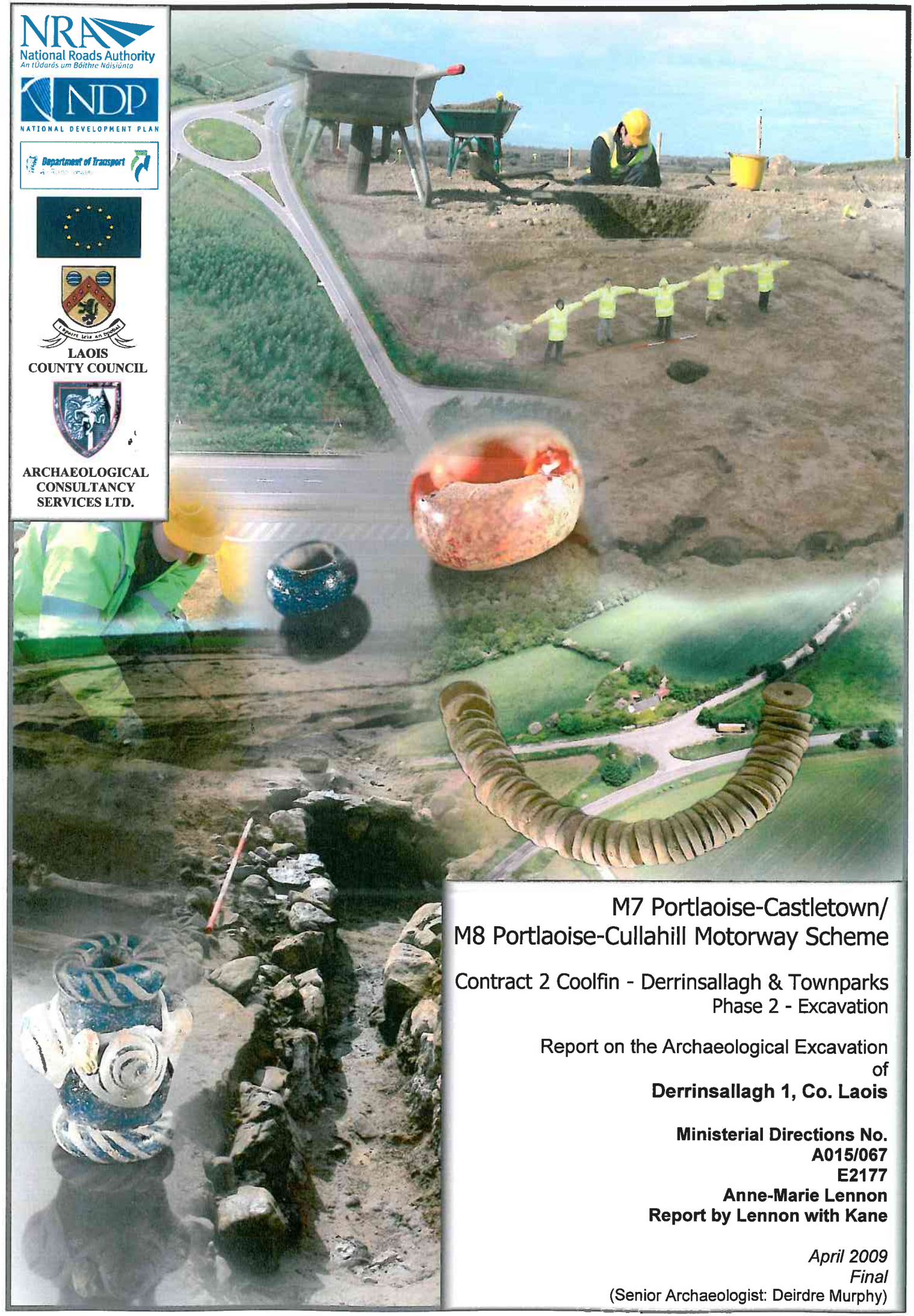
National Roads Authority
An tÚdarás um Bóithre Náisiúnta

NDP
NATIONAL DEVELOPMENT PLAN

Department of Transport

LAOIS
COUNTY COUNCIL

ARCHAEOLOGICAL
CONSULTANCY
SERVICES LTD.



M7 Portlaoise-Castletown/ M8 Portlaoise-Cullahill Motorway Scheme

Contract 2 Coolfin - Derrinsallagh & Townparks
Phase 2 - Excavation

Report on the Archaeological Excavation
of
Derrinsallagh 1, Co. Laois

Ministerial Directions No.
A015/067
E2177
Anne-Marie Lennon
Report by Lennon with Kane

April 2009
Final
(Senior Archaeologist: Deirdre Murphy)

PROJECT DETAILS

Project	M7 Portlaoise to Castletown/ M8 Portlaoise to Cullahill Motorway Scheme
Client	Laois County Council, County Hall, Portlaoise, County Laois
Contract	Contract 2
Site Name	Derrinsallagh 1
Townland	Derrinsallagh, Co Laois
Nat. Grid Ref.	224782, 186230
OD Height	114.03m
OS Map Ref.	OS 6 inch sheet 21
Chainage	1950 -2000
Ministerial Directions No.	A015/067
Record No.	E2177
Archaeologist	Anne-Marie Lennon
Senior Archaeologist	Deirdre Murphy
Report Type	Final
Report Status	Final
Report by	Lennon with Kane
Date of Submission	April 2009
Distribution	Elspeth Logan & Mary Deevy

ACKNOWLEDGEMENTS

This report has been prepared by Archaeological Consultancy Services Ltd on behalf of Laois County Council, Kildare National Roads Design Office (NRDO), and the National Roads Authority (NRA).

The excavation was carried out in accordance with the Directions of the Minister for the Environment, Heritage and Local Government (DOEHLG), in consultation with the National Museum of Ireland (NMI) issued under Section 14 of the National Monuments Acts 1930–2004.

Consulting Engineers – ARUP Consulting Engineers

Project Engineer – Mike Evans
Engineer – Gráinne Wolfe

Kildare County Council, National Roads Design Office

Senior Executive Engineer – Adrian King
Project Archaeologist – Sylvia Desmond
Engineer – Damian McGinnity

Laois County Council

Executive Engineer-Brenda Cuddy
Liaison – Sarah Dunne

National Monuments, Department of the Environment, Heritage and Local Government

Chief Archaeologist – Brian Duffy
Archaeologist – Martin Reid

Irish Antiquities Division, National Museum Of Ireland

Keeper - Nessa O Connor
Assistant Keeper – Isabella Mulhall

NON TECHNICAL SUMMARY

The proposed M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme consists of approximately 41km of motorway and 11km of single dual carriageway commencing to the southwest of the existing Portlaoise Bypass and running in a southern direction tying into the existing N8 at Oldtown. A portion of the scheme runs to the west tying into the existing N7 near Borris-in-Ossory. The Archaeological Works contract is subdivided into three separate contracts. Contract 2 consists of 11 km of motorway which extends east-west from Aghaboe to west of Borris in Ossory through the townlands from Coolfin to Derrinsallagh and Townsparks. The following report describes the results of archaeological excavation along one section of the planned M8 Portlaoise to Castletown Motorway Scheme, at Derrinsallagh 1, County Laois, Contract 2.

The site was identified during archaeological testing carried out by Linda Clarke of Archaeological Consultancy Services Ltd in March – May 2005. One trench was excavated within this field and a number of potential archaeological features were identified. The site was designated Derrinsallagh 1.

Archaeological resolution of Derrinsallagh 1 was carried out in October 2005 by Anne Marie Lennon. For recording purposes, the site was designated the scheme no A015/067 and record no E2177. Topsoil stripping on this site revealed archaeological features. These features included a small complex of pits and a hearth/furnace associated with iron working. The activity at this site dated from the Medieval Period (See Appendix 8.3). One sherd of modern delph was retrieved from this site.

CONTENTS

8. Appendices

List of Figures

List of Plates

1. INTRODUCTION

1.1 Site Location

This report details the results of the archaeological excavation of a site on the M7 Portlaoise – Castletown/M8 Portlaoise-Cullahill Motorway Scheme at Derrinsallagh 1, Contract 1, County Laois (Ordnance Survey six-inch sheet 21; National Grid Co-ordinates 224782, 186230; Figures 1–6). The site at Derrinsallagh 1 was situated south of Borris in Ossory village. It was located between Chainage 1950-200 of the proposed scheme, in the townlands of Derrinsallagh and Doon and within the Parish of Aghaboe.

1.2 Scope of the Project

The purpose of the Archaeological Services Project was to conduct Archaeological Site Investigations within the lands made available for the scheme and to assess the nature and extent of any new potential archaeological sites uncovered (Phase 1). This phase of the project was carried out in March-June 2005 and throughout 2006 when access to land became available. The principal aim of this phase of the project was to test the known sites, including sites of potential identified in the EIS and through aerial photography. It sought to test for any previously unknown sites that may by virtue of their size or complexity lead to significant delays and costs if revealed during construction works. This phase of the project also tried to assess the archaeological risk across the scheme by examining the volume, range, complexity and distribution of archaeology identified during testing.

The second phase of the project involved the resolution of all archaeological sites identified within the proposed road corridor prior to commencement of the construction of the motorway (Phase 2). The aim of this phase of works was to clear the entire route of archaeology in order to avoid delays and costs during construction works. This phase of the project was carried out from July 2005-October 2006 and excavations were conducted by seven licensed directors under the management of a Senior Archaeologist, Deirdre Murphy. In total, ninety-two sites were excavated during this phase of works and all excavations were given separate record numbers issued by The Department of the Environment, Heritage and Local Government.

Following completion of fieldwork a programme of post-excavation analysis was necessary as reports on the archaeological findings must be published. A dissemination strategy also forms a crucial part of this phase of the project. It is proposed that all final reports will be submitted to the relevant authorities by March 2009 and that publication and public

lectures/seminars will follow thereafter. Both the format and timescale for publication and seminars will be decided in consultation with the Project Archaeologist.

1.3 Circumstances of Discovery

An archaeological assessment of this site was carried out in advance of the construction of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, on behalf of Laois County Council by Linda Clarke. The site was identified during archaeological testing carried out by Linda Clarke of Archaeological Consultancy Services Ltd in March – May 2005. One trench was excavated within this field and a number of potential archaeological features were identified. The site was designated Derrinsallagh 1.

1.4 Date and Duration of Excavation Works

Excavation of this site was undertaken from 10th October 2005 - 21st October 2005.

1.5 Size and Composition of the Excavation Team

The excavation team was composed of:

One director
One supervisor
Four archaeological assistants

2. RECEIVING ENVIRONMENT

2.1 Detailed Overview of the receiving environment (Information was provided by Niall Kenny on behalf of Anne Marie Lennon)

2.1.1 Topographic

The sites at Derrinsallagh (1-5) are located in an area in Co. Laois where grey-brown podzolic (medium textured, moderately deep) soils are prevalent (Feehan 1983, 90-3). The grey-brown podzolic soils are among the best soils in Ireland. The soils in this area are medium textured, well-drained, friable podzolics and are especially good for tillage farming, although these soils are also highly suitable for grass production and grazing (Feehan 1983, 92). However, there are frequent pockets of rough and unproductive gley soils in the areas around Derrinsallagh and Derryvorrigan especially to the south and south-west of Derrinsallagh 4 and the low-lying area to the north of Derryvorrigan 1 and 2. These less fertile soils are much wetter and are not good for tillage and crop husbandry and at best are only suitable for rough summer grazing (Feehan 1983, 93-4). We know from the 1st and 3rd Edition OS Maps that this rough and unproductive boggy land was much more prevalent in the past and that the boggy areas to the south-west of Derrinsallagh 4 and north of Derryvorrigan 1 and 2 were more extensive in the past.

The location of the site of Derrinsallagh 4 in particular, but also the other recently discovered sites associated with metal-working and iron production (Derrinsallagh 1, 5 and Derryvorrigan 1 East), in close proximity to patches of bogland with free-flowing streams and oak abundant woodlands is quite significant. The integral use of oak wood in charcoal production and the important exploitation of locally available bog-iron ores will be discussed in detail later on in the report, but these factors would no doubt have had a major influence in the siting of these iron-producing sites.

2.1.2 Archaeological

Five areas or sites of archaeological activity were uncovered in Derrinsallagh as a result of the archaeological investigations along the proposed route of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme in this townland. The five sites have been termed Derrinsallagh 1, Derrinsallagh 2, Derrinsallagh 3, Derrinsallagh 4 and Derrinsallagh 5. At Derrinsallagh 1, four pits associated with iron working along with two accompanying postholes were uncovered at this site. It seems to represent medieval iron-production/working activity, possibly smelting or smithing (or even both), however the full extent of the site is not

known, as it appears to extend outside of the road-take. At Derrinsallagh 2, a stone lined keyhole-shaped corn-drying kiln with charred plant remains was uncovered and excavated at this site. Forty-four pits associated with metal-working (bowl/or low shaft furnaces) were uncovered at this site (Lennon 2007b). Five possible charcoal producing kilns were also found at Derrinsallagh 4. At Derrinsallagh 5, one bowl furnace, ten pits and ten postholes/stake-holes as well as a curvilinear feature were uncovered.

The main of activity identified at Derrinsallagh 3 undoubtedly represents the remains of an early medieval ringfort site. The morphology, size, characteristic features (Ditch dimensions, entrance towards the east, occurrence of rotary quern etc), landscape and topographical setting all seem to indicate that this was in fact an early medieval enclosure site more commonly known as a ringfort (Stout 1997). There is not a very high density of ringforts or enclosures in the immediate area around Derrinsallagh and quite notably not one ringfort/enclosure or circular earthwork occurs within 2.3km of the Derrinsallagh 3 complex. Within the c.3km study area taken around Derrinsallagh 3, there were three monuments that have been classified as 'ringforts' and five monuments that have been classified as 'enclosures'. Three of the five enclosure sites could quite possibly be ringforts. The three enclosure sites of interest (LA021-022----; LA021-025----; LA022-015----) and the three ringfort sites are all very similar in nature; they are circular or sub-circular in shape and tend to be defined by banks with external fosses. The average diameter of these monuments is between 35-40m with some variation. One ringfort (LA021-024----) has evidence of an original entrance at the southeast while another ringfort (LA021-030001-) has evidence for a possible original entrance at the east. This is reminiscent of the entranceway occurring in the E at the site of Derrinsallagh 3. Including the recently uncovered site of Derrinsallagh 3 and the possible ringfort in the townland of Clonagooden, there is a total of eight ringforts within the 3km study area taken around the site of Derrinsallagh 3.

These eight 'enclosure-like' circular and sub-circular sites c.40m in diameter seem to represent what was the secular early medieval settlement of the surrounding landscape. These sites primarily functioned as domestic settlements and farms and so tend to be located in more fertile and arable land (Edwards 1990, 19), perhaps this can possibly explain their distribution in the surrounding areas around Derrinsallagh. The secular settlement in the surrounding areas appears to be scattered although more densely concentrated c.2km to the southwest of Derrinsallagh in the Killasmeestia, Clonlahy and Newtown or Skirk areas. However, we do know that there is a history of a ringfort in the townland to the west of Derrinsallagh and also that according to the folklore evidence, there is a history of local interference and removals of ringfort bushes and features in the area. This raises the question of whether the current

distribution pattern is anything like what the original picture would have been. The hills in other parts of Co. Laois have numbers of ringforts scattered on their lower slopes (i.e. in the Ballyquaid Glebe/ Newtown or Skirk area to the west of Derrinsallagh). Perhaps the absence of any surviving ringforts on the lower slopes of Knockseera and Sentryhill can be explained by the fact that these areas were likely to have been more intensively farmed over the years owing to the soils being better drained and that the destruction of monuments was more widespread in this area. Another factor, which may help explain the more slightly concentrated distribution of ringforts to the southwest of the Derrinsallagh area, is that the hill of Knockseera was the site of a possible early ecclesiastical foundation. This foundation spread across parts of Knockseera hill and consisted of a church, graveyard, holy well, holy bush and altar site. The foundation was associated with St. Kieran and may also have been associated with the pilgrims' route, which traversed the landscape and ran eastwards to the sites of Lismore and Aghaboe.

2.1.3 Historic

The prehistoric period is generally under-represented in relation to the later medieval periods, perhaps a reflection on the problems inherent in identifying prehistoric sites in the modern landscape than an actual archaeological truth. It is also an expression of how the physical geography of the region since the last glacial period has affected human settlement within the county when later communities settled and developed sites that may have previously been settled by prehistoric groups with the earlier archaeological sites being effectively removed by later domestic, industrial or agricultural activity, from the medieval period to the present. The Mesolithic period is currently unrecorded in Laois, but it is unlikely that early hunter-gatherers didn't utilise the rich post-glacial environment as they did at Lough Boora, County Offaly. As the transition from a subsistence economy to cereal cultivation and livestock rearing was made during the fourth millennium BC, large tracts of forest cover were cleared, permanent settlements were established, pottery was first used, and elaborate burial rites were developed. The numerous eskers which cross the county provided well drained, easily worked soils for agricultural purposes, however the widespread clearance of the woodland cover, coupled with a climatic deterioration, led to a prolonged period of bog growth that covered much of Slieve Bloom. Neolithic ritual sites and artefacts are known from the county; however settlement sites have yet to be identified. A similar situation exists for the Bronze Age and Iron Age, whereby certain types of sites are known but actual settlement evidence is non-existent or uncommon.

Early Medieval Ireland was divided into five provinces known as *cóiceda* or fifths. In the early medieval period, Laois essentially marked the boundary between the Laigin and the Osraige, in essence the boundary between Leinster and Munster. It was in this region that the greater political manoeuvrings of the seventh and eighth centuries played out, as the opposing dynasties of the Uí Neill and Eóganachta vied for supremacy with terrible consequences for the Laigin. Although they remained locally important, their territory was reduced to a fraction of their former kingdom, comprising a small section of the current county. Archaeologically, this was the period in which ringforts and monasteries were first constructed. Monasteries, such as those at Timahoe and Aghaboe among others, would become important centres of trade and learning taking on the appearance, and performing many of the functions, of towns.

In AD1169, Laois was settled by the Anglo-Normans, led by Maurice de Prendergast, acting in association with the Osraige. During the subsequent colonisation, ringworks, motte and baileys, moated sites and stone castles were constructed; perhaps the most important fortification being the castle atop the Rock of Dunamase. The Anglo-Normans founded at least three boroughs but were rather unsuccessful and never fully developed as urban centres. Indeed, it wasn't until the plantations of the fifteenth century that any attempts at town planning succeeded with the establishment of Portlaoise and Ballinakill. The remaining towns and villages of the county date mainly to the eighteenth century and include Mountrath, Portarlington, Rathdowney, Mountmellick, Abbeyleix and Stradbally.

3. RESEARCH FRAMEWORK

The research framework for Derrinsallagh 1 will address the following topics

(i) The construction date or date of initial site occupation/use

(ii) The absolute/relative chronology of site use in terms of periods, levels, phases, sequences and events

(iii) The date of site abandonment

(iv) The extent of the archaeological site/activity

(v) The location and distribution of known contemporary sites in the local, regional and national (and international, if appropriate) context.

(vi) The extent of the viable (local/regional) economic catchment area, i.e. the nearest viable contemporary sources of water, food, raw materials, centres of trade, transportation routes, etc.

(vii) The nature and composition of the archaeological finds, features, layers and deposits on site.

(viii) The phases of activity on site

(ix) The nature and phases of construction, use, repair and abandonment of the site.

