

**Archaeological Excavation of
a cist burial at
Site 137, Carn More 6,
Dundalk, Co. Louth
M1 – Dundalk Western Bypass**

**Final Report
NGR: 304884/310870
Chainage: 25040
Excavation Licence Number: A010/002 (E3976)
ÆGIS Ref: 255-1.21
Licence Holder: Avril Hayes MA MIAI**



**by
Avril Hayes MA MIAI
of
ÆGIS ARCHAEOLOGY LIMITED
32 Nicholas Street, King's Island, Limerick
Tel: 061-634375 E-mail: info@aegisarc.com**

April 2007

COPIES OF THIS REPORT HAVE BEEN PRESENTED TO:

CLIENT:	Celtic Roads Design Group C/o Ascon Ltd, Kill, Co. Kildare
STATUTORY BODIES:	Archaeological Planning and Licencing Unit National Monuments Section (formerly <i>Dúchas</i>) The National Museum of Ireland
PROJECT ARCHAEOLOGIST:	Niall Roycroft

PLEASE NOTE...

That the archaeological recommendations, mitigation proposals and suggested methodology followed in this report were first formulated and approved by the National Roads Authority Project Archaeologist Niall Roycroft, prior to the commencement of the archaeological dimension of the project. The National Monuments Acts 1930-2004 is the current legislation in relation to archaeological projects.

Every effort has been taken in the preparation and submission of this report to provide as complete an assessment as possible within the terms of the brief, and all statements and opinions are offered in good faith. However, ÆGIS cannot accept responsibility for errors of fact or opinion resulting from the data supplied by any third party, for any loss or other consequences arising from decisions made or actions taken on the basis of facts and opinions expressed in this report, (and any supplementary information), howsoever such facts and opinions expressed may have been derived, or as the result of unknown and undiscovered sites or artefacts.

ÆGIS acknowledges the information supplied by the Project Archaeologist with the National Roads Authority and the information supplied by the client.

This report is based on a template formulated by T.Collins and A. Hayes.

COPYRIGHT NOTE

Please note that the entirety of this report, including any original drawings and photographs, remain the property of the author(s) and ÆGIS ARCHAEOLOGY LIMITED. Any reproduction of the said report thus requires the written permission of ÆGIS. Ordnance Survey of Ireland (OSI) material in this report, has been reproduced under licence no. AR0095407 © Ordnance Survey of Ireland/Government of Ireland.

Contents

	page
I. Abstract	4
II. List of figures and plates	5
III. Abbreviations and terms used in the text	6
 1. Introduction	 7
1.1 Background to Excavation	
1.2 Project Personnel	
1.3 Location & Existing Environment	
1.4 Historical Background	
1.5 Excavation Methodology	
 2.Context List	 15
 3. Stratigraphic Sequence	 16
3.1 Matrix	
3.2 Context Descriptions	
 4. Interpretation of Stratigraphy	 26
 5. The Artefacts	 27
5.1 Inhumation (Linda G. Lynch MA MIAI)	
5.2 Pottery (Helen Roche & Dr Eoin Grogan)	
 6. Discussion	 29
 7. Sample and Find List	 36
7.1 Samples	
7.2 Finds	
 8. Conclusions	 37
 9. Non-Technical Summary	 38
 10.Project References	 40
 11.Signing-Off Statement	 42
 12.Archive Index Sheet	 43
 13.Appendices	 45
13.1 Osteo-archaeological material	
13.2 Pottery Report	
13.3 Radio-Carbon Report	

Linda G. Lynch
Helen Roche & Eoin Grogan
Beta Analytic

I. Abstract

This final excavation report details the licenced archaeological excavation of a cist discovered during drainage works (licence holder: Avril Hayes; licence no: A010/002) associated with the construction of the M1 Dundalk Western Bypass, Dundalk, Co. Louth. The feature was uncovered at Carn More townland under the north side of the road embankment. Full site details include:

- Project Site No: Site 137, Carn More 6
- NGR: 304884/310870
- Chainage: 25040

The north side of a cist burial was cut during drainage works associated with the M1-Dundalk Western Bypass. The cist formed part of a larger cist cemetery excavated by Irish Archaeological Consultancy (IAC) in 2003 (DWB Site 127, Carn More 5, 03E0873, Licence Holder: David Bayley). The resolution of the site included the recording and partial excavation of the grave. The contents of the grave were excavated by hand and the cist itself was infilled and preserved *in situ*. The site was located in flat ground on the floodplain of a small stream to the north, at the base of rising ground to the south, immediately west of the main Dundalk to Belfast railway line. The excavation took place in June 2005 and was undertaken by the licence holder and osteo-archaeologist Linda G. Lynch MA MIAI.

A preliminary report on the excavation was completed in September 2005 and issued to the NRA Project Archaeologist. The report was submitted to the National Monuments Section of the DoEHLG, in January 2006, subsequent to its approval by the NRA Project Archaeologist.

The excavation project was funded in full by Celtic Roads Design Group. The site was centred at NGR 304884/310870 around project chainage 25040 at 9.80m OD.

This site was a Bronze Age cist grave containing the remains of one crouched, adult male inhumation and an associated bowl food vessel, tripartite (variant) type. The dates returned for the burial were 1760-1610 cal BC.

II. List of Figures and Plates

FIGURES:

	<i>page</i>
1. General location map of site, (after Discovery Series 36, 1box = 1km ²)	8
2. Location of site in relation to Dundalk Western Bypass (supplied by NRA Project Archaeologist with additions)	9
3. Detail of RMP sheets 4 and 7, for Louth showing site location (Archaeological Survey of Ireland 1994)	10
4. 1 st edition 6-inch map showing site location, proposed road in blue (OS 1835)	11
5. Pre-excavation drawing showing north facing section of cist	18
6. Plan of cist interior with burial [c7] lying over paved floor surface [c9]	20
7. Plan of cist interior showing paved basal stone lining [c9] on floor of cist	21
8. North facing section of cist showing Ordnance Datum levels	22
9. Plan of cist showing NGR	22
10. Reconstruction of possible position of individual in cist at Carn More 6	27
11. Tripartite bowls (variant type) of similar decoration to Carn More pot (after Ó Riordáin & Waddell 1993)	28
12. Distribution of tripartite bowls and variants, Carn More 6 location in red (after O'Riordain & Waddell 1993)	33

PLATES

(Note- scale in photos 1m)

1. Location of cist in drainage trench, from west	23
2. Cist in drainage trench underlying road embankment infill [c1]	23
3. Cist in north facing baulk of drainage trench, pre-excavation, from north	23
4. Natural silting [c8] of sand over burial [c7], from north	23
5. Exposed skeleton [c7] overlying basal paving [c9], from north	24
6. Detail of pot lying beside skull	24
7. Side stones of cist [c4] with packing [c2] evident. Capstone [c3] rests on side packing	24
8. Paving [c9] at bottom of cist	24
9. Cist in section, post excavation	25
10. Bowl tripartite (variant) type recovered from the cist (find no 7:2)	25
11. Bowl food vessel, tripartite (variant) type	25
12. Grave no. 6, Keenoge, Co. Meath (Waddell 1990)	31

III. Abbreviations & Terms Used in Text

Bank Right bank and left bank of a river or stream may be determined when one looks downstream, i.e. in the direction that the river is flowing. It may also be an earthen “wall” around an enclosure, often associated with a ditch.

Barony, Parish, Townland These terms refer to land divisions in Ireland. The barony is the largest land division in a county, which is formed from a number of parishes. These parishes are in turn made up of several townlands, which are the smallest land division in the country. The origins of these divisions are believed to be in the Early Medieval/Christian period (AD500-AD1000), or may date earlier in the Iron Age (500BC-AD500).

Bronze Age C. 2,500 – 500BC (2500-2000BC sometimes referred to as “Beaker Period”)

Context Each feature found during the excavations is allocated a number, commonly termed a “Context Number” in order to record the archaeology.

Ditch A cut feature forming an enclosure and associated with a bank in some cases.

Diaphyses Shaft area of a long bone

First Edition This relates to editions of the OS 6 inch maps for each county. The first edition map completed for the area dates to the early 1840s and this is referred to in the text as the “first edition”.

G.S. Grid square

LH - This number is the number of the site on the RMP map (see below). It begins with the county code, here LH for Louth, the 6-inch sheet number, followed by the number of the archaeological site.

M Metres, all dimensions are given in metres or part of a metre, unless otherwise stated

OS Ordnance Survey

Ph Parish

RMP Record of Monuments and Places. An update of the older SMR, (sites and monuments record), on which all known archaeological sites are marked and listed in an accompanying inventory. The sites marked afford legal protection under the National Monuments Acts 1930-1994. The record is based on the 6 inch map series for the country and is recorded on a county basis.

Sheet This relates to the six inch map for each county which is divided into sheets.

Td Townland

1. Introduction

1.1 Background to Excavation

The site at Carn More 6 was noted during drainage works associated with the construction of the Dundalk Western Bypass, which was monitored under licence: 04E0335. There was no trace of the feature above ground. The site was excavated over a period of one week in June 2005. The cist is part of Carn More 5, an archaeological site complex excavated subsequent to the test trenching stage of the project (DWB Site 127, Carn More 5, 03E0873, David Bayley of IAC).

The entire length of the route was subject to an Archaeological Impact Assessment in 1993 and 2000. A programme of centre-line testing was subsequently undertaken in 2002 by Irish Archaeological Consultancy Ltd (licence Nos 02E0373 & 02E0658) and archaeological sites encountered during the testing were excavated prior to the topsoil stripping phase of the project.

1.2 Project Personnel

The site at Carn More was excavated by two staff of Aegis Archaeology Ltd. The licence holder for the project was Avril Hayes. Jack Curley was the site agent for the client. Niall Roycroft is the NRA Project Archaeologist. Linda G. Lynch was the osteo-archaeologist. Helen Roche and Eoin Grogan were the pottery specialists.

1.3 Location and Existing Environment (figures 1 & 2)

The site is located to the north of Dundalk town in the townland of Carn More (NGR 304906/310875), the parish of Dundalk and Barony of Upper Dundalk (*Townland Index* 1982).

The Dundalk Western Bypass joins the existing N1 roadway from Dundalk to Newry in this vicinity.

The cist burial was located in a flat field formerly in pasture to the west of the Belfast to Dublin railway line (AOD 9.50m).

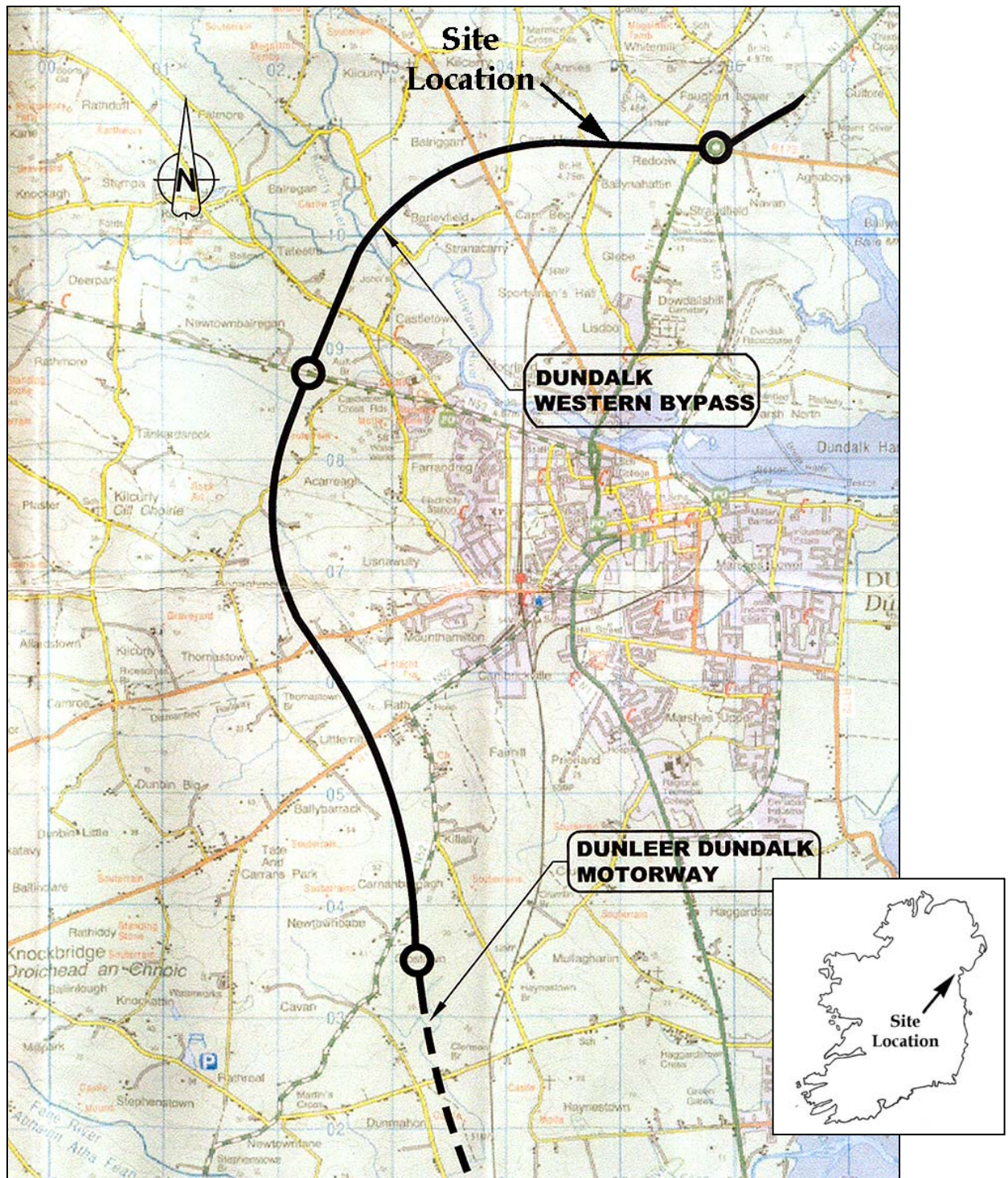


Figure 1. General location map of site, (after Discovery Series 36, 1box = 1km²)

ÆGIS ARCHAEOLOGY LIMITED
REF 255-1.21

1.4 Background (figs 3 & 4)

The entire route of the Dundalk Western Bypass was subject to a phase of centre line test trenching. Numerous archaeological sites were identified and excavated as a result of this. A Bronze Age cemetery was located in the townland of Carn More (DWB Site 127, Carn More 5, 03E0873). This was excavated in 2003 by IAC. It appears that the cist burial under discussion (A010/002) was not recognised during the original investigations (03E0873) but was within the excavation area. Site 137 (A010/002), the site in question, is believed to be part of this cemetery (Site 127).

The site location was a large field in the 1840s, as is noted in figure 4. The digging of the railway embankment to the west of the site has altered the landscape dramatically. The townland of Carn More is located in the parish of Dundalk and the Barony of Upper Dundalk. Lewis does not make a specific reference to the townland of Carn More. He noted that the parish of Dundalk comprised 6202 statute acres of fertile land in a good state of cultivation (Lewis 1837, 571).

