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**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
Boherard 3, Co. Laois

Ministerial Directions No.
A015/118
E2227

Ed Danaher
Report by Danaher with Kane

November 2008
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	Boherard 3
Townland	Boherard, Co. Laois
Nat. Grid Ref.	233687, 184939
OD Height	106.521m
OS Map Ref.	OS 6 inch sheet 22
Chainage	18750
Ministerial Directions No.	A015/118
Record No.	E2227
Archaeologist	Ed Danaher
Senior Archaeologist	Deirdre Murphy
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Report by	Danaher with Kane
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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.

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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. The following report describes the results of archaeological excavation along one section of the planned M8 Portlaoise to Cullahill Motorway Scheme, at Boherard, County Laois, Contract 2.

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 Townsparks and Derrinsallagh. The site was identified during archaeological testing carried out by Robert O'Hara of Archaeological Consultancy Services Ltd in March-May 2005 under ministerial direction (A015/028) from The Minister of the Environment, Heritage and Local Government, issued in consultation with the National Museum of Ireland (NMI) issued under Section 14 of the National Monuments (Amendment) Act 2004. A total of 9 trenches were excavated within one field and the remains of a *fulacht fiadh*/burnt mound were identified. The site was designated Boherard 3.

Archaeological resolution of Boherard 3 commenced on 28th June 2006 by Ed Danaher of Archaeological Consultancy Services Ltd. For recording purposes, the site was designated the scheme no. A015/118 and record no. E2227. Topsoil stripping exposed the remains of two burnt mound spreads in close proximity to each other with associated pits and troughs, dated to the Early-Middle Bronze Age. No artefacts were recorded.

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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 Boherard 3, Contract 2, County Laois (Ordnance Survey six-inch sheet 22, National Grid Co-ordinates 233687, 184939; Figures 1-7). The site at Boherard 3 was situated c.1km to the southeast of Aghaboe monastic complex, c.10km to the west of Abbeyleix and c.9km to the east of Borris-in-Ossory. It was located at Chainage 18750 of the proposed scheme, in the townland of Boherard and within the Parish of Aghaboe. Each of the two *fulachta fiadh* that comprised Boherard 3 was situated on low naturally formed mounds.

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 February 2009 and that publication and public lectures/seminars will follow thereafter. Both the format and time-scale 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 Robert O'Hara. The site was identified during archaeological testing carried out by Robert O'Hara of Archaeological Consultancy Services Ltd in March-May 2005 under ministerial direction number A015/028. A total of 9 trenches were excavated within one field and some potential archaeology was identified. The site was designated Boherard 3.

1.4 Date and Duration of Excavation Works

Topsoil stripping of the site began on 27th June 2006 while the initial clean back started the following day. All site works were completed by 5th July 2006.

1.5 Size and Composition of the Excavation Team

The excavation team was composed of:

One site director

Two supervisors

Six archaeological assistants

Six general operatives

2. RECEIVING ENVIRONMENT

2.1 Detailed Overview of the Receiving Environment

2.1.1 Topographic Description.

Boherard 3 was situated in relatively low-lying land that was used for pasture at the time of excavation. It is likely that this area would have been marshland in prehistoric times, which had been reclaimed in more recent times as indicated by the number of drainage ditches within the locale. Interestingly, both *fulachta fiadh* that comprised Boherard 3 were situated on separate low natural mounds of which at least three were situated within this site. It is possible that during the occupation of the site, these would have been the driest locations within an otherwise wet environment. A stream was present in close proximity to the site.

2.1.2 Archaeological

Fulachta Fiadh in Laois

Prior to the recent excavations on the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, there were 19 *fulachta fiadh* recorded in the Archaeological Inventory of Co. Laois (Sweetman *et al* 1995, 12-3). Of the 19 *fulachta fiadh* sites recorded in Laois 13 (68%) have been completely ploughed out and levelled through various agricultural practices such as ploughing and land reclamation. One of the remaining recorded sites was fully excavated; another was revealed through ploughing and is still reasonably intact, while four still survive as upstanding mounds (Sweetman *et al* 1995). All of these recorded sites occur in the southern parts of the county and eight of the 19 *fulachta fiadh* sites in Laois were recorded by Candon (1987) in his separate archaeological surveys of the baronies of Clandonagh and Clarmallagh.

In recent years, four more *fulachta fiadh* were excavated in the county; one at Cloonaddadoran, one at Morett and two at Ballyshaneduff or the Derries (Crumlish 1997; Moore 2003; Breen 2003). Two more *fulachta fiadh* were discovered on the N7 Heath-Mayfield Monasterevan Bypass scheme but these were preserved *in situ* (Tierney 2003). Furthermore, several other excavated sites were found to contain a number of burnt spreads and mounds associated with *fulacht fiadh* activity (10 distinct areas of *fulachta fiadh*/ burnt mound activity in total) (Duffy 1995; Breen 1998; Dempsey 2003). Altogether then, a total of 25 *fulachta fiadh*/ burnt mounds and another 10 or so sites associated with *fulachta fiadh*/burnt mound activity was known in the county prior to recent excavations. The excavations on the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme uncovered in excess of 40 *fulachta fiadh*/burnt mounds/spreads of burnt mound material and

so these discoveries have great potential to add to our very limited knowledge and understanding of hot stone technology and associated burnt mound/*fulachta fiadh* activity in Bronze Age Laois (Kenny, 2008).

2.1.3 Historic

Boherard translates as *Bóthar Ard* which means ‘high road’ (Flanagan and Flanagan 1994, 148; Joyce 1871, 522). *Boher* originally referred to a road for cattle; it is derived from *bó* which is Irish for ‘cow’ (Joyce 1871). The *ard* suffix does not necessarily indicate high-lying terrain in the area – the place-name can occur in low-lying areas where there is any deviation from level ground in the form of a rise, ridge, hill or knoll (O’Connor 2001, 19). In at least one of the cases where this place-name occurs it has been suggested that ‘high road’ may refer to a road not to be travelled by the faint hearted after dark. This place-name once again gives an indication of the topography, but it also refers to a possible route-way, road or trackway which once existed in the townland - which may or may not have some antiquity.

The famous 6th century foundation of St. Canice at Aghaboe is located c.2km to the northwest of Boherard, which became the most important monastery in the kingdom of Ossory. St. Canice also founded the ecclesiastical centre at Kilkenny (‘The church of Canice’) during this period. In Cross townland, a cross shaped depression in a field is recorded in the Archaeological Inventory. An altercation reputedly occurred between St. Canice’s followers at Aghaboe and those at Kilkenny as they argued over which group would receive his remains for burial. While they argued, a stranger appeared with two coffins, so each group could take some of his remains. The cross in this townland supposedly marks the spot where this happened (Sweetman et al 1995, 92). Aghaboe was linked to the island retreat of Monahincha by a pilgrim road (Kennedy 2003, 9). The road reputedly passed through Lismore and Bushfield, where recent excavations have revealed a large early medieval enclosure with a cemetery and metalworking area. The monastery at Aghaboe was raided in 845 and 913 AD by Vikings, after which it was restored until 1116 AD, when it was almost burned to the ground. Becoming the Episcopal See of the Diocese of Ossory in the early 12th century, Aghaboe enjoyed power until the Normans took control at the end of the century in which Strongbow granted the monastic lands to Thomas de Hereford, one of his Norman Knights. A motte and bailey dating to the time of the Anglo-Norman occupation here has been recorded (Sweetman et al 1995, 101). In 1234, the monastery was rebuilt as a priory church for the canons regular of St. Augustine. The church was attacked again in the 14th century by the MacGillapatricks during the Irish resurgence which saw the shrines, bones and reliquaries of St. Canice destroyed (O’Hanlon and O’Leary, vol I, 1907, 167). They took control of the area and in 1382 a Dominican Friary was established there by Florence MacGillpatrick, Lord of

Ossory (Kennedy 2003, 12). The friary was suppressed in 1540 and was subject to unrest during the suppression of religious houses in the 16th and 17th centuries. In 1556, Laois and Offaly were renamed the Queen's County and the King's County respectively and the area was targeted for plantation. About one third of the marginal land in Laois was granted back to the O'Connors and the O'Moores on the condition that they were loyal to the crown and they abandoned their Gaelic ways. The rest of the county was colonised by English settlers and plantation towns were established (Kennedy 2003, 13). Several sites dating to the Post-Medieval period have been excavated recently in advance of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme. These include a smithy/forge at Cuffsborough 5, an industrial site at Gortnagroagh 1, a possible Post-Medieval well at Cuffsborough 3 and a Post-Medieval trackway with wheel ruts at Cuffsborough 4. A protestant parish church was also built there in 1818 (Kennedy 2003, 14).

3. RESEARCH FRAMEWORK

The research framework for Boherard 3 will address the following topics:

- (i) The construction date or date of initial site occupation/use
- (ii) The date of site abandonment
- (iii) The extent of the archaeological site/activity
- (iv) 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.
- (v) What cultural group/unit would have occupied the site
- (vi) Why the site location would have been chosen
- (vii) How the site would have been constructed and what activities would have taken place at and within the site
- (viii) The likely social status of the builders/occupiers of the site
- (ix) The longevity of the site, its success (or otherwise) and the reasons for the site being abandoned

4. EXCAVATION RESULTS

4.1 Excavation Methodology

Excavation began on 28th June 2006 under Ministerial Direction Number A015/118. 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. E2227:3:1 represents find number 1 within feature number 3 in Boherard 3, which was excavated under record number E2227. 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

- F001** Topsoil
- F002** Natural subsoil
- F003** Fill of F004
- F004** Cut of pit filled with F003 (Zone A)
- F005** Fill of F006
- F006** Cut of trough filled with F005 (Zone A)
- F007** Fill of F008
- F008** Cut of trough filled with F007 (Zone A)
- F009** Burnt mound spread (Zone A)
- F010** Fill of F011
- F011** Cut of cultivation furrow filled with F010 (Zone A)
- F012** Fill of F013
- F013** Cut of cultivation furrow filled with F012 (Zone A)
- F014** Fill of F015

- F015** Cut of cultivation furrow filled with F014 (Zone A)
- F016** Fill of F017
- F017** Cut of cultivation furrow filled with F016 (Zone A)
- F018** Fill of F019
- F019** Cut of trough filled with F018 (Zone B)
- F020** Fill of F021
- F021** Cut of pit filled with F020 (Zone B)
- F022** Fill of F023
- F023** Cut of pit filled with F022 (Zone B)
- F024** Main fill of F026
- F025** Burnt mound spread (Zone B)
- F026** Cut of pit filled with F028, F024 (Zone B)
- F027** Natural boulder clay beneath F002
- F028** Primary fill of F026
- F029** Burnt mound spread (Zone B)

4.2.2 Stratigraphical Matrix

Natural Deposits

F001	Topsoil: Consisted of loose, mid brown-grey, silty clay. Occasional charcoal, tree roots and stones (0.02-0.20m) included. Measured 0.15-0.50m (depth). No artefacts recorded.
F002	Natural subsoil: Consisted of relatively compact, grey-yellow (with orange spots), silty clay. Frequent stones included. Above F027, below all archaeological features.
F027	Natural boulder clay: Consisted of hard, grey, silty clay. Frequent decayed stones included. Extends across the site. Above bedrock, below F002.

Zone B (Figure 9)

Trough (Pit 1; Figure 11; Plate 6)

F019	Cut of sub-rectangular trough, with rounded corners. Orientated east-west. Measured 2.10m x 1.14m x 0.29m. It had a sharp break of slope at top, near vertical sides leading to a flat base with a sharp break of slope. Filled with F018. Cut into the eastern side of a naturally occurring, low mound and lay southeast of the main burnt
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	mound deposit, F025. Located between F021 and F023, abutted F023. Above F002, below F018.
F018	Fill of F019, composed of hard, black, silty clay, frequent heat shattered stones, charcoal and organic roots included. Measured 2.10m x 1.14m x 0.29m. No artefacts recorded. Two soil samples taken. C14 analysis of charcoal (ash) returned a date of Cal BC 2460-2190 (SUERC 20398) (See Appendices 10.1 & 10.3). Above F019, below F001.

Pit 2 (Figure 11)

F021	Cut of possibly circular pit, amorphous at its surface due to root action. Orientated north-south. Measured 1.50m x 1.30m x 0.24m. It had a gradual break of slope at its surface, sloping-concave sides leading to a rounded base with a gradual break of slope. Filled with F020. Truncated by 'root activity'. This pit was located directly north of F019, and may have functioned as a hearth used to provide hot stones for the trough. Although no oxidation was evident within the base or sides, its fill, F020 was consistent with hearth debris. Stratigraphically below F025. Above F002, below F020.
F020	Fill of F021, with loose, dark grey-black, silty clay. Frequent heat shattered stones and charcoal included. Measured 1.50m x 1.30m x 0.24m. No artefacts or samples taken. Above F021, below F025.

Pit 3 (Figure 11, Plate 6)

F023	Cut of circular pit. Measured 1.30m x 1.30m x 0.11-0.21m. It had a gradual break of slope at its top, steeply sloping sides leading to an undulating base with a gradual break of slope. Filled with F022. Abutted F019 to the south. It was filled with secondary refuse associated with burnt mound technology but was unlikely to have functioned as a hearth, as no indication of burning, such as oxidation at the base or sides was evident. Above F002, below F022.
F022	Fill of F023, with hard, black, silty clay. Frequent heat shattered stones, charcoal and organic roots included. Measured 1.30m x 1.30m x 0.11-0.21m. No artefacts recorded. Two samples taken (See Appendix 10.1). Above F023, below F001.

Pit 4 Possible trough (Figure 11)

F026	Cut of large oval pit. Orientated east-west. Measured 2.60m x 1m x 0.21m. It had a gradual break of slope at its surface, convex sides leading to a flat base with a sharp break of slope. Filled with F028, F024. Truncated F029. Located south in Zone B. This feature may represent the basal remains of a ploughed-out deposit of burnt mound material, which may have filled a naturally-formed depression or a paleochannel, the latter is indicated by the presence of F028, a water-sorted deposit underlying this cut. Above F029, below F028.
F028	Primary fill of F026, with soft, silty sand (water sorted deposit). Occasional decayed stone included. Measurements not recorded. No artefacts or samples taken. Above F026, below F024.
F024	Main fill of F026, with soft, black, silty sand. Frequent charcoal, heat shattered stones and organic roots included. Measured 2.60m x 1m x 0.21m. No artefacts recorded. Two samples taken (See Appendix 10.1). Above F028, below F001.

Burnt mound spread (Figure 11)

F025	Irregular deposit of hard, black, silty clay. Frequent heat shattered stones, charcoal and organic roots included. Orientated east-west. Measured 4.90m x 2.50m x 0.10m. No artefacts recorded. Two soil samples taken. Lay stratigraphically above F021. Located north in Zone B, on a natural hillock. Above F020, below F001.
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Burnt mound spread (Figure 11)

F029	Oval deposit of soft, grey, silty sand. Frequent decayed and heat shattered stones and charcoal included. Measurements 2.8m x 1.25m. No artefacts or samples taken. Located south in Zone B, truncated by F026. Above F002, below F026.
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Zone A (Figure 8)**Pit 1 (Figure 10; Plate 2)**

F004	Cut of sub-circular pit. Orientated east-west. Measured 1.10m x 1.02m x 0.13m. It had a gradual-sharp break of slope at its top, gently sloping-vertical sides terminating at a flat base with a sharp break of slope. This pit was located beside and possibly truncated by the northwestern side of F006. Although the location of this feature
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	would suggest that it may have functioned as a hearth, the absence of oxidation along its base and sides may rule out this possibility. Filled with F003. Truncated by F006. Located north in Zone A. Above F002, below F003.
F003	Fill of F004, with relatively loose, black, peaty-clayey silt. Frequent heat shattered stones and occasional charcoal included (Consistent with the standard secondary refuse deriving from burnt stone technology). Measured 1.10m x 1.02m x 0.13m. No artefacts recorded. Two soil samples taken (See Appendix 10.1). Above F004, below F006.