(x) What cultural group/unit would have occupied the site

(xi) What their material culture would have been

(xii) Why the site location would have been chosen

4. EXCAVATION RESULTS

4.1 Excavation Methodology

Excavation was carried out between 10th and 21st October 2005 under Ministerial Direction Number A015/067. Topsoil stripping on this site was carried out by means of a twenty tonne mechanical excavator equipped with a grading bucket. Spoil was managed by a dumper and was stored on archaeologically sterile areas within the limits of the site. The recording techniques employed were based on a recording system that best suits a rural environment. All potential archaeological features exposed were cleaned, recorded (by plan, photographs, levels, feature sheets etc.) and removed by hand excavation. The site was recorded using multi-context planning of all features exposed. An appropriate sampling strategy was employed. Any finds were washed (where appropriate), treated and catalogued on site and left ready for any further post excavation analysis deemed necessary. They were numbered according to the requirements of the National Museum of Ireland from 1 to 99 according to record number and feature number, i.e. E2177:3:1 represents find number 1 within feature number 3 in Derrinsallagh 1 which was excavated under record number E2177. Unless otherwise stated, the features have been measured length-width-depth. All measurements are in metres. Upon completion of excavation all cuttings were surveyed using GPS equipment and only areas within the CPO were resolved.

4.2 Full Stratigraphic Report

4.2.1 List of features

C001 Topsoil

C002 Natural subsoil

C003 Cut of sub-circular pit filled with C008

C004 Cut of linear furrow southwest of pit C003

C005 Cut of linear furrow north of C003

C006 Cut of oval shaped pit filled with C009 & C010

C007 Layer/deposit over C003

C008 Fill of C003 pit

C009 Upper fill of C006

C010 Lower fill of C006

C011 Cut of oval shaped pit filled with C012, C013, C023

C012 Upper fill of C011

C013 Lower fill of pit C011

C014 Cut of furrow

C015 Cut of furrow

C016 Semi-circle of stones within C025

C017 Fill of C025

C018 Cut of posthole/stakehole on edge of pit C003

C019 Outcrop of bedrock

C020 Secondary fill situated between stone setting within C025

C021 Non archaeological

C022 Non archaeological

C023 Middle fill of/Layer of clay in C011

C024 Fill of C025

C025 Cut of hearth filled with C016, C026, C017, C020, C024

C026 Lower fill of C025

C027 Cut of posthole filled with C028

C028 Fill of C027

4.2.2 Stratigraphic Matrix

Natural Deposit

C001	Topsoil: Consisted of light-mid brown sandy clay. Occasional charcoal flecking included. This layer was removed by machine exposing the underlying features.
C002	Subsoil: Into which all features were cut

Period 2 Phase 1:

Hearth/Furnace

C025	Sub-rectangular shaped hearth: measuring 3.80m NE/SW x 2.40m x 0.25m. Had a sharp break of slope by the bedrock, steeply sloping sides and a rounded base. Truncated by furrow C004 & posthole C027. Filled with C016, C017, C020, C024 and C026. Above C002, below C016, C024 & C027.
C016	Arc of limestone stone used for a hearth or fire setting. Averaged 0.20m x 0.10m in size. Above C025, below C017.
C026	Lower fill of C025 to the northeast, with a small pocket of softly compacted re-deposited yellow clay. No other inclusions noted. Measured 0.60m x 0.20m x 0.08m. Located beside the bedrock at the northeast side of the hearth, below C017.
C017	Fill of C025, with compact mid brown silty clay. Frequent charcoal fragments, oxidized clay flecking and iron slag included. Measured 0.50m x 0.35m x 0.12m. Above C016 & C026, below C007, C020.
C020	Secondary fill of C025, located in and around stone setting C019. Comprised softly compacted greyish black silt (See Appendix 8.2). Frequent charcoal flecking and a moderate amount of slag pieces included. Measured 1.40m x 1.16m x 0.15m. Above C017 (C019), below C007, C024.
C024	Pockets of fill in C025, with softly compacted grey silt. Frequent pieces of charcoal and iron slag included. Above C024, C025 & C028, below C007.

Pit C003

C003	Cut of sub-circular pit. Measured 1.27m x 1.27m x 0.08m. Had a gradual break of slope at the top, slightly concave sides and a gradual break leading to a gradual break leading to a slightly rounded base. Filled with C008. Truncated C011. Contained stakehole C018. Above C012, below C018.
C008	Fill of C003, with softly compacted black silt. A high concentration of charcoal flecking and frequent iron slag included (See Appendix 8.1).

	Measured 1.27m x 1.27m x 0.08m. Above C018, below C007.

Pit C011

C011	Cut of oval shaped pit. Measured 2.15m NE/SW x 1.07m x 0.22m. Had a sharp break of slope at the top, steeply sloping sides and a gradual break leading to a rounded base. Filled with C012, C013, C023. Above C002, below C013.
C013	Lower fill of C011, with loosely compacted black silt (See Appendix 8.2). Frequent charcoal flecking included. Above C011, below C023.
C023	Middle fill of C011, with compacted yellow clay. No other inclusions noted. Measured 2.15m x 1.07m x 0.04m. Above C013, below C012.
C012	Upper fill of C011, with compact mottled orangey brown silty clay. Frequent charcoal flecks and oxidized clay included. Measured 2.15m x 1.07m x 0.07m. Above C001, below C023.

Pit C006

C006	Cut of oval shaped pit. Measured 1.28m NS x 2.18EW x 0.27m. Had a sharp break of slope to the south; gradual to the north, concave sides and a sharp break to the south; gradual to the north leading to a rounded base. Filled with C009, C010. Above C002, below C010.
C010	Lower fill of C006, with compact grey/black sandy silt. Frequent charcoal flecking included. Measured 2.18m EW x 1.28m x 0.21m. Above C006, below C009.
C009	Upper fill of C006, with compact yellow clay. Frequent charcoal flecking included. Measured 1.28m NS x 2.18m x 0.06m. Above C010, below C001.

Posthole/Stakehole

C018	Cut of circular posthole/stakehole. Measured 0.09m x 0.09m x 0.16m. Had a steeply sloping sides and a flat base. Filled with loosely compacted black silt. Frequent charcoal flecking included. Cut into the base of C003. Above C003, below C008.

Posthole

C027	Cut of sub-rectangular posthole. Measured 0.20m x 0.17m x 0.15m. Had a sharp break of slope at the top, concave sides and a sharp break leading to a U-shaped base. Filled with C028. Cut into the base of hearth C025. Above

	C025, below C028.
C028	Fill of C027, with softly compacted grey silty clay. No other inclusions noted. Measured 0.20m x 0.17m x 0.15m. Above C027, below C024.

Sealing Layer

C007	Sealing layer consisting of compact mid orangey/brown layer of clay. Frequent charcoal flecking included. Measured 0.22m deep and covered several features including C003 & C025.

Period 3 Phase 1:

Furrow 1

C004	Linear furrow extending northeast-southwest. Measured 1.35m x 0.46m x 0.09m. Had a gradual break of slope at the top, gradually sloping sides and a gradual break leading to a rounded base. Filled with loosely compacted brown silty clay. Occasional charcoal flecking included. Above C002, below C001.

Furrow 2

C005	Linear furrow extending northwest-southeast. Measured 1m x 0.40m x 0.09m. Similar to C004 in profile (Had a gradual break of slope at the top, gradually sloping sides and a gradual break leading to a rounded base). Filled with compact mid brown silty clay. Charcoal flecks included. Above C002, below C001.

Furrow 3

C014	Linear furrow that extended across the north of the site in an east-west direction. Measured *c.*7m x 0.27m x 0.09m. The furrow was U-shaped. Filled with compact mid brown sandy silt. Above C002, below C001.

Furrow 4

C015	Linear plough furrow that extended in a northeast-southwest direction. Measured 1.14m x 0.40m x 0.09m. Filled with compact mid brown silty clay. Occasional charcoal flecking included. Above C002, below C001.

4.2.3 Stratigraphic Sequencing

Table … Stratigraphic Groups		
Site Name: Derrinsallagh 1		**Record No.: E2177 – Scheme No.: A015/067**
Period	**Phase**	**Composition**
I	1	Natural subsoil (post-glacial geological depositions)
II	1	High Medieval period: Initial clearance of site and cutting of pits
	2	Abandonment of site and final deposition of C007
III	1	Formation of topsoil

This report details each unit in the stratigraphic sequence, starting with the earliest.

Period 1

Environmental stabilisation/Subsoil formation (10,000BC-2000BC)

Period 2 High Medieval Period

Phase 1

The use of the site for industrial activity in the form of small scale iron working pits and a hearth.

Period 3

Modern Agricultural Activity and Sod Formation

Prior to the excavation of the site, this field was used for pasture. During excavation several Post Medieval furrows were excavated likely to represent an intensive phase of farming in the nineteenth century.

4.2.4 Stratigraphic Discussion

Period 2, Phase 1

A small complex of iron working pits was uncovered and excavated at this site (Figs. 8, 9 and 10). The complex consisted of a hearth/furnace C025, pits C006, C003, C011, one posthole C027, and stakehole C018. The hearth C025 was sub-rectangular in outline, measuring 3.80m NE/SW x 2.40m x 0.25m (Plates 1 & 2). The sides of the hearth were sharp and the base was rounded. The hearth utilized a natural outcrop in the bedrock (C019) to create the sharp sides and also to delimit the edges. Broken limestone bedrock C016 was used to form an arc of stones delimiting the north eastern edges of the hearth. The hearth was filled with C017, C020, C024 and C026. Context 017 consisted of compact mid brown silty clay that contained frequent inclusions of charcoal flecking, pieces of iron slag and oxidized clay flecking. C020, the secondary fill of the hearth was located in, and around stones, delimiting the stone setting.

The deposit comprised softly compacted greyish black silt that contained frequent charcoal flecking and a moderate amount of slag pieces. Pockets of re-deposited softly compacted grey silt C024 that contained frequent pieces of charcoal and iron slag were found throughout. C026, a lower fill in the northeast side comprised a small pocket of softly compacted re-deposited yellow clay that contained no inclusions. To the north of the hearth were two inter-cutting pits. The earlier pit C003 was circular in outline, measuring 1.27m x 1.27m x 0.08m. The sides of the pit and base were slightly concave. It was filled with C008 softly compacted black silt that contained a high concentration of charcoal flecking with frequent inclusions of iron slag (Plate 3). C003 was truncated by second pit C011. This pit was oval in shape, measuring 2.15m NE/SW x 1.07m x 0.22m. The sides were steep and the base was rounded (Plate 4). It was filled with C012, C013 and C023. The upper fill C012 consisted of compact mottled orangey brown silty clay that was flecked with frequent charcoal inclusions and oxidized clay. The middle fill C023 consisted of compacted yellow clay that had no inclusions and the lower fill C013 comprised loosely compacted black silt that contained frequent inclusions of charcoal flecking. Extending over the upper fill of the hearth and pit C003 was a layer of compact mid orangey/brown clay, C007 that contained frequent inclusions of charcoal flecking. The layer was 0.22m deep and covered the northwest of the site. Cut into the base of pit C003 was a stakehole C018. The stakehole measured 0.09m x 0.09m x 0.16m. The sides had a steep gradient and the base was flat. It was filled with loosely compacted black silt that contained frequent inclusions of charcoal flecking. Cut into the base of the hearth C025 was a small posthole C027. The posthole was sub-rectangular, measuring 0.20m x 0.17m x 0.15m with concave sides and a U-shaped base. It was filled with C028 softly compacted grey silty clay that had no inclusions. The posthole and stakehole may have been used as a wind break for a large oval pit to the east. This pit C006 was oval shaped, measuring 1.28m NS x 2.18EW x 0.27m (Plates 5 & 6). The sides had a gradual slope and the base was rounded. It was filled with C009 compact yellow clay that contained frequent inclusions of charcoal flecking and lower fill C010 compact grey/black sandy silt that contained frequent inclusions of charcoal flecking.

4.2.5 Stratigraphic Conclusion

The composition of the various features on this site suggests that this was a small area of industrial activity that comprised several pits and one hearth/furnace used for iron working (Appendix 8.4) dating from the Medieval Period; the 14th-15th century (Appendix 8.3). It may well represent a single phase of activity as no associated structural features were uncovered. However, it has to be noted that this site was located close to edge of the road take and it is possible that other associated features may lie beyond the road take.

4.3 Artefactual Material

4.3.1 Pottery

Pottery Archive					
Record: Context: Find number	**Period**	**Completeness**	**Artefact type**	**Condition**	**Comments (decoration etc)**
E2177	Modern	Sherd	Delph	Good	White glazed

4.4 Environmental Evidence

4.4.1 Wood ID analysis

See Appendix 8.1

Site	E number	Feature type	Context	Sample no	Date	Identification	Comment
Derrinsallagh 1	E2177	Pit	F008	4	1390-1460AD Medieval	Oak (0.1g, 3f) Hazel (2.9g, 50f) Pomoideae (0.1g, 2f)	

4.4.2 Botanic

Soil Flotation Results			
Context No.	**Sample No.**	**Weight prior to flotation**	**Quantities of material recovered**
7	1	0.270kg	0.021kg
8	4	4.00kg	0.028kg
8	3	0.441kg	0.37kg
10	7	1.665kg	0.068kg
13	8	2.800kg	0.145kg
13	10	1.583kg	0.133kg
13	9	0.280kg	0.097kg
18	14	0.616kg	0.0kg
20	24	2.400kg	0.102kg
20	18	0.398kg	0.018kg
24	21	0.338kg	0.021kg

8 & 17	2	0.578kg	0.025kg
27	23	1.244kg	0.0kg

4.4.3 Slag analysis

See Appendix 8.4

4.4.4 Environmental analysis

See Appendix 8.2

Context		13	20
Sample		10	24
Material available for C14 dating		✓	✓
Flot volume (ml)		550	300
Flot matrix (relative abundance)			
Burnt stone		-	1
Charcoal		5	5
Culm node (charred)		-	1
Charred remains (total number)			
(a) *Raphanus raphanistrum* (Wild Radish)	pod frag.	-	1
(c) *Avena* spp (oat species)	grain	13	39
(c) *Triticum* cf. *aestivum* (cf. Bread Wheat)	grain	17	150
(c) Cerealia indeterminate	grain	1	11
(t) *Corylus avellana* (Hazel)	nutshell frag.	-	21
(x) *Vicia* spp (vetch)	seed	-	2

4.5 Dating Evidence

See Appendix 8.3

Two radiocarbon dates were returned for this site. The first was obtained from a sample taken from C017, the fill of hearth/furnace C025. It returned a date of early 14th-15th century (2 SIGMA CALIBRATION: Cal AD 1320 to 1340 (Cal BP 630 to 600) AND Cal AD 1390 to 1440 (Cal BP 560 to 510)). The second was taken from fill C008, of pit C003 (Cal AD 1390 to 1460).

5. DISCUSSION

The site dates from the Medieval Period and comprises a series of small industrial pits and a hearth/furnace used for iron working. The pits and hearth all contained pieces of iron slag residue from the production of iron bloom. Iron working from an earlier period has been found within the same townland at Derrinsallagh 4 and 5. The continuation of iron working into the Medieval Period within the area would suggest a local source for the ore that was being exploited for over millennium. The basic principles used in early iron working did not change much over this period. It was not until the introduction of the more sophisticated blast furnaces in late Medieval Period that large scale iron production took place.

6. CONCLUSION

This site has been adequately archaeologically assessed and resolved. There are no other archaeological features within the limits of the roadtake.

7. BIBLIOGRAPHY

7.1 References

Bennett, I. (1989) 'The settlement pattern of ringforts in county Wexford', *JRSAI*, 119, 50-61.

Clarke, L. (2005), *Report on the archaeological assessment of Testing Area 13, Co. Laois*, unpublished report prepared on behalf of ACS Ltd

Edwards, N. (1990) *The Archaeology of Early Medieval Ireland*, London: Routledge.

Evans, Emyr Estyn, (1957), *Irish folk ways*, London Routledge, 123

Feehan, J. (1983) *Laois: an environmental history*, Stradbally: Ballykilcavan Press.

Kelly, F (1998) *Early Irish Farming: a study based on the law-texts of the 7th and 8th centuries A.D.*, Dundalk: Dundalgan Press.

Kenny, N, (2007), *On the Early Medieval Landscape and the recent archaeological discoveries in the townland of Derrinsallagh, "Ringforts and Kilns"*, unpublished report prepared on behalf of ACS Ltd

Lennon, A.M. (2007a) *Preliminary Report on Excavations at Derrinsallagh 3, Co. Laois*, unpublished report prepared on behalf of ACS Ltd

Lennon, A.M. (2007b) *Final Report on Excavations at Derrinsallagh 2, Co. Laois*, unpublished report prepared on behalf of ACS Ltd

Lennon, A.M. (2007c) *Preliminary Report on Excavations at Derrinsallagh 1, Co. Laois*, unpublished report prepared on behalf of ACS Ltd

Stout, M. (1997) *The Irish Ringfort*, Dublin: Four Courts Press.

Sweetman, D.P., Alcock, O., Moran, B., 1995, *The Archaeological Inventory of Co. Laois*, The Stationary Office, Dublin.

Waddell, J. (1998) *The Prehistoric Archaeology of Ireland*. GUP: Galway.

7.2 Other Sources

Environmental Impact Statement, M7 Portlaoise-Castletown & M8 Portlaoise-Cullahill Road Scheme, Volume 7, Appendix 3.5.1, Archaeology, Architecture and Cultural Heritage Report. Prepared by Margaret Gowen & Co

Record of Monuments and Places (RMP), The Department of the Environment, Heritage and Local Government, 7 Ely Place Upper, Dublin 2.

Topographical Files of the National Museum of Ireland, Kildare Street, Dublin 2

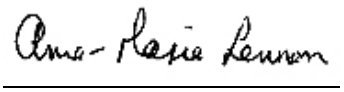
7.3 Cartographic Sources

1839 1st edition Ordnance Survey Map

1891 2nd edition Ordnance Survey Map

1909 Ordnance Survey Revision edition RMP map

Signed:



Anne-Marie Lennon

Licensed Archaeologist

April 2009

8. APPENDICES

8.1 Appendix 1: Wood Identification analysis report

Derrinsallagh 1, M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co Laois, Ireland

Species identification of charcoal samples

September 2008

Ellen OCarroll MA DIP. EIA MGT

Archaeological Consultancy & Wood Specialist

8 Cumberland Street, Dun Laoghaire, Co. Dublin

Contents

1. Introduction

Three thousand eight hundred and ninety seven charcoal fragments from one hundred and four contexts relating to twenty seven archaeological sites were analyzed from excavations along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill motorway scheme, contract 2. Thirty four wood samples from Middle and Late Bronze Age *fulacht* sites and wooden troughs were also analyzed within the framework of these studies. Contract 2 covers a length of approx 13 km and includes numerous *fulacht fiadh* sites, charcoal production pits, bowl furnaces, cremation pit, linear feature, hearths, burnt spread, wells, kilns, pits, postholes and one ring gully.

In recent years, a considerable amount of structural as well as non-structural wood and charcoal has been recovered from archaeological deposits in Ireland. Wood was a vital and widely used raw material from prehistoric to medieval times although its importance is rarely reflected in the analysis of archaeological assemblages mainly due to its perishable nature. It is important to note that people in prehistoric, Early Christian and medieval communities were mainly dependant on woodland resources for the construction of buildings, for the manufacture of most implements and for fuel for wood-burning activities. The woods in a surrounding catchment area were exploited and often managed to provide an essential raw material for the community. A study of the range of species on an archaeological site offers an indication of the composition of local woodland in its period of use and any selection policies for particular species at any given time and place.