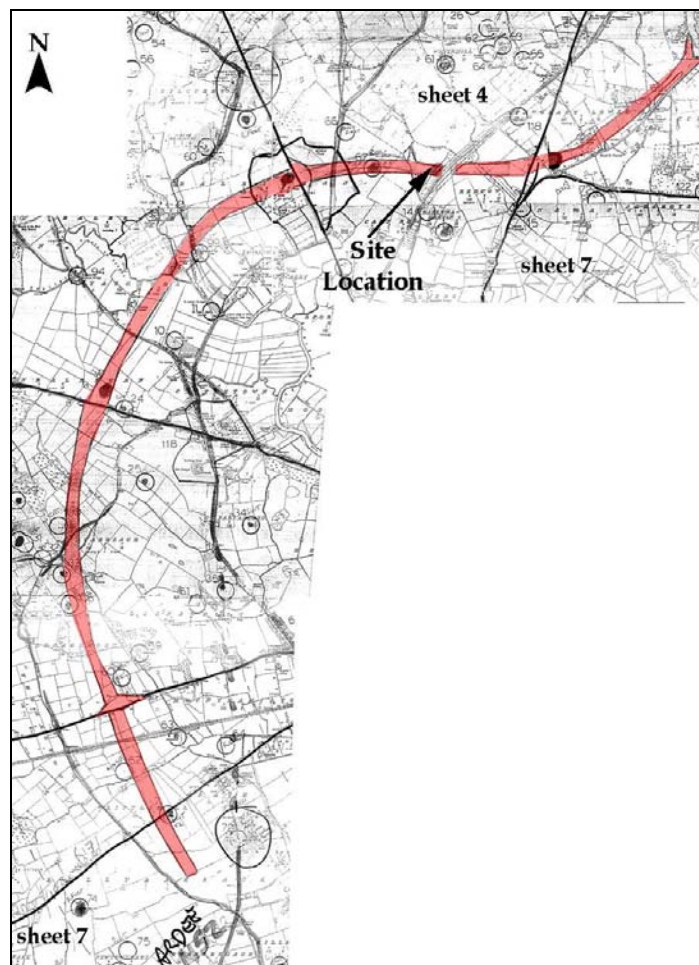


Figure 3. Detail of RMP sheets 4 and 7, for Louth showing site location (Archaeological Survey of Ireland 1994)

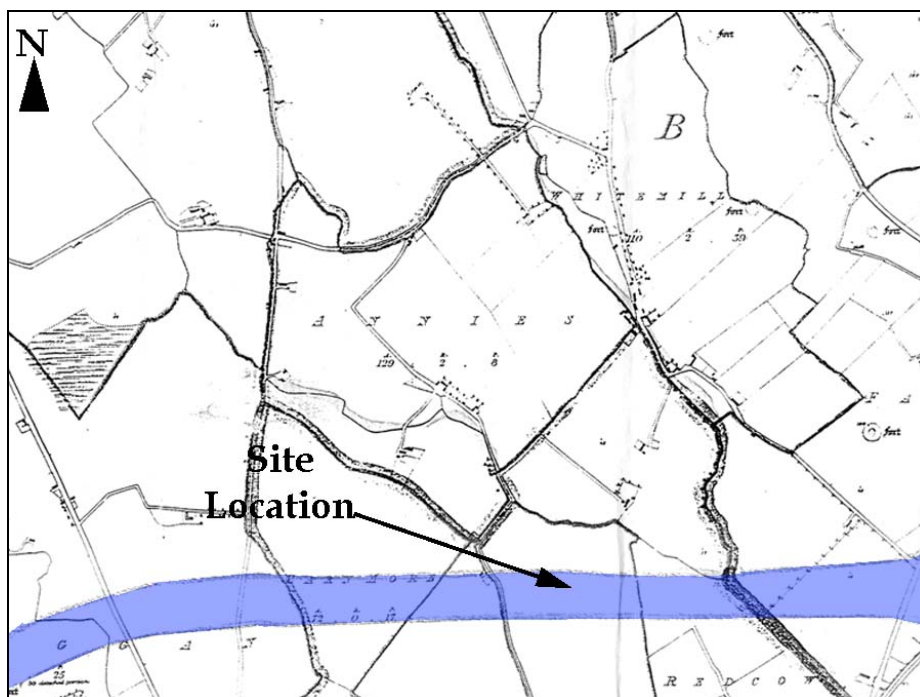


Figure 4. 1st edition 6-inch map showing site location, proposed road in blue (OS 1835)

There are no finds recorded in the National Museum Topographical files from the townland of Carn More, Co. Louth, prior to the archaeological investigations related to the Dundalk Western Bypass Project.

The prehistoric archaeological record of this area of Louth has been significantly added to with the construction of the Dundalk Western Bypass. As noted by Roycroft (2005, 66), 53% of sites excavated along the route were prehistoric in date. Prior to the roadworks, just 22.5% of known archaeological sites in the vicinity of the route were prehistoric in origin (*ibid.*). This indicates that the current known prehistory of the Dundalk area may be somewhat misleading and not representative of the actual reality. It is likely that this region is rich in prehistoric remains, albeit yet to be uncovered.

The earliest evidence of human activity in the Dundalk area, or indeed the county of Louth, is a waste flint flake was recovered from glacial gravel, which was deposited as early as 200,000BC near Drogheda, Co. Louth (Mitchell and Sieveking 1972, after Herity and Eogan 1989, 16). However, the flake appears to have been transported along with the gravel from an area close to the basin of the Irish Sea and instead is indicative of human activity in that area in the Middle Palaeolithic period (*ibid.*). The Mesolithic period ('Middle Stone Age') dates from 8000-4000BC and is the earliest period in Ireland with secure evidence of human habitation. People living in the Mesolithic period were gatherers, hunters, and fishers. It is thought they lived near the coastlines and along rivers, using flint and other suitable stones

to make sharp tools (Anderson 1993, 16). These people are found in the archaeological record by the material they left behind, usually in the form of stone tool-making waste ('debitage'), and the tools themselves, and more rarely by habitation evidence such as house structures, pits, and hearths. One of the most well-known sites of the Early Mesolithic is Mount Sandel in Co. Derry (Woodman 1985). There is a noticeable lack of Mesolithic sites in the county of Louth in general. A perusal of the *Archaeological Inventory of County Louth* (Buckley 1986) reveals a distinct shortage of sites dating to this period. Indeed the Mesolithic appears to be primarily represented in Louth by surface scatters of diagnostic flints, such as at Richardstown (LH017-0216--). No new Mesolithic sites were recorded during the archaeological phase of the construction of the M1 Dundalk Western Bypass.

The Neolithic ('New Stone Age') saw the introduction of farming into Ireland, and the period spans from 4000 to 2500BC. The change is seen in the archaeological evidence through domesticated plant and animal remains and a more sedentary lifestyle, although it is now thought that a certain amount of hunting and gathering would have continued (Waddell 1998). An important development in the Neolithic is the appearance of community burial places, megalithic tombs (of which there are 4 types), which took much time, effort, and planning to construct (Twohig 1990). Evidence of land-clearance, possibly associated with the beginnings of cereal growing have been recorded at Ravensdale Park (Mitchell 1951, in Herity and Eogan 1989, 25) and at Redbog (McAulay and Watts 1961, in Herity and Eogan 1989, 25), with the latter manifesting as elm clearance dating to 3210BC (*ibid.*). A number of megalithic monuments are known from the area. Indeed, Dundalk appears to be the eastern end of a line of delineation stretching eastwards from Westport in Co. Mayo, north of which are virtually all of one of the earliest megalithic tombs – court cairns (Herity and Eogan 1989, 27). One of the most visually impressive tombs in the region is Proleek portal tomb (LH004-074---), located approximately 3km to the east of Carnmore. A ceremonial enclosure or henge monument, dating to the Neolithic Period (3400-2900BC) was excavated at Balregan (excavated by Irish Archaeological Consultancy under licence no. 03E015; Roycroft 2006, 9). Later Neolithic and Iron Age dates were also recovered from the site (*ibid.*). Early Neolithic dates were recovered from a settlement site at Donaghmore (*ibid.*), also along the route of the M1 DWB.

The Bronze Age (2500-500BC) marks the first introduction of widespread metal-use into Ireland, firstly copper and then bronze. It is thought that society in this period became more hierarchical, with stress in the community evidenced in the archaeological record by the disproportionate amount of weapons, particularly those which appear to be ritually deposited in watery places. A number of bronze swords are recorded in this region. These

include the butt and a portion of the blade of a sword from Drogheda now housed in the British Museum in London (Eogan 1965, 73), and another sword found under 'three feet of gravel' at Derrycammagh Ford at the River Glyde and now in the National Museum of Ireland (*ibid.*, 138). Another bronze sword was recovered in 1862 in a bog between Faughart and Ravensdale, along with a twisted bronze annular ring (Eogan 1983, 106-7). The whereabouts of the sword, along with '17 pieces of Bronze Money' (probably bronze rings) is unknown (*ibid.*). Three golden dress-fasteners were also recorded as being recovered from a bog in Cos Louth/Meath pre-1773. The Lord Chancellor acquired one of the fasteners at that time, while the other two were melted down (*ibid.*).

A variety of prehistoric sites were uncovered along the 9.5km long bypass. The artefact assemblage includes two polished stone axes; 2000 sherds of Neolithic to Early Bronze Age pottery, at least 13 Bronze Age pots; c.450 struck flints, nine metal finds and seven worked or decorated stone objects (Roycroft 2005, 72-74). The sites from which the material was uncovered consisted of domestic sites, *fulachta fiadh* and cemetery sites. The cemetery complex at Carnmore 5 (excavated by Irish Archaeological Consultancy under licence no. 03E0873) to which the Carnmore 6 cist belongs, is one of these cemetery sites which has added greatly to the prehistoric archaeological record of the area.

1.5 Excavation Methodology

The excavation of the site at Carn More was run in compliance with the agreed method statement submitted to the project archaeologist and approved by the National Monuments Section of the Department of Environment, Heritage and Local Government. The cist was backfilled and left *in situ* once the interior had been recorded and excavated. The site at Carn More was excavated by hand in June 2005. The team consisted of one director and one osteo-archaeologist.

The resolution of the project is being undertaken in accordance with guidelines as set out by the heritage policy paper *Policy & Guidelines for Archaeological Excavation* (DAHGI 1999). The project also draws on English Heritage's policy document *Management of Archaeological Projects* (1991), which includes the following project pathway:

- | | |
|-----------|--------------------------------------|
| • Phase 1 | Project Plan |
| • Phase 2 | Fieldwork (on-site resolution) |
| • Phase 3 | Assessment of Potential for Analysis |
| • Phase 4 | Analysis and Report Production |

- Phase 5 Dissemination

Phase Two- the site excavation, by hand, of the site, used an amended version of the MoLAS (Museum of London Archaeological Service 1994) system of context recording. This is a method of excavation that has been used in Britain since the 1970s and has proved to be very successful, in both the efficiency of on-site recording/excavating and in the formation of the report in post-excavation.

Aegis has its own Quality Manual (2001 and revisions) which sets out all its Standard Operating Procedures (SOPS) for work of this type. These are followed as part of the company's wider Quality Management System. The Assessment of Potential for Analysis was undertaken during the post-excavation stage of the project. The main areas for analysis consisted of material sampled for identification and dating, details of which can be found in the appendices of this report (section 13).

A preliminary archaeological report detailing the initial findings was submitted to the Department of the Environment Heritage and Local Government in January 2006. This report represents phase 4 of the project pathway. Specialist analysis has been undertaken and appear as appendices to this report (section 13). A discussion based on these findings is included in this report (sections 5 and 6). Subsequent to specialist analysis, licences to alter and export material for dating were sought and received from the National Museum of Ireland in 2006.

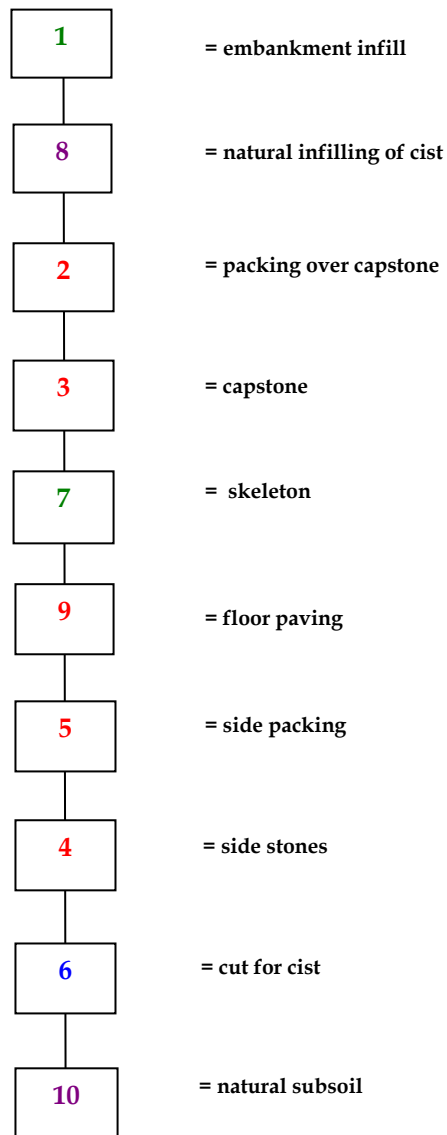
2. Context List

Context Number	Description
1	Embankment Infill
2	Packing over capstone
3	Capstone
4	Side Stones
5	Side Packing
6	Grave cut
7	Skeleton
8	Fill: Natural silting of Cist
9	Basal paving
10	Natural subsoil (parent material)

3. Stratigraphic Sequence

3.1 Matrix

The first stage of report compilation is the formation of the site matrix. This structure collates all the contexts excavated and recorded, and preserves their stratigraphic relationships in flow chart fashion. The entire interpretation of the site rests on this visual manifestation of the archaeology as excavated. The contexts of the matrix are then grouped and segmented to create features and phases, all of which are described in detail below (section 3.2 Context Descriptions and section 4 Interpretation of Stratigraphy).



