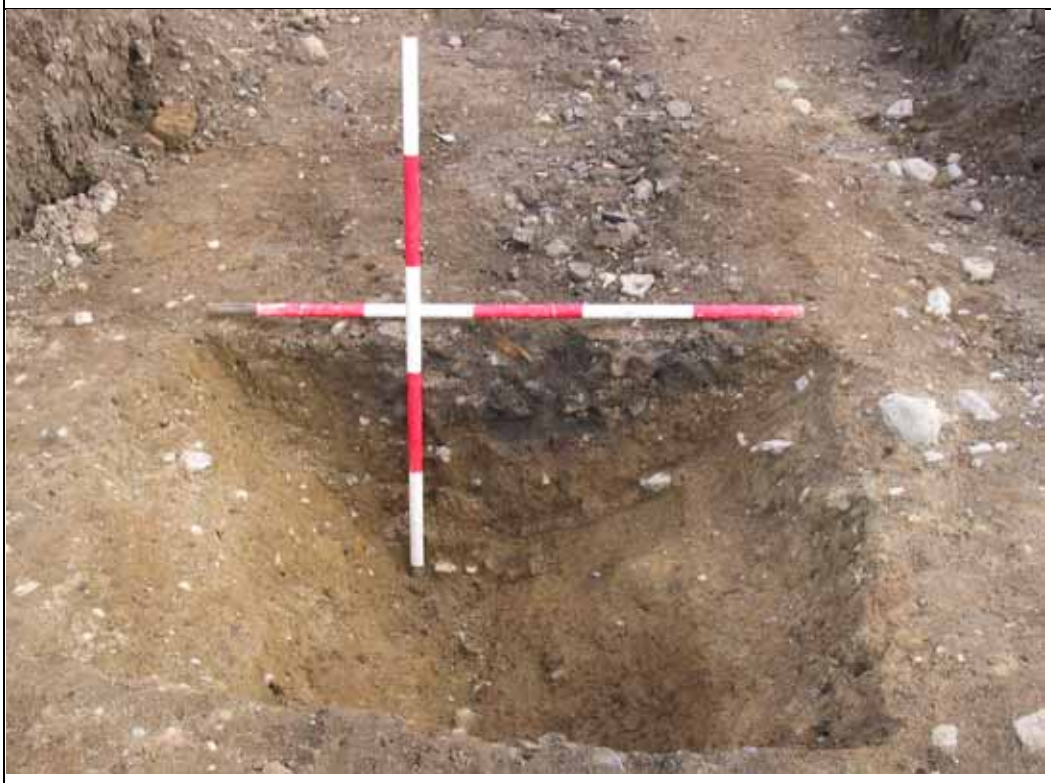


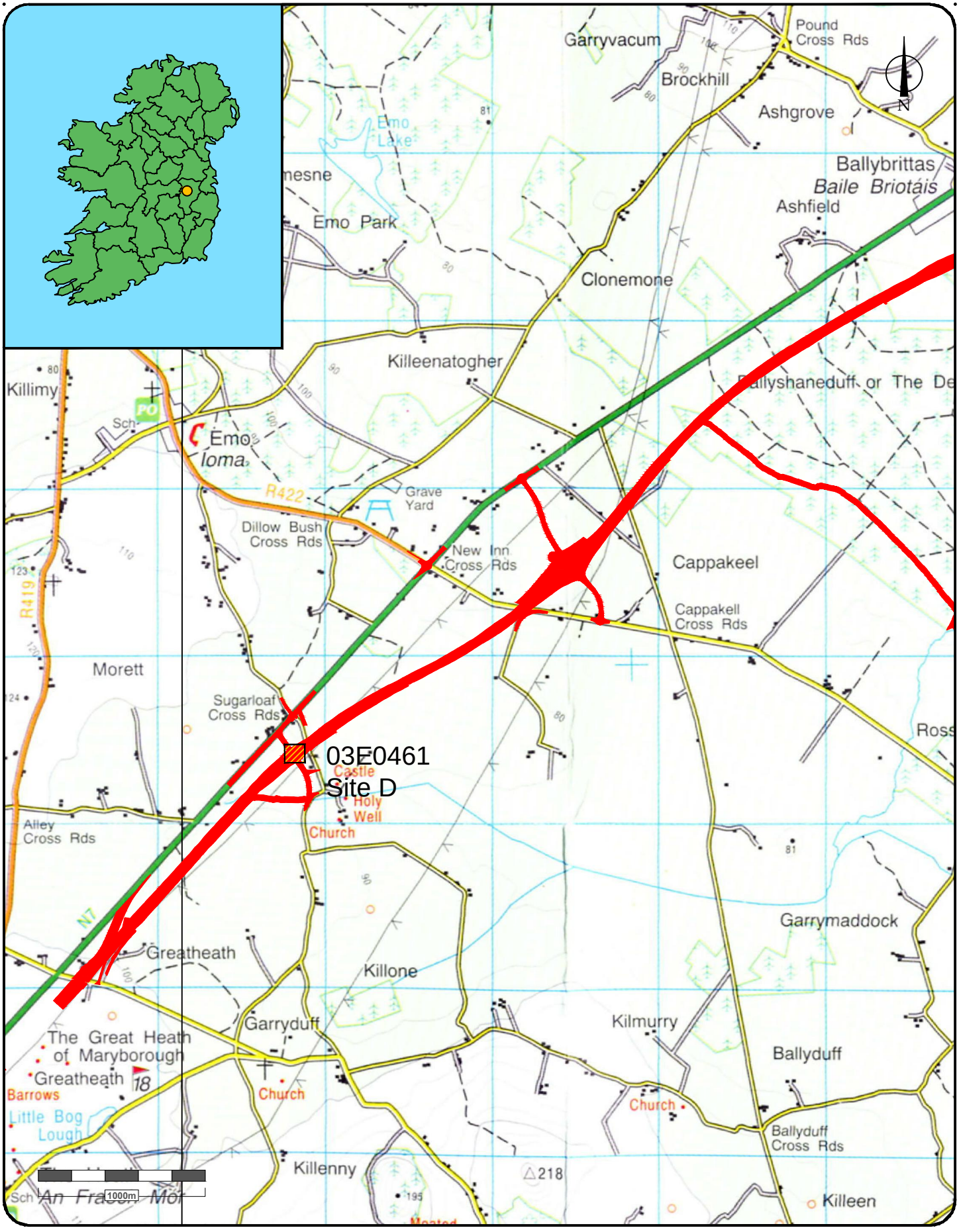
Plate 8 Typical section through larger ring-ditch