Trough 1 (Figure 10, Plate 2)

F006	Cut of rectangular trough, with rounded corners. Orientated east-west. Measured 2.20m x 1.40m x 0.27m (max.). It had a sharp break of slope at top, vertical sides leading to a flat base with a sharp break of slope. Filled with F005. Truncated F004. Located north in Zone A, east of F008. Above F003, below F005.
F005	Fill of F006, with loose, dark grey-black, clayey silt. Frequent heat shattered stones and occasional charcoal included. Measured 2.20m x 1.40m x 0.27m (max.). No artefacts recorded. Two soil samples taken (See Appendix 10.1). Probably represented a single episode of in-filling associated with the final use of F006. It resulted from a single episode of activity, which was typical of secondary refuse associated with burnt mound activity. It was poorly sorted, with a higher silt content at its surface and contained fewer burnt stone inclusions than either the pit F004 or the trough fill, F007. Above F006, below F001.

Trough 2 (Figure 10; Plates 3 & 5)

F008	Cut of rectangular trough, with rounded corners. Orientated north-south. Measured 1.90m x 1.28m x 0.04-0.20m. It had a sharp break of slope at its top, sloping-concave sides that gave way to a flat-rounded base with a gradual break of slope. The western extent was clearly truncated by post medieval/early modern cultivation furrows, while the trough itself was cut into the slope of the natural mound forming F002. Filled with F007. Located north in Zone A, west of F006. Above F002, below F007.
F007	Fill of F008, with loose, black, clayey silt. Frequent heat shattered stones and charcoal included (Consistent with the standard secondary refuse deriving from burnt stone technology). Measured 1.90m x 1.28m x 0.04-0.20m. No artefacts recorded.

	Two soil samples taken. C14 analysis of a charcoal sample (ash) returned a date of Cal BC 1620-1440 (SUERC 20394) (See Appendices 10.1 & 10.3). Above F008, below F001.
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Burnt mound spread (Figure 10)

F009	Deposit of relatively loose, black, clayey silt. Frequent heat shattered stones and occasional charcoal included. This context represented the secondary refuse associated with burnt mound technology and constituted the main concentration of burnt mound material within the site. It overlay the summit of a natural mound, while its associated features were present to its south and cut into the north-facing slope of this mound. Orientated east-west. Measured 19m x 11.50m x 0.04m. No artefacts recorded. Two soil samples taken (See Appendix 10.1). Located south of F004, F006, F008, on a natural hillock. Truncated by F011, F013, F015, F017. Above F002, below F011, F013, F015, F017.
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Modern features (Figure 8)

Cultivation furrow 1

F011	Cut of linear furrow. Orientated northwest-southeast. Measured <21.50m x 0.40m x 0.05m. It had a gradual break of slope at top, concave sides that gave way to a flat base with a gradual break of slope. Filled with F010. Truncated F009. Located east of F013. Above F009, below F010.
F010	Fill of F011, with loose, brown-grey, clay. Occasional charcoal included. Measured <21.50m x 0.40m x 0.05m. No artefacts or samples taken. Above F011, below F001.

Cultivation furrow 2

F013	Cut of linear furrow. Orientated northwest-southeast. Measured <21.50m x 0.85m x 0.05m. It had a gradual break of slope at its top, concave sides leading to a flat base with a gradual break of slope. Filled with F012. Truncated F009. Located west of F011. Above F009, below F012.
F012	Fill of F013, with loose, brown-grey, clay. Occasional charcoal included. Measured <21.50m x 0.85m x 0.05m. No artefacts or samples taken. Above F013, below F001.

Cultivation furrow 3

F015	Cut of linear furrow. Orientated northwest-southeast. Measured <21.50m x 0.45m x 0.10m. It had a gradual break of slope at top, concave sides terminating at a flat base with a gradual break of slope. Filled with F014. Truncated F009. Located west of F013. Above F009, below F014.
F014	Fill of F015, with loose, brown-grey, clay. Occasional charcoal included. Measured <21.50m x 0.45m x 0.10m. No artefacts or samples taken. Above F015, below F001.

Cultivation furrow 4 (Figure 10)

F017	Cut of linear furrow. Orientated northwest-southeast. Measured <21.50m x 0.45m x 0.10m. It had a gradual break of slope at its surface, concave sides leading to a flat base with a gradual break of slope. Filled with F016. Truncated F009. Located west of F015. Above F009, below F016.
F016	Fill of F017, with loose, brown-grey, clay. Occasional charcoal, burnt clay and stones included. Measured <21.50m x 0.45m x 0.10m. No artefacts or samples taken. Above F017, below F001.

4.2.3 Stratigraphic Sequencing

Table ... Stratigraphic Groups		
Site Name: Boherard 3		Record No.: E2227
Period	Phase	Composition
I	1	Formation of subsoil
	2	Early Bronze Age: Zone B
II	1	Middle Bronze Age: Zone A
III	1	Early Modern period: Cutting of cultivation furrows

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

Burnt mound activity (Figures 7-9)

Boherard 3 consisted of the remains of two separate *fulachta fiadh* situated on a low naturally formed mound. The site was divided into two Zones for ease of recording. Zone A comprised a spread of burnt mound material, two sub-rectangular troughs and a circular pit. Zone B contained two spreads of burnt mound material, a sub-rectangular trough, an oval pit and two

circular pits. A stream was present in close proximity to the site. No artefacts were found in association with any of the features/deposits exposed on site.

Period 1

Phase 2 Early Bronze Age

Zone B (Figures 9 & 11, Plate 6)

Six features were recorded in this area (F019, F021, F023, F025, F026 & F029). A sub-rectangular trough (F019: 2.10m x 1.14m x 0.29m) was positioned between two pits (F021, F023), Oriented east-west, it was filled with black silty clay (F018) containing heat shattered stones and charcoal. Radiocarbon determination of a sample of ash (See Appendix 10.1) extracted from this deposit returned a date of Cal BC 2460-2190, placing it within the Early Bronze Age period (SUERC 20398) (See Appendix 10.3). Two circular pits F021 and F023 (1.30-1.50m x 1.30m x 0.11-0.24m) lay to the north and south of F019 respectively. The latter abutted the southern side of F019, while the former was separated from it by c.0.50m, both were filled with burnt mound material (F020, F022). There was no evidence to suggest that either functioned as a hearth but it is possible that they may have functioned as pot boilers. Lying stratigraphically above F021, a spread of burnt mound material, F025 (4.90m x 2.50m x 0.10m) was recorded. This was deposited on a natural hillock, it comprised similar burnt mound refuse consisting of black silty clay, heat shattered stones, charcoal and organic roots. Further south, a relatively shallow, east-west aligned, oval pit F026 (2.60m x 1m x 0.21m) was recorded, which may have functioned as a trough. It contained two deposits; the primary of which (F028) contained a thin layer of soft, silty sand and decayed stone, while the secondary fill, F024 comprised burnt mound material consisting of a black silty sand with charcoal, heat shattered stones and organic roots. It truncated burnt spread F029. Oval in plan, this spread was filled with grey silty sand, heat shattered stones and charcoal. No artefacts were recorded.

Period 2

Phase 1 Middle Bronze Age

Zone A (Figures 8 & 10; Plates 2, 3 & 5)

Four archaeological features were noted in this area (F004, F006, F008 & F009). Two of these were rectangular troughs (F006 & F008) and were recorded perpendicular to one another. F006 (2.20m x 1.40m x 0.27m) was an east-west aligned, sub-rectangular trough which contained a single fill (F005) comprising burnt mound material. It lay to the east of a second trough on the site, F008. The latter (1.90m x 1.28m x 0.04-0.20m) was rectangular in plan and oriented in a north-south direction. Its only fill, F007 was a deposit of burnt mound

material consisting of loose, black, clayey silt containing heat shattered stones and charcoal. C14 analysis of a charcoal sample (ash) returned a Middle Bronze Age date of Cal BC 1620-1440 (SUERC 20394) (See Appendices 10.1 & 10.3). Pit F004 (1.10m x 1.02m x 0.13m) was truncated by F006 and was oriented in a northeast-southwest direction. Sub-circular in plan, it was filled with a single episode of burnt mound material, F003. To the south of these pits, a large burnt spread of burnt mound material (F009: 19m x 11.50m x 0.04m) had been deposited as a black, clayey silt, with heat-shattered stones and charcoal inclusions. This was the main concentration of secondary refuse associated with the site and was oriented in an east-west direction and deposited on a natural hillock within the site. It was truncated by four modern cultivation furrows (F011, F013, F015, F017). No artefacts were recorded.

Period 3

Phase 1 Early Modern period

Zone A & B (Figures 8 & 10)

Prior to excavation, this field was used for tillage. Four linear cultivation furrows (F011, F013, F015, F017: <21.50m x 0.40-0.85m x 0.05-0.10m) recorded were evidence of this. Truncating F009, they were filled with single deposits of brown-grey, silty or sandy clay containing some burnt mound material. No artefacts were recorded.

4.2.4 Stratigraphic Discussion

The excavations at Boherard 3 exposed the presence of burnt mound activity, which produced two phases of activity: the Beaker/Early Bronze Age and a later phase dating to the Middle Bronze Age (See Appendix 10.3) (See Figures 8-11, Plates 1-7). A technical description of this activity and its associated features can be found in the matrix and sequencing above.

A number of features associated with burnt mound activity were noted at Boherard 3 following the removal of topsoil (See Figure 7). For ease of reference, the site was divided into two zones, labelled A-B. In Zone A, two rectangular troughs (F006, F008), and a smaller pit F004 were recorded (See Figure 8). The pit, F004 was truncated by the trough F006, perhaps indicating continuous use of the area, and while no C14 date was obtained for these features, a Middle Bronze Age date was returned for the trough, F008 to their west (See Appendix 10.3). A third trough (F019), similar to in plan to F006 was recorded in Zone B (See Figure 9). Charcoal (ash) from the only deposit of burnt mound material filling it yielded a C14 date of Cal BC 2460-2190 (See Appendix 10.3). A smaller similar pit (F004), mentioned above, was identified as such due to its shallow nature (0.13m depth) (See Figure 10), along with two similar pits (F021, F023) with depths of 0.11-0.24m, which were

recorded in Zone B, (See Figure 9). Given their proximity to the troughs combined with the fact that they were filled with burnt mound material, these pits were potentially used in conjunction with the troughs' activities, but appear to have had an alternative role such as pot boiling or baking/dry roasting, the latter of which would not have required water.

An additional pit (F026) situated at the southern part of Zone B, was unlike those mentioned above (See Figure 9). Relatively large in size (2.60m x 1m x 0.21m), it contained two deposits of silty sand with heat shattered stones and charcoal. This pit may well have functioned as a trough possibly later in date than trough F019 as might be implied by the fact that it truncated burnt mound spread F029. In each zone, a large spread/mound of burnt mound material (F009, F025) was recorded on a natural hillock (See Figures 7-9). When consideration is given to the sites at Boherard 1 and 2 in combination with the present site, a complex of burnt mound activity spread out across a large area is observed. Tempting though it is to conceptualise large-scale simultaneous activity spread over the townland, radiocarbon analysis of samples from these sites would indicate more sporadic, intermittent activity, with intervening periods of abandonment. Perhaps the emerging pattern is more indicative of groups returning to the same place periodically in order to perform similar activities. Topographical considerations must also be taken into account; along with the presence of natural resources such as a stream or lake (an example of the former was present close to the site) to provide necessary water sources.

4.2.5 Stratigraphic Conclusion

Through the various stages of archaeological investigation burnt mound activity was recorded at this location. Two distinct *fulachta fiadh* were discovered at Boherard 3. When comparing this site with neighbouring archaeological sites (Boherard 1 and 2), a pattern of human activity across the townland emerges, which shall be dealt with in greater detail below.

4.3 Artefactual evidence

No artefacts were recorded.

4.4 Environmental Evidence

4.4.1 Wood ID analysis

Table 4.4.1 Taxa identified at Boherard 3. Taken from O'Carroll (Appendix 10.1)

Site	E-number	Feature type	Context	Sample No	Date	Identification	Comment
Boherard 3	E2227	FF pit	F024	1	Undated BA	Alder (0.2g, 5f) Oak (1.3g, 6f) Ash (2.7g, 31f) Yew (0.1g, 2f)	Unburnt <i>Prunus</i> twigs poss. Modern
Boherard 3	E2227	FF pit	F003	2	Undated BA	Alder (0.2g, 7f) Oak (0.8g, 21f) Ash (0.5g, 9f) Hazel (0.2g, 6f) Pomoideae (0.5g, 13f) Birch (1.2g, 17f) Elm (0.1g, 2f)	Iron stained
Boherard 3	E2227	Trough	F005	3	Undated BA	Oak (0.6g, 10f) Ash (0.01g, 1f)	Tiny fragments
Boherard 3	E2227	Trough	F018	4	Cal BC 2460-2190 EBA	Alder (0.1g, 2f) Oak (1.4g, 22f) Ash (2.5g, 21f) Alder/Hazel (0.05g, 1f)	
Boherard 3	E2227	Trough	F007	5	Cal BC 1620-1440 MBA	Oak (0.1g, 2f) Ash (1.2g, 11f) Alder/Hazel (0.3g, 4f) Hazel (0.6g, 6f) Pomoideae (1.8g, 12f) Birch (0.9g, 8f)	
Boherard 3	E2227	FF pit	F022	6	Undated BA	Alder (0.1g, 1f) Oak (1.1g, 8f) Ash (2.4g, 36f) Alder/Hazel (0.2g, 4f) Hazel (0.7g, 2f) Pomoideae (0.2g, 3f) Birch (0.1g, 1f)	Tiny fragments
Boherard 3	E2227	FF spread	F009	7	Undated BA	Alder (0.5g, 8f) Oak (0.5g, 4f) Pomoideae (0.2g, 3f) Birch (1.2g, 15f) Cherry (0.5g,	

						1f)	
Boherard 3	E2227	FF pit	F024	8	Undated BA	Oak (0.3g, 8) Ash (0.2g, 10f) Yew (0.01g, 2f)	Iron stained and distorted

Oak, ash, alder, birch, pomoideae, hazel, yew, elm and cherry in that order were identified from Boherard 3. Features analysed included a trough, pit, and spread all associated with *fulacht fiadh* activity. The charcoal is most likely representative of firewood collected and used for activities at the site. The identified taxa are related to a range of environments including dryland, wetland and scrub. The high occurrence of ash may suggest that the area was clearfelled in earlier periods for the inhabitants of the area as ash trees tend to develop in areas of open ground with access to lots of light.

4.4.2 Petrographical Analysis

(Taken directly from Mandal, See Appendix 10.2)

Site	MD #	Sample	Description
Boherard 3	A015/131	?	Predominantly broken heat shattered pebbles of coarse quartzite and sandstone, plus angular limestone, sandstone, quartz and chert

All of the materials identified within the samples are readily available at the site, in bedrock and in the overlying glacial tills.

However, the closest bedrock source for quartzite occurs in the Clay Gill Sandstone Formation which occurs in the upland areas c. 3k east of Durrow. Whilst it is possible that quartzite occurs in the glacial tills, the importing of quartzite from other areas, or the preferential extraction of quartzite from the tills cannot be ruled out.

4.5 Dating Evidence

(See Appendix 10.3)

Two radiocarbon dates were retrieved from charcoal samples obtained from this site. Radiocarbon determination of a sample of ash (See Appendix 10.1) extracted from F018, the fill of a sub-rectangular trough associated with the Zone B *fulacht fiadh* returned a date of Cal BC 2460-2190. A Middle Bronze Age date of Cal BC 1620BC-1440 (SUERC 20394) was

obtained from an ash sample, extracted from the fill (F007) of trough F006 associated with the Zone A *fulacht fiadh*.