Key to Matrix

Red:	Fill
Blue:	Cut
Purple:	Layer
Green	Deposit

3.2 Context Descriptions (figure 5)

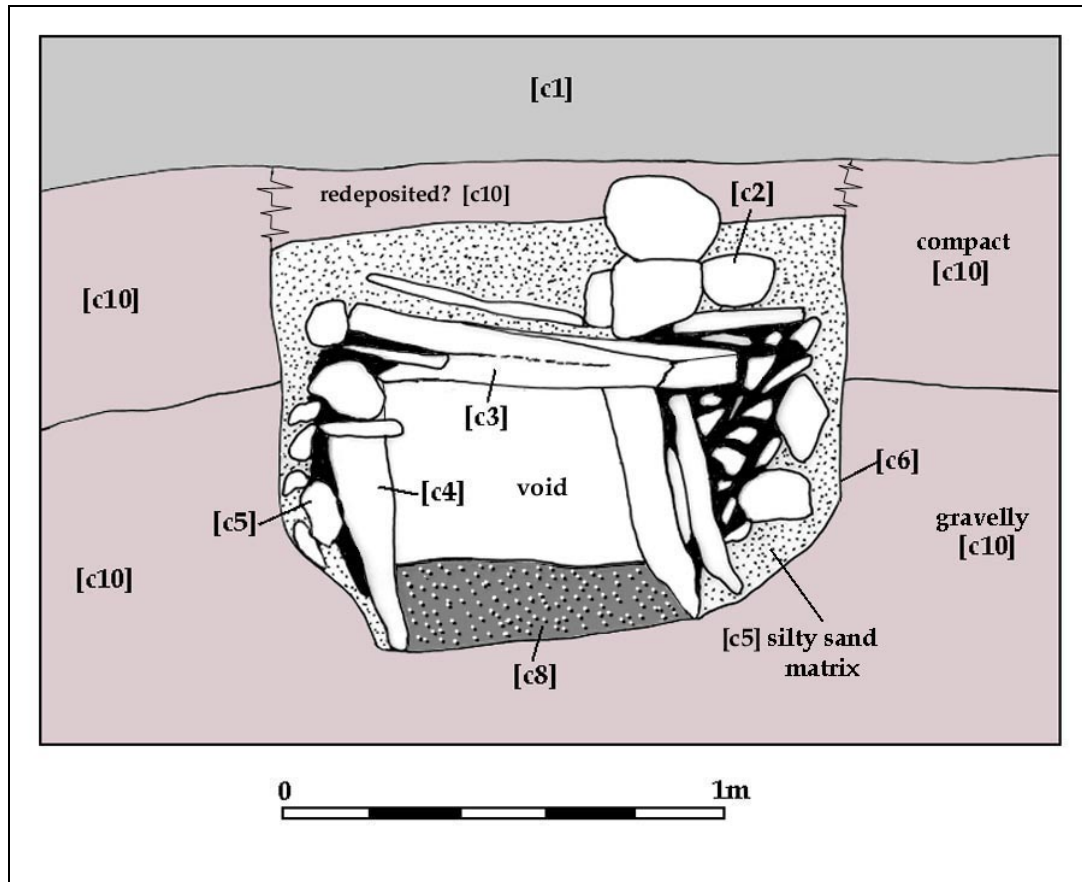


Figure 5. Pre-excavation drawing showing north facing section of cist ([c7] & [c9] obscured by [c8])

Context 1 (figure 5, plate 1)

Context type: Layer

Description: Embankment infill

This context consisted of an imported gravel infill for the road foundation. It overlay the cist and was between 2 and 3m in depth. It was a firm, light greyish brown gravel and clay infill with occasional large, rounded stone inclusions.

Context 2 (figure 5; plates 2 & 3)

Context type: Fill

Description: Backfill packing

This packing measured 1.25m wide and was 0.25m deep at west and 0.20m deep at east. The context consisted of angular and rounded stones- (average size 0.15m by 0.10m) in a silty sand matrix. The packing appeared to continue over the rear and south side of the cist. Pacing stones were visible in the void between the top of the southern side stone and the capstone. The full extent of the packing was not realised due to preservation *in situ*.

Context 3 (figure 5; plates 2, 3 & 7)

Context type: Fill

Description: Capstone

This capstone was a single stone measuring 1m in length (north-south) by 0.95m wide (east-west) and was 0.10m thick. The stone was cracked in places but remained *in situ*. The extreme north end of the capstone was broken off during drainage works. This broken piece was located in the bottom of the trench during the excavation and measured 0.20m in length. This gave the total length of the capstone as 1.20m. The east and west sides of the capstone lay directly over side stones [c4] but it formed a void over the rear (southern) side stone where it overlay small stones associated with the side packing [c5].

Context 4 (figure 5; plates 2-4)

Context type: Fill

Description: Side Stones

This context consisted of the side stones which formed the edge of the stone grave. There were three side stones set on edge around the burial at south, east and west. The northern side stone was accidentally excavated during drainage works and was not located during the subsequent archaeological investigation. The east stone measured 1.15m in length by 0.68m wide and was 0.15m thick. The west side stone measured 0.85m in length by 0.60m wide and was 0.10m thick. Both east and west flanking side stones were inclined eastward at the top. The south stone measured 0.60m in length, 0.50m wide and 0.10m thick. A second flanking stone, outside the west side stone, was visible in section only. Decoration was not noted on any of the stones.

Context 5

Context type: Fill (figure 5; plates 2, 3 & 7)

Description: Side Packing

This context measured 0.15m wide at the east and was 0.30m at the west. The packing was 0.60m deep and was located between the side of the grave cut [c6] and the side stones [c4]. The side packing consisted of angular and sub-angular medium sized stones set in a silty sand matrix. The full extent of this context was not excavated.

Context 6

Context type: Cut (figure 5; plates 2, 3 & 9)

Description: Gravecut

This grave cut measured 1.34 wide and was 0.90m deep. The length of the grave-cut could not be measured as it was not fully excavated. The cut was probably rectangular or sub-rectangular in plan. The cut had a sharp break of slope at top, straight sides and a 'U' shaped

base. It was orientated north south and was filled by the cist elements [c9], [c7], [c4], [c5], [c3] and [c2]. The upper extent of the cut was obscured in section due to the heavy compaction of natural subsoil. The natural subsoil overlying packing [c2] was probably re-deposited natural.

Context 7 (figure 6; plates 5 & 6)

Context type: Burial Deposit

Description: Skeleton

This context consisted of the crouched inhumation of an adult male skeleton (find no: 7:1). The surviving remains consisted of the fragments of the diaphyses of the left femur and humerus and fragments of the cranial vault and mandible (for detail see section 5.1). The skeleton was lying on its right side, facing a pot (find no: 7:2).

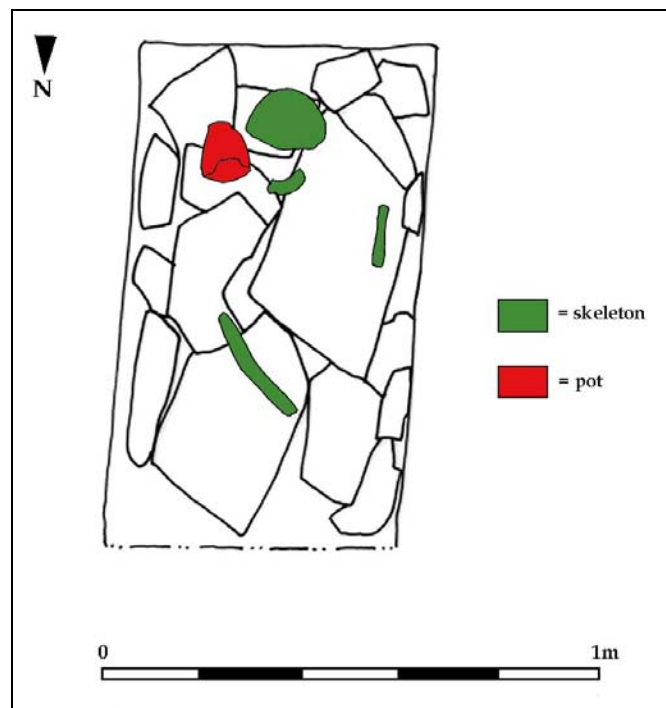


Figure 6. Plan of cist interior with burial [c7] and pot (7:2) lying over paved floor surface [c9]

Context 8 (figure 5; plate 4)

Context type: Fill

Description: Natural sandy infill

This was a loose, light yellow brown sand which had filled in naturally over time, through the voids in the stone lining. This infill layer covered the burial [c7]. It measured 1m long (north-south) and 0.60m wide (east-west) and was 0.20m deep. A soil sample was taken from this context (sample no: 1).

Context 9 (figure 7; plate 8)

Context type: Fill

Description: Basal Paving

The basal stone paving consisted of eighteen flat stones forming the base of the cist. [c9] underlay the skeleton [c7] and pot. The context consisted of a layer of large, flat, angular stones with smaller flat stones angled against the sides of the stone lining. The context measured 1m north to south by 0.60m east to west. It was 0.05m deep. The average size of the basal stones was 0.30m by 0.20m with the biggest stone measuring 0.50m by 0.30m. The angled stones at the side of the context were smaller with an average size of 0.20m by 0.15m. This basal surface sits on natural sand.

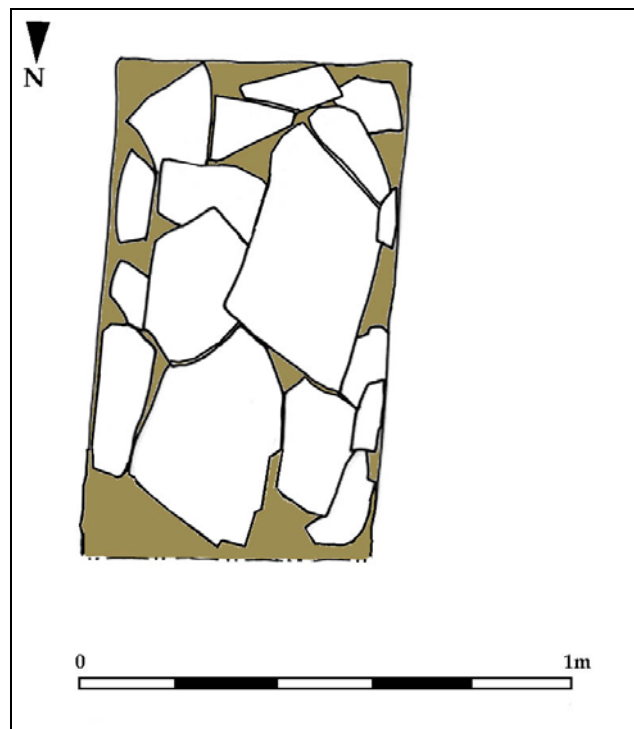


Figure 7. Plan of cist floor showing paved basal stone lining [c9] on floor of cist

Context 10 (figures 5 & 8; plate 9)

Context type: Layer

Description: Natural subsoil

The cist grave [c6] was cut into this context. Although the upper portions of the cut were obscured it is likely that re-deposited natural formed the upper layer of the [c10]. The upper 0.50m of the natural subsoil consisted of a compact light yellowish brown silty clay. The lower portions of the natural subsoil contained moderate to frequent pebble sized stone inclusions.

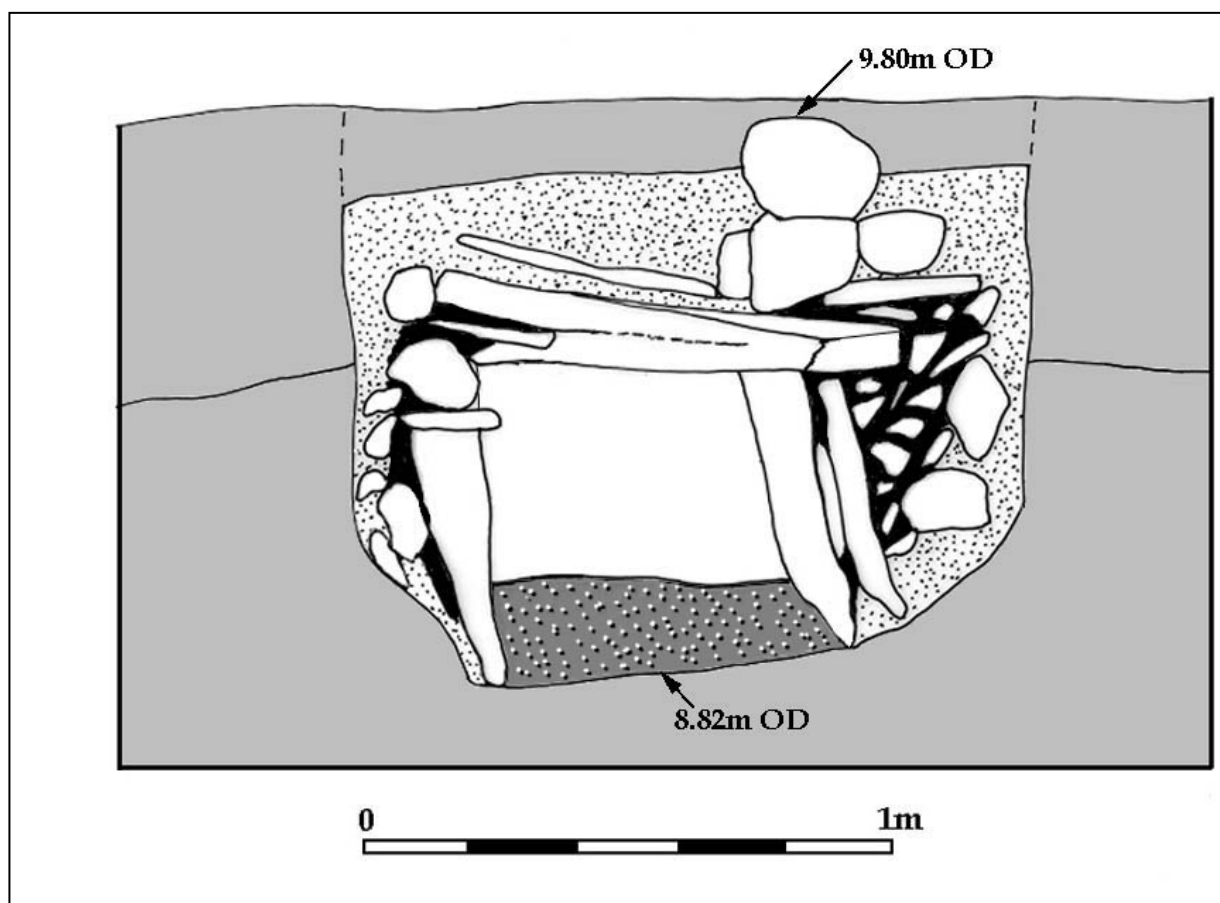


Figure 8. North facing section of cist showing Ordnance Datum figures

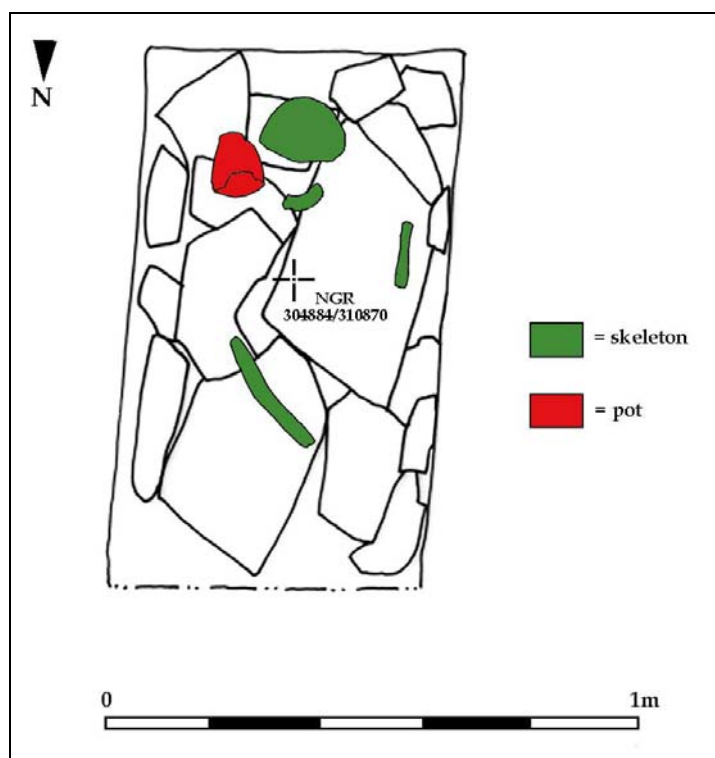


Figure 9. Plan of cist showing NGR



Plate 1. Location of cist in drainage trench, from west



Plate 2. Cist in drainage trench underlying road embankment infill [c1]