Large assemblages of wood and charcoal from the numerous road schemes currently under excavation, and subsequent analysis of the sampled wood and charcoal is currently on-going in Ireland. Although relatively little of the charcoal and wood analysis carried out from these analyses has been published, one recent publication includes the gas-pipe line to the west which is used for comparative purposed in this report (Grogan *et al*. 2007).

Analysis of timbers can provide information on two different levels. These can be seen as the structural and constructional aspects gained from studying the timbers as 'timber' and also the environmental and dendrochronological aspects gained from a study of the timber as 'wood'. From preliminary analysis of some of the work in progress on the wood assemblages it is clear that oak was the most common species used for wall-posts and planks, hazel was preferred for wattle structures and species such as pomoideae, ash, willow, alder, birch and holly were utilised for a variety of other structural requirements. Alder, ash and oak are the most frequent species used in the construction of plank-lined troughs while hazel and ash are selected for wattle posts also used in the construction of wattle troughs.

The analysis completed from the wood and charcoal excavated along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme will add important information to the rapidly expanding database of environmental indicators particularly in relation to the Neolithic, Bronze Age and Medieval periods in the area. This area of work is especially important in Ireland where there are no written records up to the 18th century relating to the amount and type of woodland in Ireland (McCracken 1971, 15).

The analysis of charcoal can also provide information on two different levels. Charcoal analysis is an important component of any post-excavation environmental work as it can help in re-constructing an environment hitherto lost, although this must be done with caution as sufficient sample numbers and fragments counts are required for a complete and full understanding of the immediate environment. Keepax suggests 50 samples in a European temperate climate. Charcoal is also analyzed and identified to determine what species are used and selected for particular functions on site i.e. post-holes, wall posts, burnt remains of wattle and so forth. In summary, charcoals are excellent indicators of exploited environments and the vegetation that developed within them.

Results from the hundreds of *fulacht fiadh* which have been analyzed throughout Ireland with regard to species selection for fuel have shown that a wide variety of taxa are identified from

these assemblages, which may suggest that the inhabitants were selecting firewood from whatever trees and branches were closest to hand. Alder charcoal does sometimes dominate the *fulacht* assemblages but this is generally confined to the wetter areas of Ireland such as Mayo (O'Carroll, N5, 2007) and the midlands area of Ireland (O'Carroll, N6 KTK, 2008) highlighting the wetter environments in these particular areas of Ireland particularly during the Bronze Age. Oak and hazel was shown to be more frequently used at *fulacht* sites in Tipperary possibly highlighting the different terrain of more dryland areas and scrubland in the south of Ireland in the Bronze Age (O'Donnell, N8 2008).

The wood and charcoal assemblage analysed in this report covers both the Prehistoric and Medieval periods. Charcoal was analysed from a Neolithic pit at Derrinsallagh 3, numerous Bronze Age *fulacht* sites, early and Late Medieval charcoal production pits, a Late Bronze Age cremation pit from Derrinsallagh 3, the fill of an Iron Age well excavated at Bushfield 4, a Bronze Age fire hearth from Boherard 2, early medieval and high medieval kilns from Derrinsallagh 3, several un-diagnostic pits dating to the Bronze Age, Iron Age and Medieval periods, Middle and Late Bronze Age postholes and an early Medieval ring gully from Lismore/Bushfield 1.

The analysis presented here concentrates on species identification, species selection and the composition of the local woodland during the Neolithic, Bronze Age, Iron Age and Medieval periods along the route of Contract 2, M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme. Woodworking analysis was completed on timbers that contained evidence of tooling, which includes recording facets and jam curves and is sometimes a useful indicator of tool types being used on a given site at a given period. Split timber types, preserved point types, annual tree-ring counts and average growth rates of the trees that the wood was felled from was also noted and recorded. Each piece of wood was also examined for blade signatures.

2. Methods

The process for identifying wood, whether it is charred, dried or waterlogged is carried out by comparing the anatomical structure of wood samples with known comparative material or keys (Schweingruber 1990). A wood reference collection from the Botanical Gardens in Glasnevin, Dublin was also used.

Wood

Thin slices were taken from the transversal, tangential and longitudinal sections of each piece of wood and sampled using a razor blade. These slices were then mounted on a slide and glycerine was painted onto the wood to aid identification and stop the wood section from drying out. Each slide was then examined under an E200 Nikon microscope at magnifications of 10x to 500x. By close examination of the microanatomical features of the samples the species were determined. The diagnostic features used for the identification of wood are micro-structural characteristics such as the vessels and their arrangement, the size and arrangement of rays, vessel pit arrangement and also the type of perforation plates.

All of the wood excavated on each site was sampled for identification and further analysis. The wood samples were firstly washed and recorded on wood working sheets and were then identified as to species. Where appropriate, the samples were measured and described in terms of their function and wood technology. This included point types, split types and individual toolmarks such as facets and tool signatures.

The annual tree rings were counted partially under a microscope and partially by eye therefore it is only an approximate age. The annual tree ring counts for the split timbers do not give a real estimate of the age of the parent tree when it was cut down as splitting implies division and therefore only partial remains of the parent tree will survive. Average growth rates were also established. A fast growth rate is around 4mm per year. As different factors (weather and soil conditions) determine growth rates of trees and growth rates vary across each sample average growth rates were calculated for each sample.

Charcoal

The soil samples were processed on-site. The flots were sieved through a 250 micron or a 1mm sieve, while the retent was put through a 2mm or 4mm sieve. All of the charcoal remains from the soil samples were then bagged and labeled.

The identification of charcoal material involves breaking the charcoal piece along its three sections (transverse, tangential and radial) so clean sections of the wood pieces can be obtained. This charcoal is then identified to species under a universal compound microscope reflected and transmitted light sources at magnifications x 10 - 400. By close examination of the microanatomical features of the samples the charcoal species are determined.

The purpose of the charcoal identifications was two-fold. In some cases the identifications were carried out prior to C14 dating in order to select specific species for dating and in other cases the charcoal was analyzed for fuel selection policies and selection of wood types for structural use. Each species was identified, bagged together and then weighed. Insect channels were noted on the charcoal fragments identified as this may indicate the use of dead or rotting wood used for fuel or other such functions. The distinction can sometimes be made between trunks, branches and twigs if the charcoal samples are large enough. This was noted where possible. When charcoal samples showed indications of fast or slow growth this was also recorded. The samples identified for environmental reconstruction and wood usage were counted per fragment and then weighed. The smaller sample amounts with less than 50 fragments were all identified while 50 fragments were identified from the larger samples.

There are inherent problems in re-constructing the environment at the time of use of the site due to the low quantity of samples and charcoal fragments identified from the assemblages. Keepax concludes that, when working in a temperate climate, at least fifty samples should be identified from an archaeological site, to make it a viable charcoal study, with a minimum of 25 samples (Keepax 1988). Notwithstanding the charcoal sample numbers, it is clear that the charcoal results coupled with the wood analysis throw up some interesting results and trends in relation to wood selection and use and woodland cover in the Neolithic, Bronze, Iron and Medieval periods in Co. Laois.

A number of wood taxa cannot be identified to species or sub-species level anatomically. Sessile oak *(Quercus petraea)* and pedunculate oak *(Quercus robur)* are both native and common in Ireland and the wood of these species cannot be differentiated on the basis of their anatomic characteristics. English elm *(Ulmus procera)* and wych elm *(Ulmus glabra)* cannot be separated by their wood structure and identifications of elm are shown as *Ulmus* spp. There are also two species of birch (*Betula pendula* and *Betula pubescens*) and several species of willow therefore the identifications are given as *Betula* spp and *Salix* spp respectively. Within the family of Pomoideae it is impossible to distinguish between crab apple (*Malus sylvestris*), pear (*Pyrus communis*), hawthorn (*Crataegus* spp.) and mountain ash/rowan (*Sorbus aucuparia*).

3. Definitions of Element Types and woodworking terminology

Dates and timeframes

Neolithic	*4000-2500BC*
Early Bronze Age (EBA)	*c. 2500-1800BC*
Middle Bronze Age (MBA)	*1800-1000BC*
Late Bronze Age (LBA)	*1000-500BC*
Iron Age	*500BC-400AD*
Early Medieval	*400AD-1200AD*
High Medieval	*1200AD-1400AD*
Late Medieval	*1400AD-1600AD*
Post Medieval	*1600AD – 1900AD*

Constructional Elements

Brushwood:	Stems or rods measuring 6 cm or less in diameter.
Roundwood:	A piece of worked or unworked wood in the round and over 6 cm in diameter.
Vertical Stake/Post:	Upright brushwood or roundwood driven vertically or at an angle into the ground. Sometimes but not always used for stabilization.
Horizontal:	Brushwood, plank or roundwood laid flat on the ground.
Twigs:	Small shoots or branches measuring around 1 cm in diameter.
Split timber:	Wood converted from the round including planks, half splits and split pegs.

Woodworking terms and definitions

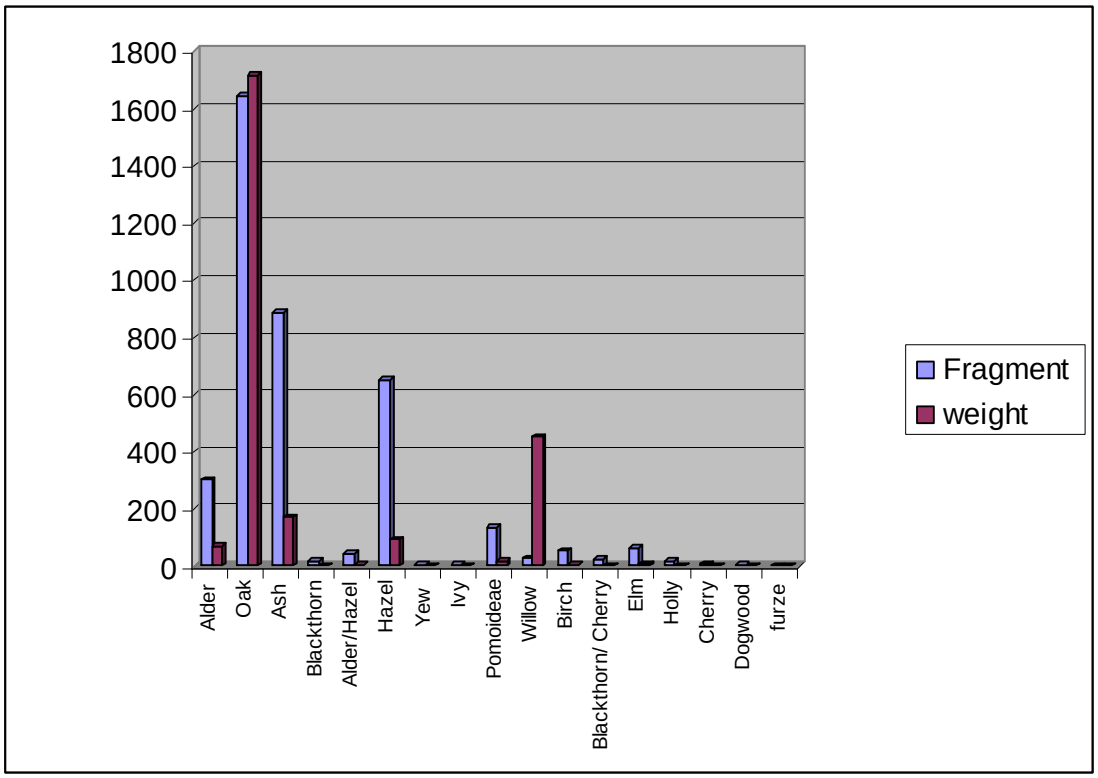
Chisel point:	The end of a piece of wood cut to a point on one single face.
Conversion:	The way in which the primary trunk has been split into smaller elements.

Facet:	The cut surface produced on a piece of wood by a tool blow. The blow can leave behind a particular signature if the cutting edge of the tool is flawed.
Facet junction:	The nature of the junctions between each facet was also assessed as to whether they were clean, ragged or stepped
Jam curves:	A complete toolmark on wood retaining the impression of the complete width of the blade used
Pencil point:	The end of a piece of wood cut to a point on multiple faces.
Signature:	A signature is an imperfection in a woodcutter's blade which is transferred onto the timber when the wood is cut. A negative impression or a groove is created where a flange of metal extends beyond the axe blade where as a positive or raised signature is created by a gap in the blade edge.
Wedge point:	The end of a piece of wood cut to a point on two faces.

4. Results & Analysis

Charcoal assemblage, all sites

Figure 1: All taxa identified from sites analysed. Weight in grams



Charcoal assemblage results at Derrinsallagh 1

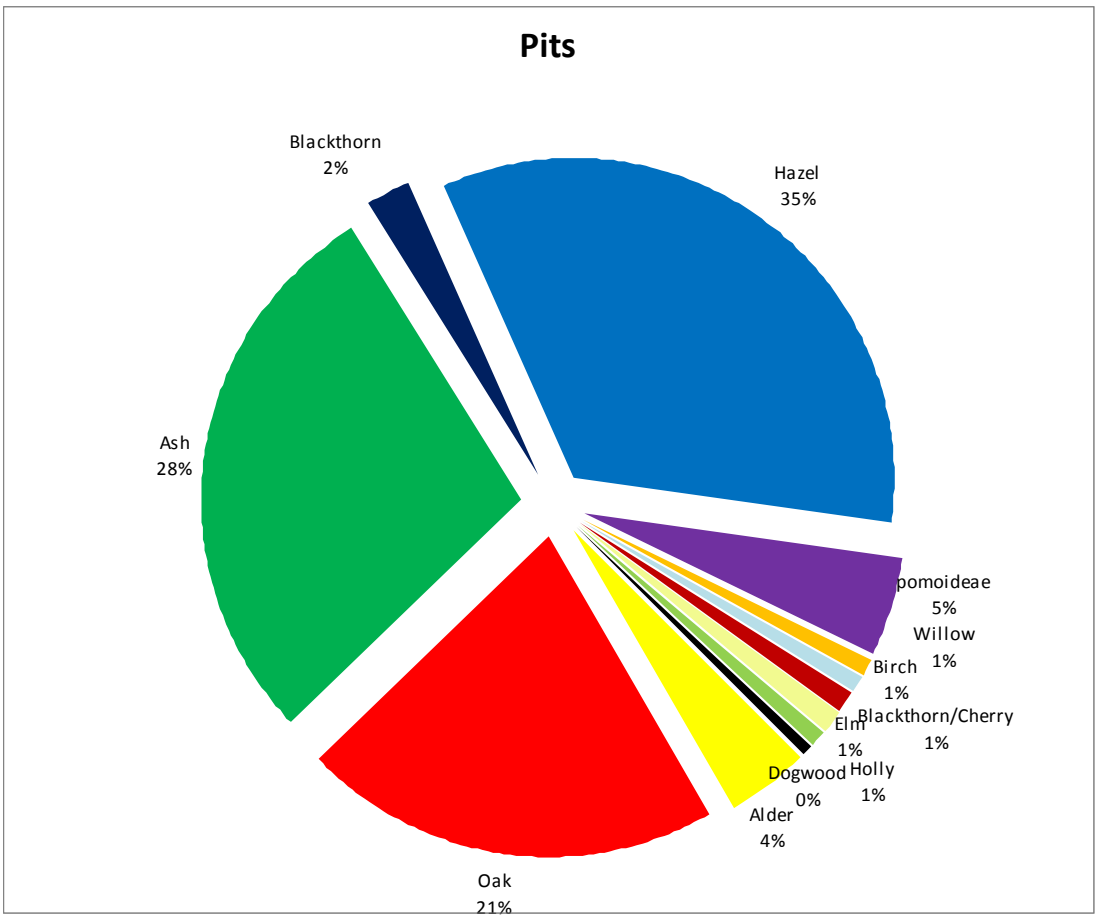
Derrinsallagh 1, fill of pit, Medieval

Table 1: Taxa identified from Derrinsallagh 1

Site	E number	Feature type	Context	Sample no	Date	Identification	Comment
Derrinsallagh 1	E2177	Pit	F008	4	1390-1460AD Medieval	Oak (0.1g, 3f) Hazel (2.9g, 50f) Pomoideae (0.1g, 2f)	

Hazel was the preferred taxon used at this enigmatic pit along with smaller quantities of oak and pomoideae. The pit is unlikely to be a charcoal production pit as the main taxon identified was hazel. It is difficult to attribute a function to the identified taxa as the function of the pit is unknown. Hazel may have been used either as wattle lining surrounding the trough or coppiced hazel may have been selected for fuel or charcoal associated with industrial activities.

Figure 2: Wood taxa identified from pits excavated along Contract 2



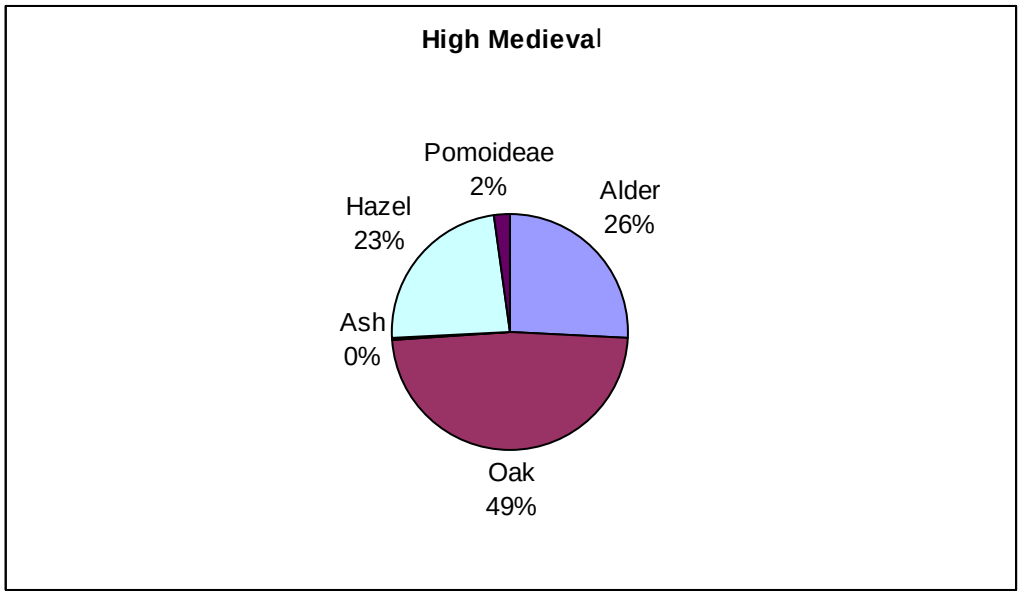
A variety of wood taxa were identified from the analysed pits excavated at Derrinsallagh 1, 2, 3 & 5, Derryvorrigan 1, Barnasallagh 1, Lismore/Bushfield 1, Bushfield 5, Shanboe 5 and Palmershill 1.

These pits are not associated with *fulacht fiadh* sites and are for the most part undiagnostic pits. The fact that oak does not dominate at these pits indicates that they were probably not single episodic events or used either as cremation pits or as charcoal production pits. The variety of taxa indicates that a range of wood taxa from a range of environments were being used at these pits although dryland taxa which include hazel, ash and oak are present in the

samples most frequently. The alder, willow and birch are wetland type trees while the ash, elm, yew and oak are normally associated with primary woodlands and the scrub material is derived from pomoideae, holly, dogwood, hazel and blackthorn/cherry. The charcoal is reminiscent of hearth/firewood material where a variety of taxa are collected from twigs and branches from near to the site.