Plate 9 The smaller ring-ditch from the northwest

Plate 10 Corn-drying kiln C245

Plate 11 Burial 4 from the northeast

Plate 12 Burials 1, 2 and 3 from the northeast



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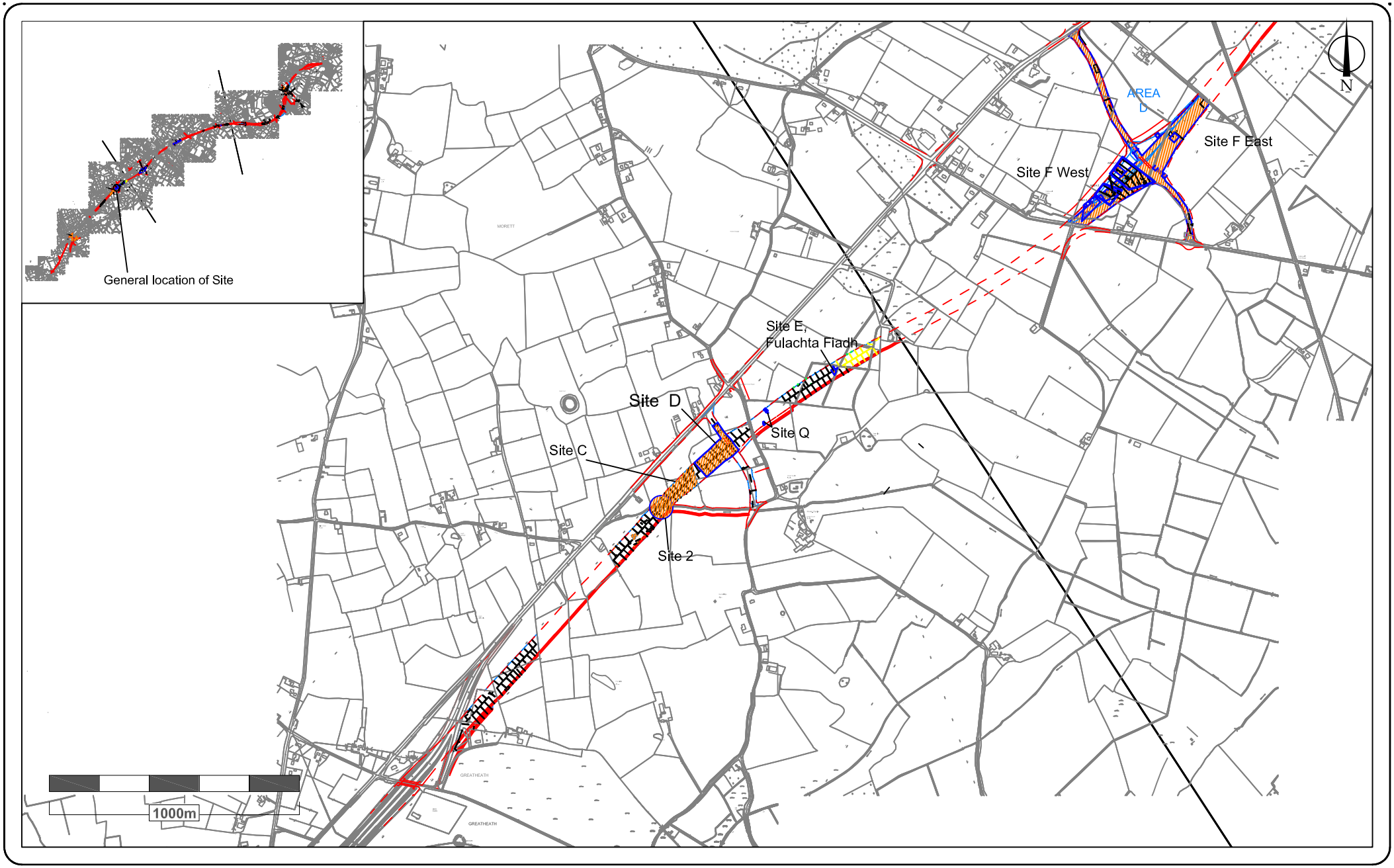
						Client Kildare County Council.
Job No. 03E0461	**Drawn by** GW	**CAD reference** 1047-03-400	**Date** Dec 11	**Scale** 1:30000	**Drawing No.** Figure 1	**Project** M7 Heath-Mayfield Motorway Scheme