Plate 3. Cist in north facing baulk of drainage trench, pre-excavation, from north

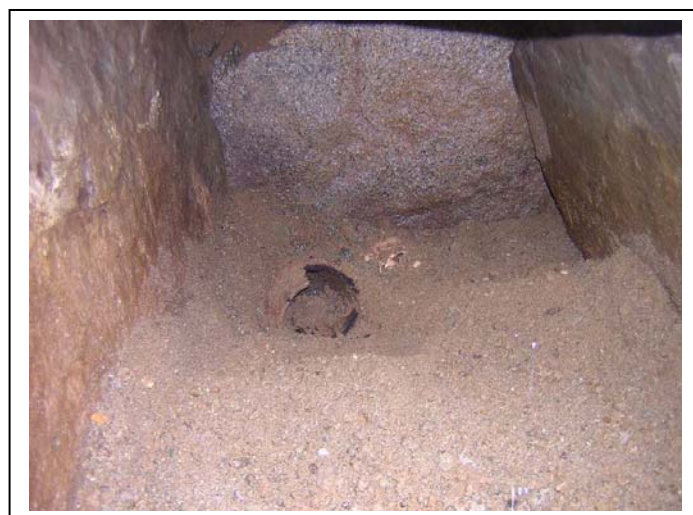


Plate 4. Natural silting [c8] of sand over burial [c7], from north



Plate 5. Exposed skeleton [c7] overlying basal paving [c9], from north



Plate 6. Detail of pot lying beside skull



Plate 7. Side stones of cist [c4] with packing [c2] evident. Capstone [c3] rests on side packing

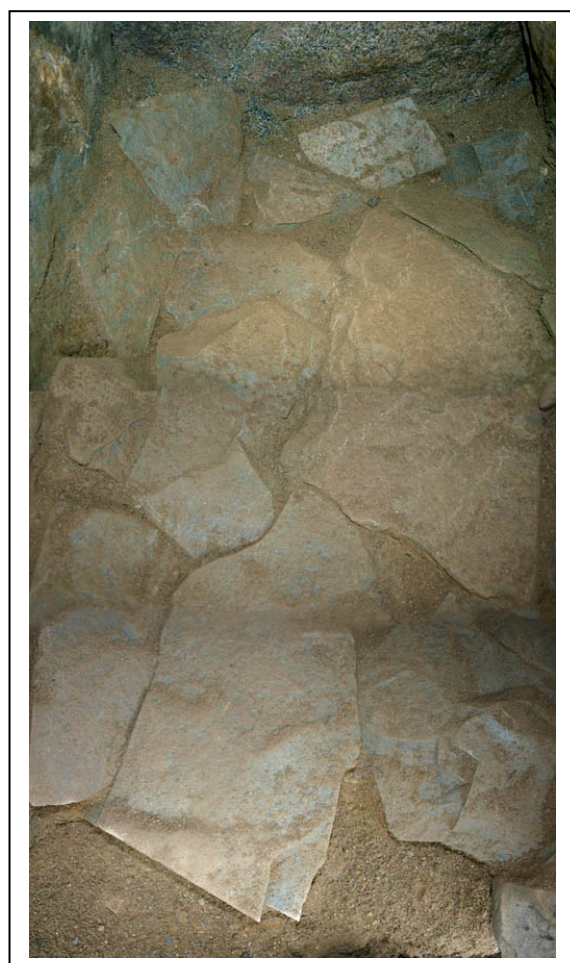


Plate 8. Montage showing paving [c9] at bottom of cist



Plate 9. Cist in section, post excavation

Plate 10. Bowl tripartite (variant) type
recovered from the cist burial



Plate 11. Bowl food vessel, tripartite (variant) type

4. Interpretation of Stratigraphy

The cist at Carn More was a short rectangular cist containing the remains of a crouched skeleton and a bowl. Short cists are the commonest type of cist grave (Waddell 1990, 16). They are usually rectangular in plan and are constructed of four stone slabs set on edge and roofed with a capstone. Several small slabs may sometimes form a floor, as was the case at Carn More.

The cut [c6] for the cist grave at Carn More was dug into the natural [c10] and was overlain by up to 3m of road embankment infill [c1]. The cut was only visible in section when a drain was dug. The cist was excavated and the structure preserved *in situ*. Once the cut was made for the grave the side stones [c4] were set on edge lining the sides of the cut. Packing stones [c5] were filled along the sides of the cut to keep the side stones in place. The base of the cut was lined with a number of flat paving slabs [c9]. The burial [c7] and pot was then placed onto the paved base. A single capstone [c3] was then placed over the burial on top of the side stones. The entire grave was then covered with a layer of small rounded stones [c2]. A layer of silty sand [c8] infilled the grave naturally over time and this material probably filtered in through gaps in the stone-lined grave.

The burial within the cist was lying on its right side with its head at south (find no. 7:1). The knees of this individual were drawn up against the abdominal area in a crouched position. A pot (find no 7:2) was placed at the southeast side of the grave adjacent to the skull, which faced the pot.

5. The Artefacts

5.1 Inhumation (Appendix 13.1; figure 10; plate 10)

The skeletal remains were very poorly preserved (find no. 7:1), with surviving remains consisting of a fragmented cranium and the very fragmentary remains of the left humerus and left tibia. Apart from the portion of the cranium that survived above the sand, the surviving bones were highly eroded and soft. The skeleton was lying in a crouched position, orientated north to south, head at south, with the legs drawn up to the right side of the skeleton.

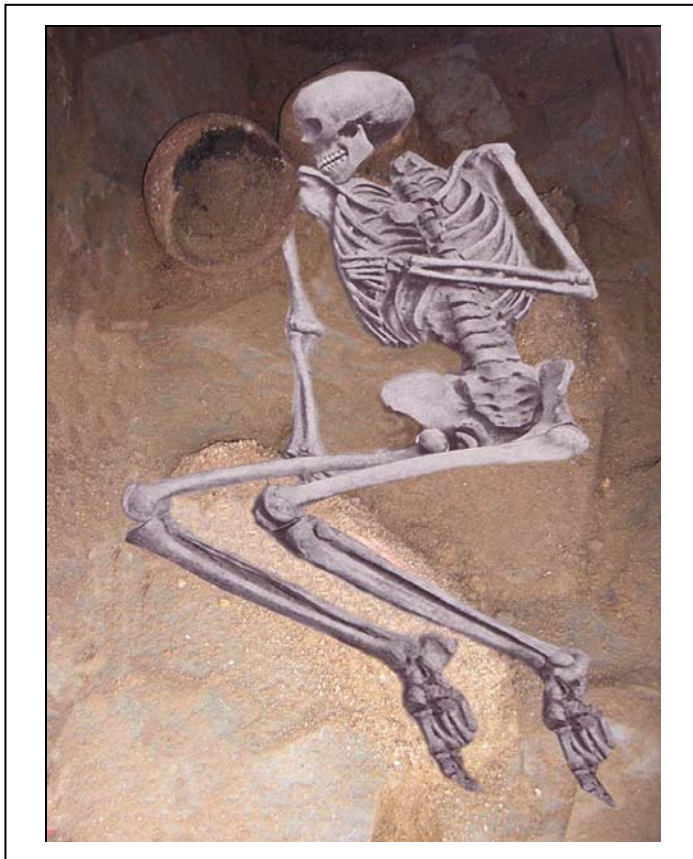


Figure 10. Reconstruction of possible position of individual in cist at Carn More 6

The head was lying on its right side with the face of the individual turned towards the pottery vessel. It is likely, from the position of the left humerus, that the torso of the individual was lying flat on its back (fig. 10). Analysis revealed that the remains consisted of an adult male (17 to 25 years). Radiocarbon dating of the inhumation returned a date of 1760 – 1610 cal. BC.

5.2 Pottery (Roche & Grogan 2005; Appendix 13.2; plates 10 & 11; fig. 11)

An almost complete bowl food vessel was found within the cist, which was lying on its side about 10cm away from the skull of the crouched inhumation. The bowl is of tripartite (variant) type. The poorly fired vessel was coil-built with an internally bevelled rim and two horizontal mouldings on the body, dividing the exterior into three distinct zones. The base is gently stepped. The vessel measures 13.6cm in height, 14.1cm in rim diameter and 7.2cm in base diameter. The correlated overall decorative arrangement present on the vessel is typical of this form of bowl, however, because of the poor quality of the fabric, the decorative motifs are faint. The Carn More example is particularly similar to tripartite bowls (variant), from Carryglass and Woodend, Co. Tyrone (Ó Ríordáin and Waddell 1993, fig. 11), not only in the form of the vessels but also in the use of whipped cord impressions as a decorative technique.

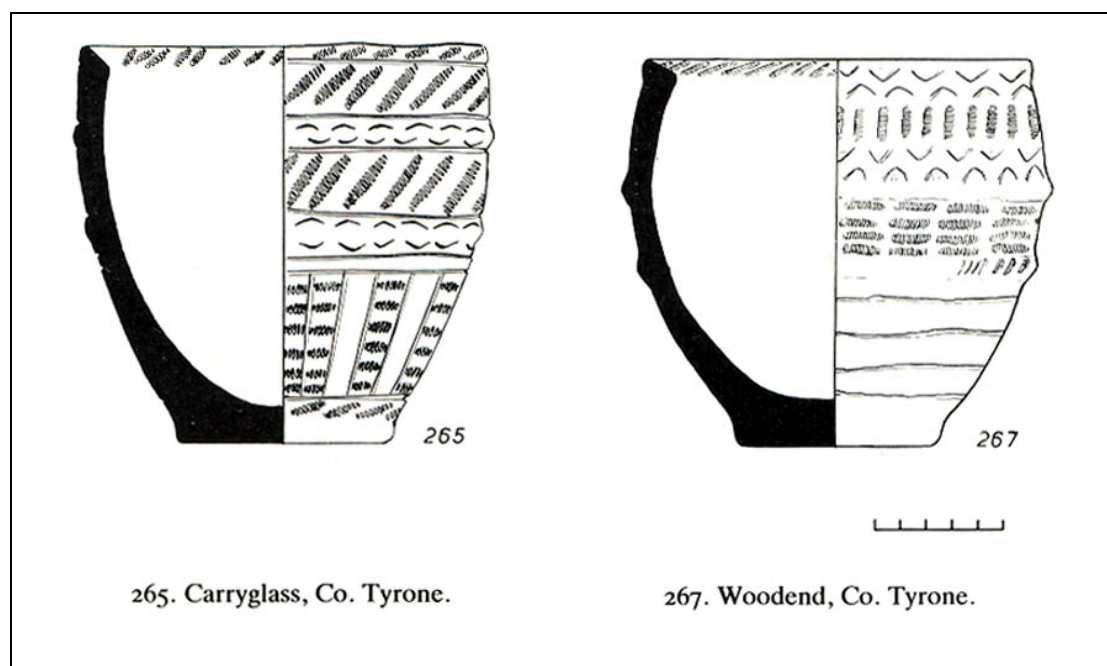


Figure 11. Tripartite bowls (variant type) of similar decoration to Carn More pot (after Ó Ríordáin & Waddell 1993)

6. Discussion

The site at Carn More is the remains of a cist burial and associated tripartite bowl food vessel (appendix 11.2.). The cist was part of a larger cemetery excavated by IAC (DWB Site 127, Carn More 5, 03E0873, Licence Holder: David Bayley, see fig. 2 this report).

The cemetery was located on a low gravel ridge and covered an area measuring 60m by 60m (Bayley 2006, 340). Three areas of activity were identified on the site. The primary area consisted of a barrow mound with an external bank. A stone-lined burial chamber was located in the centre of the mound. Finds recovered from this area included scattered cremated bone; encrusted run fragments; a copper alloy pin and other ornaments or fastenings. Three pieces of struck flint were also recovered (*ibid.*). The second area uncovered was a cist-cairn monument centred on a burial pit and two low kerb walls (*ibid.*). A stake-built structure and a pit were located close to the central pit as well as a possible quarry pit. Two concentric circles of burials were focused on this main burial. The inner 'circle' consisted of at least ten stone-line cists and one boulder burial. The Carn More 6 cist excavated by Aegis Archaeology is believed to be part of this 'circle'. The outer circle consisted mainly of unlined pits containing pottery, which were placed in three distinct areas. A second boulder burial was located on the eastern arc of this outer ring. Finds from this second area included nine complete pottery vessels, one almost complete encrusted urn; inscribed stones including a seal shaped granite stone; copper alloy artefacts and twelve pieces of worked flint. The third area of activity consisted of two small ring barrows with central pits (*ibid.*). The barrows were located c. 20m southeast of the cist cairn monument.

Most current knowledge of the Early Bronze Age in Ireland derives from two main groups of archaeological material: the numerous artefacts of copper, bronze and gold, and the numerous burials, many contained in or accompanied by pottery vessels. 'The burial rite of the Early Bronze Age was largely a single grave one, either in a stone cist or in a pit, perhaps

without any surface marking or sometimes beneath a mound of earth or a cairn of stones' (O'Kelly 1989, 189). Occasionally burials are found in groups or cemeteries as was the case at Carn More. This burial was part of a number located in the immediate vicinity. The variety of funerary ritual recorded within the burials of the Bronze Age shows the diversity of belief and practice within the period – unburnt burial, cremated burial, cist grave, pit grave, tumulus, flat grave cemetery and solitary burial are all represented. Grave goods may or may not be present and pottery is the most common artefact placed in the graves. The major pottery types comprise bowl and vase food vessels, enlarged food vessels or vase urns, encrusted urns, cordoned urns and collared urns. There are over 1,300 certain or possible earlier Bronze Age burials recorded from Ireland and even this must be regarded as a minimum number (Waddell 1990).

Cists are the name given to small stone built “coffins” or “boxes”, which can be dug into the ground surface so forming a flat burial, or can be covered by mounds. Cists were usually short, rectangular slab-built boxes, at most large enough to contain an adult corpse in a crouched position: usually with a capstone, they sometimes also have paved floors (Waddell 1998, 143). The cists are roofed with stone lintels or a single capstone and burial within the cists can be unburnt or cremated. The Carn More 6 cist contained fragments of an unburnt individual. However, the remaining cists at Carn More 5 had cremated remains. The cist at Carn More 6 did not appear to have any above ground marking. It may be that the marker did not survive or that it may never have existed.