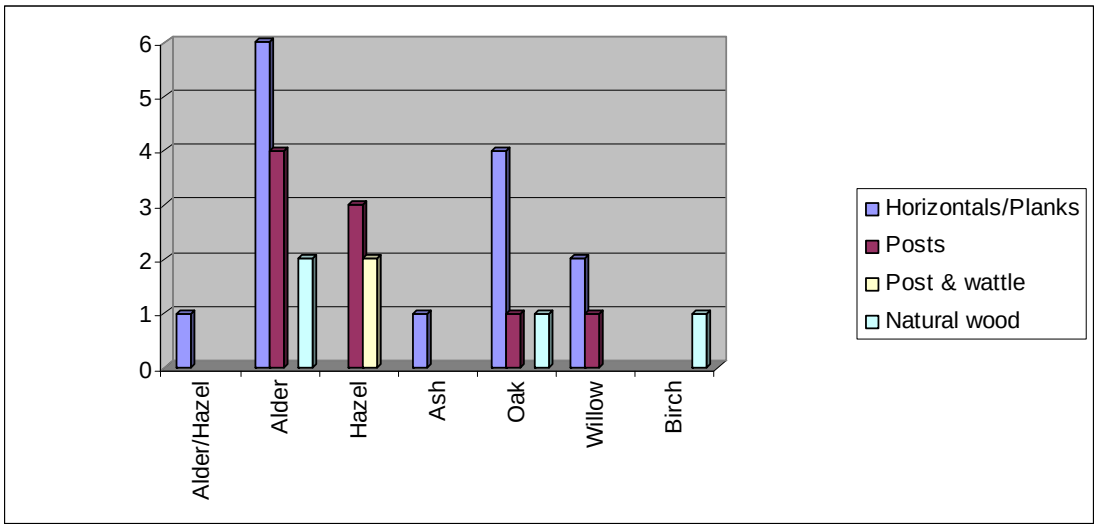
Large fragment counts of hazel as well as frequent amounts of hazel nut shells were noted in the Iron Age pits at Derrinsallagh 5, Derryvorrigan 1 and Lismore/Bushfield 1. This may indicate a function for the pits as storage receptacles for foodstuffs or nuts to use when supplies of other food types and resources were low.

Figure 3: Wood taxa identified from the High Medieval periods



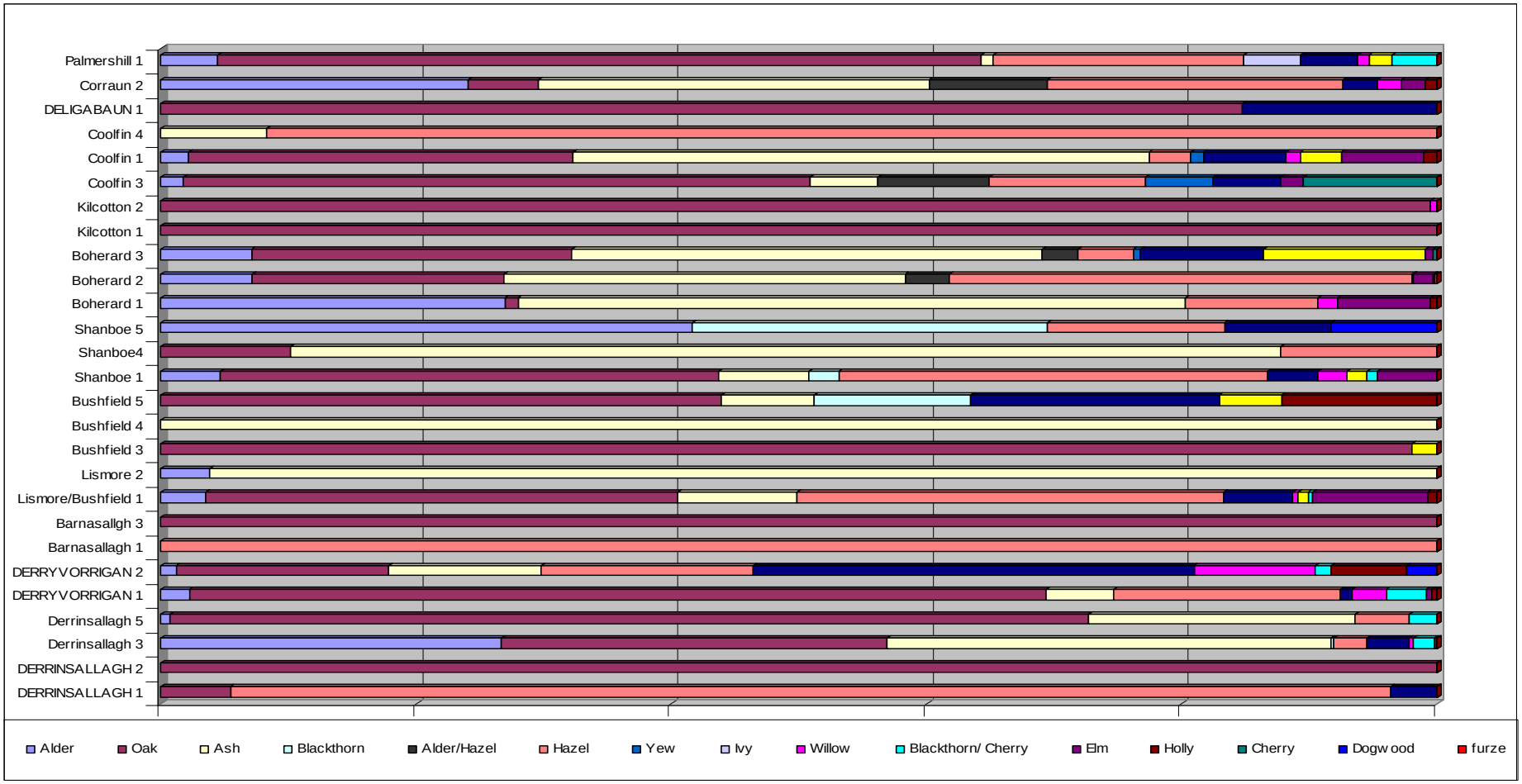
Four samples from Derrinsallagh 1 (pit), Derrinsallagh 3 (kiln) and Kilcotton 1 (charcoal production pit) were identified from the assemblage relating to the High medieval period. Oak is most prevalent from these features with alder and hazel also present in considerable quantities. Other taxa present in lesser quantities are pomoideae and ash.

Figure 4: Wood types used for different structural requirements at the sites analysed



5. Discussion of Charcoal and wood assemblage

Table 2: Wood taxa identified from each site excavated along Contract 2, M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme



Aims of the study

1. To determine the types of wood selected for use either as fuel or as structural wood.
2. To re-construct the environment that the charcoal and wood was selected from and the possible changes and differences in different time periods between woodland present in the areas during the Neolithic, Early, Middle and Late Bronze Age, Iron Age and Medieval periods.
3. To determine use and function of particular features and their associated charcoal through the identification of taxa types

Wood types identified from charcoal and wood assemblages

Table 3: Taxa types identified from the charcoal and wood assemblage along Contract 2

Botanical name	**Species**
Corylus avellana	Hazel
Prunus spinosa	Blackthorn
Prunus avium/padus	Bird/Wild Cherry
Ulmus sp.	Elm
Pomoideae	Apple type
Quercus spp	Oak
Alnus glutinosa	Alder
Salix sp	Willow
Fraxinus excelsior	Ash
Cornus sanguinea	Dogwood
Betula sp	Birch
Taxus Baccata	Yew
Ulex europeas	Furze
Ilex acquilofium	Holly
Hedera helix	Ivy

Three thousand eight hundred and ninety seven charcoal fragments from one hundred and four contexts relating to twenty seven archaeological sites were analysed from excavations along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, contract 2. Thirty four wood samples from a Middle Bronze Age walkway and Late Bronze Age *fulacht* sites were also analysed within the framework of these studies. Contract 2 covers a

length of approx 13 km and includes numerous *fulacht fiadh* sites, charcoal production pits, cremation pit, a well, kilns, bowl furnaces, a linear feature, pits, postholes and one ring gully.

Charcoal from pits excavated at Palmershill 1, Derrinsallagh 1, 2, 3 and 4, Derryvorrigan 1, Barnasallagh 1, Bushfield/Lismore 1, Bushfield 5 and Shanboe 5 were also identified to determine possible function and fuel type used at the pits. Possible structural wood used at the site were analysed from charcoal associated with postholes/stakeholes at Derrinsallagh 2, Derryvorrigan 2, Lismore 2 and Palmershill 1.

There were fifteen taxa present in the charcoal and wood remains. Taxa identified from the assemblage were oak (*Quercus* sp), hazel (*Corylus avellana*), ash (*Fraxinus excelsior),* alder (*Alnus glutinosa),* Pomoideae (apple type), elm (*Ulmus* sp), birch (*Betula* sp), blackthorn/cherry (*Prunus* spp), holly *(Ilex acquilofium*), willow *(Salix* spp), yew (*Taxus baccata*), ivy *(Hedera helix),* dogwood *(Cornus sanguinea)* and *Ulex europeas* (Furze) in order of representation. The range of taxa identified from the features analysed includes large trees (elm, ash, yew and oak), medium sized trees (alder and birch) and smaller scrub or hedgerow trees like blackthorn, blackthorn/cherry, willow, dogwood, hazel, holly, furze, and pomoideae. Ivy is classed as a woody stem creeper and was very abundant on trees, walls and rocks (Webb 1953, 73).

Not surprisingly oak was also more prevalent at the medieval dated charcoal production sites as well as the bowl furnaces used for metalworking activities. The pattern of oak use at these sites is repeated elsewhere across the country where oak was exclusively collected for charcoal production. Oak is a dense wood and is very suitable for charcoal production and associated metalworking activities. It also makes good firewood when dried and will grow in wetland areas when conditions are dry. The oak identified suggests that there was a supply of oak in the surrounding environment. The oak was possibly selected from a coppiced wood. A coppice tree is where the tree is cut down at its base and as a consequence several new shots or straight growing trees will grow out of this one stump. The use of quickly renewable oak coppiced trees would have been the most efficient method of sustaining a continuous supply of fuel for use in these charcoal production pits.

The existence of these charcoal production pits conjures up many scenarios of an organized well-structured society which places our ancestors away from obvious settlement centres and refocuses attention into the broader landscape, in which so much of the medieval day would have been spent. The charcoal burner would have roamed around from place to place in order

to access new areas of coppiced woodlands as previously coppiced areas regenerated. The area around Kilcotton may have been particularly rich in oak coppiced trees throughout the Medieval period.

Ash was identified from a ring gully dated to the medieval period and a variety of taxa including a higher than normal fragment count of yew was identified from a linear feature at Coolfin 3. Yew is also present in larger quantities in one particular area of the road scheme which include the sites of Derrinsallagh 3 and 5 and Derryvorrigan 1. Does this indicate that yew stands were more accessible in these areas. Ash also occurs more frequently around the areas of Boherard, Corraun and Coolfin, Lismore/Bushfield and Shanboe 1. Ash and yew are sometimes associated with land clearance so could it be possible from these small sample numbers and identifications to infer that the areas surrounding Derrinsallagh/Derryvorrigan.

It is difficult to attribute a function to the charcoal identified from the pits as the function of them, for the most part, is unknown. The high quantities of hazelnut shells within the Iron Age dated pits may suggest that they were used as storage pits. The other taxon identified from the pits include includes hazel, ash and oak which the most frequently identified species. The alder, willow and birch are wetland type trees while the ash, elm, yew and oak are normally associated with primary woodlands and the scrub material identified include pomoideae, holly, dogwood, hazel and blackthorn/cherry. The charcoal is reminiscent of hearth/firewood material where a variety of taxa are collected from twigs and branches from near to the site.

Oak dominates the charcoal assemblage from the Iron Age and Medieval periods. The high quantities of oak in these periods are mainly due to the features analysed which included numerous charcoal production pits and metal working bowl furnaces.

6. Conclusions on Wood and charcoal Assemblage

Three thousand eight hundred and ninety seven charcoal fragments from one hundred and four contexts relating to twenty seven archaeological sites were analysed from excavations along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, contract 3. Thirty four wood samples from a Middle Bronze Age walkway and Late Bronze Age *fulacht* sites were also analysed within the framework of these studies. Contract 2 covers a length of approx 13 km and includes numerous *fulacht fiadh* sites, charcoal production pits, cremation pit, wells, kilns, bowl furnaces, a linear feature, pits, postholes/stakeholes and one ring gully.

There were fifteen taxa present in the charcoal and wood remains. Taxa identified from the assemblage were oak (*Quercus* sp), hazel (*Corylus avellana*), ash (*Fraxinus excelsior),* alder (*Alnus glutinosa),* pomoideae (apple type), elm (*Ulmus* sp), birch (*Betula* sp), blackthorn/cherry (*Prunus* spp), holly *(Ilex acquilofium*), willow *(Salix* spp), yew (*Taxus baccata*), ivy *(Hedera helix),* dogwood *(Cornus sanguinea)* and *Ulex europeas* (Furze) in order of representation. The range of taxa identified from the features analysed includes large trees (elm, ash, yew and oak), medium sized trees (alder and birch) and smaller scrub or hedgerow trees like blackthorn, blackthorn/cherry, willow, dogwood, hazel, holly, furze, and pomoideae. Ivy is classed as a woody stem creeper and was very abundant on trees, walls and rocks (Webb 1953, 73).

Oak along with ash, hazel and alder dominate the charcoal assemblage while alder, oak, hazel, willow and ash in that order are present in the wood assemblage.

Oak may have been used as post material at Derrinsallagh 3 and was the preferred taxon for use at metalworking activities including Medieval charcoal production pits and Iron age dated bowl furnaces. Ash stakes may have been used at Lismore 2 and ash was also quite prevalent at the features analysed from Boherard and the fill of a well at Bushfield 4.

In contrast to the analysis carried out along the route of Contract 1 and 3 hazel, ash, alder and oak are the dominant taxa identified from the *fulacht* sites. Alder was identified in higher quantities along this stretch of the road scheme which may indicate that the surrounding environment of these *fulacht* sites were wetter than other stretches of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme. Alder brushwood was also identified from a Medieval kiln at Derrinsallagh 3 and a possible cremation pit from the same townland. Here again the higher quantities of alder is more representative of wetland environments rather than dryland forested areas. Chaff was also present in one of the samples from the kilns at Derrinsallagh which may indicate that remains from the wheat and barley grasses were being used as firewood within the kilns.

Other trends recorded from the analysis shows that yew was identified in more frequent amounts from the townland areas of Derrinsallagh and Derryvorrigan. Elm also occurred in higher quantities in the Early Bronze Age periods as opposed to later periods. Hazelnut shells were identified in large quantities from the pits dated to the Iron Age which may indicate a

function such as storage receptacles for these enigmatic pits. There is also a notable increase in alder wood in the Later Bronze Age.

Alder tangentially split planks and alder posts were mainly used for the walkway at Coolfin 3. Toolmarks evident on the posts show that a narrow metal axe with a slightly splayed edge was used to fell and trim the wood. The trough **F25** excavated from Corraun 2 may have been lined with ash wood while the trough **F9** had hazel posts present within the trough. Hazel wattle lined the trough at Shanboe 1. Oak planks were also identified from Corraun 2 and Shanboe 1.

All of the wood taxa identified from the excavations were of native origin. The inhabitants of the sites along the route of Contract 2 had access to a mosaic of environment types which included oak in the Neolithic periods, primary woodland trees and many varieties of smaller and scrubland trees in the Bronze Age and Iron Age and then larger fragment counts of oak in the Medieval periods. Alder plays a more significant role in the sites analysed along this stretch of the routeway.

It would be of great benefit to the project if the results were compared and contrasted with local and regional pollen cores from the areas that underwent excavation.

Appendix 1

Description of wood types

Alnus glutinosa (Alder)

Alder is a widespread native tree and occupies wet habitats along stream and river banks. It is an easily worked and split timber and therefore quite commonly manufactured into planks.

Betula sp (Birch)

Hairy birch (*Betula pubescens Ehrh*) and silver birch (*Betula pendula Roth*) cannot be distinguished microscopically. Silver birch requires light and dry soil while hairy birch grows on wet-marginal areas. Birch more often occurs on wet marginal areas and is one of the first trees to establish itself on raised bogs. The wood from birch trees is strong but it rots quickly when exposed to outdoor conditions.

Corylus avellana (Hazel)

Hazel is a native species and was very common up to the end of the 17th century. McCracken (1971, 19) points out that "it was once widespread to a degree that is hard to imagine today". With the introduction of brick, steel and slate the crafts associated with hazel became obsolete, and today the woods that supplied hazel have diminished rapidly.

Hazel is normally about 3-5m in height and is often found as an understory tree in broadleaf woods dominated by oak. It also occurs as pure copses on shallow soils over limestone as seen today in The Burren in Co. Clare and survives for 30 to 50 years. Its main advantage is seen in the production of long flexible straight rods through the process known as coppicing. Hazel also makes good fuel.

Fraxinus excelsior (Ash)

Ash is a native species to Ireland preferring lime rich freely draining soils. It is not a very durable timber in waterlogged conditions but has a strong elastic nature and is easily worked. Ash appears to have colonised the open land after the first farmers removed much of the native woodland therefore it is frequently used as structural timber in the Later Bronze Age periods as seen at Clonfinlough in Co. Offaly. Ash is also abundant in native hedgerows and was quite common in the later historic period.

Ilex aquifolium (Holly),

Holly is a shrub found quite commonly in hedgerows alongside blackthorn and furze and in the understory of oak woods. The *Bretha Comaithchesa* (Laws of neighbourhood) which are listed in the ancient Irish law tracts records holly as one of the five nobles of the wood namely for its use in the construction of cart-shafts and its leaves were valuable as cattle fodder during the winter months (Nelson 1993, 43).

Pomoideae, (Apple type)

Pomoideae includes apple, pear, hawthorn and mountain ash. It is impossible to distinguish these wood species anatomically but as wild pear is not native and crab apple is a rare native species in Ireland it is likely that the species identified from the site along the N5 are hawthorn or mountain ash (rowan) (Nelson 194-200, 1993). Hawthorn (*Crataegus monogyna*) is a native species, and is found in many hedgerows throughout Ireland. Mountain ash (*Sorbus aucuparia*) is also a common tree in Ireland growing particularly well in rocky and hilly mountainous places.

Prunus spinosa (Blackthorn)

It is difficult to differentiate between cherry and blackthorn particularly in relation to charcoal therefore the identified charcoal has been classified as *Prunus* spp which could be either blackthorn or cherry.

The sloe bush, as blackthorn is commonly referred to, is a very durable wood and is as strong as oak. It is a thorny shrub found in woods and scrubs on all soil types. In a woodland situation it is more likely to occur in clearings and at the woodland edges.

Prunus padus/Prunus avium (Bird /Wild cherry)

The genus *Prunus spp.* includes *Prunus spinosa* (Blackthorn), *Prunus avium* (Wild cherry) and *Prunus padus* (Bird cherry). Wood of the genus *Prunus* can be difficult to differentiate microscopically. Wild cherry and blackthorn are more common in Ireland than bird cherry. There is very little archaeological evidence for the use of cherry wood in Ireland although the wild cherry tree is commonly found in many hedgerows (Nelson 1993, 167). It is a very durable wood and is as strong as oak.