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		Date Dec 11	**Scale** 1:20000	**Drawing No.** Figure 2	**Project** M7 Heath Mayfield Motorway Scheme

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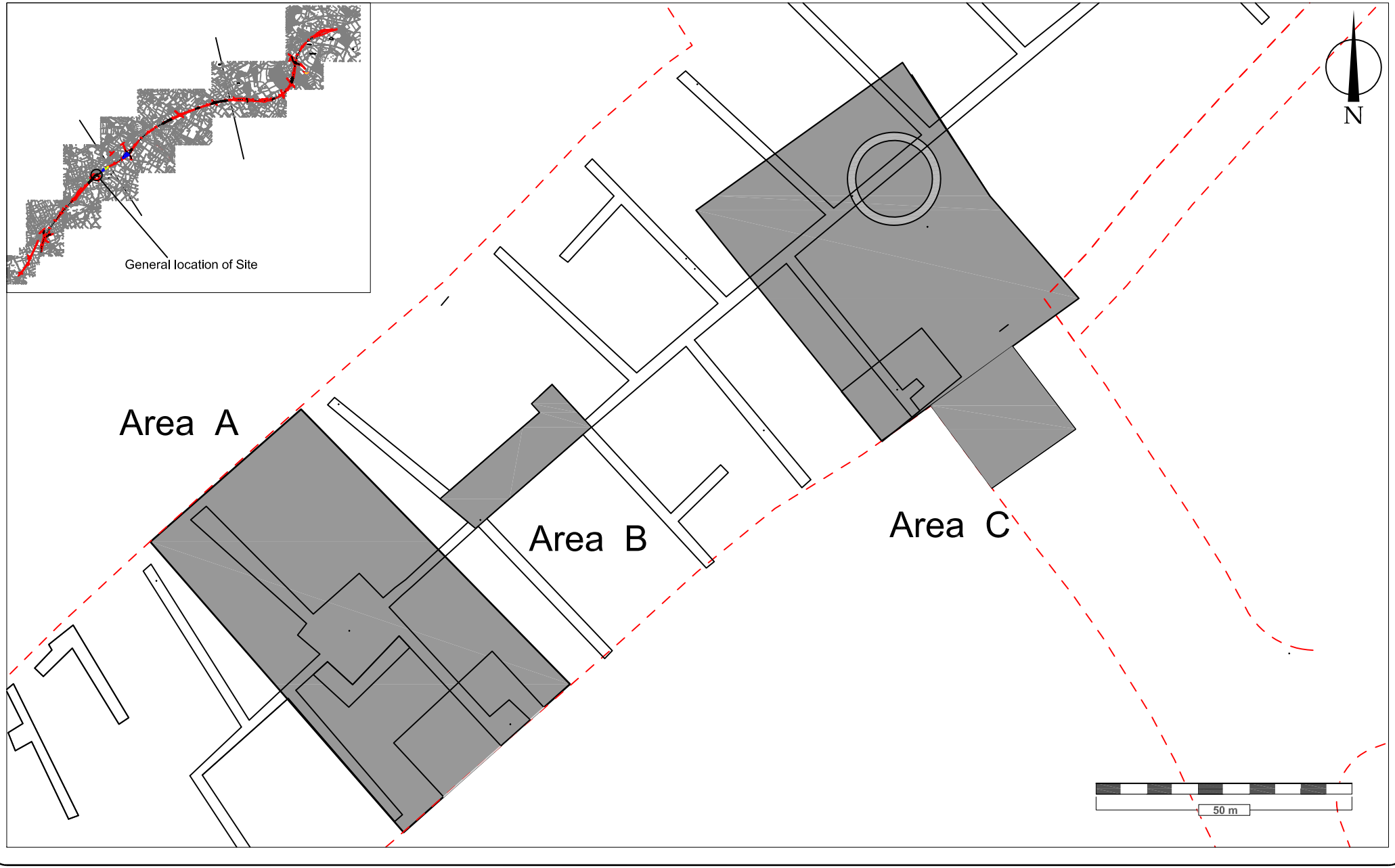

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		Date	**Scale**	**Drawing No.**	**Project**
		Dec 11	1:1000	Figure 3	M7 Heath Mayfield Motorway Scheme