Of those burials with associated bowls all the unburnt burials ‘appear to have been “crouched” in either a pit or a cist and... it would seem that the bowl had, more often than not, been placed beside the skull, frequently in front of the face’ (Waddell 1990, 6). This was the case at the cist in Carn More 6. Similar morphological examples include the cist grave 6 at Keenoge, Co. Meath (see plate 12). Although the cist at Keenoge contained the remains of a woman, similar elements with the Carn More 6 cist include a paved base on top of which the crouched burial lay facing the pot. Furthermore the cist at Keenoge was one of a number of pits and cists containing a mixture of burnt and unburnt burials (Mount 1995 & 1997a).



Plate 12. Grave no. 6, Keenoge, Co. Meath (Waddell 1990)

On the basis of the ceramic types contained in the many graves, four distinct ceramic traditions have been recognised – The Bowl Tradition, The Vase Tradition, The Collared Urn Tradition and the Cordoned Urn Tradition. The Carn More 6 burial may be included in The Bowl Tradition, based on the accompanying pot (see appendix 13.2). However, the remainder of the cemetery (Carn More 5) contained bowls and vases as well as an encrusted urn (Bayley 2006; Roche & Grogan 2005).

The Bowl Tradition (by Frank Coyne BA MIAI)

The pottery of this tradition consists of several forms of highly decorated, hand made bowls, usually between 8-15cms in height. The exterior is almost always covered with impressed or incised designs, while the bases and rims are also sometimes decorated. The principal forms of bowl are: simple and bipartite bowls, necked bipartite bowls, tripartite bowls and ribbed bowls. The bowl at Carn More 6 was a bowl of tripartite (variant) type (Roche & Grogan 2005: Appendix 11.2) Bowls have mainly been recovered from the northeast of the country in funerary contexts, the greatest number being recovered from cist and pit burials. This, along with the vase tradition, is one of the most frequently found types of pottery from burials. In a few important instances burials containing pottery from the Bowl Tradition have been disturbed by those of the Vase Tradition, and while it is considered that the two traditions

were contemporary, it seems that the Bowl Tradition was later superseded by the Vase Tradition (Waddell 1990, 35). The burial rite associated with the bowl tradition is mixed and comprises both unburnt crouched inhumations and cremations of both males and females, adults and children.

The almost complete pot recovered from the cist at Carn More 6 has been identified as a Bowl of tripartite (variant) type. Tripartite bowls have been defined as having two horizontal mouldings, emphasised by ornament above and below, and these mouldings may be decorated by slanting stamped impressions, or lines of chevron pattern. The chief characteristic of the group, apart from the tripartite form, is the rhythmic overall pattern, for which the same implement is often used in varying combinations (Young 1951 in ÓRiordáin and Waddell 1993, 10). As noted in appendix 13.2 the Carn More 6 example is particularly similar to tripartite bowls (variant), from Carryglass and Woodend, Co. Tyrone, not only in the form of the vessels but also in the use of whipped cord impressions as a decorative technique (Roche & Grogan 2005).

Even with a tripartite form, there is still considerable variation in general shape, and the range is best illustrated by internal profile. Heights vary too, but the great majority of bowls vary from 10cm to about 15cm high. The Carn More 6 bowl is 13.6cm high. The principal decorative motifs employed are only four in number: parallel horizontal lines, false relief chevrons, vertical lines and oblique lines, often forming a herring-bone motif (ÓRiordáin and Waddell 1993, 12-13).

The Irish distribution of tripartite bowls is mainly northern and eastern. Ten tripartite bowls from the northern part of the country have been found with probable crouched unburnt burials, but over twice this number of burials have been accompanied by such bowls in the east midlands, where, it seems, this rite was particularly popular (*ibid.* 14). A cist with an inhumation and tripartite bowl was recovered from Corkey, Co. Antrim (Waddell 1998, 143). It seems to have been popular to place the bowl mouth upwards in the cist (Waddell 1990, 6). Although the bowl at Carn More 6 was found on its side it is likely that its original placing would have been mouth upwards.

Sherds of pottery from the Bowl Tradition have also been found on a few habitation and ritual sites, but the majority are known from funerary contexts. A small number have also been found as later secondary deposits in megalithic tombs. About 43% of bowls have been found with unburnt burials and about 57% with cremations. The unburnt corpse was almost always placed on its side in the grave in a crouched position with the bowl usually in front of

or behind the skull. The Carn More 6 inhumation is thought to have been placed on its back (see sections 5.1 & 13.1). Unburnt burial was popular in the midlands and the southeast; it was occasionally practiced in the north, but here cremation was commoner (Waddell 1998, 142-3).

Distribution

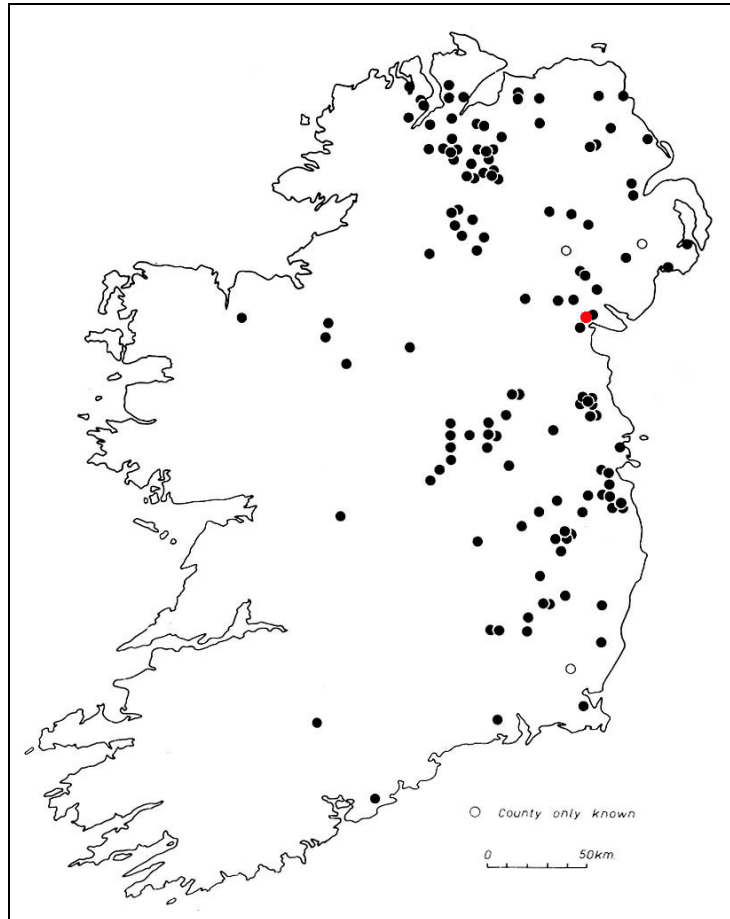


Figure 12. Distribution of tripartite bowls and variants, Carn More 6 location in red (after O’Riordain & Waddell 1993)

The distribution of the burial types described at the beginning of this section is predominantly eastern, though there are examples in Connacht with distinct groups in Sligo/south Mayo and Galway. Another major group occurs in the south Limerick/north Cork region. However, the major groupings are in the east – north Antrim, parts of Down, Derry and Tyrone, mid Fermanagh, south Westmeath, south Dublin, west Wicklow, north Carlow and elsewhere in that region. Tripartite bowls and variants appear to be found mainly in the north and east of the country (figure 12, Waddell 1998, 142). The Carn More 6 cist would further emphasise this distribution pattern.

Twenty-seven cist and pit burials have been identified in County Louth with a further eight possible cist and pit burials noted (Buckley 1986). As noted by Roche and Grogan (2005) the closest parallels for the pottery at Carn More 6 are at Aghnaskeagh, Co. Louth and Keenoge, Co. Meath.

Dating (appendix 13.3)

The cemetery at Carn More 5 has varying dates of between 2400-600 BC with the main phase of activity dating to 1900-1190BC (Roycroft 2006). As stated above a radio-carbon date of 1760-1610BC (3360 \pm 40 BP) was returned for the skeleton from the Carn More 6 cist (see section 13.3.4). Ó'Riordáin & Waddell (1993, 39) have published an average date range of 3800–3600 BP from radio-carbon dates of unburnt bone at sites with associated bowls and vases (including tripartite bowls). Roche and Grogan (2005) note that the majority of dates for burials associated with bowls cluster between c. 2460 cal. BC and 1980 cal. BC so it appears that the Carn More 6 cist is somewhat later than the average date range for cist burials but still within the Early Bronze Age period. Brindley (2007, 74) notes that the preliminary calibrated date range for bowls is c.2220-c.1800 BC (based on 51 dates including Keenoge, Co. Meath and Rathbennett Co. Westmeath).

Synthesis and Conclusions

This cist burial at Carn More 6 appears to be part of a larger cemetery excavated by David Bayley of IAC (DWB Site 127, Carn More 5, 03E0873). The cemetery consisted of three distinct burial areas: a barrow with a central stone-lined burial; a cist-cairn type monument, which included a number of boulder burials, and two small ring barrows with central pits-possibly cremations (Bayley 2006). The cist excavated by Aegis Archaeology probably belongs to the complex of eight cists, which were found in a ring around the central burial of the cist-cairn monument. None of those eight cists had obvious above ground markings (D. Bayley pers. comm.) as was also the case with the cist investigated by Aegis Archaeology. It is likely that the satellite cists at Carn More were never intended to be visible above ground given that the central burial had an intact cairn superimposed. Natural taphonomic processes, which may have destroyed any above ground indications over the nine cists, may also have obliterated the cairn around the central burial. However, the society using the cemetery may have amended earlier graves during later phases of burial. Roycroft (2005) has suggested that the boulder burials and ring barrows represent later phases of burial within the complex.

It has been noted that the Early Bronze Age was socially differentiated, where high-ranking individuals were marked out from the rest by more elaborate funerary treatment (Waddell 1998). The burial record appears to show that single interments were predominantly

associated with adult males, while multiple burials were associated with women and children. The Carn More 6 cist contained an adult male (Lynch 2006: Appendix 13.1.), which appears to reflect the trend regarding single interments.

The Early Bronze Age was for a long time seen as a single grave culture. The individuals were prepared for burial in a variety of ways (Mount 1995, 97). Of the nine cists found at Carn More, five contained cremations (Roycroft 2005, 70) and four contained inhumations, reflecting the diversity of burial ritual of the period. Other excavated Bronze Age cemeteries exhibit single burial cists containing inhumations and cremations. Nineteen burials at Edmondstown Co. Dublin consisted of a number of cists each containing inhumated and cremated remains. This was also the case at Keenoge, Co. Meath where a cist featuring an inhumation was found in association with pit graves containing cremated and inhumated remains (Waddell 1998). Although the bowl at Carn More 6 has close associations with cist cemeteries in Co. Tyrone, the Woodend bowl was found in association with cremated bones while the cist cemetery at Carryglass consisted primarily of inhumations.

7. Sample & Find List

7.1 Samples (see section 13)

Samples were only taken and numbered of those contexts that yielded sample material in the excavation.

Sample number	From Context	Material	Purpose of sample	Result
1	[c8]	Soil Sample	Archaeobotanical	No ecofacts / archaeobotanical remains recovered from wet sieving

7.2 Finds (see section 13)

The finds numbers below are prefixed by the site excavation licence number: A010/002, followed by the context number and then by the find number of that context.

Pottery (plates 10 & 11), analysed by Helen Roche & Dr Eoin Grogan (appendix 13.2)

Find No.	Description	Analysis
7:2	Decorated Pot associated with burial [c.7]; 15cm in diameter x 16cm high; almost complete with two broken sherds	1 Bowl: Tripartite (variant) Type, Early Bronze Age

Human Bone, analysed by Linda G. Lynch (appendices 13.1 & 13.3)

Find No.	Description	Analysis
7:1	Skeleton fragments (cranial vault, humerus; femur; mandible)	Adult male (17-25 years) Date: 1760-1610 cal. BC

8. Conclusions

The excavation of the cist burial discovered during the drainage works associated with the construction of the Dundalk Western Bypass at Carn More, Dundalk, Co. Louth was undertaken in June 2005. There were no above ground indications of the site prior to or after topsoil stripping. The cist was located in the area of archaeological site Carn More 5 and appears to belong to a cemetery previously excavated by IAC (DWB Site 127, Carn More 5, 03E0873, Licence Holder: David Bayley).

This site appears to have been an Early Bronze Age cist grave containing one adult male inhumation and an associated tripartite bowl. A date of 1760-1610 cal. BC was returned for the inhumation. The interior of the cist was excavated and recorded, after which the stone-lined grave was infilled and preserved *in situ*.

The entire archaeological dimension of this project was funded by the client.

9. Non-Technical Summary

9.1 Introduction

This report details the partial excavation of a cist burial at Carn More 6, Dundalk, Co. Louth. This partial excavation and preservation *in situ* was necessitated due to the proposed Dundalk Western Bypass, the construction of which would destroy the grave.

9.2 Context list

A context method of recording the archaeology was used at Carn More 6. This method uses a numbering sequence for the archaeological features found. Each feature or each element in a feature is numbered one to infinity. The context list then is a full list of all the numbers allocated during the excavation (section 2 of the report).

9.3 Stratigraphic Sequence

Section 3 of the report visually shows the numbers allocated during the excavation and the relationships between them in the form of the “matrix”. These relationships are also described in words.

9.4 Interpretation of Stratigraphy

Section 4 attempts to explain what the site at Carn More 6 was and what it was used for. A dating sequence for the site is an important consideration at this point and it is attempted to show the use of the site over time.

9.5 Artefacts

This section presents a general summary of the inhumation and associated bowl found during the excavation. This information is taken from the specialist reports in section 13: appendices.

9.6 Discussion

A comparative discussion on similar excavated evidence is undertaken in section 6 of this report. The cist is also discussed in light of the specialist reports and dates returned.

9.7 Sample and Find List

This is a numbered list of the samples taken during the excavation for the purposes of analysis and the results of that analysis. Fragments of pottery and the remains of a skeleton were recovered from the cist.

9.8 Conclusions

The report concludes with a brief summation on the purpose of the excavation, its findings and the results of the specialist analysis.