Quercus spp (Oak)

Sessile oak *(Quercus petraea)* and pedunculate oak *(Quercus robur)* are both native and common in Ireland and the wood of these species can not be differentiated on the basis of their anatomic characteristics. Pedunculate oak is found growing in areas of heavy clays and loams, particularly where the soil is alkaline. Sessile oak is found on acid soils and often in pure stands. Unlike pedunculate oak, it thrives on well-drained soils but is tolerant of flooding (Beckett 1979, 40-41). Both species of oak grow to be very large trees (30-40m high).

Oak was one of the most prevalent trees growing in Ireland throughout the medieval period. The anglicised form of the Irish name for oak (derry) is included in many townland names today. Out of 62,000 townlands in Ireland about 1,600 contain the word "derry" in one form or another, either as a prefix or suffix (Mc Cracken 1971, 23).

Oak is a dense wood and is very suitable for charcoal production. It also makes good firewood when dried and will grow in wetland areas when conditions are dry. Charcoal was important in pre-historic and Medieval Ireland as it burned hotter and cleaner than wood and was considered superior to wood in that respect. We know from historical sources that the charcoal maker, or collier, was an important figure in Early Medieval Ireland.

Oak also has unique properties of great durability and strength and was frequently used in the manufacture of posts and wooden plank.

Salix sp (Willow),

Willow is a very strong wood in tree form and is excellent for the use as posts. It is also a very flexible wood and was commonly used for the construction and weaving of baskets. It is a native species in Ireland and can be found in a tree and shrub form. According to Webb (1971, 160-2) thirteen species of willow are found growing wild in Ireland, of which eight are certainly native. The wood of *salix* trees and shrubs cannot be differentiated to species on the basis of anatomical features.

Taxus Bacatta (Yew)

The yew *(Taxus bacatta L.)* is a slow-growing conifer, living as long as 1000 years and reaching 65 feet, they are known for their strength and resistance to the cold. *Taxus bacatta* has a preference for well-drained lime rich soils. It is much less common in recent times because of overharvesting (its hard, springy wood was the source of English longbows). The evergreen needles are very broad, and the seeds are produced in red, berry-like cones. Yews

are toxic; one of the toxic compounds, taxol, is an effective treatment for some cancers. Yew is used for the manufacture of wooden bows, spears and many staves were constructed from yew in the Early Medieval periods.

Ulmus spp (Elm)

A few fragments of elm charcoal were identified from the trough fill, the early burnt spreads and the early Neolithic hut sites.

English elm *(Ulmus procera)* and wych elm *(Ulmus glabra)* cannot be separated by their wood structure. As suggested by Mitchell (1986) elm declined (although would not have completely died out) with the advent of farming and possibly elm disease epidemic around 3700BC. It generally prefers damp woods particularly on limestone.

Cornus Sanguinea (Dogwood)

A medium sized shrub with reddish twigs. It is found in thickets and rocky places and is more commonly found along the western seaboards and parts of central Ireland.

Ulex europeas (Furze, Gorse or Whin)

A bushy shrub with green thorny branchelets. The furze shrub reaches a height of 2-5 feet and contains bright yellow flowers. Furze or gorse is commonly found on heaths, pastures and stony places.

Hedera Ilex (Ivy)

Ivy is a woody creeper and climbs by clinging roots. It is a native taxa and is abundantly found on trees, walls and rocks.

7. References

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

Eogan, G., 1983, *Hoards of the Irish Later Bronze Age*, University College Dublin

Edlin, HL, 1956. *Trees, wood and man*, Collins, London

Grogan, E, O Donnell, L, Johnston, P. 2007. *The Bronze Age Landscapes of the pipeline to the west.* Wordwell, Wicklow

Grogan, E., O'Donnell, L. & Johnston, P. (2007) *The Bronze Age landscapes of the Pipeline to the West: an integrated archaeological and environmental assessment*. Wordwell Ltd., Dublin.

Grogan, E. (2005) *The North Munster Project*. 2 Volumes. Wordwell Ltd., Dublin.

Heery, A. (1998) *The vegetation history of the Irish midlands: Palaeoecological reconstructions of two lake sites adjacent to eskers* PhD thesis, University of Dublin (Trinity College).

The Heritage Council (2007) *A review of research needs in Irish archaeology*, The Heritage Council of Ireland Series, Kilkenny

Hall V & J Piltcher, 2001, *Flora Hibernica*, The Collins Press

Hall, V., 1995, "Woodland Depletion in Ireland over the last Millennium" in J.R. Pilcher and S. Mac An tSaoir (eds), *Wood, Trees and Forests in Ireland, 23-35*

Hurley, M.F., 1982, "Wooden artefacts from the excavation of the medieval City of Cork" in S. McGrail, *Woodworking Techniques before A.D 1500*, B A R **129**, 301-311

Hurley, M.F., 1986, *A study of Skeletal and Wooden Artefacts from Medieval Cork*, unpublished M.A. Thesis, University College Cork

Hurley, M. & Scully, O., 1997, *Late Viking Age and Medieval Waterford Excavations 1986-1992*, Waterford Corporation

Kelly, F., 1988, *A Guide to Early Irish Law Institute* for Advanced Studies, Dublin.

Keepax, C. A. (1988) *Charcoal analysis with particular reference to archaeological sites in Britain*, Ph.D. Dissertation, University of London

McCracken, E., 1971, *The Irish Woods Since Tudor Times.* Institute of Irish Studies, Belfast

Morgan, R., 1975, "The Selection and Sampling of Timber from Archaeological Sites for Identification and Tree-ring analysis", *Journal of Archaeological Science*, 2, 221-230

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

Moloney et al, 1994) Excavations at Clonfinlough, Co. Offaly, Crannog Publications

Mac Coitir, N., 2003, *Irish Trees, Myths, legends and Folklore*, The Collins Press

O Carroll, E., 1996, *The analysis of two wooden assemblages from Corlea Bog, Co. Longford and King John's Castle, Co. Limerick.* Unpublished M.A. Thesis, University College Cork

O Carroll, E., 2004, The analysis of wood and charcoal from Monanny, Co. Monaghan, Unpublished report for IAC.

O Carroll, E., 2007, The analysis of wood and charcoal from Cashelduff, Co. Mayo, Unpublished report for Mayo County Council.

O Carroll, E., 2007, The analysis of wood and charcoal from the N11, Arklow to Rathnew, Co. Wicklow, Unpublished report for the NRA/Wicklow County Council.

OCarroll, E. 2004. *The analysis of charcoal remains from Ballybrowney Lower 1, Co. Cork*. Unpublished specialist report for ACS Ltd

OCarroll, E. 2000. *The analysis of charcoal remains from Bettystown, Co. Meath*. Unpublished specialist report for ADS Ltd.

OCarroll, E. 2002. *The analysis of charcoal remains from Hermitage, Co. Limerick*. Unpublished specialist report for Aegis.

O Carroll, E, 2007, Wood and Charcoal identifications from the N5, Charlestown by-pass, Mayo Co. Co./NRA

O Carroll, E, 2008, Wood and Charcoal identifications from the N6 KEK, VJ Keeley Ltd/NRA

O Carroll, E, 2008, Wood and Charcoal identifications from the M7/M8 Portlaoise to Cullahill/Castletown, Contract 1, post excavation report for ACS & NRA

O Carroll, E, 2008, Wood and Charcoal identifications from the M7/M8 Portlaoise to Cullahill/Castletown, Contract 3, post excavation report for ACS & NRA

O Donnell, L. 2005, *Wood and charcoal identifications from Charlesland, Co. Wicklow*, Unpublished specialist report for Margaret Gowen and Co.

O Donnell, L. 2005, *Wood and charcoal identifications from Ballynagran, Co. Wicklow*, Unpublished specialist report for Margaret Gowen and Co.

O Donnell, 2008, *Wood and charcoal identified from the N8 Cashel to Mitchesltown*, unpublished post excavation report for NRA/Margaret Gowen & Company

O' Sullivan, A., 1987, "Wood in Archaeology", *Archaeology Ireland 4***,** 69-73.

O' Sullivan, A., 1994, "The use of Trees and Woodland in early medieval Ireland", *Irish Forestry* **51,** 80-94

Rackham, O., 1976, *Trees and Woodlands in the British Landscape.* Weidenfeld & Nicholson, London

Rackham, O., 1980, *Ancient Woodland: its history, vegetation and uses in England,* Edward Arnold, London

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

Sands, R. 1997, *Pre-historic woodworking. The Analysis and Interpretation of Bronze and Iron Age toolmarks,* Institute of Archaeology, University of London

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

Western, C. A., 1970, "Wood and Charcoal in Archaeology", *Science in Archaeology*, 178-187

8.2 Appendix 2: Environmental analysis report

Derrinsallagh 1, M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co Laois, Ireland

Plant macrofossil analysis

on behalf of

Archaeological Consultancy Services Ltd

Report 1883
April 2008

archaeological.services@durham.ac.uk
www.durham.ac.uk/archaeological.services

Contents

1. Summary

The project

1.1 An excavation was undertaken by Archaeological Consultancy Services Ltd at Derrinsallagh 1, Co Laois, Ireland. The site consisted of small-scale ironworking activity dated to the medieval period. This report presents the results of plant macrofossil analysis of contexts (13) and (20).

Results

1.2.1 Charcoal was abundant in both contexts and included timber and roundwood fragments. Charred wheat and oat grains were present in both flots, and hazel nutshell fragments and weed seeds were recorded.

2. Project background

Location and background

2.1 An excavation was undertaken by Archaeological Consultancy Services Ltd at Derrinsallagh 1, Co Laois, Ireland. The site consisted of small-scale ironworking activity dated to the medieval period. This report presents the results of plant macrofossil analysis of a charcoal and slag layer in an oval pit (context 13) and a charcoal fill between stone settings (context 20).

Objective

2.2 The objective was to analyse the plant macrofossil remains from the site in order to further our understanding of medieval agricultural and industrial activity in Co Laois.

Dates

2.3 Samples were received by Archaeological Services Durham University in October 2007. Analysis and report preparation was conducted between October 2007 - April 2008.

Personnel

2.4 Sample processing was undertaken by Archaeological Consultancy Services Ltd. The plant macrofossil analysis and report preparation was carried out by Dr Charlotte O'Brien.

Archive

2.5 The record number is A015/067 (E2177). The flots are currently at the Environmental Laboratory at Archaeological Services Durham University awaiting collection or return.

3. Methods

3.1 The flots were scanned at up to x60 magnification using a Leica MZ6 stereomicroscope and seeds were identified by comparison with modern reference material held in the Environmental Laboratory at Archaeological Services Durham University. Plant taxonomic nomenclature follows Stace (1997).

4. Results

4.1 Charcoal was abundant in both contexts and included timber and roundwood fragments. Charred wheat and oat grains were present in both flots, and weed seeds of wild radish and vetch were recorded in context (20). Context (20) also contained hazel nutshell fragments, burnt stone and a charred straw culm node. The results are presented in Table 1.

Table 1: Plant macrofossils from Derrinsallagh 1

Context		13	20
Sample		10	24
Material available for C14 dating		✓	✓
Flot volume (ml)		550	300
Flot matrix (relative abundance)			
Burnt stone		-	1
Charcoal		5	5
Culm node (charred)		-	1
Charred remains (total number)			
(a) *Raphanus raphanistrum* (Wild Radish)	pod frag.	-	1
(c) *Avena* spp (oat species)	grain	13	39
(c) *Triticum* cf. *aestivum* (cf. Bread Wheat)	grain	17	150
(c) Cerealia indeterminate	grain	1	11
(t) *Corylus avellana* (Hazel)	nutshell frag.	-	21
(x) *Vicia* spp (vetch)	seed	-	2

(a: arable; c: cultivated; t: woodland; x: wide niche)

Relative abundance is based on a scale from 1 (lowest) to 5 (highest)

5. Discussion

5.1 The most abundant cereal type in the flots was wheat grains. Although wheat grain morphology is not a reliable diagnostic tool, all of the grains had the short, stout shape most often seen in bread wheat. Unfortunately, no diagnostic wheat chaff was present to confirm this identification, but its occurrence would be in line with archaeobotanical evidence from other sites which suggests that large-scale production of free-threshing wheat was observed in the medieval period (Monk 1986).

5.2 Unlike wheat, oats appear to have been of greater significance during the early medieval period (McClatchie 2007). Oat grains were recorded in both flots, but in the absence of floret bases it is uncertain if these were the cultivated species. The grains were relatively slender, and therefore may have been from a wild oat species growing as a weed amongst the wheat crop. The occurrence of hazel nutshell fragments

suggests that gathered foods continued to form a part of the diet at this site. Wild radish and vetch would have grown as arable weeds with the cereals.

5.3 The absence of chaff and relatively low number of weed seeds indicates that the cereals had been cleaned prior to their incorporation into the deposits. The charred remains may reflect accidents of food preparation thrown on the industrial fires as a means of disposal or to act as an additional fuel. This reflects the small-scale, 'backyard', nature of the iron-working at this site.

6. Sources

McClatchie, M 2007 The Study of Non-wood Plant Macro-remains: Investigating Past Societies and Landscapes, in Murphy, EM & Whitehouse, NJ (eds), *Environmental Archaeology in Ireland*, Oxford

Monk, MA, 1986, Evidence from macroscopic plant remains for crop husbandry in prehistoric and early historic Ireland, *Journal of Irish Archaeology*, **3**, 31-36

Stace, C, 1997, *New Flora of the British Isles*, 2nd Edition, Cambridge

8.3 Appendix 3: Radiocarbon dating analysis

Ms. Rachel Sloane Report Date: 8/17/2006

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age (*)
Beta - 218624	540 +/- 40 BP	-26.1 o/oo	520 +/- 40 BP

SAMPLE: A015/67:C17:S15
ANALYSIS: Radiometric-Standard delivery
MATERIAL/PRETREATMENT: (charred material): acid/alkali/acid
2 SIGMA CALIBRATION: Cal AD 1320 to 1340 (Cal BP 630 to 600) AND Cal AD 1390 to 1440 (Cal BP 560 to 510)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26:lab. mult=1)

Laboratory number: **Beta-218621**

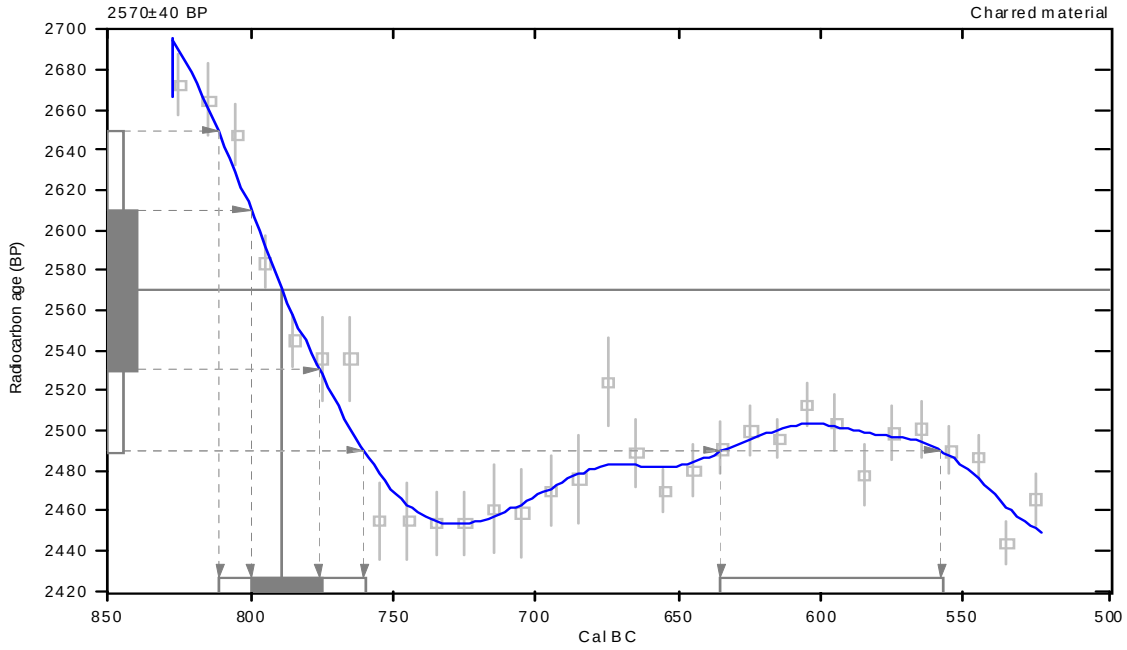
Conventional radiocarbon age: **2570±40 BP**

2 Sigma calibrated results: (95% probability) **Cal BC 810 to 760 (Cal BP 2760 to 2710) and Cal BC 640 to 560 (Cal BP 2580 to 2510)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 790 (Cal BP 2740)

1 Sigma calibrated result: (68% probability) Cal BC 800 to 780 (Cal BP 2750 to 2730)



References:

Database used
INTCAL98

Calibration Database

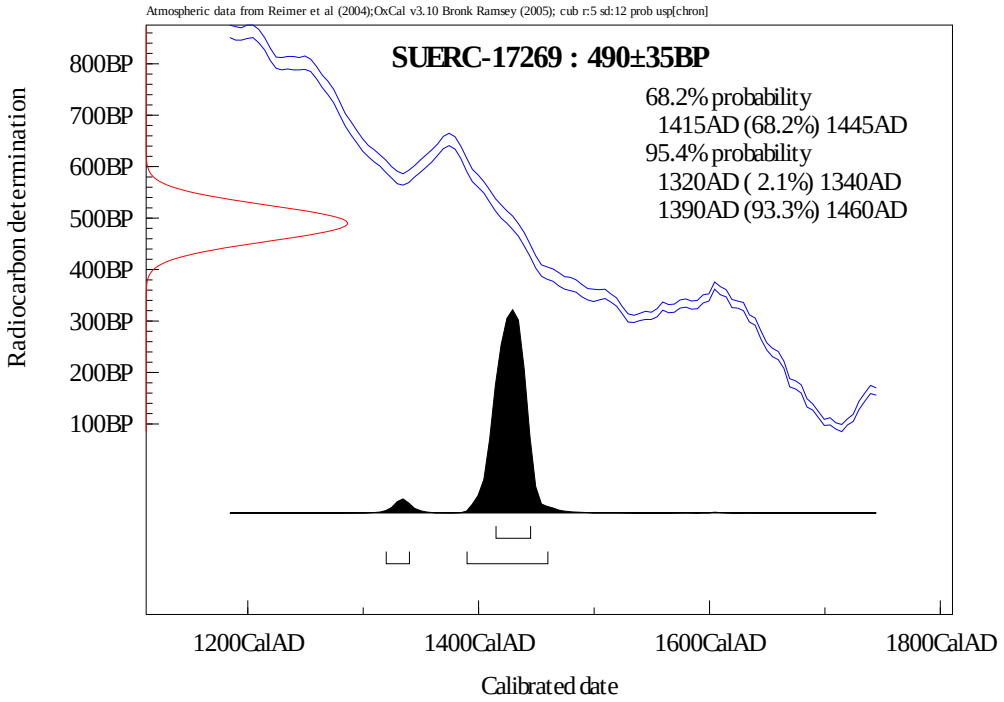
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

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

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



GU No.	Reporting Number	Sample Type	Site	Sample Id	Species Dated	d13C	Age % Modern	Ageerror 1 sigma
16133	SUERC-17269	Charcoal	Derrinsallagh 1	Derrinsallagh 1:E2177:F8:S4	Hazel	-27.0	490	35

8.4 Appendix 4: Metallurgical analysis report

GeoArch

Report 2008/21

Evaluation of Archaeometallurgical residues from the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme Contract 2: Derrinsallagh 1 (E2177)

Dr Tim Young
12th December 2008

Abstract

Derrinsallagh 1 yielded 12.1kg of materials for examination as possible archaeometallurgical residues. The residues are principally materials produced during iron smelting in a non-slag tapping shaft furnace, although there are just a few pieces that might possibly be from smithing. There are no certain smithing residues. Particular interest attaches to this furnace because of its late medieval 14C age.