5. DISCUSSION

Fulachta fiadh or burnt mounds have been identified throughout Ireland and are the most common prehistoric monument in the country. At present, over 4,600 have been recorded though this number will undoubtedly increase with further field survey and development led excavations. The largest concentrations of these sites are in Munster with over 2,500 examples alone in County Cork (Buckley 1990, 3), approximately one per 2.97 sq km. Power (1990) notes that in County Cork, as elsewhere in the country, the location of *fulachta fiadh* shows a preference towards streamside sites. They are also to be found close to other water sources such as lakes, rivers and marshes.

It is probably true to say that the basic function of a *fulacht fiadh* was to provide hot/boiling water. Once the trough had been constructed and filled with water, the primary function of the *fulacht fiadh* could begin. Although formal hearths have been identified at a number of sites, they are not extremely common. Most hearths would probably have been placed close to the trough to allow for the easy transportation of the heated stones. Although no traces of a hearth were present in association with this site, it may have been destroyed as a result of later activity.

The precise function of burnt mounds is as yet not fully clear, but it is generally regarded that *fulachta fiadh* were cooking sites where the process by which the meat was cooked involved the digging of a pit or trough that may have been lined with clay or timber (Buckley 1991, 88). This was filled with water while situated close by was a fire where stones were heated until red hot. These stones were then placed into the water bringing it to the boil. In 1952, Professor M.J. O'Kelly demonstrated this process when a 4.5kg leg of mutton wrapped in straw was cooked in three hours and forty minutes. After the meat was cooked, the burnt stones were removed from the trough and dumped on three sides of the hearth and trough, giving rise to the characteristic shape of the mound (Buckley 1991, 88).

Although the cooking hypothesis is the most widely accepted, it has come under increased scrutiny in more recent times due to the scarcity of food waste and artefacts associated with excavated *fulachta fiadh*. However, an increasing number of sites have produced animal bone

such as Fahee South, Co Clare (O'Drisceoil 1988), and Curraheen 4, Co Cork (Russell 2004). Alternative suggestions that have been put forward regarding their function include brewing, textile-processing and leather working. However, Diarmuid O'Drisceoil is of the opinion that there is little sustainable supporting evidence for these suggestions (O'Drisceoil 1988, 671–80).

A strong case for the interpretation of burnt mounds as prehistoric saunas or bathing places has been put forward by Barfield and Hodder (1987, 370–79). Examination of numerous excavated burnt mounds led them to suggest that these sites were the remains of steam or sauna baths and they used ethnographical and historical evidence to support their argument. There are two main types of bath: dry-heat sweat baths and baths which use water to produce steam. The use of hot stones is the most common method of heat production in sweat baths. Stones heated in an open fire can be brought into simple tented structures with wooden tongs or can be simply rolled in. An alternative method is to light a fire, heat the stones, remove the ashes and then erect a structure covered with skins above the hot stones (Barfield and Hodder 1987). These steam or sweat baths were likely to have had a practical, ritual and social function. An examination of the archaeological, literary, experimental and ethnographical evidence for the possible uses of these sites would suggest that cooking was the primary function while bathing by immersion or sweating may have been a secondary activity. While this suggests that the sites were multi-functional, some may have had a single role, i.e. their use either as a sauna or for cooking.

The terms *fulacht fiadh* and *fulacht fian* may have been in use in Ireland for over a millennium (O'Drisceoil 1988, 671–80). When translated, the word *fulacht* originally meant recess or cavity but later came to mean cooking place. *Fiadh* can be translated as of the deer or of the wild while *fian* means of a roving band of hunters or warriors or also of the Fianna or Fionn Mac Cumhail, mythical figures of Irish folklore. The above terms are referred to in the literature of ancient Irish law tracts prior to AD 800. Of the many references, one in particular stands out. Geoffrey Keating in *The History of Ireland*, written in the early seventeenth century, refers to the Fianna thus:

And it was their custom to send their attendants about noon with whatever they had killed in the morning's hunt to an appointed hill...and to kindle raging fires thereon, and put into them a large number of emery stone; and to dig two pits in the yellow clay of the moorland, and put some of the meat on spits to roast before the fire; and to bind another portion of it with sugans in dry bundles, and to set it to boil in the larger of two pits, and

keep plying them with the stones that were in the fire...until they were cooked. And these fires were so large that their sites are today in Ireland burnt to blackness, and these are now called Fulacht Fian by the peasantry.

As to the Fian...each of them stripped off, and tied his shirt around his waist; and they ranged themselves around the second pit...bathing their hair and washing their limbs, and removing their sweat, and then exercising their joints and muscles, thus ridding themselves of their fatigue (O'Drisceoil 1988).

Keating's description of the cooking pit and cooking process matches the archaeological evidence. From the text, it is clear that cooking is the primary function of the site but that bathing also occurs. This dual function is referred to in other Irish texts. Keating's account sees the site being used by hunters but the large number of these sites and the density of their distribution cannot be explained by hunting alone. This would give us an abundance of evidence for hunting with little evidence for more permanent settlement being present.

While *fulachta fiadh* cannot be described as settlement sites, they may indicate settlement patterns. A wider picture of settlement in the Bronze Age may be gleaned from the precise dating of settlement sites contemporary with the span of the *fulachta fiadh*/burnt mound radiocarbon dates as is the case with sites such as Curraghtoor and Ballyvealish in Co Tipperary, Carrigillihy in Co Cork and possibly Coolfin in Co. Laois. The suggestion that *fulachta fiadh* are evidence for transient settlement appears to be untenable (Buckley 1990, 7). Cooney and Grogan propose that these sites may be part of an integrated system including domestic and burial sites as is evident in south Limerick where "*a complex landscape organisation with extensive cemeteries, domestic sites and fulachta fiadh form an integrated pattern*" (Cooney and Grogan 1999, 141).

Boherard 3 contained the remains of two separate and probably unrelated *fulachta fiadh*, both of which were situated on a low naturally formed mound. The site was divided into two Zones for ease of recording. Zone A comprised a spread of burnt mound material, two sub-rectangular troughs and a circular pit. Zone B contained two spreads of burnt mound material, a sub-rectangular trough, an oval pit and two circular pits.

Fulachta fiadh are generally recognised through a number of consistent features: a mound of heat-fractured stones, a trough and traces of fires, sometimes represented by a formal hearth. Other components, such as post-built structures and roasting-pits, can also be associated with

these sites (Waddell 1998). Generally, for a site to be called a *fulacht fiadh* it should contain a spread of burnt mound material and an associated trough (see Brindley and Lanting 1990, 55). Owing to the nature of development-led archaeology, however, some sites are not fully exposed and important features such as troughs may lie outside the roadtake. Therefore, spreads of burnt mound material discovered without an associated trough may originally have formed part of a *fulacht fiadh*. Alternatively, portable troughs may have been used, leaving no trace in the archaeological record. Water may have been boiled in containers of wood, bronze or leather; the shallow circular pits associated with many burnt mound spreads may have acted as receptacles for these containers, likewise they may have been used for dry-roasting. For the purposes of discussion, any site not containing these two elements (a spread of burnt mound material and a trough) will not be referred to as a *fulacht fiadh* but as either a spread of burnt mound material or pit(s) containing burnt mound material, depending on the nature of the evidence. This, however, does not imply that these sites did not originally function as *fulachta fiadh*. The evidence from Boherard 3 conforms to Brindley's and Lanting's (1990, 55) definition of a *fulacht fiadh*, with two probable distinct *fulachta fiadh* being present at this location. The earlier of the two dates to the Beaker/Early Bronze Age period while the second is of Middle Bronze Age date (See Appendix 10.3).

6. INTERPRETATION AND RECONSTRUCTION

This site conforms to the definition of a *fulacht fiadh* outlined above, with two probable distinct *fulachta fiadh* being identified at this location. The burnt mound spreads and associated troughs and their respective fills clearly demonstrate that hot stone technology took place at this site.

7. ASSESSMENT OF ARCHAEOLOGICAL POTENTIAL AND SIGNIFICANCE

In order to assess the archaeological potential and significance of this site, it needs to be discussed in association with the sites discovered at this and the neighbouring townlands of Corraun, Friarsland, and those further on at Palmershill, Coolfin, Springfield and Cuffsborough. Testing and subsequent excavation in Boherard townland revealed two additional sites containing burnt mound activity, one of these, Boherard 2, comprised a *fulacht fiadh* and associated pits dating to the Early Bronze Age while a pit containing Beaker pottery was also discovered at this site. Boherard 1 returned 2 C14 determinations dating to the earliest and latest phases of the Early Bronze Age periods. While Boherard 1 and 2 were

located within a few fields of each other Boherard 3 was situated at the other side of this townland to the northeast.

At the nearby townland of Corraun, two *fulachta fiadh* were located 20m apart, while at Palmershill, the remains of sporadic small scale settlement that spanned much of the Middle Bronze Age (Palmershill 1) and a 19th Century vernacular cottage were discovered. Other *fulacht fiadh* discovered in relatively close proximity to the Boherard sites included sites at Curragh, Ballyhinode, Corraun and Friarsland. An enclosure site was recorded at Boherard. This site was identified as a cropmark of a circular enclosure, visible on aerial photographs. Another enclosure was noted further to the east in Boherard and was identified as a circular area with a diameter of 27.5m. The enclosure is defined by a low scarp c.1.3m in height (Sweetman et al 1995, 40). A circular enclosure is recorded in Corraun townland, although it is difficult to determine a date for the feature. To the north of Corraun at Aghaboe, there is possible prehistoric evidence in the form of a cairn, although it is possible that this feature is actually a leacht (Sweetman et al 1995, 43, 7). Two bronze axeheads were uncovered in a field wall at Aghaboe and were recorded in the NMI topographical files. One was a broad flat axehead and the other was a flanged axehead and the discovery of these items could consolidate a Bronze Age presence in the area.

Testing and subsequent excavation in the townland of Springfield revealed three distinct areas of archaeological potential within relatively close proximity to each other. These comprised the remnants of a possible palisade enclosure along with a small pen-annular structure, a small hearth and a number of cultivation furrows (Springfield 1), a shallow pit filled with burnt mound material (Springfield 2) and six pits containing burnt mound material (Springfield 3). The neighbouring townland of Cuffsborough was also an archaeologically rich area. Cuffsborough 2 was located 300-400m to the south of Springfield 1 and consisted of possible Bronze Age settlement and cremation activity. Further south, Cuffsborough 1 & 3 revealed burnt mound activity. The settlement at Cuffsborough 4 consisted of an Early-Middle Bronze Age 17m ring of large posts, which were interconnected by a narrow slot trench. These remains may represent different phases of activity and may actually have functioned as a timber ceremonial enclosure. Also present at this site was: an oval structure; a horse-shoe shaped structure and a C-shaped structure. There are records of a cist containing an Early Bronze Age crouched inhumation with a food vessel at Cuffsborough that has since been destroyed (Sweetman et al 1995, 5). Most of the archaeology recently excavated in this

general area dates to the Bronze Age and it appears that this area was subject to continuous settlement and use during this period.

At Springfield 1, at least four phases of activity were uncovered, two of which were dated through C14 analysis. The hearth at Springfield 1 would appear to be much earlier in date, Cal BC 2870-2570 (BETA 218629), the surrounding palisade, dated to Cal BC 1130-910 (SUERC 17594), while from on-site stratigraphic associations, it is evident that the small pen-annular structure was truncated by the palisade is therefore earlier in date, but to what period it originated remains unknown. At Springfield 2, charcoal from this isolated pit was dated to Cal BC 1690-1510 (BETA 218616) while charcoal from one of six pits discovered at Springfield 3 returned a date of Cal BC 2870-2800 and Cal BC 2770-2460 (BETA 218622), which was similar to the date of the hearth at Springfield 1 suggesting these two sites may have been contemporary. There is a mound recorded to the east of Springfield at Farraneglish Glebe, which is located on the lower, north facing slope of a hill overlooking marsh to the northwest. The site is a large, tree covered, elongated earth and stone mound (Sweetman et al 1995, 11). There are two enclosures in Dairyhill townland to the southeast of Springfield (Sweetman et al 1995, 44). There is a *fulacht fiadh* site reputedly located to the south of Springfield at Kilminfoyle, although the current location is unknown (Sweetman et al 1995, 12).

Coolfin 1 was situated to the west of Springfield 3 on the higher ground and consisted of a Middle Bronze Age roundhouse. Coolfin 2, 3 & 4 were located in the lower lying ground near Springfield 3 and were all associated with burnt mound activities. Settlement in this area was obviously located in the higher, well drained soil as with Palmershill, while the *fulachta fiadh* were located in the lower lying, wetter soil, adjacent to streams. Cross 1 was sited c.300m to the northwest of Springfield 3 and consisted of a substantial spread of burnt stone material, which overlay a rectangular trough and an oval pit/trough. Ballycuddahy 1 was located c.800m to the northeast of Springfield 3 and consisted of a trough and three associated burnt mound pits.

8. CONCLUSION

The site contained the remains of two separate *fulachta fiadh*, each was situated on a low naturally formed mound. Zone A comprised a spread of burnt mound material, two sub-rectangular troughs, one of which was dated to the Middle Bronze Age, and a circular pit. Zone B contained two spreads of burnt mound material, a sub-rectangular trough, dated to the

Beaker/Early Bronze Age, an oval pit and two circular pits. When considering the evidence outlined above under Section 7, it becomes more transparent that Boherard 3 was a component of a wider Bronze Age settlement pattern that spanned the final Neolithic to the Late Bronze Age. Cooney & Grogan's (1994, 141) analysis of prehistoric settlement patterns in Limerick suggests that there was an *'emergence of a complex landscape organisation, with extensive cemeteries, domestic sites and fulachta fiadh forming an integral pattern'* during the Bronze Age. Therefore, it is probable that this is what is in evidence at this area of Co. Laois. This site has been adequately archaeologically assessed and resolved. There are no other archaeological features within the limits of the roadtake. Consequently no further work is required prior to the construction phase of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme.

9. BIBLIOGRAPHY

9.1 References

Barfield, L. and M. Hodder 1987, 'Burnt mounds as saunas, and the prehistory of bathing', *Antiquity*, 61, 370-379.

Breen, T. 2003, Site G, Ballyshaneduff or the Derries, Co. Laois, Fulacht Fiadh: <http://www.excavations.ie/Pages/Details.php?Year=&County=Laois&id=9887>

Brindley, A. L., et al. 1989-90, 'Radiocarbon dates from Irish fulachta fiadh and other burnt mounds', *JIA*, 5, 25-33.

Brindley, A.L. & Lanting, J.N. 1990, 'The Dating of Fulacht fiadh', in Buckley, V. (Ed.) *Burnt Offerings, International Contributions to Burnt Mound Archaeology*, 55-58, Wordwell: Dublin

Buckley, V. 1990, *Archaeological inventory of County Louth*, Dublin: Stationery Office

Buckley, V. 1991, (ed.) *Burnt offerings: International contributions to burnt mound archaeology*, Dublin: Wordwell

Candon, A. 1987, *Archaeological Survey of Upper Ossory, phase 2. The barony of Clarmallagh*. AnCo/ Roscrea Heritage Society report.

Cooney, G & Grogan, E 1999, *Irish prehistory: A social perspective*, Dublin: Wordwell

Corlett, C. 1997, 'A fulacht fiadh site at Moynagh Lough, County Meath', *Ríocht na Mídhe*, **9(3)**, 46-49.