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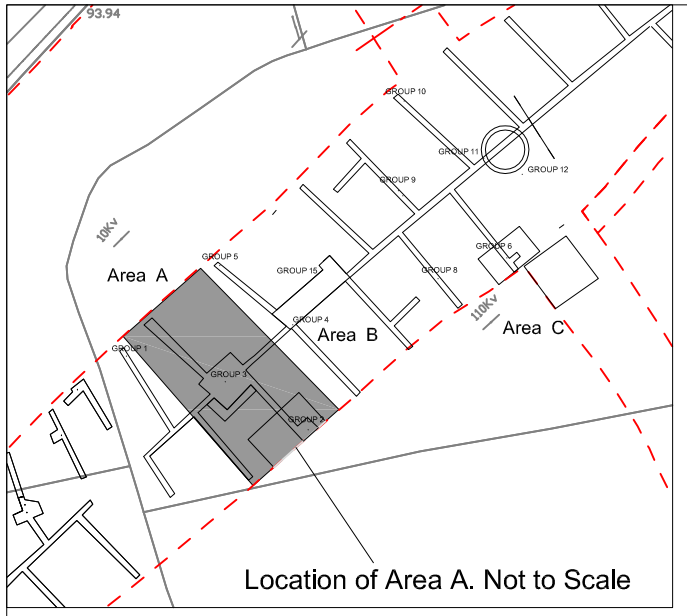
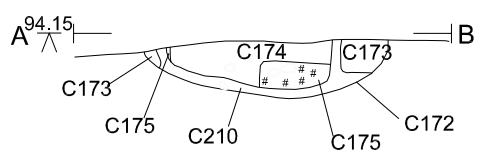
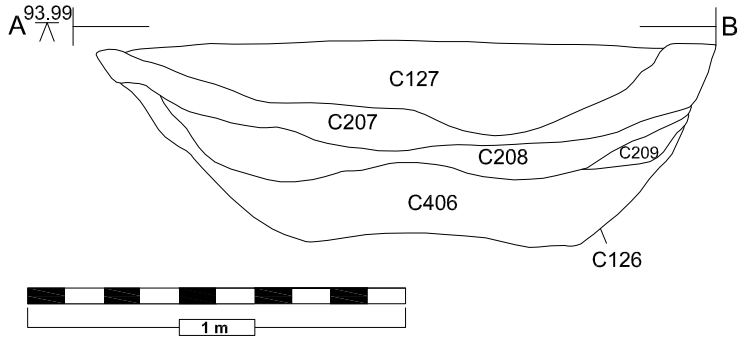


Location of Area A. Not to Scale

Northwest facing section through C172, Area A



Northwest facing section through C126, Area A



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C442 C200 C445 C443 C444 C62 C446 C70 C66 C63 C202 C80 C63 C78 C72 C309 C125 C115 C454 C447 C206 C145 C144 C104 C204 C162 C124 C123 C147 C160 C308 C108 C307 C308 C368 STONE SOCKET C370 C365 C322 C450 C240 C270 C312 C242 C310 C244 C436 C434 C238 C236 C265 C300 C233 C304 C229 C302 C263 C247 C260 C331 C228 C226 C259 C261 C276 C224 C286 C329 C268 C222 C258 C220 C218 C348 C248 C217 C216 C215 C296 C279 C326 C249 C253 C354 C352 C362 C251 C252 C360 C350 C324 C172 C388 C386 C384 C382 C128 C155 C126 C132 C134 CPO