The residues were contained in three features, pit C003, pit C011 and furnace setting ("hearth") C025. The term "furnace setting" is increasingly used for the sometimes complex sites of bloomery furnaces that may have been partly or wholly reconstructed in approximately the same location over a long period of time; it is probably the most appropriate term for C025. The details of the construction of the furnace are unclear. Below the various deposits, the natural includes two sub-parallel raised ribs of bedrock extending above the subsoil 0.60-0.90m apart and oriented NE-SW. Between the bedrock ribs the surface of the natural is oxidised fired over a distance of 1.15m NE-SW. The SW limit of the firing lies below an accumulation of large stones and the NE limit lies very close to the cut of pit C003. This scorching is interpreted as recording the footprint of the base of the furnace. The superstructure presumably used the bedrock ribs for support, but the tumbled stones now only provide a hint of its form. Detailed re-evaluation of the field records may yield further clues, but at present it would seem a fairly large diameter furnace rested on the natural surface and location of working hollows/pits C003 and C001 to the NE, beyond the gap between the bedrock ribs hints at a furnace arch on this side, so that slag and ash could be raked from the furnace into the working hollows. The slags indicate a non-slag tapping furnace, but the structural evidence suggests that this was not a slagpit furnace as seen in typical Iron Age and early medieval smelting, but that the furnace base was at ground level or only very slightly below.

Contents

Methods

All investigated materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were summarily described and recorded to a database (Tables 1 and 2). As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

Results

Material

The archaeometallurgical residues from Derrinsallagh 1 probably all represent waste from iron smelting in a non-slag tapping furnace. A small proportion of the material (see below) is not certainly from iron smelting, but there are no pieces which are certainly not from iron smelting.

The proportions of various classes of residue in the three slag-bearing features are indicated in Table 3. These classes are somewhat arbitrary and overlapping, but serve to indicate the general nature of the assemblages:

Floor fines: this class embraces a wide variety of small particles which are interpreted to have accumulated on the floor

of a non-slag tapping furnace. The component particles include small prills and sub-spheroidal droplets of up to 10mm (often dimpled from contact with fuel particles and informally termed "coffee-bean spheroids") indicative of slags descending through the fuel bed. Other material is less clearly flowed and includes dull or resinous-appearing slag with poorly developed flow-lobe structures. Accumulations of charcoal and ore dust partly cemented by slag and secondary iron oxides are often present in such material, but did not form a significant component of the material here (rarely present in C013). This class of residue is particularly present in pit C003.

Flow slags: this class includes well-flown slags in prills and accumulations of prills, similar to the small prills which occur within the floor fines. The prills in most cases are descending (on other sites this have been demonstrated to be related to the formation of the "furnace bottom" below the bloom, which is often little more than coalesced prills) and fairly thin (diameter of 5-12mm). Rather stronger flows may occur down the blowing wall and former thicker, more massive, accumulations at the foot of the wall, and also sometimes cross-floor flows (which may mimic tap slag); there is an example of such a flow from C013. Such cross-floor flows may prove to be a feature of medieval furnaces, for material similar to tap slags has been recorded from medieval contexts at Carrickmines (Young 2006b) and Farrananstack (Dowd & Fairburn 2005), without certain proof of either site possessing slag-tapping furnaces. One feature of many non-slag tapping furnaces is that the basal pit (or equivalent) may be packed with organic material that is different to the main fuel; in most cases in Ireland this appears to have been quite substantial pieces of what is probably wood rather than charcoal (sizes up to 70x50x200mm have been recorded; Young 2005a, 2005b, 2006a, 2008a). The large down-wall flows often pass around such wood pieces creating moulds (as in several pieces from C008).

crust/burr: these materials are dense slags forming curved sheets. The crusts are typically formed of coarse-grained slag with crystals oriented perpendicular to the crust margin. They may also have tubular vesicles, indicating loss of volatiles from the substrate.

They typically form where molten slag reaches a cool interface, where molten slag fills a hollow in a substrate, or where very hot slag reacts with the wall of a furnace, eating a hole back into the wall. Examples of temperature control would be where slag chills against and above the air blast into a furnace creating a slag hood over the blowhole (material from C013 may be from a hood and compares well with material from furnace C397 from Derrinsallagh 4, Young 2008c), chilling against a physical barrier is commonly seen at the base of

smithing hearth cakes, but may be seen in smelting furnaces if sufficient slag flows to the base of the pit, and convex sheets from reaction are typical of the "burr" region, just below the blowhole where ponded hot slags may react with the wall in both smelting furnaces and smithing hearths (pieces of material from C008, C013 and C020 are probably from burrs).

Distinction of small pieces of these different sorts of crust can be very difficult. None of the crust fragments from Derrinsallagh 1 has characteristics indicative of it being from a smithing hearth cake, but it is not possible to certainly exclude with certainty an origin in fragmented smithing hearth cakes for some of these pieces.

ashy concretions: this class has been used to include a variety of materials which appear (in the absence of detailed analysis) to be concretions formed of fine ashy materials, but often cored with slag particles. These materials typically form small particles (<30mm).

Low-density slags in small pieces: the fine grained slag assemblages from smelting furnaces are often rich in fragmentary material derived from the breakage of slag accumulations related to the dull and resinous-lustred material mentioned previously, as well of slag types rich in charcoal inclusions. This material will thus include both material from the furnace floor and also slags which solidified close to the bloom. The material from the floor is often in the form of rounded blebs (which if fund with other classes of floor material would be placed in the floor fines class), but often the overall form of the piece is not clear.

In this assemblage such fragmentary material has been recorded from all the major contexts.

Low-density slag in large blocks: this class has been used for a single piece from C003. The fragment is of low-density charcoal-rich slag, with a top bearing a smoothish, but ropey texture. Such textures have been observed on the upper surface of "furnace bottoms" from Tullyallen (Young 2003) and Adamstown (Young 2006c), so a similar origin is tentatively suggested for this example.

Indeterminate slag: this includes slag not falling into other categories, which in this assemblage includes broken fragments of iron slag with no clear morphological traits allow assignation to a particular class, often too large to be classed as "floor fines", many are charcoal rich textures.

Ceramic: fragments of both oxidised and reduced fired clay occur. These are probably part of the furnace structure, although some firing has taken place on the base of the waste pits. The pieces in this assemblage are all too small to be diagnostic of any particular origin.

Distribution

The residues from the site derive from three areas (Table 3). Firstly, various deposits within the furnace setting (C025), although none appears to be an in-situ deposit, yielded a total of 2.0kg of archaeometallurgical residues.

Secondly pit C003, which had a single fill C008, containing 6.8kg of residues, yielded well over half the material from the site. C003 was a sub-circular pit (1.27m in diameter x .08m deep) lying immediately NE of the scorched area of the furnace setting.

The third area was the later pit (C011), which contained three fills, of which the lower fill yielded 2.9kg of residues. C011 was slightly further from the furnace than C003 (which it cut), but was elongate (2.15m NE/SW x 1.07m wide x .22m deep) with its axis oriented towards the furnace setting.

There is no significant difference between the residue assemblages recovered from these three areas. These contexts all appear to date from a period within the mid-fourteenth to mid- fifteenth centuries (2 samples, one from C017 a fill of the furnace area and one from fill C008 of pit C003, gave identical 14C dates of Cal AD 1320 to 1340 (Cal BP 630 to 600; 2.3%) and Cal AD 1390 to 1460 (Cal BP 560 to 510; 93.3%).

Interpretation

The furnace setting C025 appear too badly damaged to be easily interpretable, although further investigation of the primary excavation records may reveal additional information.

The constraint of the furnace base within the natural rock outcrops to E and W and by a large volume of loose stone to the SW, but not to the NE, in which direction lie the two successive pits C003 and C011, suggests the likelihood of a furnace with an arch facing NE, for the extraction of the slag at the end of the smelt. The scorching below the base of C025 extends close to the lip of C003, and the site photographs suggest some scorching of the base of C003 (presumably through the raking out of hot materials from the furnace base in this direction.

The rather elaborate furnace setting and the associated waste pits resemble to some degree the medieval slag tapping furnaces in Britain, although for these the tapping channel leading to the arch is usually more pronounced. Earlier furnaces with an arch may be found in Ireland at sites such Derrinsallagh 4 (Iron Age; Young 2008c), probably Derrinsallagh 3 (Early Medieval; Young 2008b) and rather less certainly at two sites on the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme east of Portlaoise: Morrett Site D (Iron Age) and Cappakeel

West Site F (possibly Iron Age; Young2005b). An early medieval furnace at Woodstown (Young 2006c) probably had an arch, but this may have been intended to allow slag-tapping.

Evaluation of potential

This site has produced a good suite of archaeometallurgical residues produced during iron smelting. Unfortunately all are in secondary contexts, mainly within two large working hollows into which slag was probably raked during furnace clearance. A second problem with the site is the lack of clear understanding of the nature of the furnace, although some inferences can be made.

The key interest in this site lies in its late date (mid-fourteenth to mid-fifteenth centuries), for which there is rather little evidence for iron smelting technology in Ireland so far.

The slags from the site are therefore worthy of analysis to help to document this current gap in knowledge. The programme of analysis should be accompanied by a re-evaluation of the primary field records for the site to see if any more detail can be teased-out of the record.

It is recommended that the materials from the site be retained for future study.

References

DOWD, M.A. & FAIRBURN, N. 2005. Excavations at Farrananstack, Co. Kerry: evidence for the use of shaft furnaces in medieval iron production. *Journal of Irish Archaeology*, XIV, 115-121.

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

YOUNG, T.P. 2005a. Metallurgical Residues from Clonmacnoise, Part 1: Evaluation of material from the waste water treatment works (02E1407). *GeoArch Report 2005/08*. 29pp.

YOUNG, T.P. 2005b. Evaluation of archaeometallurgical residues from the Heath-Mayfield N7 development (03E0151, 03E0966, 03E0461, 03E0603, 03E0633, 03E0679, 03E0602, 03E0635). *GeoArch Report 2005/12*. 28pp.

YOUNG, T.P. 2006a. Evaluation of archaeometallurgical residues from Ballykilmore 6, Co. Westmeath (A001:032). *GeoArch Report 2005/15*. 17pp.

YOUNG, T.P. 2006b. Evaluation of metallurgical residues from Carrickmines Castle, South Co. Dublin, 00E0525. *GeoArch Report 2006/03*. 11pp.

YOUNG, T.P. 2006c. Evaluation of archaeometallurgical residues from sites on the N25, Co. Waterford (Woodstown 6, Adamstown 1,2,3). *GeoArch Report 2006/15*. 38pp.

YOUNG, T.P. 2008a. Archaeometallurgical residues from Cherryville Site 12, Kildare Bypass. 01E0955 *GeoArch Report 2007/24*. 33pp

YOUNG, T.P. 2008b. Evaluation of Archaeometallurgical residues from the M7/M8 Contract 2: Derrinsallagh 3 (E2179). *GeoArch Report 2008/22*. 11pp.

YOUNG T.P. 2008c. Detailed recording of furnace C397, Derrinsallagh 4 (E2180), M7/M8 Contract 2. *GeoArch Report 2008/34*.

Context	Sample	sample wt.	wt.	no.	Notes
8	4	532	532		golden brown furnace floor material. Resinous lustre material approx 10% of which is well flowed (coffee bean spheroids and small prills), rest dull fragmentary, Some flows broken and appear glassy
8	5	2679	562	6	dense crust fragments with tubular vesicles, SHC or burr fragments
		(3395 unwashed)	28	15	dense flow slags, mainly small prills, but one larger piece with moderately large wood mould
			64	5	ashy, slightly concretionary, slag lumps
			2025	c230	small slag fragments, mainly dull blebby materials and associated low density slags and prills
8	6	3620	1396	78	good flow slag, quite large prills, 1 piece shows flow around large wood mould
		(4330 unwashed)	2	1	bright blue glassy slag fragment
			12	1	reduced fired vitrified lining
			150	1	massive block of low density slag with raised lobes on upper surface - possibly top of a furnace bottom
			74	1	dense crust fragment intimately associated with red oxidised fired lining - it would appear the slag fragment was embedded in the clay
			46	1	curved fragment of very dense slag, part of a crust or burr
			1940	c240	rather indeterminate slag fragments, some dull and blebby but others more massive
13	11	416	52	1	well-developed cross-floor slag flow
		(524 unwashed)	1	1	reduced fired lining
			363	c140	dull blebby slags grading into fine charcoal-rich sinter-like material, all in small slightly rounded fragments
13	16	2818	292		sieved washings – includes some slag fragments and spheroids in sandy matrix
		(3420 unwashed)	368	3	Strange flowed crust-like material, slag hood? Or attached to wall?
			178	1	dense crust fragment - SHC or burr?
			356	14	charcoal rich and/or vesicular slag fragments
			54	2	Sinter
			50		stones
			1520	c200	dull surfaced poor flow slags. No dense prills,
17	13	730	118	1	15mm thick crust with tubular vesicles, curved, non-wetted exterior with adhering clay, micro-dimpled in places
		(900 unwashed)	24	2	vitrified lining fragments
			588	45	flow slag, mainly low density tending towards vesicular masses, but a couple of pieces are more dense.

20	17	247	128	10	dull textured, poorly developed flow slag.
		(326 unwashed)	110	16	charcoal-rich slag fragments
			8	1	burnt/fired stone
			1	1	charcoal
Context	Sample	sample wt.	wt.	no.	notes
20	18	892	550	2	large blocks of very dense crust, c30 mm thick. Tops rather clinkery in appearance, tending to massive texture with tiny charcoal debris. Base rough to microprilly, probably from a burr
		(1010 unwashed)	252	24	dull blebby slags, moderately dense, vesicular
			44	4	fired lining
			46	3	dense flow slag
20	20	100	62	1	dense vesicular, slightly microprilly indeterminate slag fragment
		(106 unwashed)	8	4	tiny indeterminate slag fragments
			30	3	dark brown, vesicular, slightly flown slags
24	22	77	61	1	charcoal dimpled slag fragment. Internally vesicular, dense massive, rusty. Indeterminate
		(82 unwashed)	16	3	iron slag fragments

Table 1: Summary catalogue of archaeometallurgical residues by context and sample

Context	sample wt.	wt.	no.	Notes
PIT 003				
8	***6831***	532		golden brown furnace floor material. Resinous lustre material approx 10% of which is well flowed (coffee bean spheroids and small prills), rest dull fragmentary, Some flows broken and appear glassy
		562	6	dense crust fragments with tubular vesicles, SHC or burr fragments
		28	15	dense flow slags, mainly small prills, but one larger piece with moderately large wood mould
		64	5	ashy, slightly concretionary, slag lumps
		2025	c230	small slag fragments, mainly dull blebby materials and associated low density slags and prills
		1396	78	good flow slag, quite large prills, 1 piece shows flow around large wood mould
		2	1	bright blue glassy slag fragment
		12	1	reduced fired vitrified lining
		150	1	massive block of low density slag with raised lobes on upper surface - possibly top of a furnace bottom
		74	1	dense crust fragment intimately associated with red oxidised fired lining - it would appear the slag fragment was embedded in the clay
		46	1	curved fragment of very dense slag, part of a crust or burr
		1940	c240	rather indeterminate slag fragments, some dull and blebby but others more massive
PIT 011				
13	***2942***	52	1	well-developed cross-floor slag flow
		1520	c200	dull surfaced poor flow slags. No dense prills,
		363	c140	dull blebby slags grading into fine charcoal-rich sinter-like material, all in small slightly rounded fragments
		368	3	Strange flowed crust-like material, slag hood? Or attached to wall?
		178	1	dense crust fragment - SHC or burr?
		356	14	charcoal-rich and/or vesicular slag fragments
		54	2	sinter
		1	1	reduced fired lining
		50		stones
		292		sieved washings - includes some slag fragments and spheroids in sandy matrix

Context	sample wt.	wt.	no.	notes
HEARTH 025				
17	***730***	118	1	15mm thick crust with tubular vesicles, curved, non-wetted exterior with adhering clay, micro-dimpled in places
		24	2	vitrified lining fragments
		588	45	flow slag, mainly low density tending towards vesicular masses, but a couple of pieces are more dense.
20	***1239***	128	10	dull textured, poorly developed flow slag.
		110	16	charcoal-rich slag fragments
		8	1	burnt/fired stone
		1	1	charcoal
		550	2	large blocks of very dense crust, c30 mm thick. Tops rather clinkery in appearance, tending to massive texture with tiny charcoal debris. Base rough to microprilly, probably from a burr
		252	24	dull blebby slags, moderately dense, vesicular
		44	4	fired lining
		46	3	dense flow slag
		62	1	dense vesicular, slightly microprilly indeterminate slag fragment
		8	4	tiny indeterminate slag fragments
		30	3	dark brown, vesicular, slightly flown slags
24	***77***	61	1	charcoal dimpled slag fragment. Internally vesicular, dense massive, rusty. Indeterminate
		16	3	iron slag fragments
		12111		total

Table 2: Summary catalogue of archaeometallurgical residues by feature and context

	floor fines	*flow slag*	*crust/burr*	*ashy concretions*	*low density (small)*	*indet. slag*	*low density blocks*	*ceramic*	***total***
PIT 003	532	1424	682	64	2025	1942	150	12	***6831***
	8%	*21%*	*10%*	*1%*	*30%*	*28%*	*2%*	*0%*	
PIT 011	0	1626	546	0	363	356	0	1	***2892***
		56%	*19%*		*13%*	*12%*		*0%*	
HEARTH 025	0	762	668	0	252	287	0	68	***2037***
		37%	*33%*		*12%*	*14%*		*3%*	

Table 3: Distribution of residue classes by feature. All weights in grams.