Crumlish, R. 1997, *Cloonaddadoran Co. Laois*. Excavations.ie- database of Irish excavation reports

Dempsey, J. 2003, Ballydavis/Greatheath/Morett/Cappakeel/Emo Park/Ballyshaneduff or the Derries/Tullaghan/Ballyadding/Jamestown or Ballyteigeduff, Co. Laois: Various: <http://www.excavations.ie/Pages/Details.php?Year=&County=Laois&id=9879>

Duffy, C. 1995, Derry, Co. Laois, *Fulacht Fiadh*:

<http://www.excavations.ie/Pages/Details.php?Year=&County=Laois&id=2409>

- Flanagan and Flanagan 1994, *Irish place names*, Dublin: Gill and Macmillan
- Feehan, J. 1983, *Laois: an environmental history*, Ballykilcavan Press: Stradbally
- Grogan, E. O'Donnell, L. & Johnston, P. 2007, *The Bronze Age Landscapes of the Pipeline to the West, an integrated archaeological and environmental assessment*, Margaret Gowen and Co. Ltd. Wordwell: Bray
- Joyce, P.W. 1871, *The History and Origins of Irish Names of Places*. De Burca. Dublin (facsimile reprint of original edition)
- Kennedy, J. 2003, *The Monastic Heritage & Folklore of County Laois*, Roscrea: Lisheen
- Kenny, N. 2008, 'Fulachta Fiadh/Burnt Mound activity excavated in the townlands of Curragh, Ballyhinode, Boherard, Friarsland and Oldtown', unpublished report prepared on behalf of ACS Ltd.
- Moore, E. 2003, Morett, Co. Laois, *Fulacht Fiadh*:
<http://www.excavations.ie/Pages/Details.php?Year=&County=Laois&id=9909>
- O'Connor, P.J. 2001, *Atlas of Irish Place names*, Oireacht na Mumhan Books. Limerick.
- O'Connor, Eimear, 2007, *Fulachta Fiadh, Burnt Mounds and Hot Stone Technology on the M3*, unpublished report for ACS Ltd.
- O'Drisceoil, D.A. 1988, 'Burnt mounds: cooking or bathing?', *Antiquity*, **62**, 671-80
- O'Drisceoil, D. 1991, 'Fulachta Fiadh: a general statement', *North Munster Antiquarian Journal*, **33**, 3-6.
- O' Hanlon, J. & O' Leary, E. 1907 (Reprint 1981), *History of the Queen's county*, Vol. 1, Kilkenny: Roberts Books
- Power, D. 1990, 'Fulachta fiadh in County Cork', in Buckley, V. (Ed.) *Burnt Offerings, international contributions to Burnt Mound Archaeology*, 13-17, Wordwell: Dublin
- Russell, I. 2004. 'Excavation report at Curraheen 4, Co. Cork', unpublished research report for ACS Ltd

Sweetman, D. *et al.* 1995, *Archaeological Inventory of County Laois*, Stationary Office:
Dublin

Tierney, J. 2003, N7 Heath-Mayfield Monasterevin Bypass, Co. Laois. Excavations.ie-
database of Irish excavation reports

Waddell, J. 1998, *The Prehistoric Archaeology of Ireland*, Wordwell, Bray

9.2 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

9.3 Cartographic Sources

1839 1st edition Ordnance Survey Map

1891 2nd edition Ordnance Survey Map

1909 Ordnance Survey Revision edition RMP map

Signed:



Ed Danaher

Licensed Archaeologist

November 2008

10. APPENDICES

10.1 Appendix 1: Wood Identification analysis report

Boherard 3, M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co Laois, Ireland

Species identification of charcoal samples

September 2008

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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 purposes 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

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

Constructional Elements

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

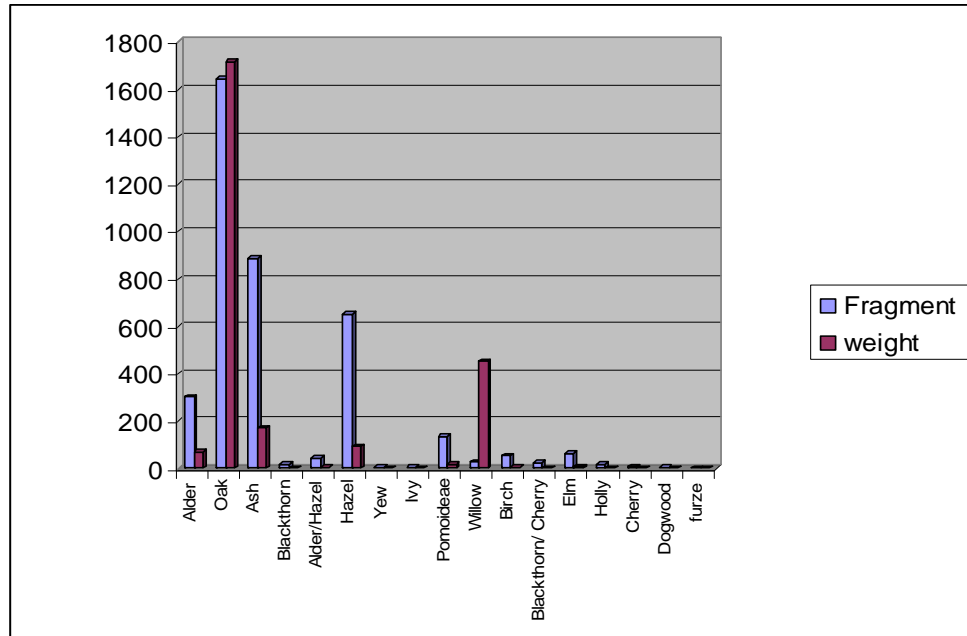
Woodworking terms and definitions

<i>Chisel point:</i>	The end of a piece of wood cut to a point on one single face.
<i>Conversion:</i>	The way in which the primary trunk has been split into smaller elements.
<i>Facet:</i>	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.
<i>Facet junction:</i>	The nature of the junctions between each facet was also assessed as to whether they were clean, ragged or stepped
<i>Jam curves:</i>	A complete toolmark on wood retaining the impression of the complete width of the blade used
<i>Pencil point:</i>	The end of a piece of wood cut to a point on multiple faces.
<i>Signature:</i>	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.
<i>Wedge point:</i>	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 analyzed. Weight in grams



Charcoal assemblage results at Boherard 3

Boherard 3, Early-Middle Bronze Age *Fulacht fiadh* activity

Table 1: Wood taxa present at Boherard 3

Site	E-number	Feature type	Context	Sample No	Date	Identification	Comment
Boherard 3	E2227	FF pit	F024	1	Undated BA	Alder (0.2g, 5f) Oak (1.3g, 6f) Ash (2.7g, 31f) Yew (0.1g, 2f)	Unburnt <i>Prunus</i> twigs poss. Modern
Boherard 3	E2227	FF pit	F003	2	Undated BA	Alder (0.2g, 7f) Oak (0.8g, 21f) Ash (0.5g, 9f) Hazel (0.2g, 6f) Pomoideae (0.5g, 13f) Birch (1.2g, 17f) Elm (0.1g, 2f)	Iron stained

Boherard 3	E2227	Trough	F005	3	Undated BA	Oak (0.6g, 10f) Ash (0.01g, 1f)	Tiny fragments
Boherard 3	E2227	Trough	F018	4	Cal BC 2460-2190 EBA	Alder (0.1g, 2f) Oak (1.4g, 22f) Ash (2.5g, 21f) Alder/Hazel (0.05g, 1f)	
Boherard 3	E2227	Trough	F007	5	Cal BC 1620-1440 MBA	Oak (0.1g, 2f) Ash (1.2g, 11f) Alder/Hazel (0.3g, 4f) Hazel (0.6g, 6f) Pomoideae (1.8g, 12f) Birch (0.9g, 8f)	
Boherard 3	E2227	FF pit	F022	6	Undated BA	Alder (0.1g, 1f) Oak (1.1g, 8f) Ash (2.4g, 36f) Alder/Hazel (0.2g, 4f) Hazel (0.7g, 2f) Pomoideae (0.2g, 3f) Birch (0.1g, 1f)	Tiny fragments
Boherard 3	E2227	FF spread	F009	7	Undated BA	Alder (0.5g, 8f) Oak (0.5g, 4f) Pomoideae (0.2g, 3f) Birch (1.2g, 15f) Cherry (0.5g, 1f)	
Boherard 3	E2227	FF pit	F024	8	Undated BA	Oak (0.3g, 8) Ash (0.2g, 10f) Yew (0.01g, 2f)	Iron stained and distorted

Oak, ash, alder, birch, pomoideae, hazel, yew, elm and cherry in that order were identified from Boherard 3. Features analysed included a trough, pit, and spread all associated with fulacht fiadh activity. The charcoal is most likely representative of firewood collected and used for activities at the site. The identified taxa are related to a range of environments including dryland, wetland and scrub. The high occurrence of ash may suggest that the area was clearfelled in earlier periods for the inhabitants of the area as ash trees tend to develop in areas of open ground with access to lots of light.

Results by feature/site types

Fulacht fiadh sites

Sixty six samples from features associated with *fulacht* sites were analyzed from Contract 2. These samples were retrieved from hearths at Boherard 2 and Coolfin 1, pits associated with Shanboe 1, Boherard 1, 2 & 3, Coolfin 1, 3, Corraun 2, posthole/stakeholes excavated at Coolfin 1 & Corraun 2, spreads at Shanboe 1, 4, Boherard 1, 2 & 3 and Coolfin 4. Charcoal from troughs was analyzed from Bushfield/Lismore 1 and Boherard 1, 2 & 3. Fourteen taxa were identified and these were mainly represented by ash (*Fraxinus excelsior*), hazel (*Corylus avellana*), oak (*Quercus* spp) and alder (*Alnus glutinosa*) mainly dryland taxa although alder is mostly associated with wetland areas. Smaller amounts of pomoideae (apple type), holly (*Ilex aquifolium*), willow (*Salix* sp), birch (*Betula* sp), elm (*Ulmus* sp), yew (*Taxus baccata*), ivy (*Hedera helix*), furze (*Ulex europeas*), blackthorn (*Prunus spinosa*) and cherry (*Prunus padus/avium*) were also identified.

Ash charcoal is seen to dominate at the hearths and pits features while hazel is more frequent at the spreads and trough features. Oak and ash is more prevalent in the identifications from the postholes and stakeholes which may suggest that oak or ash may have been used as post/stake material at these sites.

Figure 2: Wood taxa identified from features associated with *fulacht* sites

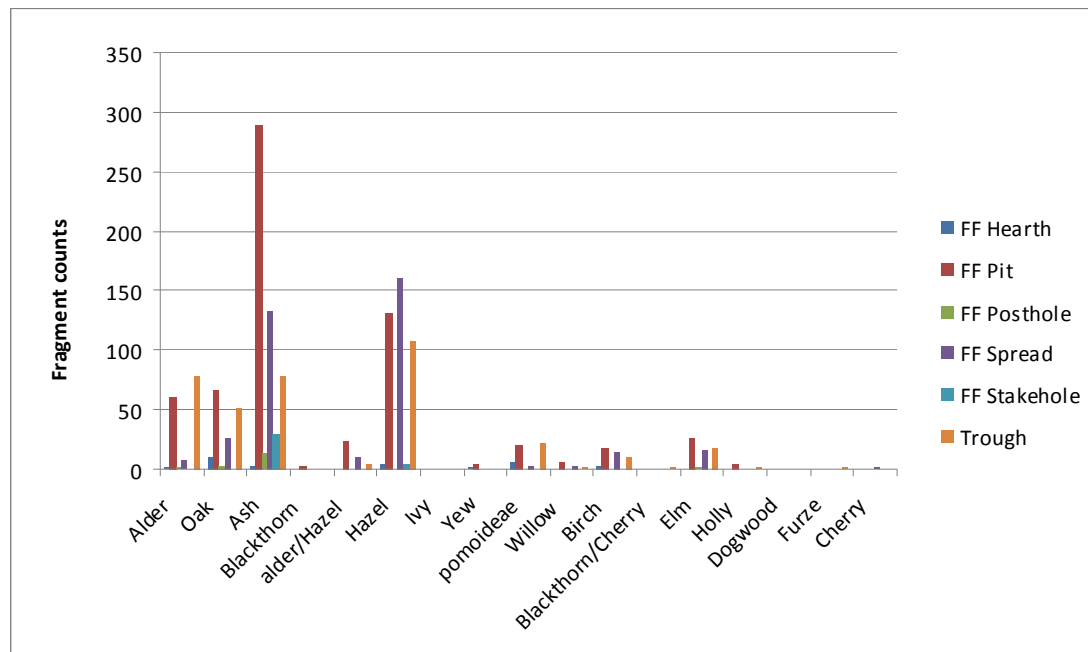
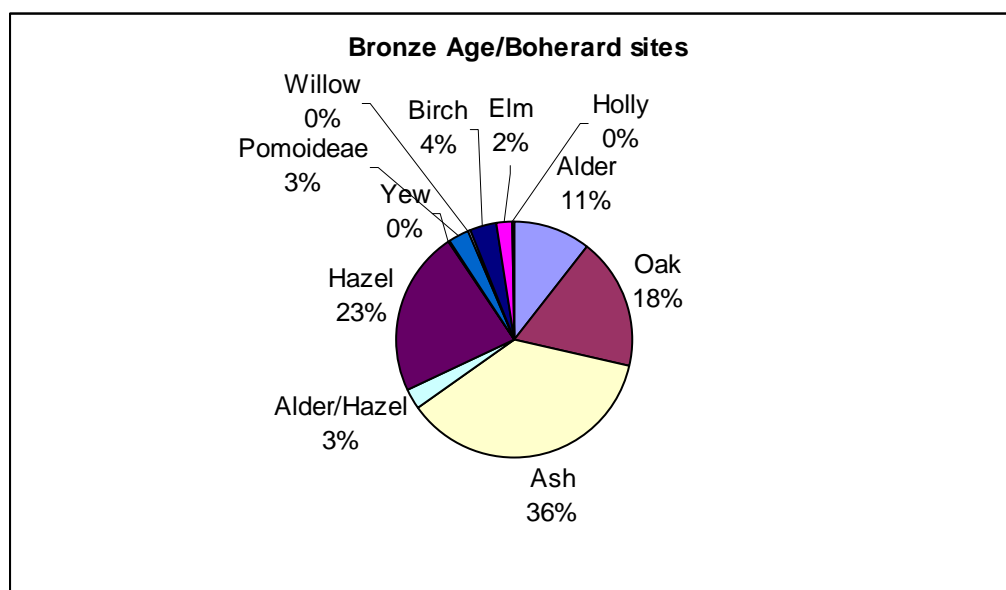
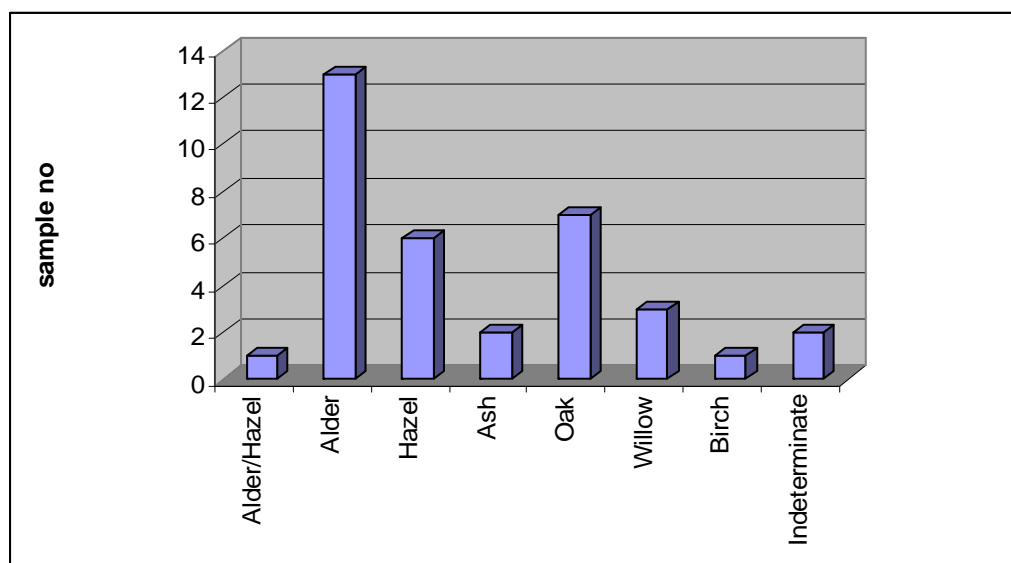