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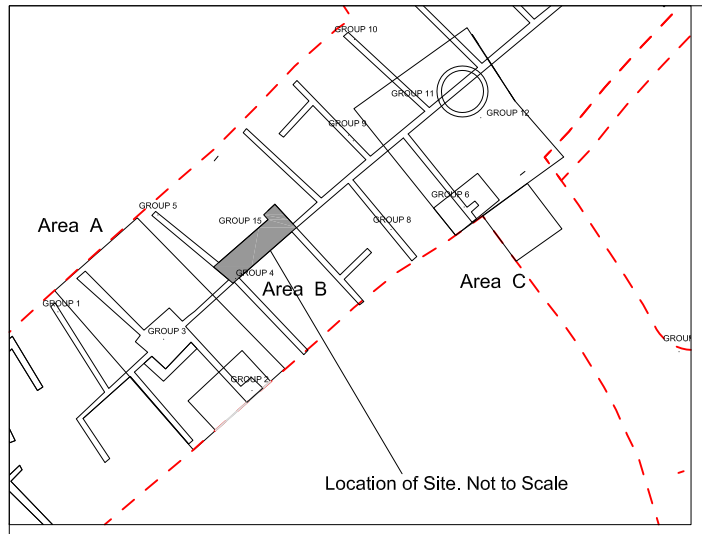
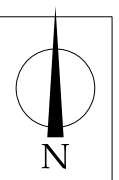
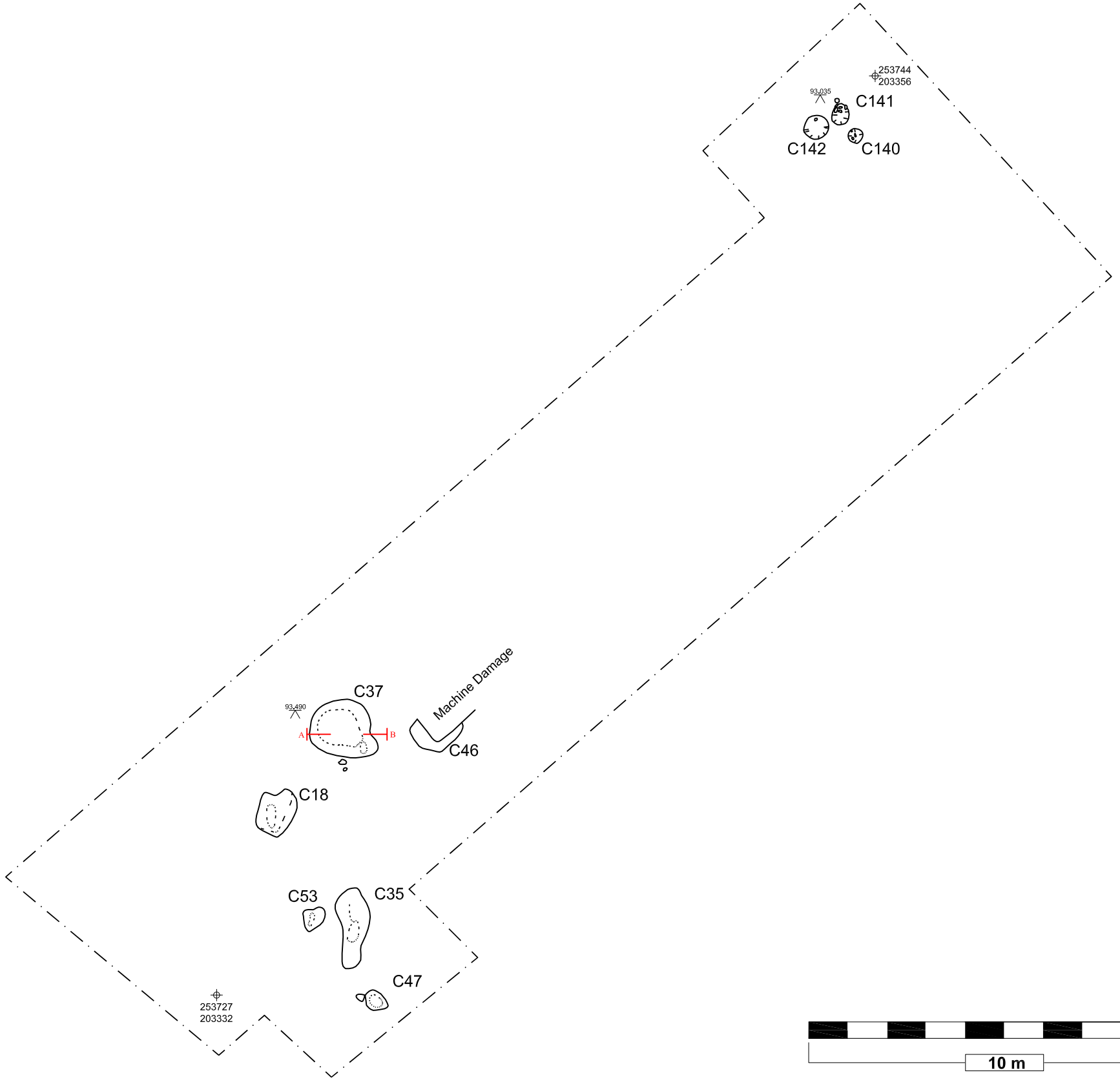
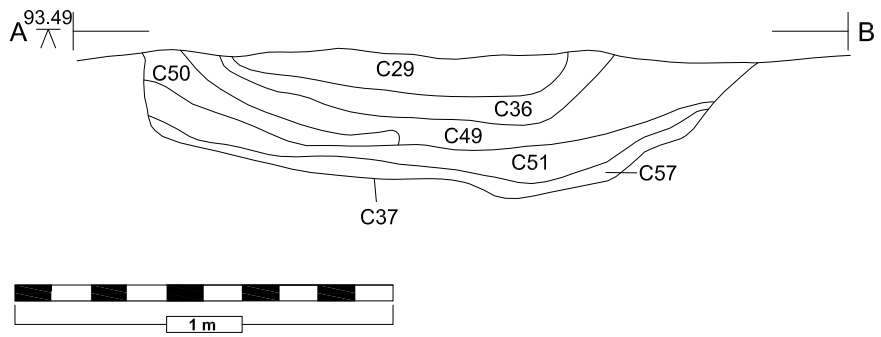






South facing section through C37, Area B



Title	Notes	Job/Exc No.	Compiled by	CAD reference	Client
Post-ex Plan and Section from Area B, Site D, 03E0461		03E0461	GW	1047-03-400/Tera3	Kildare County Council
		Date Dec 11	**Scale** Main: 1:125 Inset: 1:20	**Drawing No.** Figure 5	**Project** M7 Heath Mayfield Motorway Scheme