GeoArch

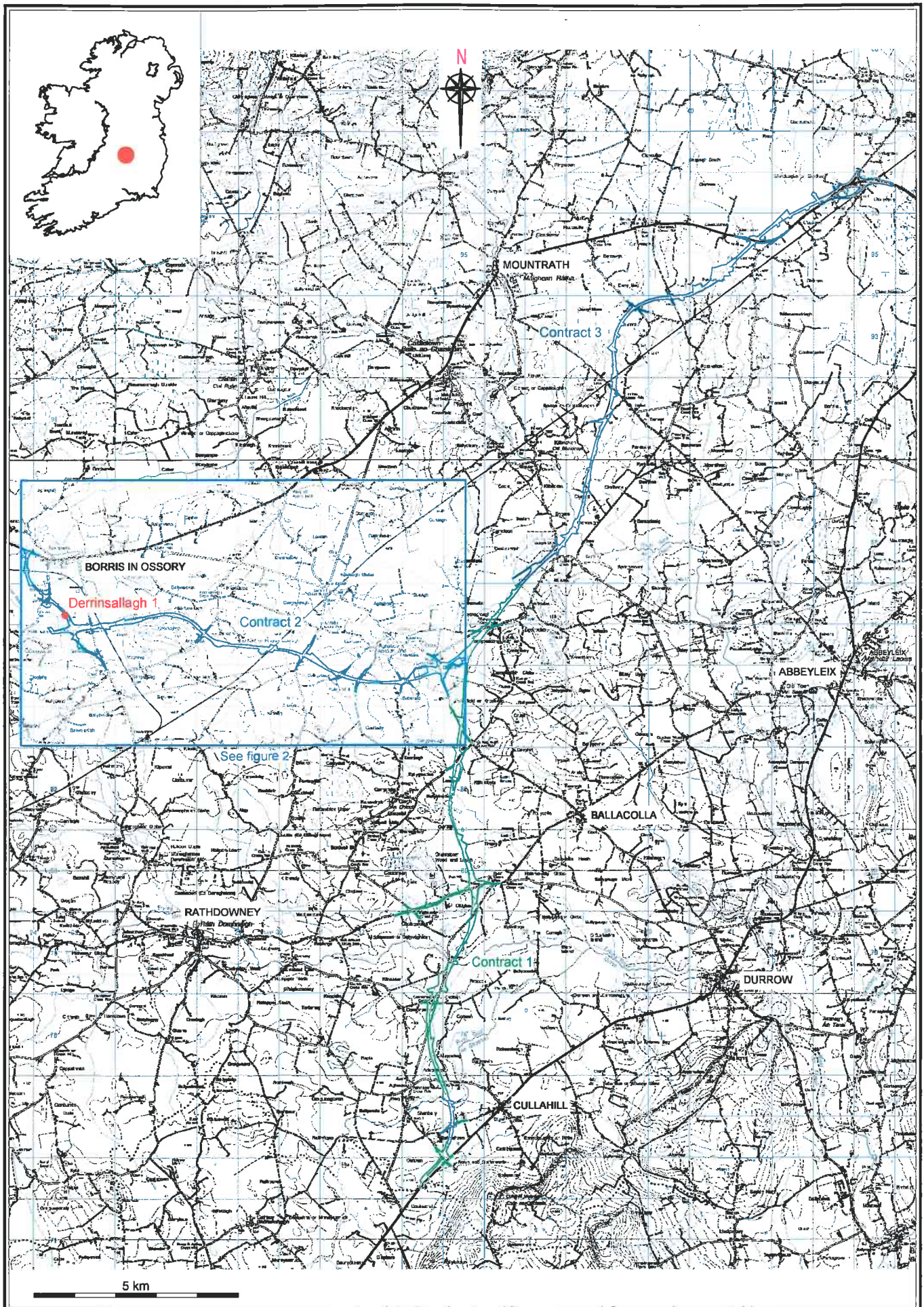
geoarchaeological, archaeometallurgical & geophysical investigations

54 Heol y Cadno,
Thornhill,
Cardiff,
CF14 9DY.

Mobile: 07802 413704
Fax: 08700 547366
E-Mail: Tim.Young@GeoArch.co.uk
Web: www.GeoArch.co.uk

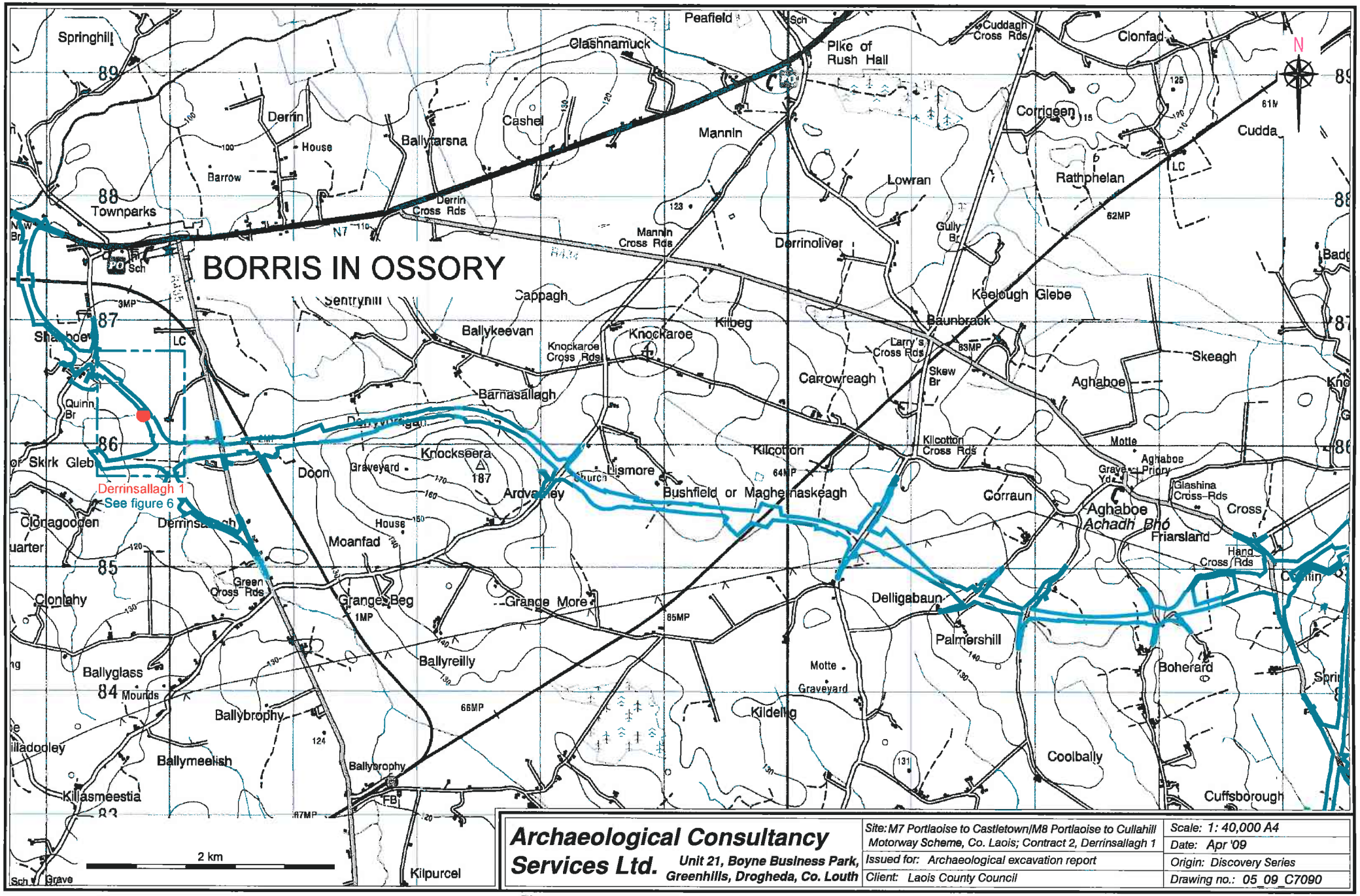
8.5 Appendix 5: Site archive

Table …. Site Archive (Basic) Summary			
Site Name: Derrinsallagh 1		Record No.: E2177 – Scheme no.: A015/067	
Type	Description	Quantity	Notes
Contexts	Validated contexts from excavation	28	All contexts sheets have been checked and cross-referenced.
Plans	'A2' 1:50 (no. of sheets)	3	Field drawings
Sections	'A2' 1:10 (no. of sheets)	1	Sections and profiles
Photographs		3 rolls	Colour prints & CDs
Registers	Plan Register Photographic Register Finds Register Sample Register	1 1 1 1	All Registers have been checked and cross-referenced.
Diaries	Director's Diary	1	All Diaries have been checked and cross-referenced.
	Flots	13	



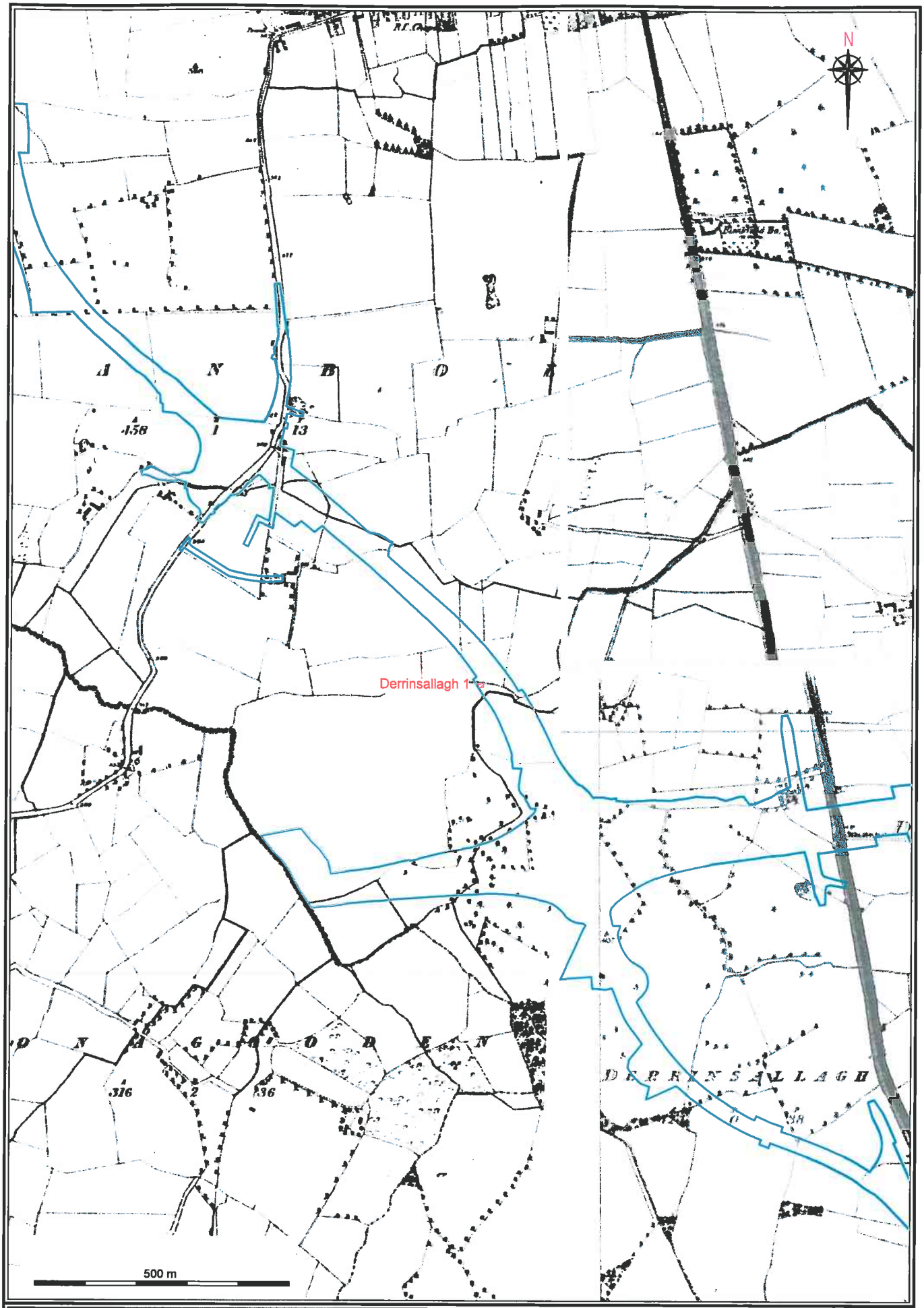
Archaeological Consultancy Services Ltd. *Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth*	Site: *M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1*	Scale: *1: 125,000 A4*
		Date: *Apr '09*
	Issued for: *Archaeological excavation report*	Origin: *ACS Ltd*
	Client: *Laois County Council*	Drawing no.: *05_09_C7089*

Figure 1: Location of M7/M8 Motorway Scheme showing location of Derrinsallagh 1



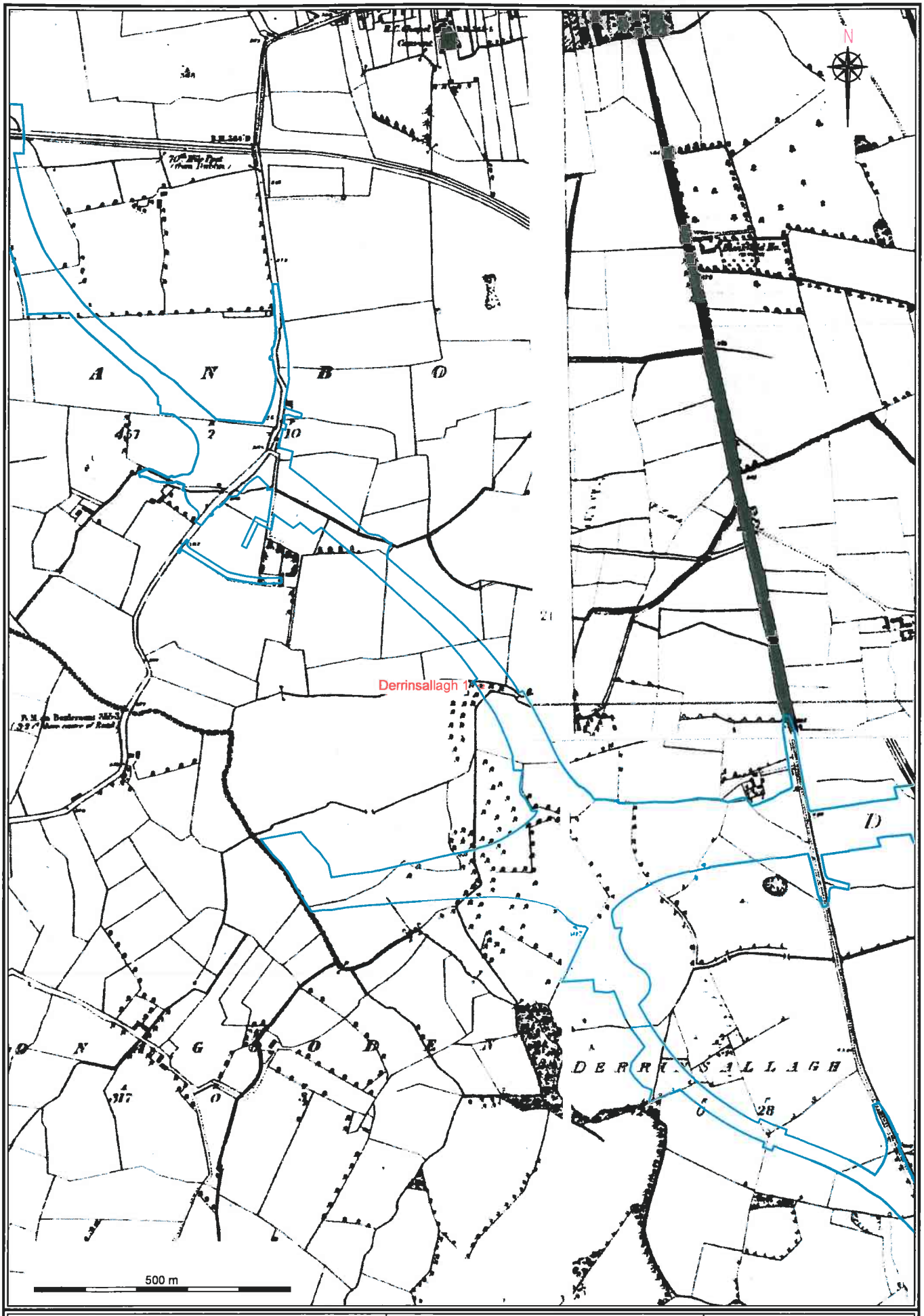
Archaeological Consultancy Services Ltd. *Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth*	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 40,000 A4
	Issued for: Archaeological excavation report	Date: Apr '09
	Client: Laois County Council	Origin: Discovery Series
		Drawing no.: 05_09_C7090

Figure 2: Location of Contract 2 showing Derrinsallagh 1



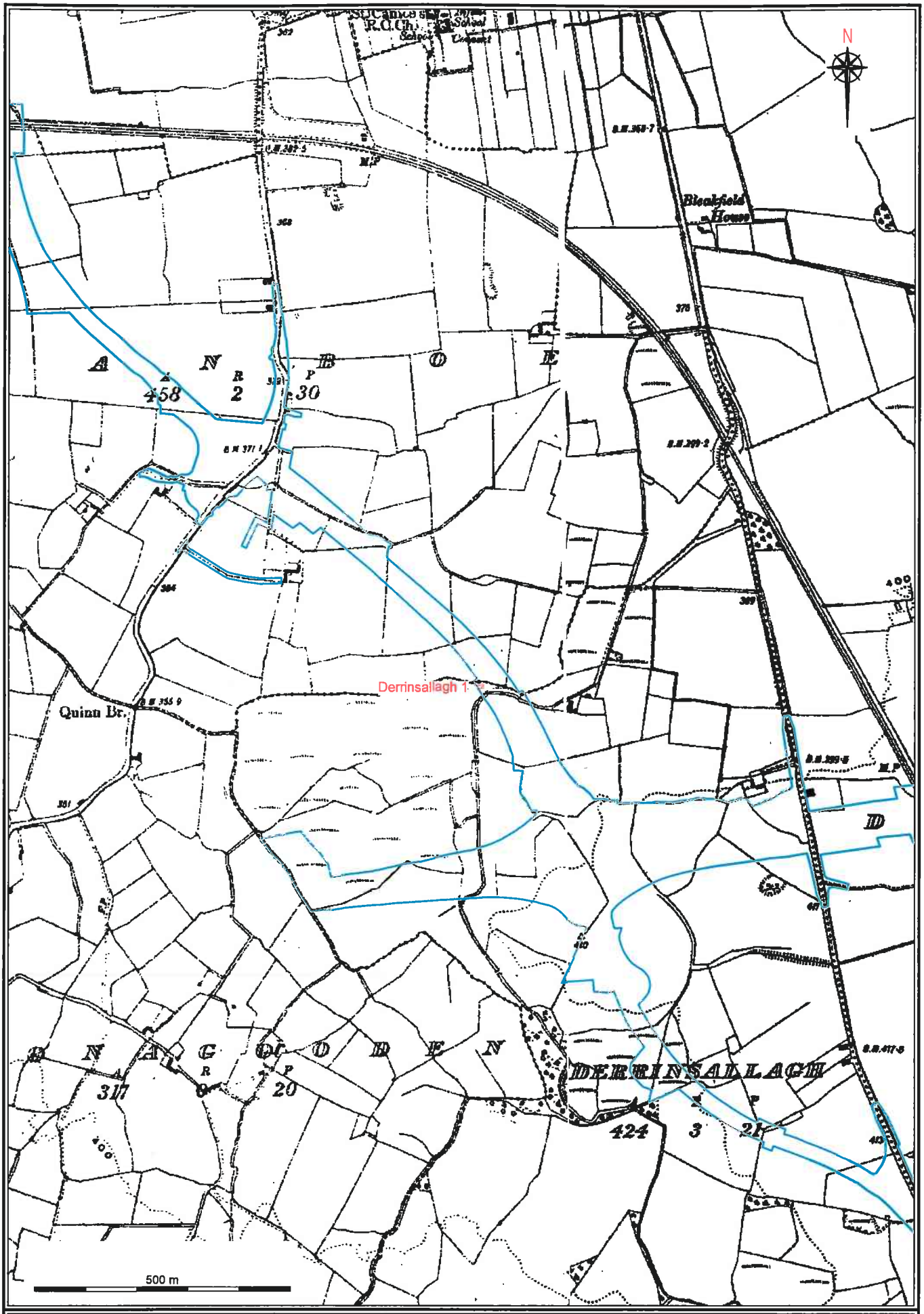
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 10,000 A4
		Date: Apr '09
	Issued for: Archaeological excavation report	Origin: OSi Laois 1st Ed. (1839)
	Client: Laois County Council	Drawing no.: 05_09_C7091