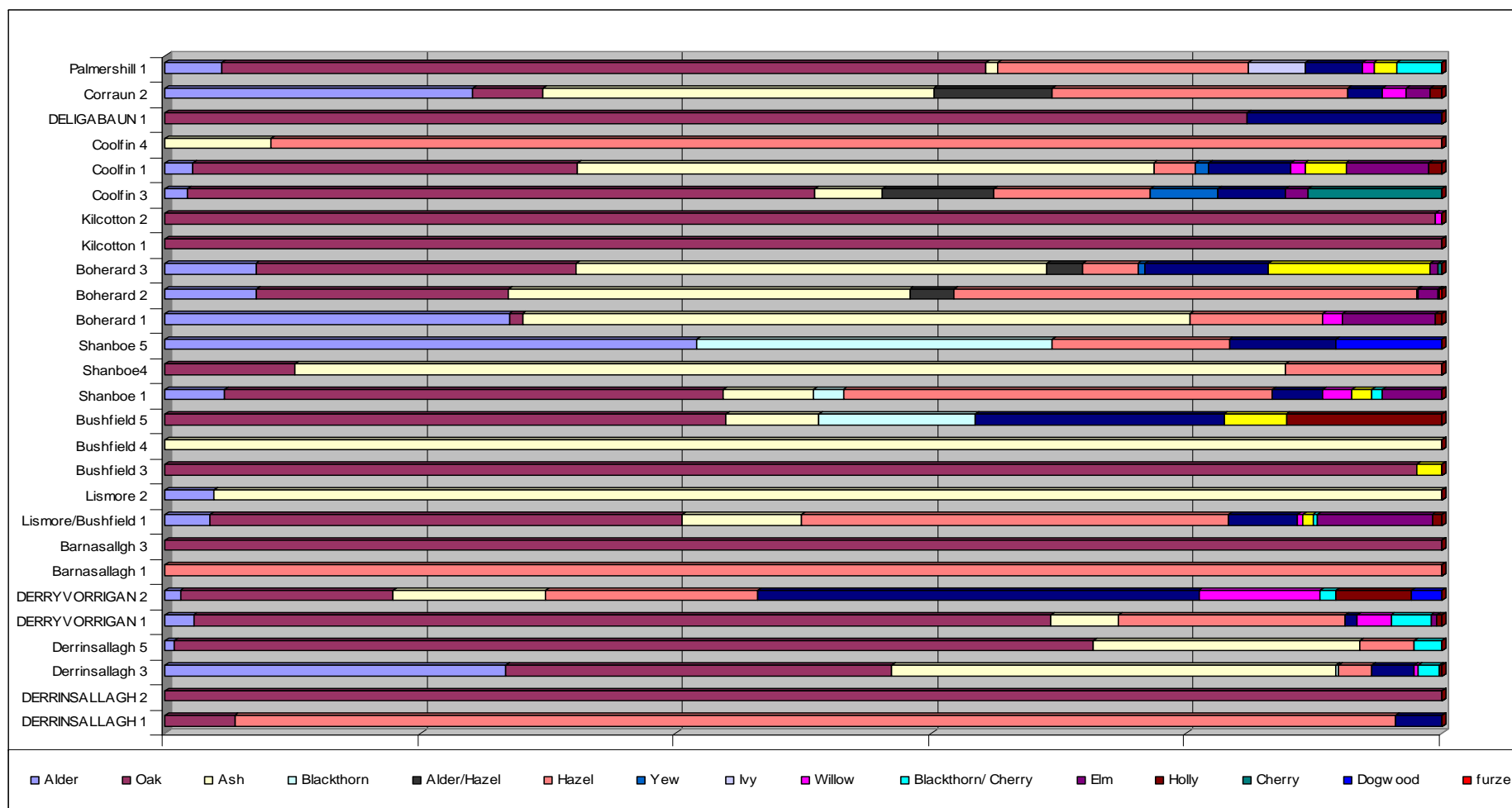
Figure 3: Taxa present in the Bronze Age

The samples from Boherard 1, 2 and 3 were dated following the completion of this report. They were assigned to the Bronze Age period in general at the time of analysis. Boherard 3 is now known to be an Early-Middle Bronze Age site. A total of 40 samples from 3 sites associated with *fulacht* activity were identified. Ash was identified in large quantities as was hazel, oak and alder and to a lesser extent birch, pomoideae, elm, yew, willow and holly. The area surrounding Boherard may have been relatively open as indicated by the higher quantities of ash and hazel. This may also be related to the higher quantities of archaeological sites and the need to clearfell the area for inhabitants and habitable areas.

Figure 4: All wood taxa identified from sites that produced wood along Contract 2

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

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 a Middle Bronze Age walkway and Late Bronze Age *fulacht* sites 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, cremation pit, a well, kilns, bowl furnaces, a linear feature, pits, postholes and one ring gully.

Charcoal was identified from the fill of various troughs, the fill of pits, from burnt mound spreads and hearths associated with excavated *fulachta fiadh*. These were from Boherard 1, 2 and 3, Coolfin 1, 3 and 4, Shanboe 1 and 4, Corraun 2 and Bushfield/Lismore 1. Wood timbers were identified from the remains of a wooden trough at Shanboe 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 aquilifolium*), 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).

The results from the wood analysis reflect to a certain extent surrounding tree land cover and selection of such trees for use at the Bronze Age sites. The identifications show that alder and oak wood were the main taxa used for planks and horizontals at these sites. Natural birch wood was identified from Shanboe 1 F009. The oak and ash may have been selected from woodlands within the area of Coolfin and Corraun while hazel coppice of a particular size may have been draw felled from areas of hazel coppice for the construction of the wattle lined trough at Shanboe 1. Any further analysis on the hazel wattle was impossible due to the degraded state of the wood. Wetland species identified were alder, birch and willow which are symptomatic of local wet condition along river banks or peat bogs. These wetland taxa may have been growing in close proximity to the *fulacht* sites as these site types are generally found in wetter areas.

Alder is more frequently identified along this stretch of the scheme as opposed to the analysis completed along the route of Contract 1 and 3. This may be related to the fact there were more *fulacht fiadh* samples analyzed from this stretch of the roadway and also the environment may have been wetter along the areas under discussion during the Pre-historic periods. The main fuel used and collected at the *fulacht* sites consisted of ash, hazel, alder and oak in that order. This is in contrast to the findings along the route of Contract 1 and 3 where dryland taxa are more dominant and alder plays a less significant role in the identifications. The higher percentages of alder along this stretch of the road particularly in relation to the

fulacht sites may suggest that the environment of the Bronze Age peoples was wetter and access to primary woodland areas such as oak was more difficult along this stretch of the road. Due to the nature of *fulacht* sites their location is normally accessible to a water source and as such within easy reach of alder trees. Alder trees are normally associated with riversides, lake shores and damp woods (Webb, 1953, 151).

The use of higher quantities of alder at the *fulacht* sites along this stretch of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme compares favourably to analysis carried out in Mayo (Charlestown by-pass) and the midlands area of Ireland (N6-KEK) by the author where alder was more apparent at these sites. The presence of similar taxa within the pits and the trough suggest that similar functions were being carried out at these sites. Another observation from the analysis is that there was a lot more hazel and ash identified from the *fulacht* spreads as opposed to any other tax and alder was not as significant when compared with the troughs and pit fills. This trend should be studied further at other sites that are examined in such detail to determine if it is of any significance in the dynamics and uses of the ubiquitous *fulacht* sites.

Comparative work carried out in other areas includes Charlesland in Co. Wicklow where charcoal and wood were analysed from four *fulachta fiadh* by O' Donnell, dating from the Early to the Late Bronze Age. Troughs, hearths, mounds, and a burnt spread were analysed from these sites. The charcoal assemblage was dominated by ash, alder, willow and hazel. The wood from two of the *fulacht* sites was mainly alder along with some hazel. The absence of oak and the greater quantities of alder in this area compared favourably to analysis carried out along the N11 in Co. Wicklow (O Carroll, 2007, unpublished post excavation reports, NRA). This is in contrast to results obtained from Contract 1 and 3 along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme and the M8 Mitchelstown to Fermoy where hazel, oak and ash dominate over any other taxa. Work carried out along the gas pipeline to the west show that the main woods used for firewood at 44 analysed *fulacht fiadh* were alder, ash, oak and hazel (O' Donnell, 2007, 32).

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 and Boherard/Corraun and Coolfin as well as Lismore/Bushfield and Shanboe 4 were more populated particularly in the Bronze Age. 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 other taxa identified from the pits

include 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.

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 and Boherard/Corraun and Coolfin as well as Lismore/Bushfield and Shanboe 4 were more populated particularly in the Bronze Age.

When the charcoal is plotted against time periods we see similar data sets for oak, hazel and ash in the early and middle Bronze Age and late Bronze Age with a notable increase in alder taxon in the Later Bronze Age. Other patterns emerging from the analysis is that elm appears to occur more frequently in the Early Bronze Age sites as seen in similar analysis carried out along the route of Contract 1 and 3. Elm is thought to have extensively died out with the occurrence of an elm disease epidemic in the Neolithic period. From the very small sample set from the Neolithic period we see oak dominating along with smaller fragments of hazel and holly. This is similar to what is seen in pollen diagrams for the Neolithic periods of Ireland where oak woodlands are seen to dominate in the early pre-historic periods to be replaced by ash in the woodland clearings created by the earlier inhabitants.

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 analyzed 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 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, 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 aquilofium*), 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 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. Hazel wattle lined the trough at Shanboe 1. Oak planks were also identified from 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. Alder plays a more significant role in the sites analyzed 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 (McCracken 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 over harvesting (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 seaboard and parts of central Ireland.

Ulex europeas (Furze, Gorse or Whin)

A bushy shrub with green thorny branchlets. 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, *Hoard 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 Pilcher, 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.
- MacCoitir, 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.
- O'Carroll, E. 2004. *The analysis of charcoal remains from Ballybrowney Lower 1, Co. Cork*. Unpublished specialist report for ACS Ltd
- O'Carroll, E. 2000. *The analysis of charcoal remains from Bettystown, Co. Meath*. Unpublished specialist report for ADS Ltd.
- O'Carroll, 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 Mitchelstown*, 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.

10.2 Appendix 2: Petrological analysis report

Petrographical Report on Stone Samples from Boherard 3, Co. Laois

(Ministerial Direction No. A015/118; Record E2227)

EurGeol Dr Stephen Mandal MIAI PGeo

Geology of the Site (see Figure 1; Archer *et al.* 1996; Gatley *et al.* 2005)

The geology of the area is dominated by Carboniferous sediments, predominantly limestone, which form a stratigraphical succession generally younging to the southeast.

However, the oldest rocks in the area occur in the northwest of the area and are of Devonian Age, comprising the Cadamstown Formation (CW) of pale and red sandstone, grit and claystone and include the Clonaslee Member (CWcl), which consists of thick flaggy sandstone and thin siltstone.

The oldest rocks of the Carboniferous Period in the area belong to the Lower Limestone Shale (LLS), consisting of sandstone, limestone and mudstone. These unconformably overlie the Ballysteen Formation (BA); Courceyan Age fossiliferous dark grey muddy limestones which make up the majority of the area. Included in the Ballysteen Formation is the Lisduff Oolite Member (BAld) of oolitic limestone. Overlying this is the Waulsortion Limestones, massive bedded limestones of Upper Courceyan Age.

Another unconformity separates the Waulsortion Limestones from the conformable Urlingford Succession of the Crosspatrick Formation (CS), pale-grey cherty crinoidal limestone; the Aghmacart Formation (AG), dark shaly micrite / peloidal limestone; the Durrow Formation (DW), shaly fossiliferous and oolitic limestone; and the Clogrenan Formation (CL), cherty bluish crinoidal limestone.

A further substantial unconformity separates this succession from the Killeshin Siltstone Formation (KN), Upper Namurian muddy siltstone and silty mudstone, in turn unconformably overlain by the Moyadd Coal Formation (MC), Lower Westphalian shale, siltstone and minor sandstone.

The bedrock at the site consists of the Ballysteen Formation of fossiliferous dark grey muddy limestones.

The geology of the area represents the period from the Devonian (*c.* 410 – 355 million years ago), when this part of Ireland was on the edge of a huge continent called Laurussia, formed by the collision of Laurentia and Avalonia – South America at the end of the Silurian. The rocks were derived from the Caledonian mountain uplift which occurred at the start of the Devonian, representing the final erosion of the mountain range prior to the inundation of the

early Carboniferous sea. The Carboniferous sequence of rocks in the area is a result of shallow (sandstones and limestones) and deeper (shales and mudstones) period of deposition on the sea floor.

Results of Assessment

Site	MD #	Sample	Description
Boherard 3	A015/131	?	Predominantly broken heat shattered pebbles of coarse quartzite and sandstone, plus angular limestone, sandstone, quartz and chert

Potential Sources

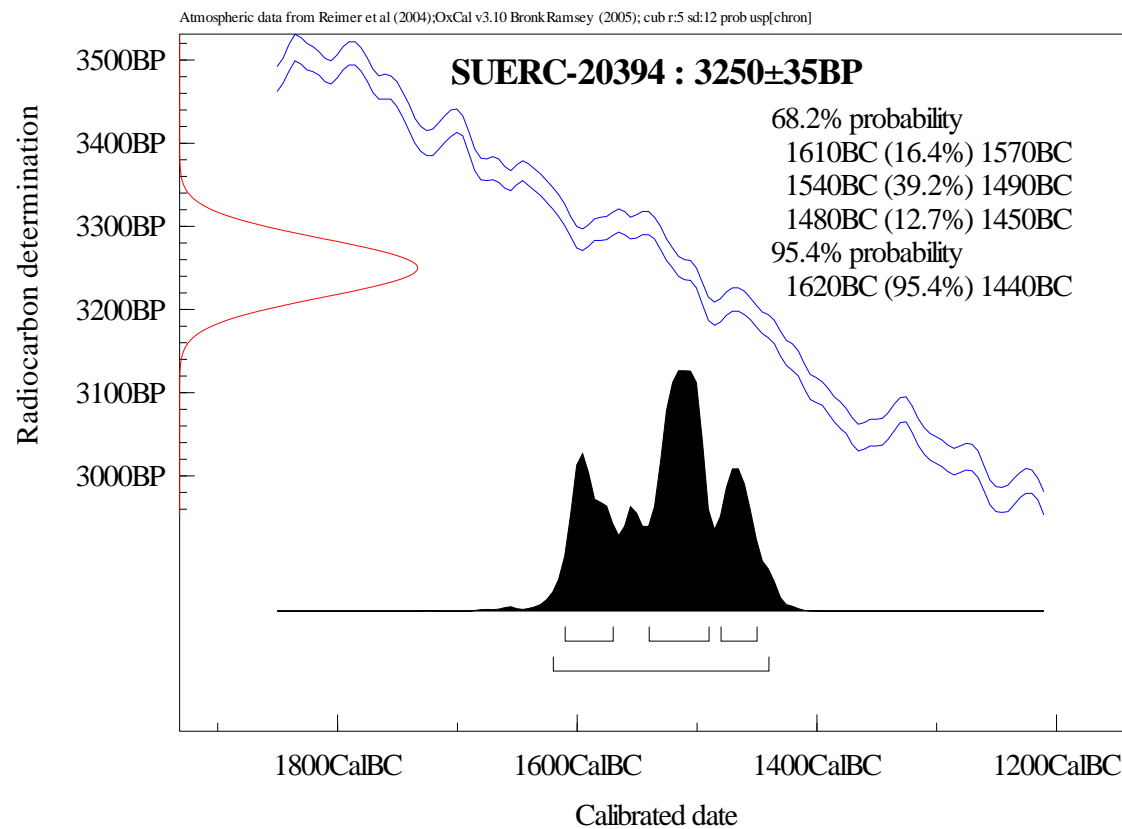
All of the materials identified within the samples are readily available at the site, in bedrock and in the overlying glacial tills.