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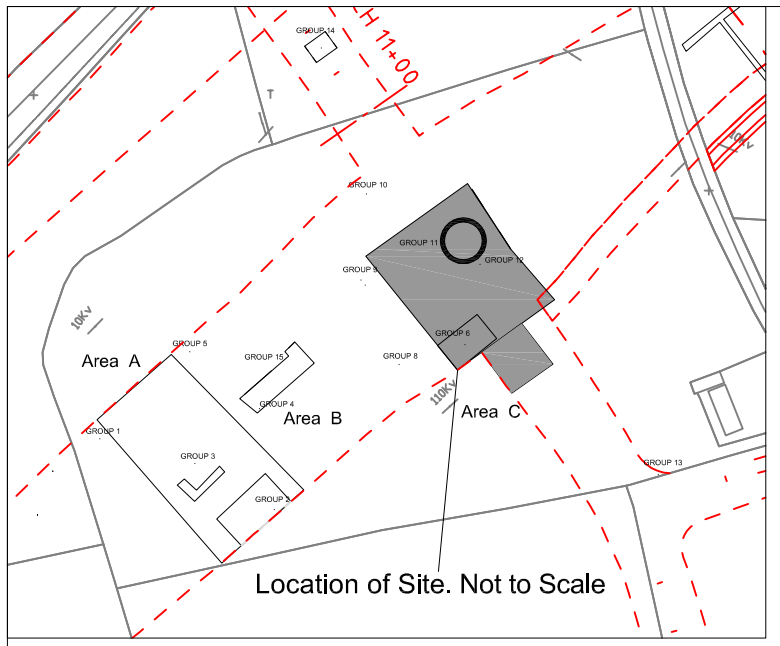
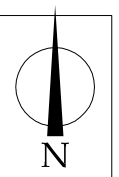
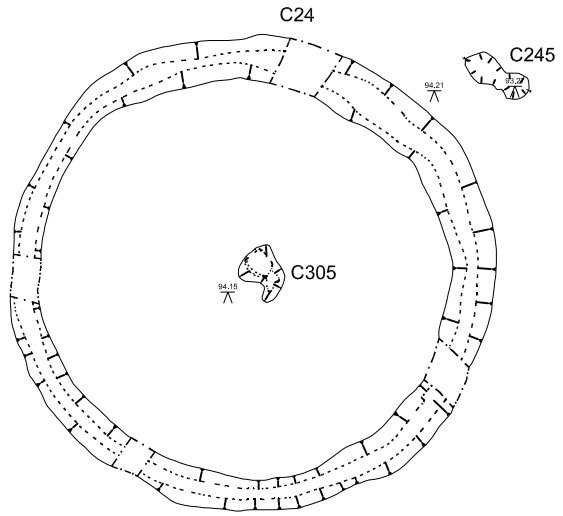
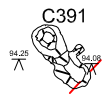


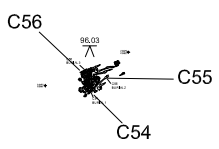


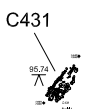


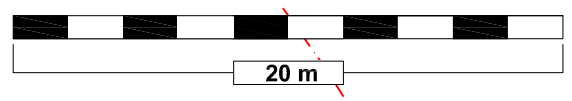
253828
203411

253774
203381

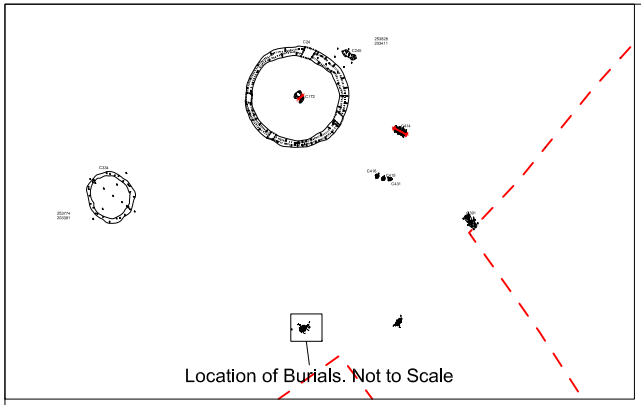








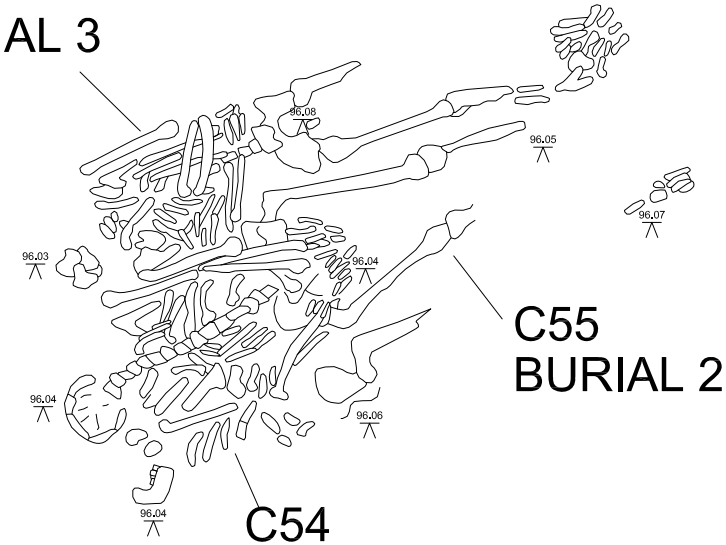
Title Post-ex Plan of Area C, Site D, 03E0461	**Notes**	**Job/Exc No.** 03E0461	**Compiled by** DE	**CAD reference** 1047-03-400/Tera3	**Client** Kildare County Council	Valerie J. Keeley Ltd. ARCHAEOLOGICAL CONSULTANCY	Brehon House, Kilkenny Road, Castlecomer, Co. Kilkenny. Tel: (+353) 056 4440236 Fax: (+353) 056 4440237 Email: vjk@vjk.ie Website: www.vjk.ie
		Date Dec 11	**Scale** 1:275	**Drawing No.** Figure 6	**Project** M7 Heath Mayfield Motorway Scheme		