Figure 3: Plan showing Derrinsallagh 1 on OSi Laois 1st Ed. (1839) background



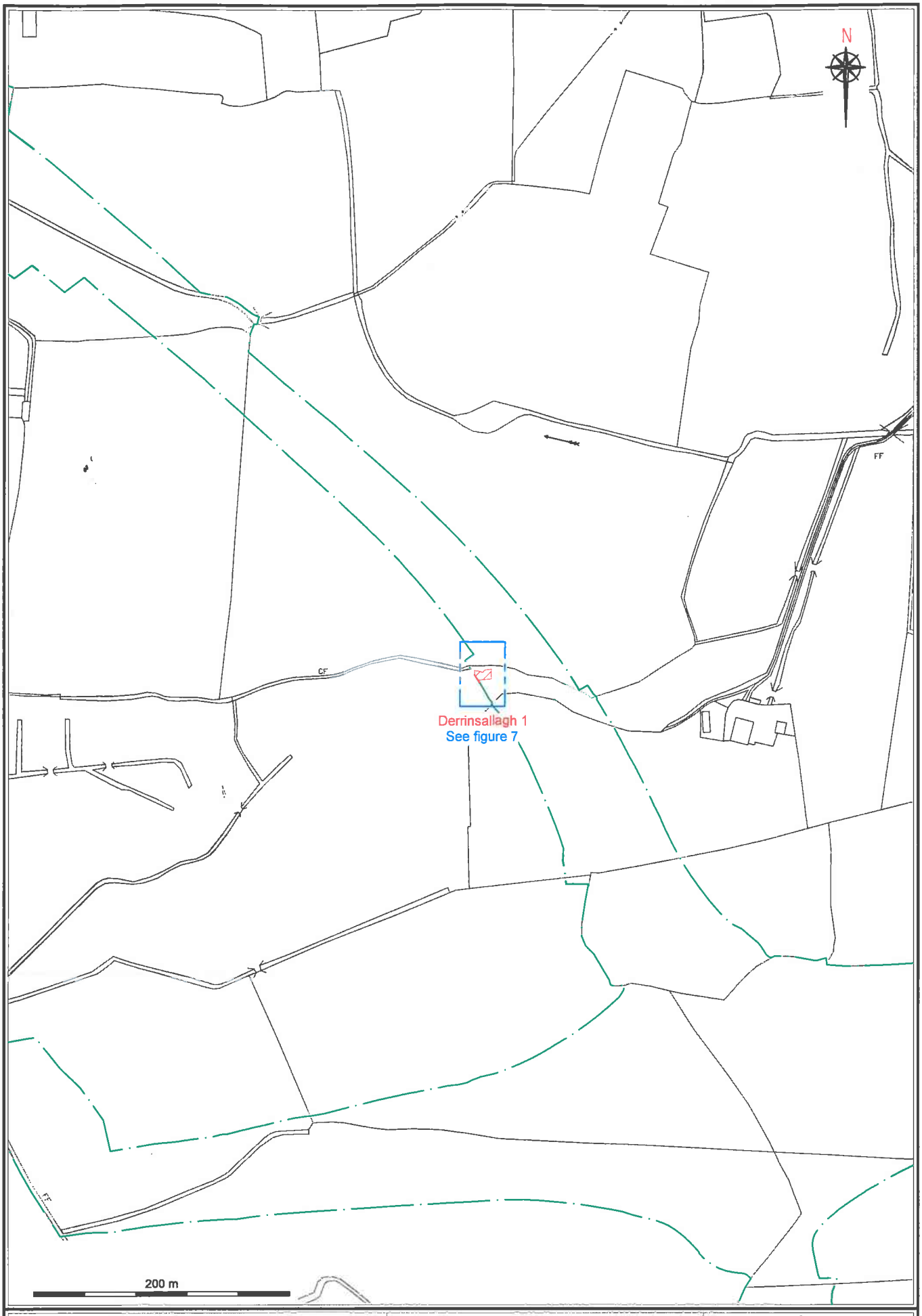
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 10,000 A4
		Date: Feb '09
	Issued for: Archaeological excavation report	Origin: OSi Laois 2nd Ed. (1889-91)
	Client: Laois County Council	Drawing no.: 05_09_C7092

Figure 4: Plan showing Derrinsallagh 1 on OSi Laois 2nd Ed. (1889-91) background



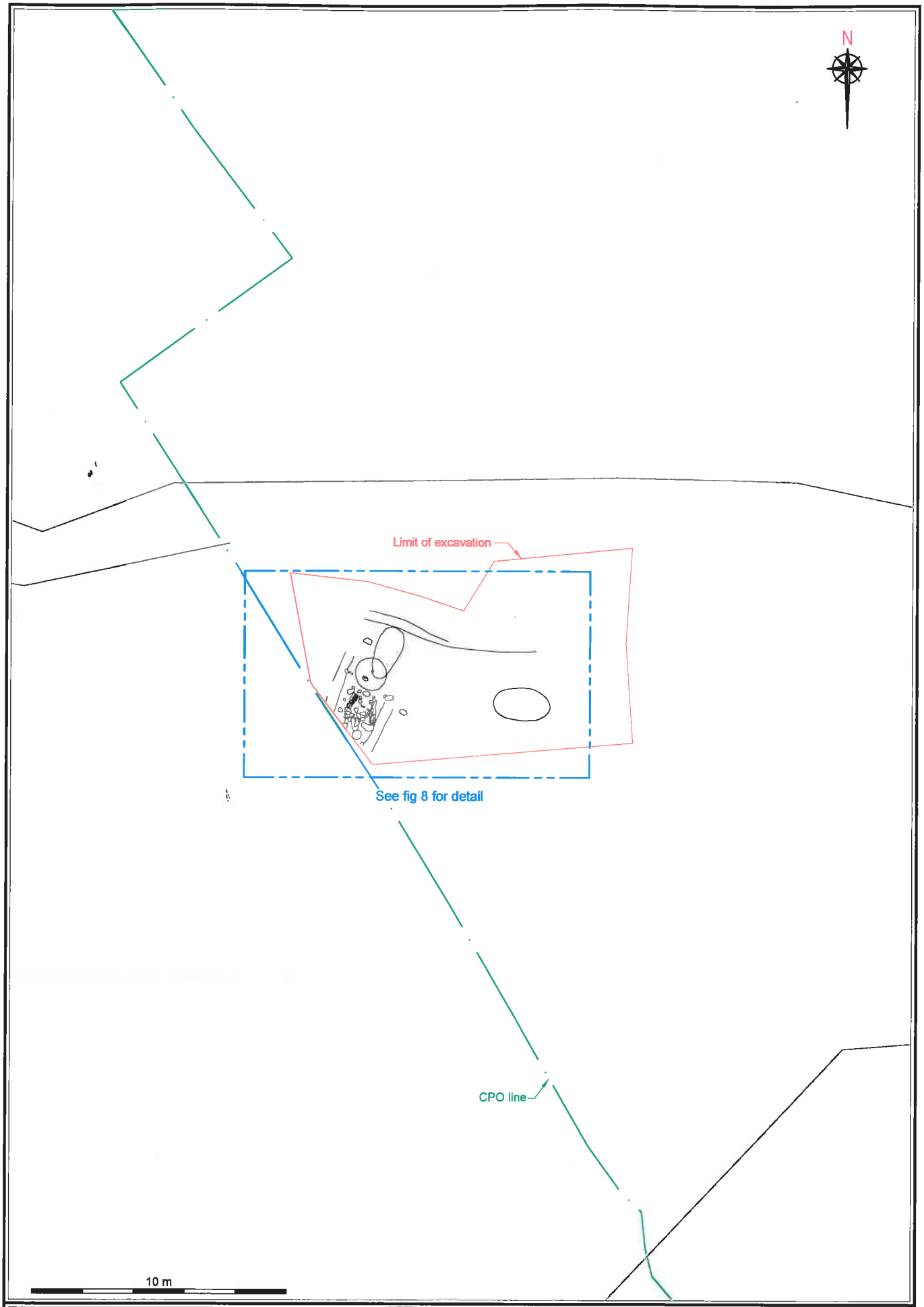
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 10,000 A4
		Date: Feb '09
	Issued for: Archaeological excavation report	Origin: OSi Laois SMR 1909
	Client: Laois County Council	Drawing no.: 05_09_C7093

Figure 5: Plan showing Derrinsallagh 1 on OSi Laois SMR 1909 background



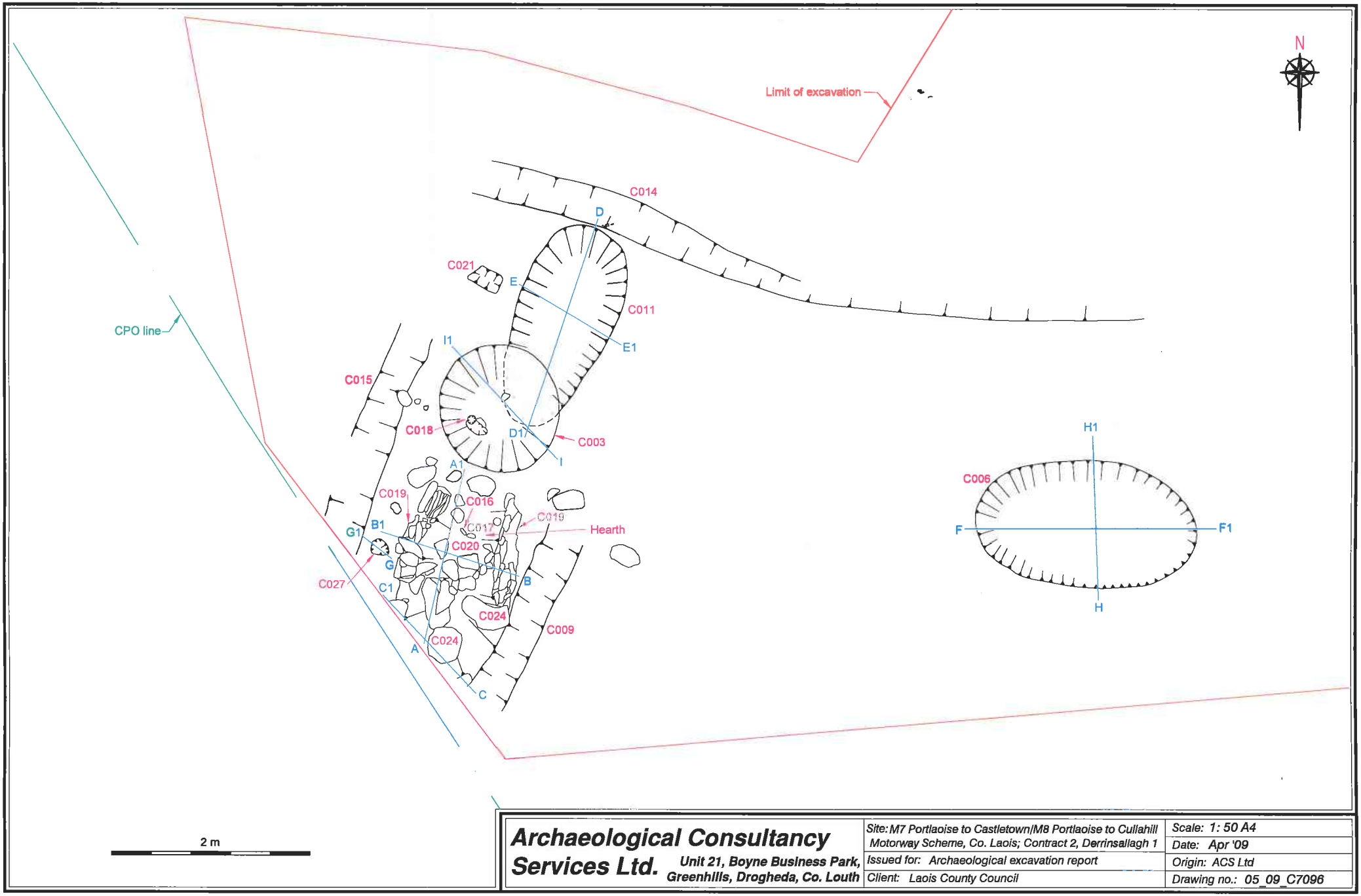
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 4,000 A4
		Date: Apr '09
	Issued for: Archaeological excavation report	Origin: ACS Ltd
	Client: Laois County Council	Drawing no.: 05_09_C7094

Figure 6: Location of Derrinsallagh 1



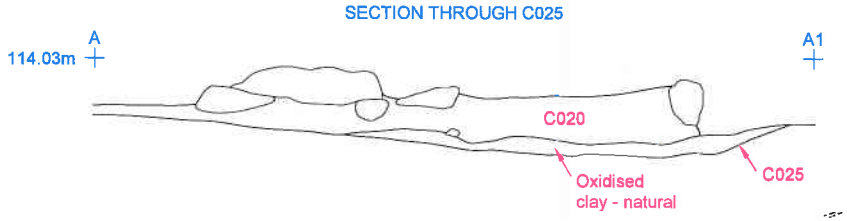
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 200 A4
		Date: Apr '09
	Issued for: Archaeological excavation report	Origin: ACS Ltd
	Client: Laois County Council	Drawing no.: 05_09_C7095

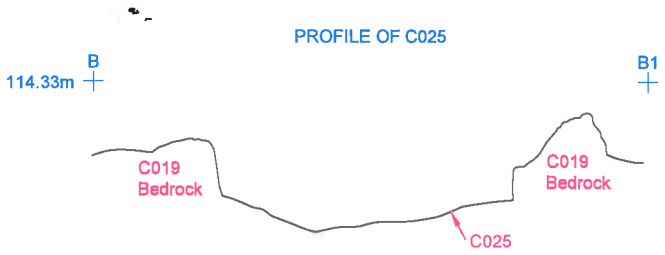
Figure 7: Plan showing extent of site

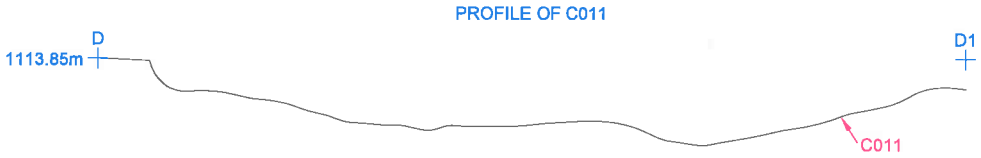


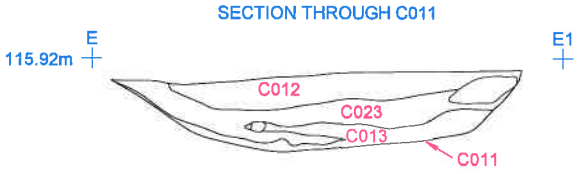
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 50 A4
		Date: Apr '09
	Issued for: Archaeological excavation report	Origin: ACS Ltd
	Client: Laois County Council	Drawing no.: 05_09_C7096

Figure 8: Detail of Derrinsallagh 1





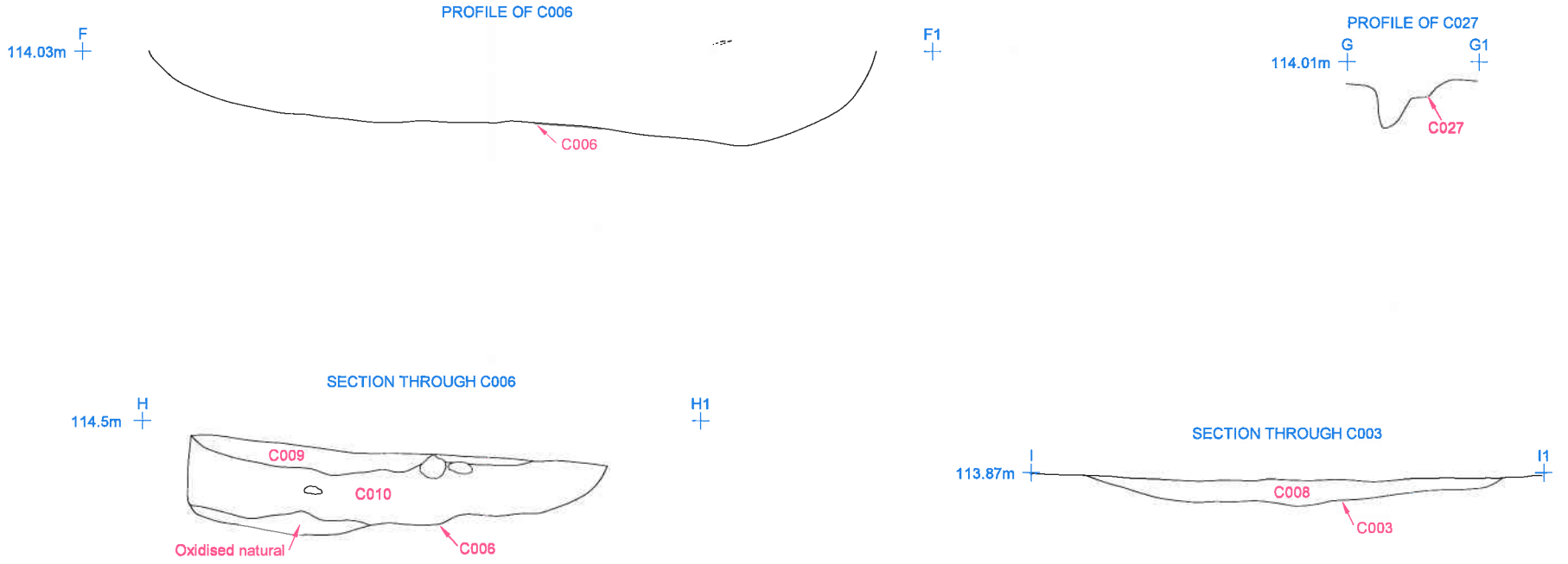




1 m

Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 20 A4
		Date: Apr '09
	Issued for: Archaeological excavation report	Origin: ACS Ltd
	Client: Laois County Council	Drawing no.: 05_09_C7097

Figure 9: Sections and profiles



Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Derrinsallagh 1	Scale: 1: 20 A4
		Date: Apr '09
	Issued for: Archaeological excavation report	Origin: ACS Ltd
	Client: Laois County Council	Drawing no.: 05_09_C7098

Figure 10: Sections and profiles

Plate 1: Mid-excavation of hearth C025 (05_09_Derrinsallagh 1_2_CP001_01)

Plate 2: Post-excavation of hearth/furnace C025 (05_09_Derrinsallagh 1_2_CP005_04)

Plate 3: Mid-excavation of pit C003 (05_09_Derrinsallagh 1_2_CP002_10)

Plate 4: Mid-excavation of pit C011 (05_09_Derrinsallagh 1_2_CP001_19)

Plate 5: Mid-excavation of pit C006 (05_09_Derrinsallagh 1_2_CP003_03)

Plate 6: Post-excavation of pit C006 (05_09_Derrinsallagh 1_2_CP002_01)