10. Project References

- 1982** *Index to the Townland and Towns, Parishes and Baronies of Ireland*. Dublin: Genealogical Publishing Co. Inc.
- Aegis Archaeology Ltd 2001 + revs** Quality Manual. Unpublished.
- Anderson, L. 1993** The Mesolithic: Fishing for Answers, in E. Shee Twohig and M. Roynane, (eds) *Past perceptions: The prehistoric archaeology of south-west Ireland*, 16-24 Cork: University Press.
- Archaeological Survey of Ireland 1994** RMP Constraint Map & List Co. Louth.
- Bayley, D. 2006** '1275. site 127, Carn More 5, Faughart: Bronze Age cemetery' in I. Bennett (ed.) *Excavations 2003: Summary accounts of archaeological excavations in Ireland*. Bray: Wordwell.
- Brindley, A. L. 2007** *The Dating of Food Vessels and Urns in Ireland. Bronze Age Studies 7*. Galway: Department of Archaeology National University of Ireland.
- Buckley, V. 1986** *Archaeological Inventory of County Louth*. Dublin: The Stationery Office.
- Department of Arts, Heritage, Gaeltacht and the Islands 1999** *Policy and Guidelines on Archaeological Excavation*. Dublin: The Stationery Office.
- Eogan, G. 1965** *Catalogue of Irish Bronze Swords*. Dublin: The Stationery Office.
- Eogan, G. 1983** *The Hoards of the Later Irish Bronze Age*. Dublin: University College.
- English Heritage 1991** *Management of Archaeological Projects*. London: Historic Buildings and Monuments Commission for England.
- Herity, M. & G. Eogan 1989** *Ireland in Prehistory*. London: Routledge.
- Lewis, S. 1837** *A Topographical Dictionary of Ireland*. London: Lewis & Sons.
- Lynch, L. 2006** Osteo-archaeological Report: Carn More, Co. Louth (A010/002). Unpublished Report.
- Mitchell, G. F. 1951** Studies in Irish Quaternary Deposits: No. 7, *Proceedings of the Royal Irish Academy* 53B, 111-206.
- Mitchell, G. F. & G. de G. Sieveking 1972** Flint flake, probably of Palaeolithic Age, from Mell Townland, near Drogheda, Co. Louth, Ireland, *Journal of the Royal Society of Antiquaries of Ireland* 102, 174-7.
- Molas 1994** *On site Excavation Manual*. London: Molas.
- Mount, C. and Hartnett, P.J. 1993** Early Bronze Age Cemetery at Edmondstown County Dublin, *Proceedings of the Royal Irish Academy* 93C, 21-79.
- Mount, C. 1995** New Research on Irish Early Bronze Age Cemeteries, in J. Waddell, and E. Shee Twohig, (eds) *Ireland in the Bronze Age*. Dublin: The Stationery Office.
- Mount, C. 1997a** Adolf Mahr's Excavations of an Early Bronze Age Cemetery at Keenoge, County Meath, *Proceedings of the Royal Irish Academy* 97C, 1-68.

Mount, C. 1997b The Early and Middle Bronze Age in South-East Ireland: Aspects of Social and Cultural Distributions, II Volumes. Unpublished Thesis resented to NUI (UCD) For Degree of Doctor of Philosophy.

O'Donovan, J. 1840 manuscript by Rev. Flanagan OS *Letters for County Louth*. Bray.

O'Kelly, M.J. 1989 *Early Ireland*. Cambridge: Cambridge University Press.

Ordnance Survey 1997 *Discovery Series map for County Louth, number 36*. Dublin: Ordnance Survey.

ÓRiordáin, S. P. and J. Waddell 1993 *The Funerary Bowls and Vases of the Irish Bronze Age*. Galway: Galway University Press.

Roche, H. & Grogan, E. 2005 Prehistoric Pottery Report: Carn More, Co. Louth (A010/002). Unpublished Report.

Roycroft, N 2005 Around the bay on the Great North Road: the archaeology of the M1 Dundalk Western Bypass in J. O'Sullivan, and M. Stanley (eds) *Recent Archaeological Discoveries on National road Schemes 2004: Archaeology and the National roads Authority: Monograph Series No. 2*. Dublin: NRA.

Roycroft, N. 2006 Iron Age Patterns: Silent Sites *Seanda*: No. 1. p9.

Twohig, E. 1990 *Megalithic Tombs*. England: Shire.

Waddell, J. 1998 *The Prehistoric Archaeology of Ireland*. Galway: Galway University Press.

Waddell, J. 1990 *The Bronze Age Burials of Ireland*. Galway: Galway University Press.

Woodman, P. C. 1985 *Excavations at Mount Sandel 1973-77*. Belfast: H.M.S.O.

11. Signing-Off Statement

Archaeological Firm: ÆGIS ARCHAEOLOGY LIMITED

Writer: Avril Hayes MA MIAI (site director and licence holder)
Aegis Archaeology Ltd
32 Nicholas Street,
King's Island,
Limerick

Client: Celtic Roads Design Group
C/o Ascon Ltd,
Kill,
Co. Kildare

Signed: _____
For AEGIS ARCHAEOLOGY LTD

Dated: April 2007

12. Archive Index Sheet

Project	M1 DWB – Carn More Cist Partial Excavation			
Site Names/Reference/	Site No: 137; Carn More 6			
Licence numbers	A010/002			
Contractor	AEGIS ARCHAEOLOGY LTD			
Field director	Avril Hayes			
	Items (quantity)	Boxes/file s (quantity)	Checked/indexed/ cross-referenced/filed etc	Further work to do
Field Records				
Site plan & section	2	1 roll	Yes	
Site registers/indexes	4	1 file	Yes	
Site diary/ notes	3 pages	1 file	Yes	
Context matrix	1	1 file	Yes	
Report	1 (preliminary report)	1 file	Yes	
Summary	1		Yes	
Survey/levels data (origin information)	levels taken on site marked on plans		GPS coordinates amended as per Project Archaeologist information	
Borehole logs etc	n/a			
Context sheets	10	1 file	Yes	
Trench record sheets	n/a			
Wood Sheets	n/a			
Skeleton Sheets	1			
Worked stone sheets	n/a			
Sample sheets used yes/no	Yes 1	1 file	Yes	
Other sheets (Specify)				
Single context & Multi context plans (totals rather than sheets)	3	1 roll	Yes	
Other plans (sketches, non- context plans etc)	n/a			
Sections/elevations	1	1 roll	Yes	
Timber drawings	n/a			
Stone drawings	N/a			
Images monochrome	n/a			
Images colour (slide)	0			
Images digital	115	2 CDs	Yes	

Image/photo index	4	1 file	Yes	
Methodology	1	1 file	Yes	
SECURITY COPY (whole or part) If so what type?	2CDs (drawings; scanned incl. photos) site archive: 1 hard copy/1 scanned copy	1 box	Yes	

	Items/ Fragments (quantity)	Boxes/files (quantity)	Processed/cleaned /sorted/checked/ indexed/x-ray/stored appropriately etc	Further work
Finds and Enviro. Archive				
Accessioned/special finds (specify types, especially wet finds or dry finds)	N/a			
Chert/flint	n/a			
Pottery (specify periods)	Bronze Age: 1 vessel mostly whole with two fragmented sherds	1 box	With specialist	For curation
Ceramic Building Material (specify types eg daub, tile)	n/a			
Inscribed stones	N/a			
Metalwork (specify types eg bronze, iron)	N/a			
Glass	n/a			
Slag	n/a			
Human bone (specify type eg cremated, skeleton, disarticulated)	Partial skeleton in fragments	1 box	yes	For curation
Animal bone	N/a			
Enviro bulk (specify number of samples and total number of litres sampled)	N/a			
Enviro monolith (specify number of samples and number of tins per sample)	n/a			
Name	Avril Hayes			
Title	Licence Holder			
Date	14/5/07			

Template supplied by NRA Project Archaeologist

13. Appendices

The bone was analysed by Aegis osteo-archaeologist Ms Linda Lynch MA MIAI. The pottery was analysed by Helen Roche and Dr Eoin Grogan. Dates were supplied by BETA Analytic.

A table showing material for further analysis was submitted as an appendix to the preliminary stratigraphic report (Ref: 255-1.19). The table below is a summary of the results of that further analysis:

Material	From Context	Specialists	Summary of Analysis
Pottery Find No: 7:2	[c7]	Helen Roche & Eoin Grogan	Bowl: Tripartite (variant) Type
Human Bone Find No: 7:1	[c7]	Linda G. Lynch	Adult male (17-25 years)
Human Bone C14 Find No. 1: left temporal bone - 8g	[c7]	BETA Analytic Ltd	Treatment: AMS standard delivery Date: 1760-1610 cal. BC
Soil Sample Sample No: 1	[c8]	Sieving by Aegis Archaeology Ltd.	No ecofacts / archaeo-botanical remains recovered

Each of the specialists reports are located in this section

- (13.1) Osteo-archaeological Report
- (13.2) Pottery Report
- (13.3) Radio-Carbon Dating Report

13.1 Osteo-archaeological Report

(Linda Lynch MA MIAI MIAPO)

Carn More 6: M1 Dundalk Western Bypass

Contents

13.1.1. Osteological Terms Used

13.1.2. Methods of Skeletal Analysis

13.1.3. Analysis

13.1.4. Catalogue of Skeletal Remains

13.1.5. References

13.1.1. Osteological terms used (fig. 1)

Where relevant, terms have been explained within the text. However, a number of basic terms are used frequently in osteo-archaeology and these are outlined below. The definitions are taken from White and Folkens (1991, 28-35) and Bass (1995, 319-321).

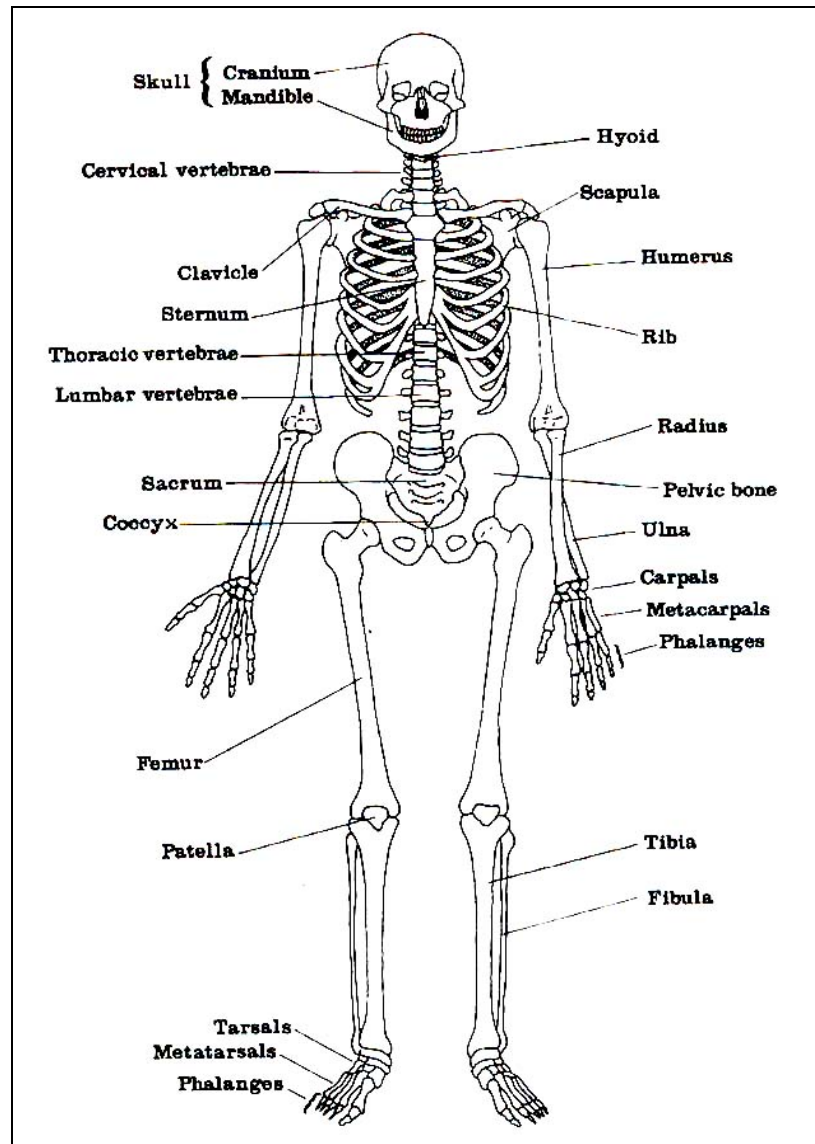


Figure 1. Annotated diagram showing main human skeletal elements (after Mays 1998, 2, fig. 1.1)

Directions - General

Superior - toward the head of the body.

Inferior - opposite of superior, body parts away from the head.

Anterior - toward the front of the body.

Posterior - opposite of anterior, toward the back of the individual.

Medial - toward the midline of the body.

Lateral - opposite of medial, away from the midline of the body.

Proximal - nearest the axial skeleton, usually used for long bones.

Distal - opposite of proximal, furthest from the axial skeleton.

Palmar - relating to the hand, the palm side

Plantar - relating to the foot, towards the sole of the foot

Dorsal - relating to the hand and foot, the back of the hand, the top side of the foot

External - outer.

Internal - opposite of external, inside.

Endocranial - inner surface of the cranial vault.

Ectocranial - outer surface of the cranial vault.

Direction - Teeth

Mesial - toward the point on the midline where the central incisors contact each other.

Distal - opposite of mesial.

Lingual - toward the tongue.

Labial - opposite of lingual, toward the lips.

Buccal - opposite of lingual, toward the cheeks.

Incisal - the biting surface of the tooth.

Occlusal - the chewing surface of the tooth.

General bone features/terms

Process - a bony eminence.

Eminence - a bony projection, usually not as prominent as a process.

Spine - generally a long, thinner, sharper process than an eminence.

Tuberosity - a large, usually roughened eminence of variable shape, often the site of a ligament attachment.

Tubercle - a small, usually roughened eminence, often a site of a ligament attachment.

Trochanters - two large, prominent, blunt, rugose processes found on the distal femur.

Malleolus - a rounded protuberance adjacent to the ankle joint.

Boss - a smooth round broad eminence.

Articulation - an area in which adjacent bones are in contact at a joint.

Condyle - a rounded articular process.

Epicondyle - a non-articular projection adjacent to a condyle.

Head - a large, rounded, usually articular end of a bone.

Shaft or diaphysis - the long, straight section between the ends of a long bone.

Epiphysis - usually the end portion or extremity of a long bone which is expanded for articulation.

Neck - the section of a bone between the head and the shaft.

Torus - a bony thickening.

Ridge - a linear bony elevation, often roughened.

Crest - a prominent, usually sharp and thin ridge of bone.

Line - a raised linear surface, not as thick as a torus or as sharp as a crest.

Facet - a small articular surface, or tooth contact.

Metaphysis - a line of junction between epiphysis and diaphysis.

Osteoblastic - process of bone formation

Osteoclastic - process of bone resorption

13.1.2. Methods of skeletal analysis

The sex of this individual was determined on the basis of the size of the mastoid process (after Buiskstra and Ubelaker 1994). The rates of dental attrition were used to determine the age-at-death (after Brothwell 1981, 71-2). Due to the incomplete nature of the remains it was not possible to determine the stature of this individual.

The adult dental remains (permanent teeth) were recorded using the following chart:

<i>right</i>								<i>left</i>							
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

The upper row represents the maxilla and the lower row represents the mandible. These are further sub-divided into left and right quadrants. Each permanent tooth (1-8) is prefixed by the number of the quadrant it belongs to (1-4).

The following symbols can be used to record the teeth:

P - tooth present	B - tooth broken post-mortem
E - tooth erupting	PM - tooth lost post-mortem
U - tooth unerupted	AM - tooth lost ante-mortem
CA - tooth congenitally absent	R - root only
12 - socket absent	

All incidences of dental diseases were recorded.

No pathological conditions were observed on the bones. The incomplete state of the bones militated against any recording of cranial and post-cranial metrics and non-metric traits.