N

253813
203362

C56
BURIAL 3



C55
BURIAL 2

253810
203361

C54
BURIAL 1

1 m

Title	Notes	Job/Exc No.	Compiled by	CAD reference	Client
Zoom of burials C54, C55 & C56		03E0461	GW	1047-03-400/Tera3	Kildare County Council
		Date	Scale	Drawing No.	Project
		Dec 11	1:20	Figure 7	M7 Heath Mayfield Motorway Scheme

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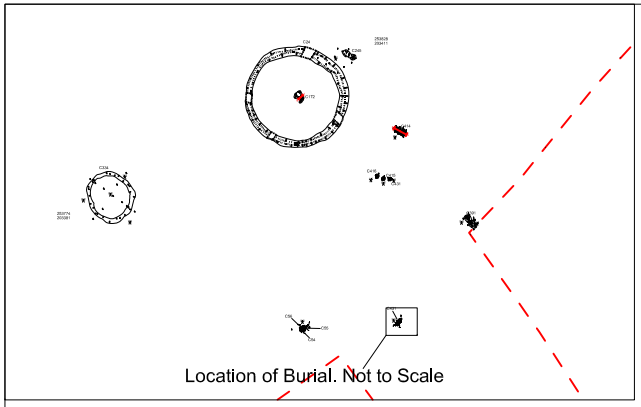

N

253829
203363

95.65
95.74
95.70
95.64
95.68
95.72
95.76
95.81

253826
203362

C431

Burial 4

1 m

Title	Notes	Job/Exc No.	Compiled by	CAD reference	Client
Zoom of single burial C431	Stone	03E0461	GW	1047-03-400/Tera3	Kildare County Council
		Date: Dec 11	Scale: 1:20	Drawing No.: Figure 8	Project: M7 Heath Mayfield Motorway Scheme