However, the closest bedrock source for quartzite occurs in the Clay Gill Sandstone Formation which occurs in the upland areas c. 3k east of Durrow. Whilst it is possible that quartzite occurs in the glacial tills, the importing of quartzite from other areas, or the preferential extraction of quartzite from the tills cannot be ruled out.

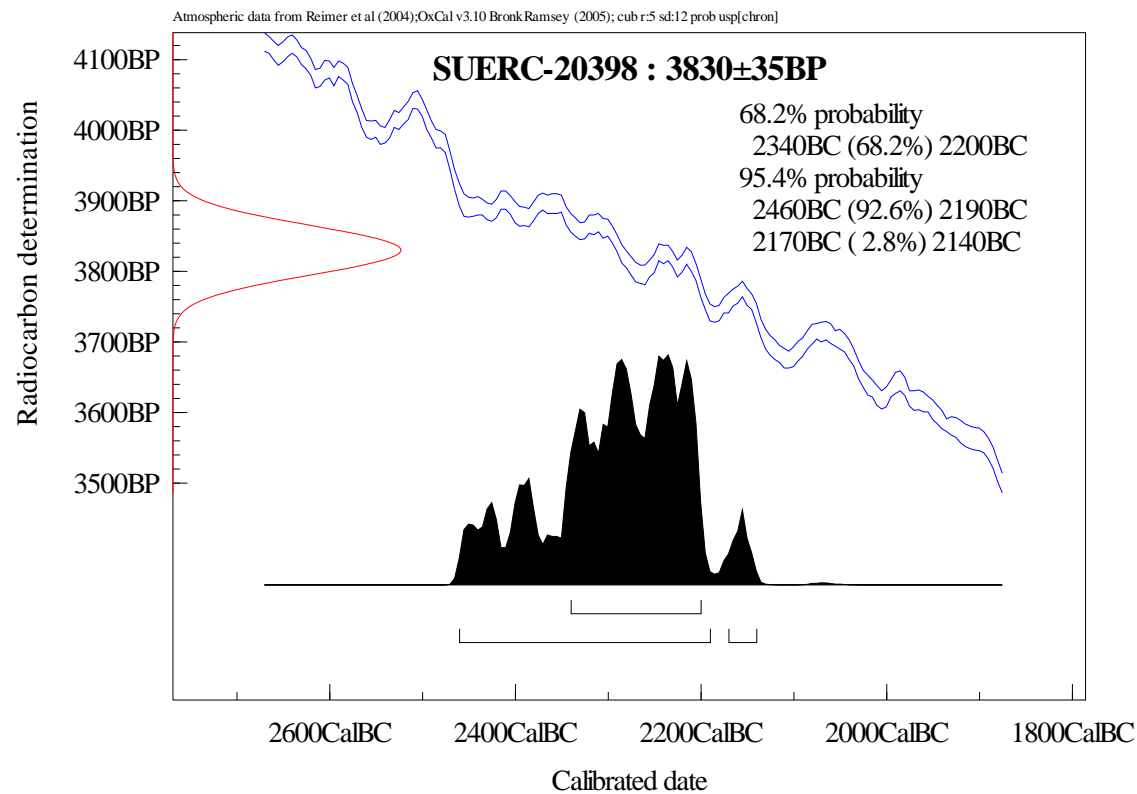
References

Archer, J.B., Sleeman, A.G. and Smith, D.C., 1996. *The Geology of Tipperary: to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 18*. Geological Survey of Ireland Publications. Westprint Ltd: Sligo.

Gatley, S., Somerville, I.D., Morris, J.H., Sleeman, A.G. and Emo, G., 2005. *Geology of Galway-Offaly: to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 15*. Geological Survey of Ireland Publications. Westprint Ltd: Sligo.

10.3 Appendix 3: Radiocarbon dating analysis report

GU No.	Reporting Number	Sample Type	Site	Sample Id	Species Dated	d13C	Age % Modern	Ageerror 1 sigma
17320	SUERC-20394	Charcoal	Boherard 3	Boherard 3:E2227:F007:5	Ash	-24.5	3250	35



GU No.	Reporting Number	Sample Type	Site	Sample Id	Species Dated	d13C	Age % Modern	Ageerror 1 sigma
17321	SUERC-20398	Charcoal	Boherard 3	Boherard 3:E2227:F018:4	Ash	-25.1	3830	35

10.4 Appendix 4: Summary of Fulachta Fiadh on the M7 Portlaoise-Castletown/M8 Portlaoise-Cullahill Motorway Scheme

Townland	Contract No.	Site Type	Description	Provisional Date
Addergoole 1	1	Burnt mound	2 burnt spreads and several paleochannels.	Late Bronze Age
Addergoole 2	1	Burnt mound	Several burnt spreads, 2 troughs and other features	Late Bronze Age
Aghmacart 1	1	Burnt mound	3 burnt spreads	Early Bronze Age
Aghmacart 2	1	Burnt mound	1 burnt spread and 1 trough	Early Bronze Age
Ballycuddahy 1	1	Burnt Mound(s)	2 small burnt spreads, 2 troughs (1 oval and 1 rectangular) and 1 pit	Bronze Age
Ballyhinode 1	1	Burnt Mound	Remains of fulacht/burnt mound	-
Ballyhinode 2	1	Burnt Mound	Remains of fulacht/burnt mound	-
Boherard 1	2	Burnt Mound	Burnt Spread	Bronze Age
Boherard 2	2	Burnt Mound	Burnt Spread and associated pits	Bronze Age
Boherard 3	2	Burnt Mound	Burnt Spread and pit furnace	Bronze Age
Bushfield or Maghernaskeagh 1	2	Burnt Mound	Several burnt spreads and troughs	Bronze Age
Bushfield or Maghernaskeagh 4	2	Burnt Mound	Several burnt spreads and troughs	Bronze Age

Bushfield or Maghernaskeagh 5	2	Burnt Mound	Several burnt spreads and troughs	Early Medieval period
Cannonswood 2	1	Burnt Mound	Several burnt spreads and troughs	Bronze Age
Cappaloughlin 5	3	Burnt mound	Remains of three <i>fulacht</i> /burnt spreads and two pit-like troughs	Bronze Age
Cappaloughlin 6	3	Burnt mound	Remains of <i>fulachta fiadh</i> activity: 8 troughs and associated spreads	Bronze Age
Clonadacasey 3	3	Burnt mound	A small number of archaeological features including a trough and two <i>fulacht</i> /burnt spreads.	Bronze Age
Clonadacasey 4	3	Burnt mound	A small number of archaeological features including a number of <i>fulacht</i> /burnt spreads, stakeholes and troughs.	Bronze Age
Clonboyne 2	3	Burnt mound	Remains of a ploughed out <i>fulacht fiadh</i> . A possible flint plough pebble and hone stone were recorded	Bronze Age
Clonrud 3	3	Burnt mound activity	Shallow irregular spreads of black charcoal-enriched clay containing heat-shattered sandstone fragments, below which were four large pits or troughs	Bronze Age
Coolfin 2	2	Burnt Mound Activity	Four small pits containing heat shattered stone. The pits ranged from circular to sub-oval in shape and had an average diameter of less than a meter and depth of 200mm.	Bronze Age
Coolfin 3	2	Burnt Mound	Burnt spread (c.12m in length). A large sub-rectangular pit situated to the north of this feature was interpreted as a well (over 3m in length, 2m in width and a metre deep) and contained a timber walkway leading from outside the northern edge to its centre. The cut for this 'U' – shaped well was while a single timber plank supported by uprights provided access into it. A stream apparently truncated the spread in the past.	Bronze Age

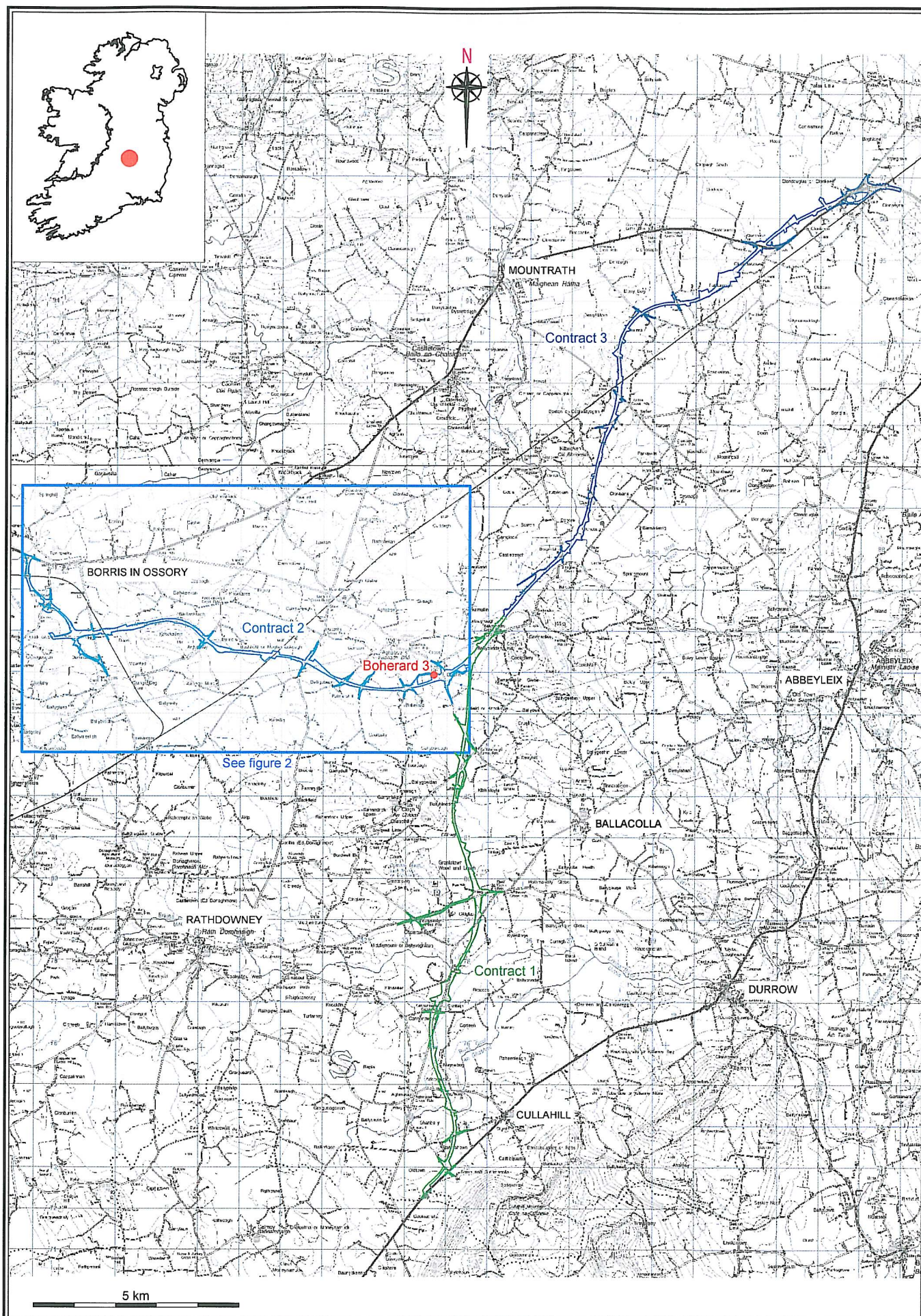
Coolfin 4	2	Burnt Mound	Rectangular pit measuring 1.6m E-W and 1.05m N-S and a depth of 0.15m. The burnt mound material and the four corner postholes suggest that this feature probably held a trough. A north-south orientated stream was situated 8m to the west.	Bronze Age
Corraun 1	2	Burnt Mound	Burnt mound activity	Bronze Age
Corraun 2	2	Burnt Mound	Substantial burnt mound & associated pits, hearths & 3 troughs	Bronze Age
Corraun 3	2	Burnt Mound	Extensive burnt mound activity	Bronze Age
Cross 1	1	Burnt Mound	Burnt stone spread and an associated trough	Bronze Age
Cuffsbororugh 1	1	Burnt Mound Site	Burnt stone spread, 3 sub-rectangular troughs, 1 sub-circular trough & 2 large pits. Linear ditches. Finds included pottery & deer antler.	Bronze Age
Cuffsborough 3	1	Burnt Mound Site Possible well	2 large deep pit features & 2 large shallow pit features (containing burnt stone), associated pits & ditches. Post-Medieval well?	Bronze Age Post-Medieval?
Curragh 1	1	Burnt mound	2 distinct fulachta fiadh	Early Bronze Age
Curragh 2	1	Burnt mound	1 fulacht fiadh and other post medieval features	Late Bronze Age/ Late Medieval period
Friarsland 1	2	Burnt Mound	Burnt spread (15 x 10m). This site very small and was completed during the testing phase.	Bronze Age
Friarsland 2	2	Burnt Mound	Burnt spread (5 x 2m)	Bronze Age

Gortnagroagh 1	1	Burnt Mound/ Industrial Activity	Drains, a large oval pit & a smaller rectangular pit all containing post-Medieval pottery while both pits contained heat shattered sandstone and dated to the Bronze Age. A number of cow-horns were also found on site	Bronze Age/Post-Medieval
Kilcotton 2	2	Burnt Mound	Remains of fulacht/burnt mound and associated pits	Bronze Age
Leap 2	1	Burnt Mound	Ploughed out remains of fulacht/burnt mound or spread	-
Oldglass 1	1	Burnt Mound	Remains of fulacht/burnt mound and a circular structure.	Iron Age
Oldglass 2	1	Burnt Mound	Remains of fulacht/burnt mound and associated pits	-
Oldglass 3	1	Burnt Mound	Remains of fulacht/burnt mound	Bronze Age
Shanboe 1	2	Burnt Mound	<i>Fulacht</i> /burnt mound spread, which covered a number of troughs and pits. One chert arrowhead was recovered.	Bronze Age
Shanboe 4	2	Burnt Mound	Ploughed out remains of a <i>fulacht fiadh</i> /burnt mound	Late Bronze Age
Shanboe 5	2	Burnt Mound	Ploughed out remains of a <i>fulacht</i> /burnt mound spread and associated pits	Early Medieval

Springfield 2	1	Burnt Mound	Troughs, pits, postholes and associated burnt mound activity	Bronze Age
Springfield 3	1	Burnt Mound	Burnt stone spread and a metalled surface	Bronze Age
Tintore 1	1	Burnt mound	2 fulachta fiadh and troughs	Bronze Age
Tintore 2	1	Burnt mound	Several fulachta fiadh spreads and associated pits	Late Bronze Age

10.5 Appendix 5: Archive contents

Table Site Archive (Basic) Summary			
Site Name: Boherard 3		Record No.: E2227 – Scheme No.: A015/118	
Type	Description	Quantity	Notes
Contexts	Validated contexts from excavation	29	All contexts sheets have been checked and cross-referenced.
Plans	‘A2’ 1:50	4	Pre & Post-ex plans
Sections	‘A2’ 1:10	8	Sections and profiles
Photographs		31	Colour Prints
Registers	Plan Register	1	All Registers have been checked and cross-referenced.
	Photographic Register	1	
	Finds Register	1	
	Sample Register	1	
Diaries	Director’s Diary	1	All Diaries have been checked and cross-referenced.