All of the raw osteological data on this individual is housed with ÆGIS ARCHAEOLOGY LIMITED. The deposition of the skeletal remains will be arranged after consultation with the National Museum of Ireland who is responsible for the long-term curation.

13.1.3. Analysis

A cist burial was excavated by Avril Hayes (licence holder) and Linda G. Lynch (osteoarchaeologist) of Aegis Archaeology Limited on the 15th June 2005. Prior to excavation part of a human cranium and a pottery vessel were visible above the silted up interior of the slab-lined cist. The silted deposit consisted almost entirely of sand, which had filtered into the cist from the surrounding environment. The interior of the cist was extensively photographed prior to the excavation. Both the pottery vessel and the cranium appeared to be in good condition.

However, once excavation commenced it became apparent that the skeletal remains were very poorly preserved, primarily due to the sandy material that had filtered into the cist. Essentially, the fragment of cranium that had been visible prior to excavation had only survived because it had not been engulfed in the sand. The cranial fragments that survived included most of the left parietal and portions of the left temporal. The enamel crowns of many of the maxillary and mandibular teeth were recovered but none of the roots survived. In addition, the very fragmentary remains of the diaphyses of what were interpreted as the left humerus and left tibia were also recovered (see section 13.1.4). Apart from the portion of the cranium that survived above the sand, the surviving bones were highly eroded and soft. In post-excavation any adhering sand was gently cleaned off the bones using a soft brush and the fragments were allowed to dry. They were sealed in air-tight bags and boxed encased in acid-free tissue paper to minimise any further fragmentation of the remains.

Although the bones were very poorly preserved it was possible to ascertain the original position of the skeleton within the cist. The skeletal was lying in a crouched position, with the legs drawn up to the right side of the skeleton. The head was lying on its right side with the face of the individual turned towards the pottery vessel. The position of the left humerus indicates that the individual was not lying on its side but rather the torso was lying flat on its back, in a supine position. The positions of the right arm, the forearms and the hands could not be determined. Only the left tibia (tentatively identified) survived of the lower limbs. The position of these fragments indicated that at least the left femur or thigh bone was turned to the right at a 90° angle to the torso, and that the left tibia and fibula (“shin-bone”) were flexed back towards the pelvis. It is surmised that the right femur lay in a similar position, with the left leg overlying it.

The very poor preservation of the fragments has hindered the osteological analysis of the remains. During the excavation of the skeleton, the left mastoid process of the temporal bone appeared quite large, which may be taken to be indicative of a male individual (after

Buiskstra and Ubelaker 1994). No other skeletal indicator of sex was preserved. The general size of the skeletal remains are indicative of a mature individual (that is, an adult). None of the typical morphological features (in particular in the pelvis) that may be used to determine the age-at-death were preserved. The rate of dental attrition (after Brothwell 1981, 71-2) was the only method of age-at-death determination possible with the skeletal remains of this individual. Age estimation using dental attrition is based on the hypothesis that as an adult grows older the occlusal surfaces of the teeth will progressively become more worn. It is apparent that attrition rates may vary significantly between individuals, communities and through time, and therefore this method is not very reliable. However given the presumed prehistoric date of the burial and the coarser diet that would have been consumed by people at that time, it is likely that attrition rates in the host population would have been high. The attrition on the dentition of the individual from Carnmore was very slight. This indicates that it is probable that this individual was a young adult, aged between 17 years and 25 years at the time of death. It was not possible to determine the stature of this individual given the extremely incomplete nature of the remains.

As mentioned earlier, dental remains were recovered with this adult male. In all instances only the crowns survived, as the roots had been eroded post-mortem. In addition, no alveolar bone (that is, the bone containing the sockets of the teeth) was preserved. A catalogue of the teeth is provided in section 13.1.4. Slight deposits of calculus, or calcified plaque, were identified on eight of the 23 preserved permanent teeth. Calculus is very frequently recorded in archaeological populations. The aetiology is multi-causal but its formation is aided by alkaline in the mouth and a high protein diet (Lieverse 1999). These deposits can be kept to a minimum during life with correct oral hygiene procedures - primarily by cleaning the teeth after eating. The slight deposits on the teeth of this individual may not necessarily be indicative of diet as he was a young individual when he died. In addition, four of the teeth had defects known as enamel hypoplastic defects. Enamel hypoplastic defects manifest as a depressed line or series of line or pits on the surface of the enamel. They occur as a result of a disturbance to the growth of the organic matrix, which is later mineralised to form enamel. The disturbance to the growth is thus reflected in the enamel (Mays 1998, 156; Hillson 1986). The defects can occur as a result of a number of diseases and/or nutritional deficiencies including diarrhoea, parasitic infestations of the gut, scurvy, rickets, allergic reactions, and general malnutrition (Mays 1998, 158). Once the enamel is formed the defects are preserved in the enamel. Teeth calcify in childhood and therefore, enamel hypoplastic defects are a reflection of stresses suffered by an individual in youth. By measuring the location of a lesion on a particular tooth it is possible to determine approximately the age at which the stress occurred, as teeth form at a known rate. The locations of the defects on the affected teeth in

this individual indicate that he underwent a period of stress when he was approximately 2.5 years.

No pathological lesions were identified on any of the preserved bones of this individual.

13.1.4 Catalogue of human skeletal remains

Skeleton 7

Age: Young adult 17-25 years (dental attrition)

Sex: Male (mastoid process)

Stature: -

Skeletal Preservation: Very poor. Remains are very incomplete. Bones have disintegrated due to contact with sand matrix. Enamel of teeth well preserved, but beginning to fragment.

Skeletal Position: Crouched on right side.

Skeletal Attitude: see above.

Orientation: Head to north.

Associated Skeleton/s: -

Associated Finds: Pottery vessel (7:2)

Bones Present: Left parietal and fragment of left temporal. Maxillary and mandibular teeth. Fragments of diaphyses of left humerus and left tibia.

Dental Inventory:

P	P	P	P	P	P	P				P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
	P	P	P	P	P						P	P	P	P	P

Dental Pathology: Calculus – 8/23 (15, 16, 25, 35, 36, 45-47); Enamel hypoplastic defects – 4/23 (12, 13, 23, 43)

Skeletal Pathology: -

Anomalies: -

Comments: -

13.1.5. References

Bass, W. M. 1995 *Human Osteology. A Laboratory and Field Manual*. 4th ed. Columbia: Missouri Archaeological Society.

Brothwell, D. R. 1981 *Digging Up Bones*. 3rd ed. Oxford: University Press.

Buikstra, J. E. & D. H. Ubelaker 1994 *Standards for Data Collection from Human Skeletal Remains*. Arkansas: Arkansas Archaeological Society

Hillson, S. 1986 *Teeth*. Cambridge: University Press.

IAPA 1999 *The Treatment of Human Remains: Technical Paper for Archaeologists*. IAPA.

Lieverse, A. R. 1999 'Diet and aetiology of dental calculus', *International Journal of Osteoarchaeology* 9, 219-32.

Mays, S. 1998 *The Archaeology of Human Bones*. London: Routledge.

White, T. D. & P. A. Folkens 1991 *Human Osteology*. San Diego: Academic Press.

13.2 Pottery Report

(Helen Roche & Eoin Grogan)

In consultation with the specialists the pottery was considered stable. It was noted that any conservation work would seriously impair any future assessment or analysis of the pottery. Secure packaging, in a padded box, will ensure the safe curation of the vessel.

Dundalk Western Bypass

Carn More, Dundalk, Co. Louth (010-001)

An almost complete bowl food vessel was found within the cist, it was lying on its side about 10cm away from the skull of a crouched inhumation. The position of the bowl can be compared to those in burials at Carryglass, Co. Tyrone and Rathbennett, Co. Westmeath (Ó Ríordáin and Waddell 1993, 13). The cist appears to represent part of the large Early Bronze Age cemetery that had previously been excavated in this area (Irish Archaeological Consultancy Ltd - 03E0873). This consisted of a group of seven cist burials that formed an arc around a cairn; only cremated bone was found within the cists as well as a number of vessels including bowls and vases of the food vessel tradition and an encrusted urn.

The bowl presently under discussion is of tripartite (variant) type. The coil-built vessel has a straight internally bevelled rim and two horizontal mouldings are present on the body dividing the exterior into three distinct zones; the base is gently stepped. The bowl was poorly fired, the fabric is friable and areas of the exterior surface are unstable. The vessel measures 13.6cm in height, 14.1cm in rim diameter and 7.2cm in base diameter. The fabric has a moderate to high content of crushed inclusions ($\leq 4.0\text{mm}$), ranges in thickness between 8.5mm and 10.6mm and has an orange-brown exterior and interior surface with a black core.

The correlated overall decorative arrangement present on the vessel is typical of this form of bowl, however, because of the poor quality of the fabric, the decorative motifs are faint. Extending from rim to base, decoration consists of short oblique whipped cord maggots on the rim top. The upper zone of the exterior is decorated with irregularly spaced horizontal rows of broad whipped cord impressions, below which the moulding is decorated with a row of quadrangular-shaped impressions, probably fashioned with a bone or similar object. The middle zone of the exterior is also decorated with irregularly spaced horizontal rows of broad whipped cord impressions and the second moulding is similarly decorated to that of the first. The lower zone of the exterior is also decorated with broad whipped cord impressions

forming a row of chevrons below which are irregularly spaced horizontal rows of broad whipped cord impressions. The Carn More example is particularly similar to tripartite bowls (variant), from Carryglass and Woodend, Co. Tyrone (Ó Ríordáin and Waddell 1993, 211, nos 265, 267), not only in the form of the vessels but also in the use of whipped cord impressions as a decorative technique.

Tripartite bowls have a mainly north-eastern distribution throughout the country (Ó Ríordáin and Waddell 1993, 14) and the majority of dates for burials associated with bowls cluster between *c.* 2460 cal. BC and 1980 cal. BC¹ (Mount and Hartnett 1993, 60). Tripartite bowls are associated with almost equal numbers of cists containing cremated and inhumation burials (Ó Ríordáin and Waddell 1993, 13). Although the majority of tripartite bowls have been found in isolated cists, a number have also been found within cemetery sites. At Aghnaskeagh, Co. Louth, a tripartite bowl was found within one of six cists found in an oval-shaped mound (Ó Ríordáin and Waddell 1993, 119) and at the large flat cemetery at Keenoge, Co. Meath, tripartite bowls were found, as well as an encrusted urn and a vase urn within cist and pit burials (Mount 1997, 31-33).

References

Mount, C. 1997 Adolf Mahr's Excavations of an Early Bronze Age Cemetery at Keenoge, County Meath. *Proceedings of the Royal Irish Academy* 97C, 1-68.

Mount, C. and Hartnett, P.J. 1993 Early Bronze Age Cemetery at Edmondstown County Dublin. *Proceedings of the Royal Irish Academy* 93C, 21-79.

Ó Ríordáin, B. and Waddell, J. 1993 *The Funerary Bowls and Vases of the Irish Bronze Age*. Galway University Press, Galway.

¹ The earlier date within this range is, of course, improbably early and it is unlikely that bowls were being produced prior to 2300 cal. BC at the very earliest.

13.3 Radio-Carbon Dating Report

(Beta Analytic)

Contents

13.3.1. Analytical Procedures

13.3.2. Pre-Treatment Glossary

13.3.3. Analysis

13.3.4. Result

13.3.1. Analytical Procedures



*Consistent Accuracy ...
Delivered On Time.*

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0197
Beta@radiocarbon.com
www.radiocarbon.com

Mr. Darden Hood
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

Calendar Calibration at Beta Analytic

Calibrations of radiocarbon age determinations are applied to convert BP results to calendar years. The short-term difference between the two is caused by fluctuations in the heliomagnetic modulation of the galactic cosmic radiation and, recently, large scale burning of fossil fuels and nuclear devices testing. Geomagnetic variations are the probable cause of longer-term differences.

The parameters used for the corrections have been obtained through precise analyses of hundreds of samples taken from known-age tree rings of oak, sequoia, and fir up to about 10,000 BP. Calibration using tree-rings to about 12,000 BP is still being researched and provides somewhat less precise correlation. Beyond that, up to about 20,000 BP, correlation using a modeled curve determined from U/Th measurements on corals is used. This data is still highly subjective. Calibrations are provided up to about 19,000 years BP using the most recent calibration data available.

The Pretoria Calibration Procedure (Radiocarbon, Vol 35, No.1, 1993, pg 317) program has been chosen for these calendar calibrations. It uses splines through the tree-ring data as calibration curves, which eliminates a large part of the statistical scatter of the actual data points. The spline calibration allows adjustment of the average curve by a quantified closeness-of-fit parameter to the measured data points. A single spline is used for the precise correlation data available back to 9900 BP for terrestrial samples and about 6900 BP for marine samples. Beyond that, splines are taken on the error limits of the correlation curve to account for the lack of precision in the data points.

In describing our calibration curves, the solid bars represent one sigma statistics (68% probability) and the hollow bars represent two sigma statistics (95% probability). Marine carbonate samples that have been corrected for $^{13}\text{C}/^{12}\text{C}$, have also been corrected for both global and local geographic reservoir effects (as published in Radiocarbon, Volume 35, Number 1, 1993) prior to the calibration. Marine carbonates that have not been corrected for $^{13}\text{C}/^{12}\text{C}$ are adjusted by an assumed value of 0 ‰ in addition to the reservoir corrections. Reservoir corrections for fresh water carbonates are usually unknown and are generally not accounted for in those calibrations. In the absence of measured $^{13}\text{C}/^{12}\text{C}$ ratios, a typical value of -5 ‰ is assumed for freshwater carbonates.

(Caveat: the correlation curve for organic materials assume that the material dated was living for exactly ten years (e.g. a collection of 10 individual tree rings taken from the outer portion of a tree that was cut down to produce the sample in the feature dated). For other materials, the maximum and minimum calibrated age ranges given by the computer program are uncertain. The possibility of an "old wood effect" must also be considered, as well as the potential inclusion of younger or older material in matrix samples. Since these factors are indeterminant error in most cases, these calendar calibration results should be used only for illustrative purposes. In the case of carbonates, reservoir correction is theoretical and the local variations are real, highly variable and dependent on provenience. Since imprecision in the correlation data beyond 10,000 years is high, calibrations in this range are likely to change in the future with refinement in the correlation curve. The age ranges and especially the intercept ages generated by the program must be considered as approximations.)



*Consistent Accuracy ...
Delivered On Time.*

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0/97
Beta@radiocarbon.com
www.radiocarbon.com

Mr. Darden Hood
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

Final Report

The final report package includes the final date report, a statement outlining our analytical procedures, a glossary of pretreatment terms, calendar calibration information, billing documents (containing balance/credit information and the number of samples submitted within the yearly discount period), and peripheral items to use with future submittals. The final report includes the individual analysis method, the delivery basis, the material type and the individual pretreatments applied. The final report has been sent by mail and e-mail (where available).