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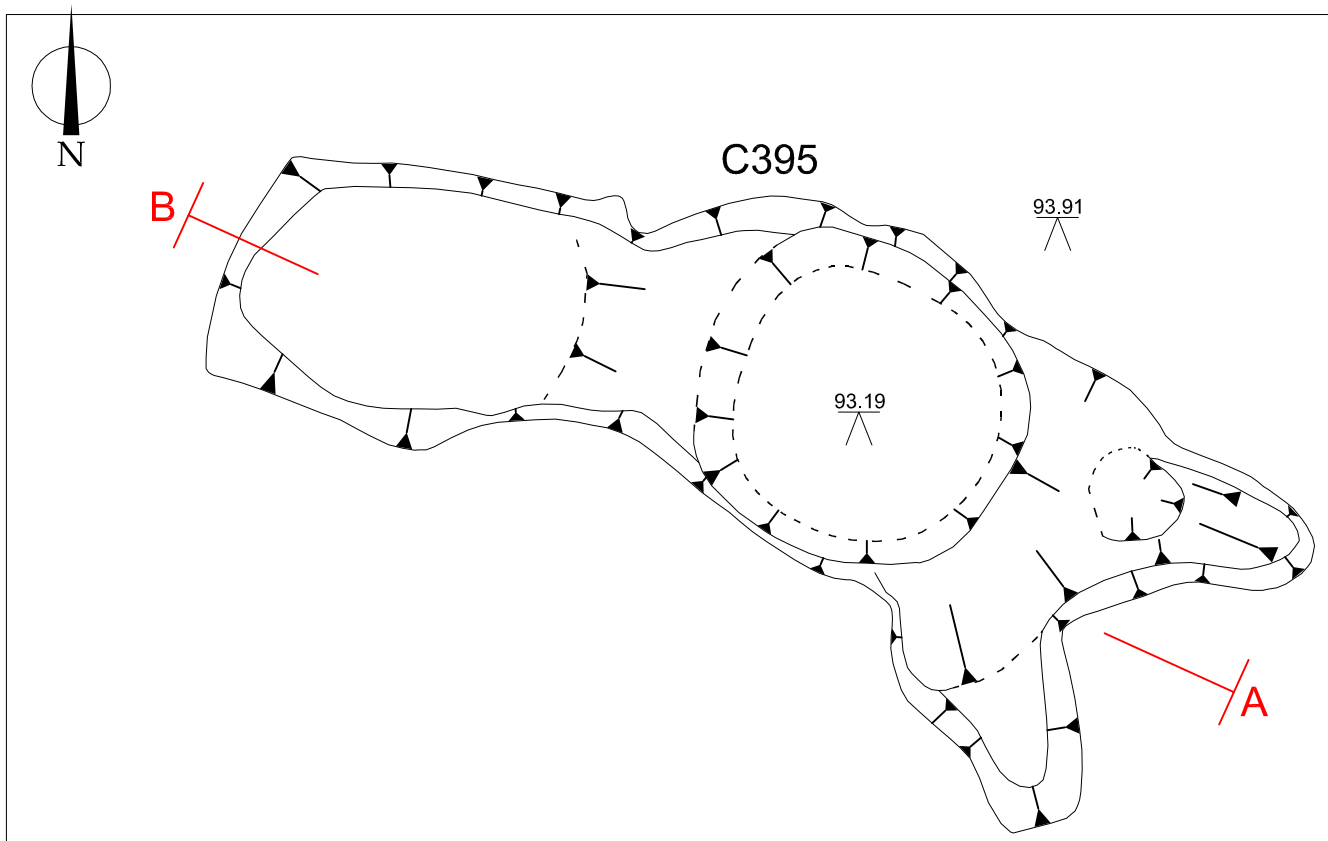
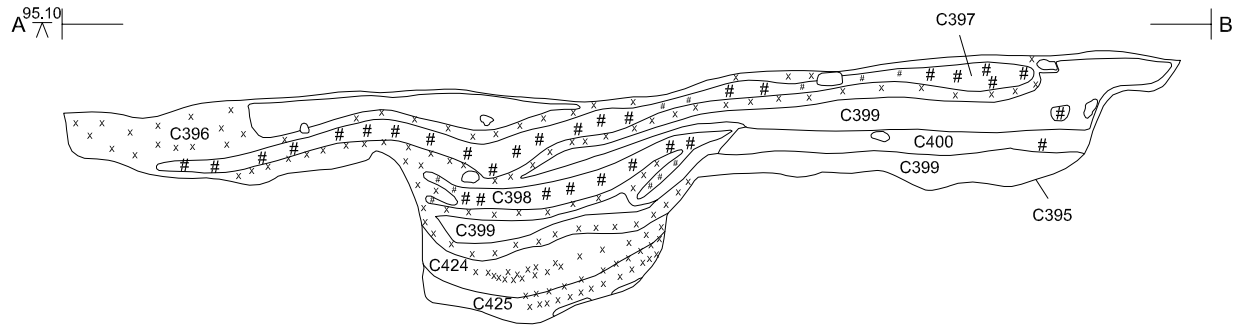
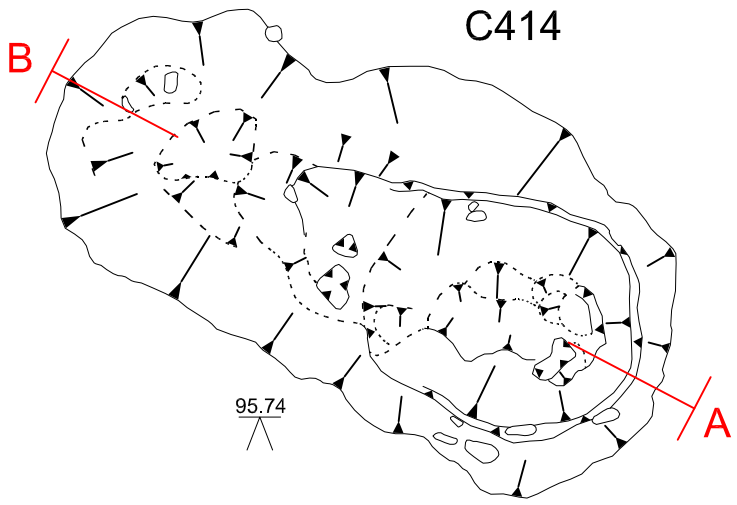
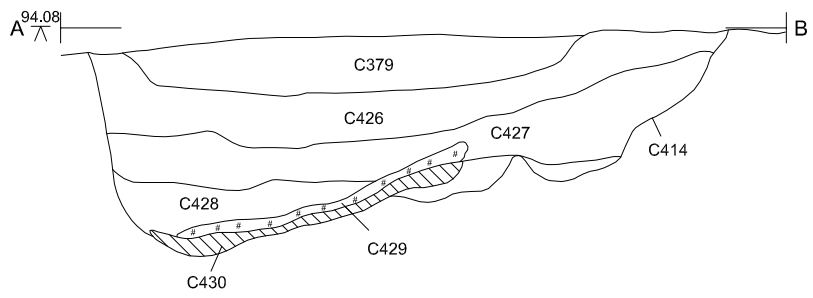


Northeast facing section through C395, Area C





Northeast facing section through C414, Area C



Scale 1:25

1 m

Scale 1:25

1 m

Title Close up Plans of sectioned features and Sections from Area C, Site D, 03E0461	**Notes**	**Job/Exc No.** 03E0461	**Compiled by** DE	**CAD reference** 1047-03-400/Tera3	**Client** Kildare County Council	Brehon House, Kilkenny Road, Castlecomer, Co. Kilkenny. Tel: (+353) 056 4440236 Fax: (+353) 056 4440237 Email: vjk@vjk.ie Website: www.vjk.ie
		Date Dec 11	**Scale** 1:25	**Drawing No.** Figure 9	**Project** M7 Heath Mayfield Motorway Scheme	Valerie J. Keeley Ltd. ARCHAEOLOGICAL CONSULTANCY