**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, Boherard 3
Issued for: Archaeological excavation report
Client: Laois County Council

Scale: 1: 125,000 A4
Date: Nov '08
Origin: ACS Ltd
Drawing no.: 05 09 C7226

Figure 1: Location of M7/M8 Motorway Scheme showing location of Boherard 3

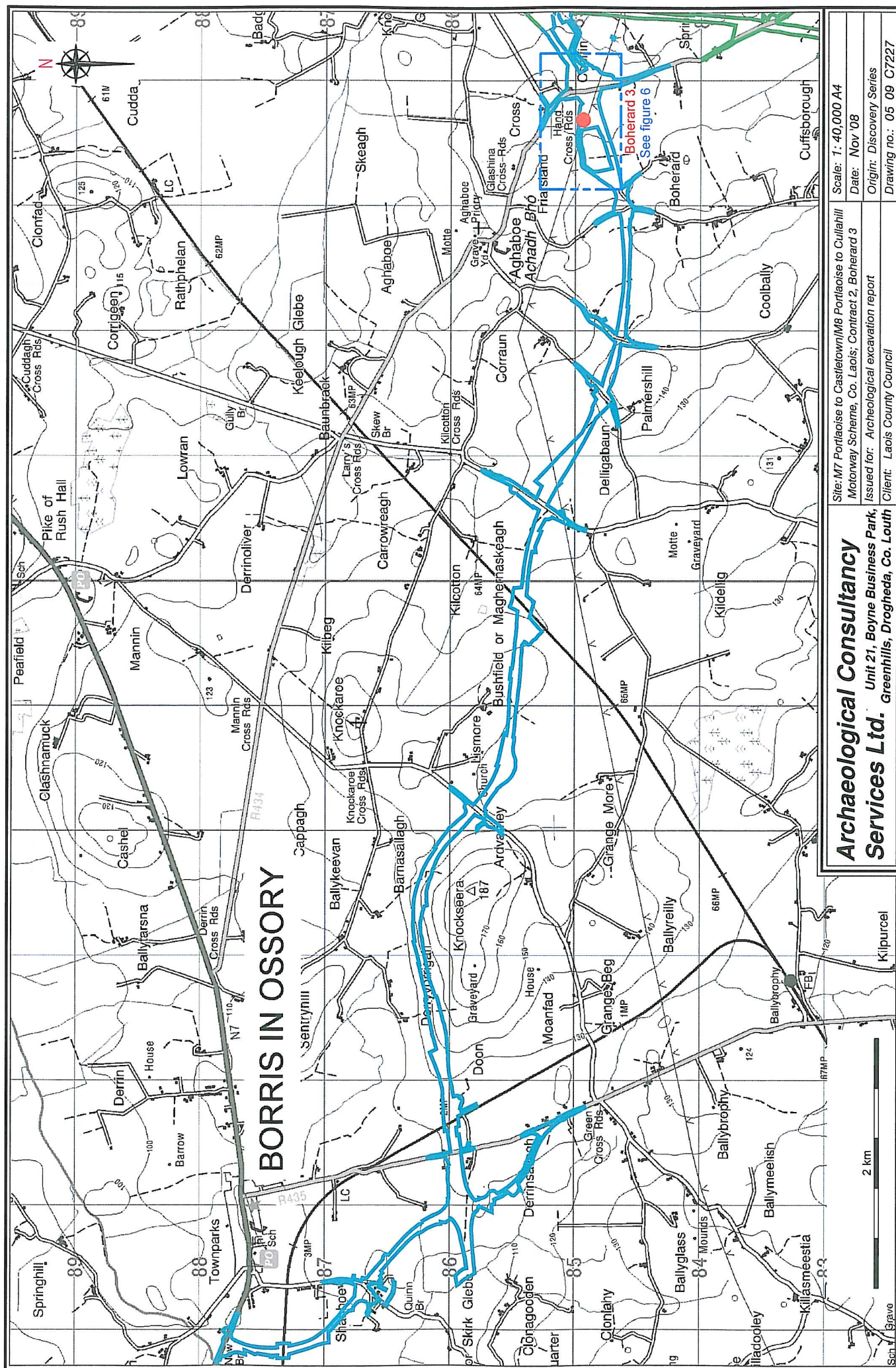


Figure 2: Location of Contract 2 showing Boherard 3

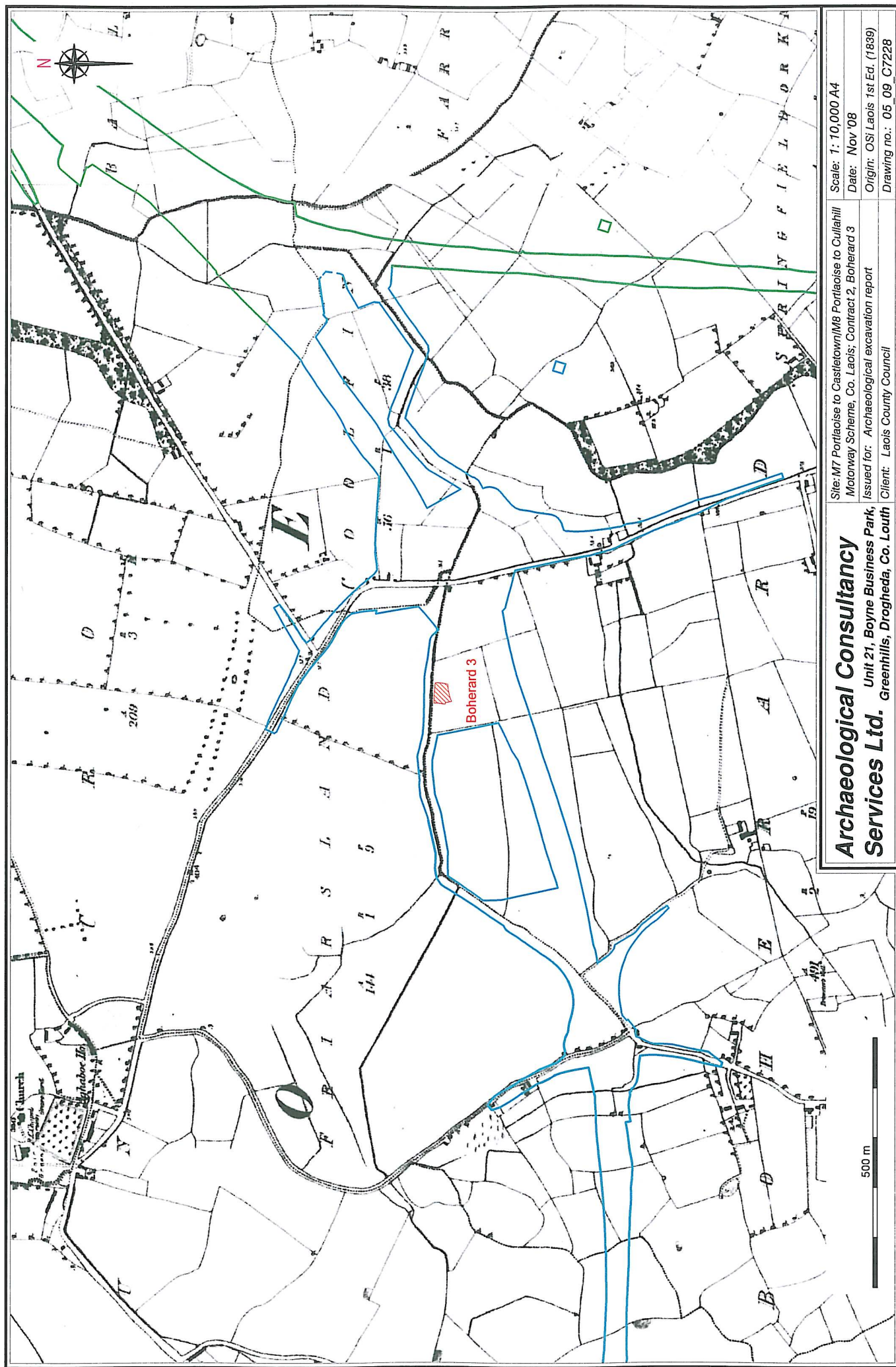
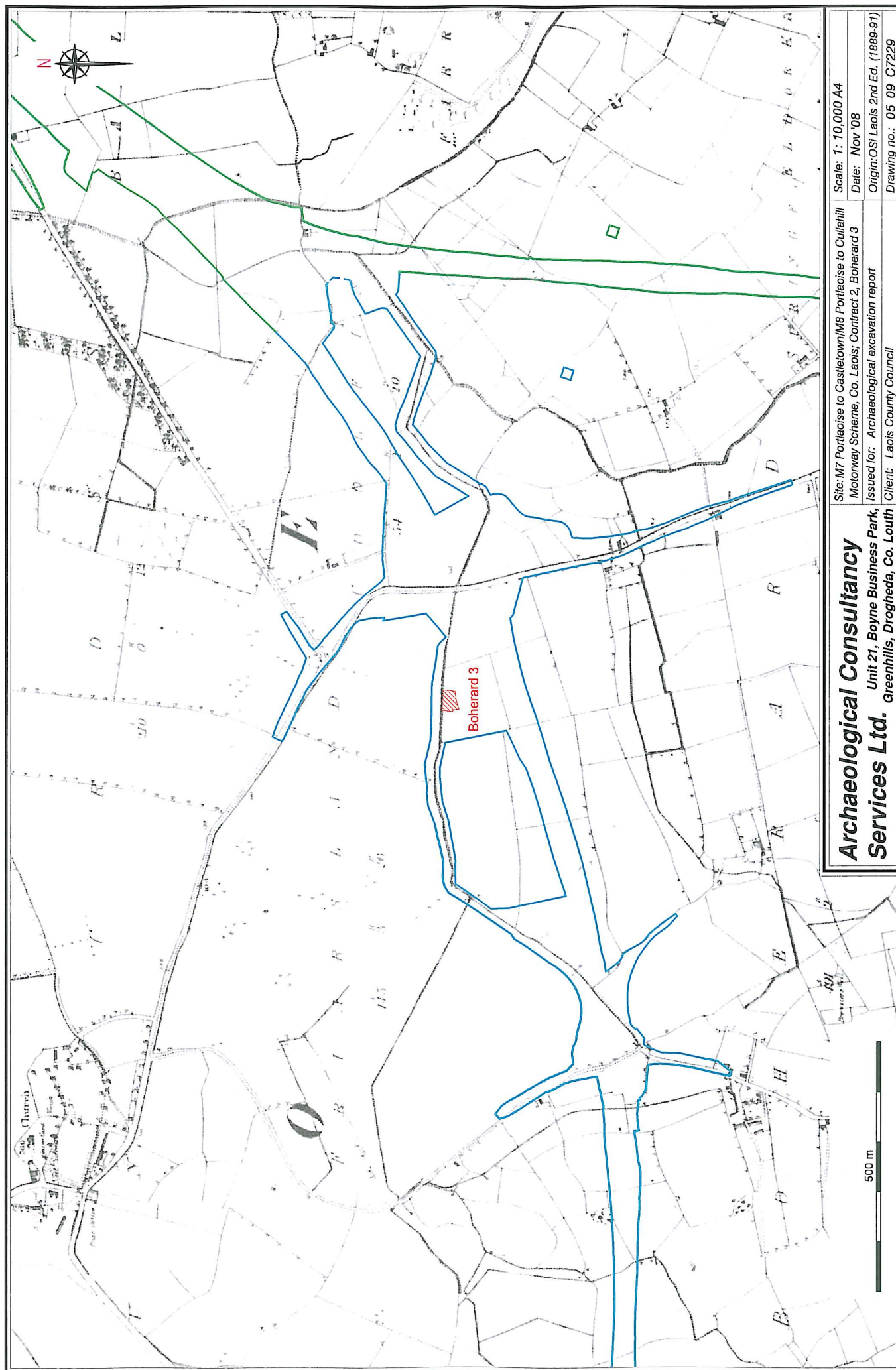
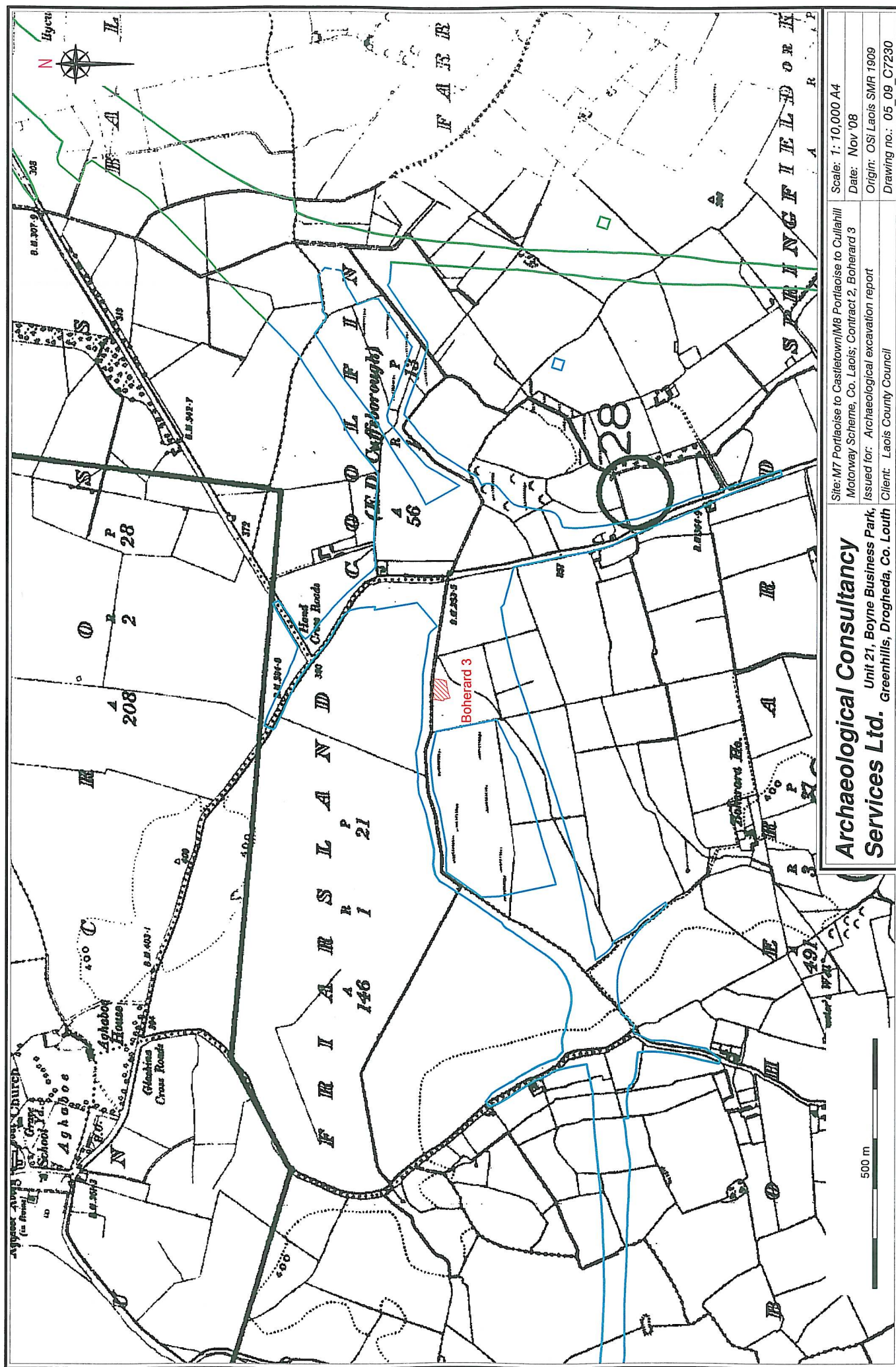


Figure 3: Plan showing Boherard 3 on OSI Laois 1st Ed. (1839) background



Archaeological Consultancy		Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill	Scale: 1: 10,000 A4
Services Ltd.		Motoway Scheme, Co. Laois; Contract 2, Boherard 3	Date: Nov '08
Unit 21, Boyne Business Park,		Issued for: Archaeological excavation report	Origin: OSI Laois 2nd Ed. (1889-91)
Greenhills, Drogheda, Co. Louth		Client: Laois County Council	Drawing no.: 05_09_C7229