Pretreatment

Pretreatment methods are reported along with each result. All necessary chemical and mechanical pretreatments of the submitted material were applied at the laboratory to isolate the carbon which may best represent the time event of interest. When interpreting the results, it is important to consider the pretreatments. Some samples cannot be fully pretreated, making their ^{14}C ages more subjective than samples which can be fully pretreated. Some materials receive no pretreatments. Please look at the pretreatment indicated for each sample and read the pretreatment glossary to understand the implications.

Analysis

Materials measured by the radiometric technique were analyzed by synthesizing sample carbon to benzene (92% C), measuring for ^{14}C content in one of 53 scintillation spectrometers, and then calculating for radiocarbon age. If the Extended Counting Service was used, the ^{14}C content was measured for a greatly extended period of time. AMS results were derived from reduction of sample carbon to graphite (100% C), along with standards and backgrounds. The graphite was then detected for ^{14}C content in one of 9 accelerator-mass-spectrometers (AMS).

The Radiocarbon Age and Calendar Calibration

The "Conventional ^{14}C Age (*)" is the result after applying $^{13}\text{C}/^{12}\text{C}$ corrections to the measured age and is the most appropriate radiocarbon age. If an "*" is attached to this date, it means the $^{13}\text{C}/^{12}\text{C}$ was estimated rather than measured (The ratio is an option for radiometric analysis, but included on all AMS analyses.) Ages are reported with the units "BP" (Before Present). "Present" is defined as AD 1950 for the purposes of radiocarbon dating.

Results for samples containing more ^{14}C than the modern reference standard are reported as "percent modern carbon" (pMC). These results indicate the material was respiring carbon after the advent of thermo-nuclear weapons testing (and is less than ~ 50 years old).

Applicable calendar calibrations are included for materials between about 100 and 19,000 BP. If calibrations are not included with a report, those results were either too young, too old, or inappropriate for calibration. Please read the enclosed page discussing calibration.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables used in the
calculation of age calibration

(Variables: est. C13/C12=-25;lab. mult=1)

Laboratory number: **Beta-123456**

The uncalibrated Conventional
Radiocarbon Age (± 1 sigma)

Conventional radiocarbon age¹: **2400 \pm 60 BP**

The calendar age
range in both
calendar years
(AD or BC) and in
Radiocarbon Years
(BP)

2 Sigma calibrated result: **Cal BC 770 to 380 (Cal BP 2720 to 2330)**
(95% probability)

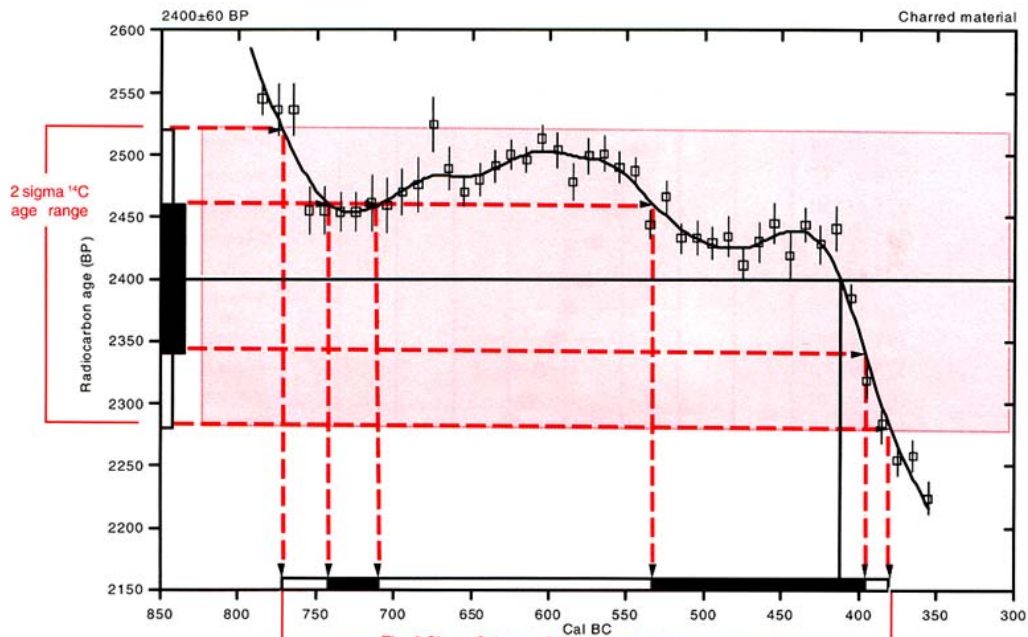
¹ C13/C12 ratio estimated

The intercept between the average
radiocarbon age and the calibrated
curve time scale. This value is
illustrative and should not be used by
itself.

Intercept data

Intercept of radiocarbon age
with calibration curve: **Cal BC 410 (Cal BP 2360)**

1 Sigma calibrated result: **Cal BC 740 to 710 (Cal BP 2690 to 2660) and**
Cal BC 535 to 395 (Cal BP 2485 to 2345)



References:

- Database used**
Intcal 98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxi-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

References for the calibration data
and the mathematics applied to the
data. These references, as well as
the Conventional Radiocarbon Age
and the 13C/12C ratio used should
be included in your papers.

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-mail: beta@radiocarbon.com

13.3.2. Pre-treatment Glossary

BETA ANALYTIC INC. - 4985 SW 74 Court, Miami, Florida 33155 USA - Tel: 305-667-5167 - Fax 305-663-0964 - beta@radiocarbon.com

PRETREATMENT GLOSSARY Standard Pretreatment Protocols at Beta Analytic

Unless otherwise requested by a submitter or discussed in a final date report, the following procedures apply to pretreatment of samples submitted for analysis. This glossary defines the pretreatment methods applied to each result listed on the date report form (e.g. you will see the designation "acid/alkali/acid" listed along with the result for a charcoal sample receiving such pretreatment).

Pretreatment of submitted materials is required to eliminate secondary carbon components. These components, if not eliminated, could result in a radiocarbon date, which is too young or too old. Pretreatment does not ensure that the radiocarbon date will represent the time event of interest. This is determined by the sample integrity. Effects such as the old wood effect, burned intrusive roots, bioturbation, secondary deposition, secondary biogenic activity incorporating recent carbon (bacteria) and the analysis of multiple components of differing age are just some examples of potential problems. The pretreatment philosophy is to reduce the sample to a single component, where possible, to minimize the added subjectivity associated with these types of problems. If you suspect your sample requires special pretreatment considerations be sure to tell the laboratory prior to analysis.

"acid/alkali/acid"

The sample was first gently crushed/dispersed in deionized water. It was then given hot HCl acid washes to eliminate carbonates and alkali washes (NaOH) to remove secondary organic acids. The alkali washes were followed by a final acid rinse to neutralize the solution prior to drying. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of the sample. Each chemical solution was neutralized prior to application of the next. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were eliminated. This type of pretreatment is considered a "full pretreatment". On occasion the report will list the pretreatment as "acid/alkali/acid - insolubles" to specify which fraction of the sample was analyzed. This is done on occasion with sediments (See "acid/alkali/acid - solubles")

Typically applied to: charcoal, wood, some peats, some sediments, and textiles "acid/alkali/acid - solubles"

On occasion the alkali soluble fraction will be analyzed. This is a special case where soil conditions imply That the soluble fraction will provide a more accurate date. It is also used on some occasions to verify the present/absence or degree of contamination present from secondary organic acids. The sample was first pretreated with acid to remove any carbonates and to weaken organic bonds. After the alkali washes (as discussed above) are used, the solution containing the alkali soluble fraction is isolated/filtered and combined with acid. The soluble fraction, which precipitates, is rinsed and dried prior to combustion.

"acid/alkali/acid/cellulose extraction"

Following full acid/alkali/acid pretreatments, the sample is bathed in (sodium chlorite) NaClO₂ under very controlled conditions (Ph = 3, temperature = 70 degrees C). This eliminates all components except wood cellulose. It is useful for woods that are either very old or highly contaminated.

Applied to: wood

"acid washes"

Surface area was increased as much as possible. Solid chunks were crushed, fibrous materials were shredded, and sediments were dispersed. Acid (HCl) was applied repeatedly to ensure the absence of carbonates. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of each sample. The sample was not be subjected to alkali washes to ensure the absence of secondary organic acids for intentional reasons. The most common reason is that the primary carbon is soluble in the alkali. Dating results reflect the total organic content of the analyzed material. Their accuracy depends on the researcher's ability to subjectively eliminate potential contaminants based on contextual facts.

Typically applied to: organic sediments, some peats, small wood or charcoal, special cases

BETA ANALYTIC INC. - 4985 SW 74 Court, Miami, Florida 33155 USA - Tel: 305-667-5167 - Fax 305-663-0964 - beta@radiocarbon.com

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic
(Continued)

"collagen extraction: with alkali or collagen extraction: without alkali"

The material was first tested for friability ("softness"). Very soft bone material is an indication of the potential absence of the collagen fraction (basal bone protein acting as a "reinforcing agent" within the crystalline apatite structure). It was then washed in de-ionized water, the surface scraped free of the outer most layers and then gently crushed. Dilute, cold HCl acid was repeatedly applied and replenished until the mineral fraction (bone apatite) was eliminated. The collagen was then dissected and inspected for rootlets. Any rootlets present were also removed when replenishing the acid solutions. "With alkali" refers to additional pretreatment with sodium hydroxide (NaOH) to ensure the absence of secondary organic acids. "Without alkali" refers to the NaOH step being skipped due to poor preservation conditions, which could result in removal of all available organics if performed.

Typically applied to: bones

"acid etch"

The calcareous material was first washed in de-ionized water, removing associated organic sediments and debris (where present). The material was then crushed/dispersed and repeatedly subjected to HCl etches to eliminate secondary carbonate components. In the case of thick shells, the surfaces were physically abraded prior to etching down to a hard, primary core remained. In the case of porous carbonate nodules and caliches, very long exposure times were applied to allow infiltration of the acid. Acid exposure times, concentrations, and number of repetitions, were applied accordingly with the uniqueness of the sample.

Typically applied to: shells, caliches, and calcareous nodules

"neutralized"

Carbonates precipitated from ground water are usually submitted in an alkaline condition (ammonium Hydroxide or sodium hydroxide solution). Typically this solution is neutralized in the original sample container, using deionized water. If larger volume dilution was required, the precipitate and solution were transferred to a sealed separatory flask and rinsed to neutrality. Exposure to atmosphere was minimal.

Typically applied to: Strontium carbonate, Barium carbonate
(i.e. precipitated ground water samples)

"carbonate precipitation"

Dissolved carbon dioxide and carbonate species are precipitated from submitted water by complexing them as ammonium carbonate. Strontium chloride is added to the ammonium carbonate solution and strontium carbonate is precipitated for the analysis. The result is representative of the dissolved inorganic carbon within the water. Results are reported as "water DIC".

Applied to: water

"solvent extraction"

The sample was subjected to a series of solvent baths typically consisting of benzene, toluene, hexane, pentane, and/or acetone. This is usually performed prior to acid/alkali/acid pretreatments.

Applied to: textiles, prevalent or suspected cases of pitch/tar contamination, conserved materials.

"none"

No laboratory pretreatments were applied. Special requests and pre-laboratory pretreatment usually accounts for this.

13.3.3. Analysis

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.5;lab. mult=1)

Laboratory number: **Beta-217961**

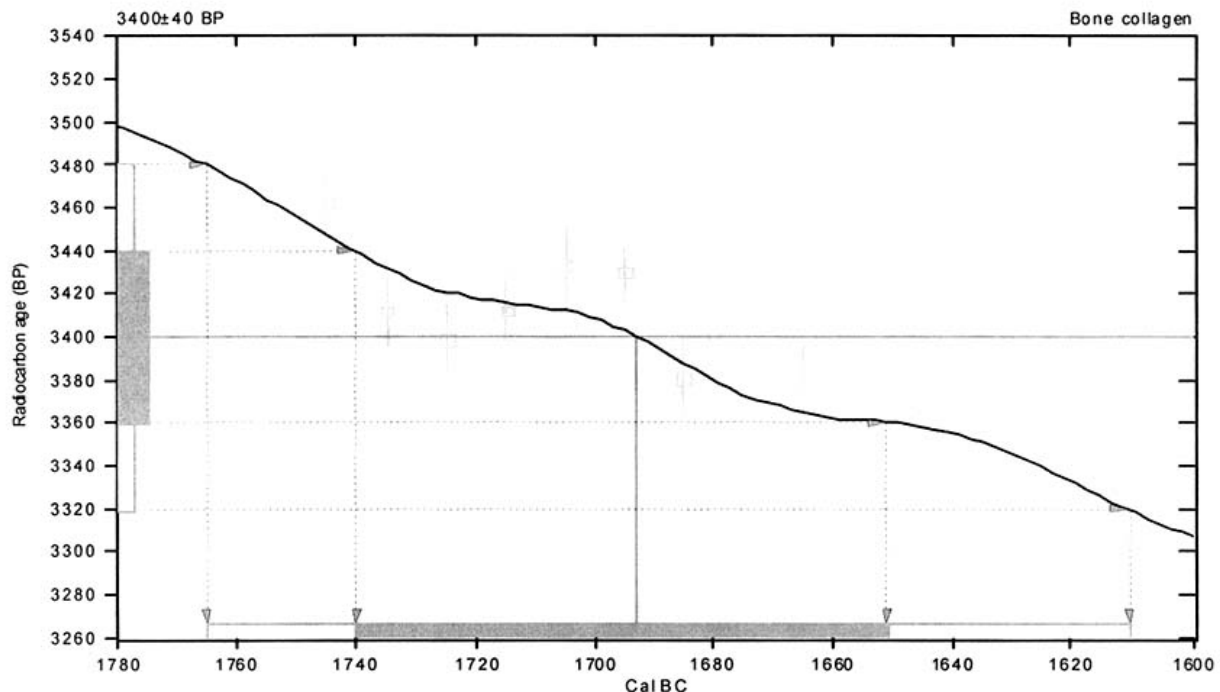
Conventional radiocarbon age: **3400±40 BP**

2 Sigma calibrated result: **Cal BC 1760 to 1610 (Cal BP 3720 to 3560)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: **Cal BC 1690 (Cal BP 3640)**

1 Sigma calibrated result: **Cal BC 1740 to 1650 (Cal BP 3690 to 3600)**
(68% probability)



References:

Database used

INTCAL 98

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxi-xiii

INTCAL 98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics


A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

13.3.4. Result

	BETA ANALYTIC INC. DR. M.A. TAMERS and MR. D.G. HOOD	UNIVERSITY BRANCH 4985 S.W. 74 COURT MIAMI, FLORIDA, USA 33155 PH: 305/667-5167 FAX: 305/663-0964 E-MAIL: beta@radiocarbon.com
---	--	---

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Avril Hayes

Report Date: 7/17/2006

Sample Data	Measured Radiocarbon Age	¹³ C/ ¹² C Ratio	Conventional Radiocarbon Age(*)
Beta - 217961 SAMPLE : A010-002:1 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali 2 SIGMA CALIBRATION : Cal BC 1760 to 1610 (Cal BP 3720 to 3560)	3360 +/- 40 BP	-22.5 o/oo	3400 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.