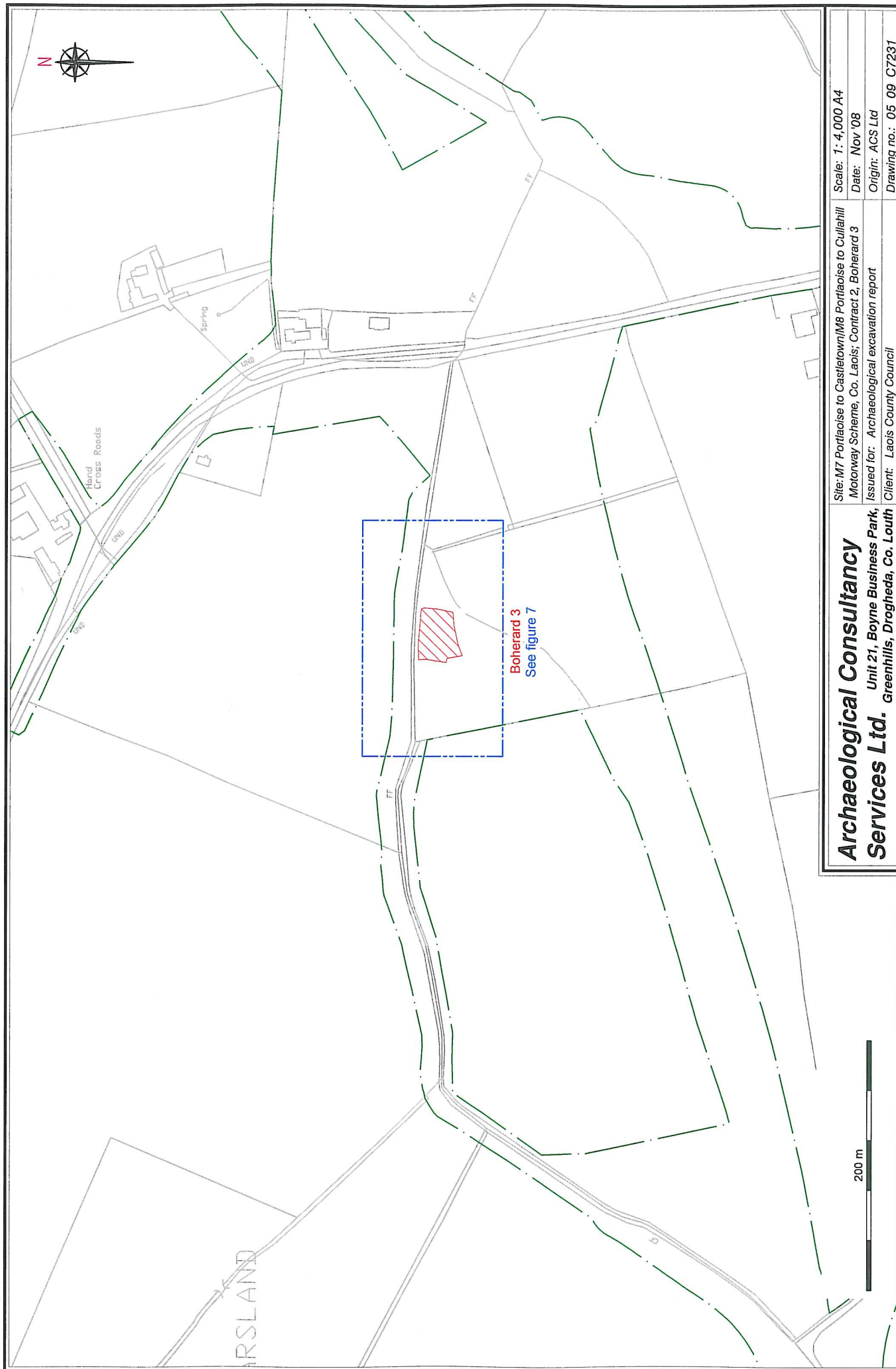
Figure 4: Plan showing Boherard 3 on OSI Laois 2nd Ed. (1889-91) background



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, Boherard 3
 Issued for: Archaeological excavation report
 Client: Laois County Council
 Scale: 1:10,000 A4
 Date: Nov '08
 Origin: OSI Laois SMR 1909
 Drawing no.: 05_09_C7230

Figure 5: Plan showing Boherard 3 on OSI Laois SMR 1909 background



Archaeological Consultancy		Scale: 1: 4,000 A4
Services Ltd.		Date: Nov '08
Unit 21, Boyne Business Park,		Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill
Greenhills, Drogheda, Co. Louth		Motoway Scheme, Co. Laois; Contract 2, Boherard 3
Client: Laois County Council		Issued for: Archaeological excavation report
		Origin: ACS Ltd
		Drawing no.: 05_09_C7231

Figure 6: Location of Boherard 3

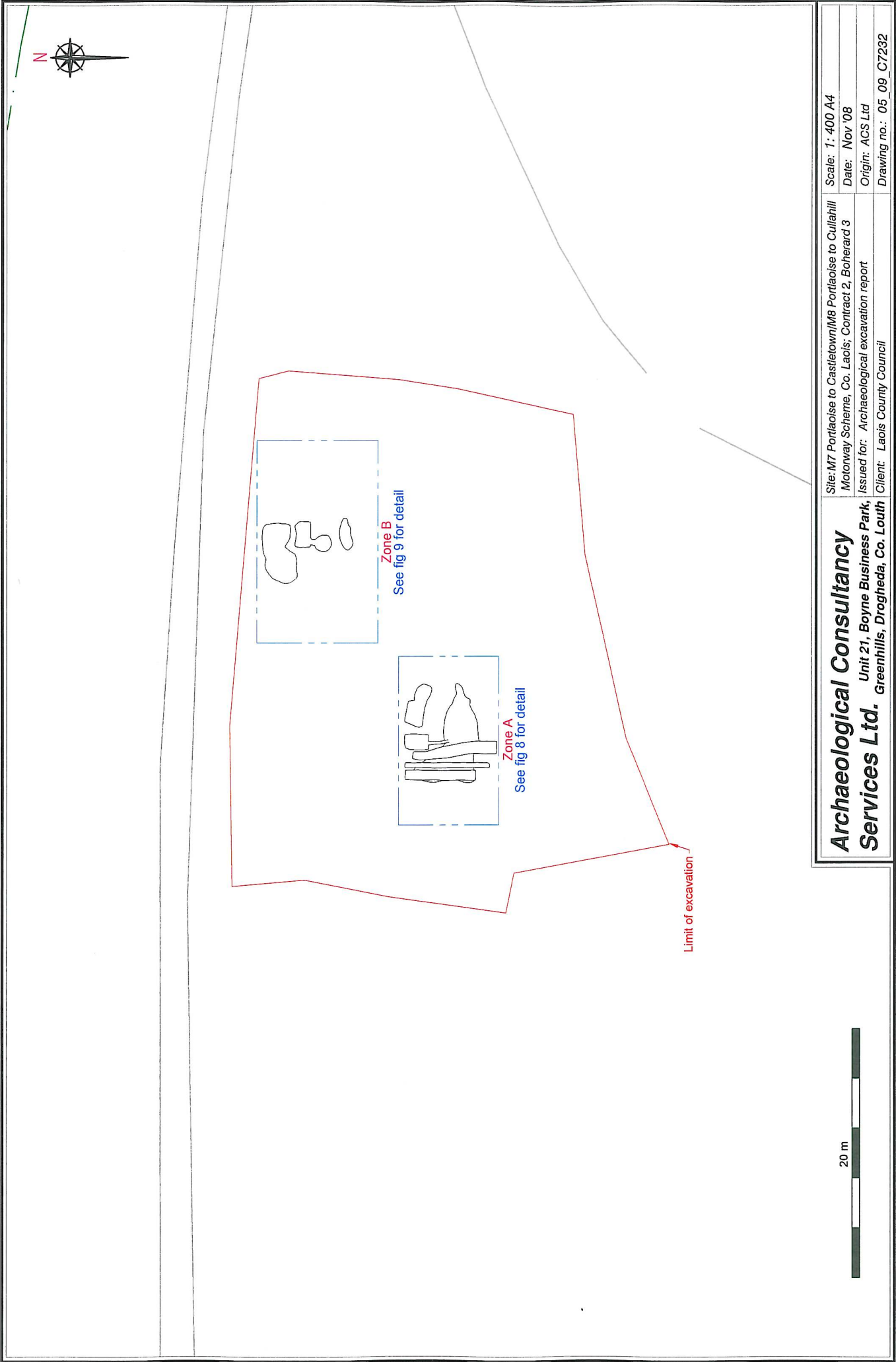
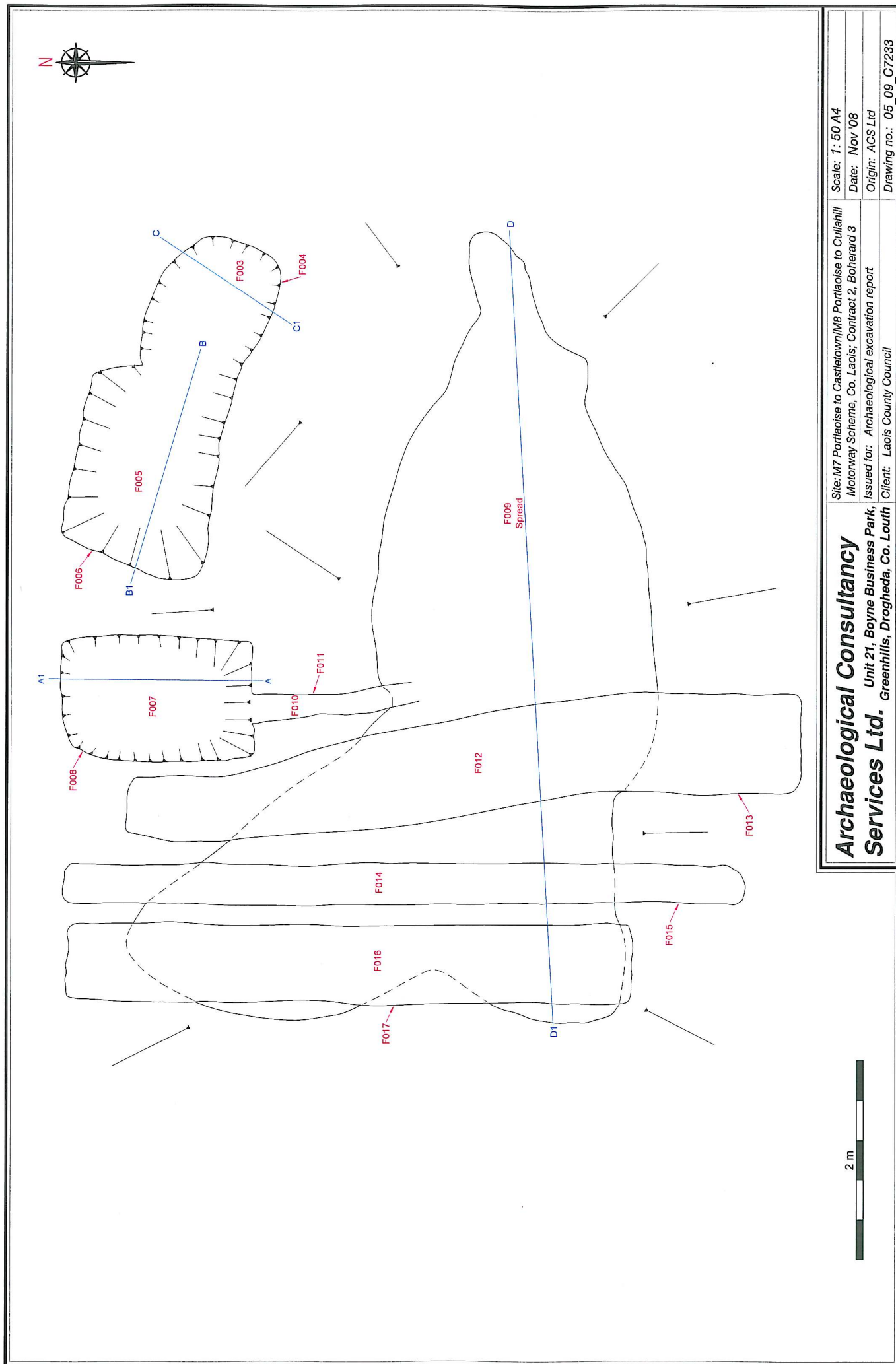
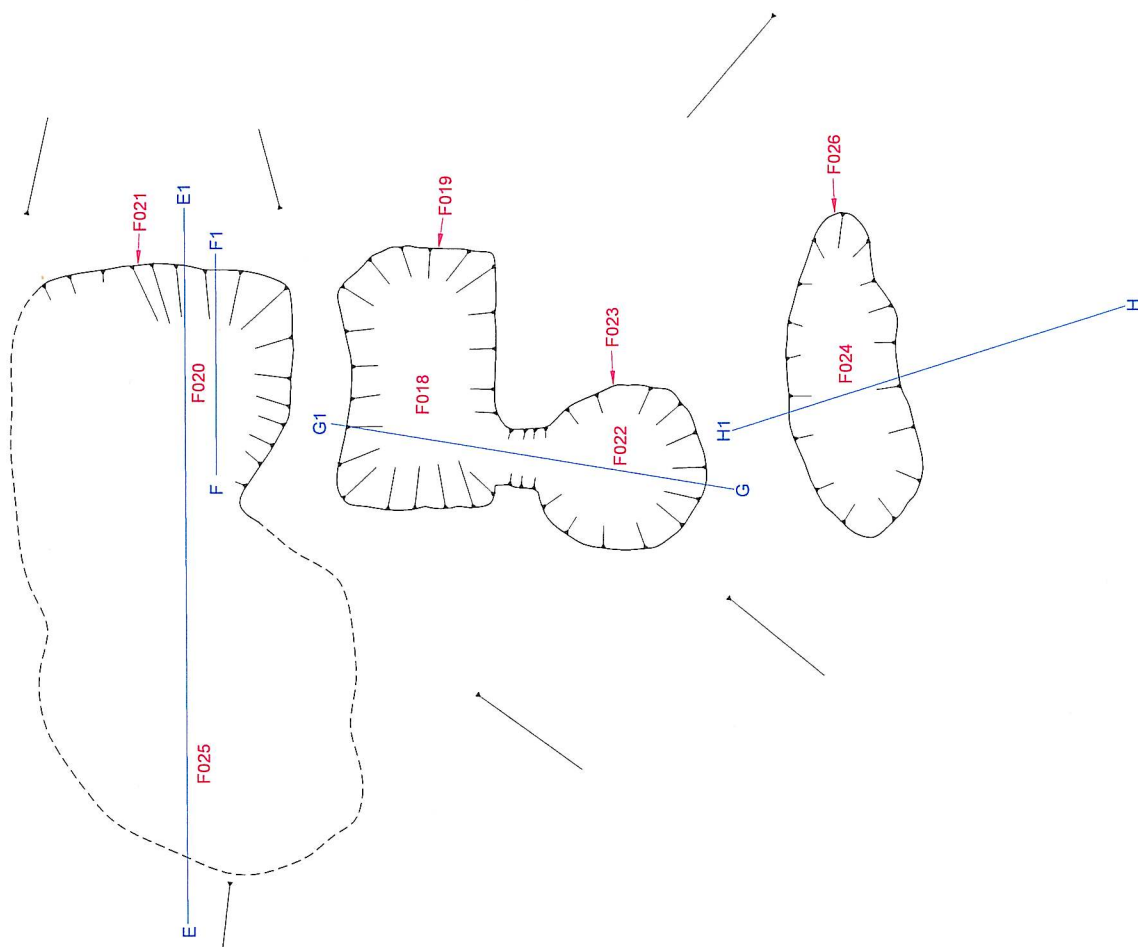


Figure 7: Plan showing extent of site



Archaeological Consultancy		Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill	Scale: 1: 50 A4
Services Ltd.		Motorway Scheme, Co. Laois; Contract 2, Boherard 3	Date: Nov '08
Unit 21, Boyne Business Park,		Issued for: Archaeological excavation report	Origin: ACS Ltd
Greenhills, Drogheda, Co. Louth		Client: Laois County Council	Drawing no.: 05 09 C7233

Figure 8: Zone A of Boherard 3



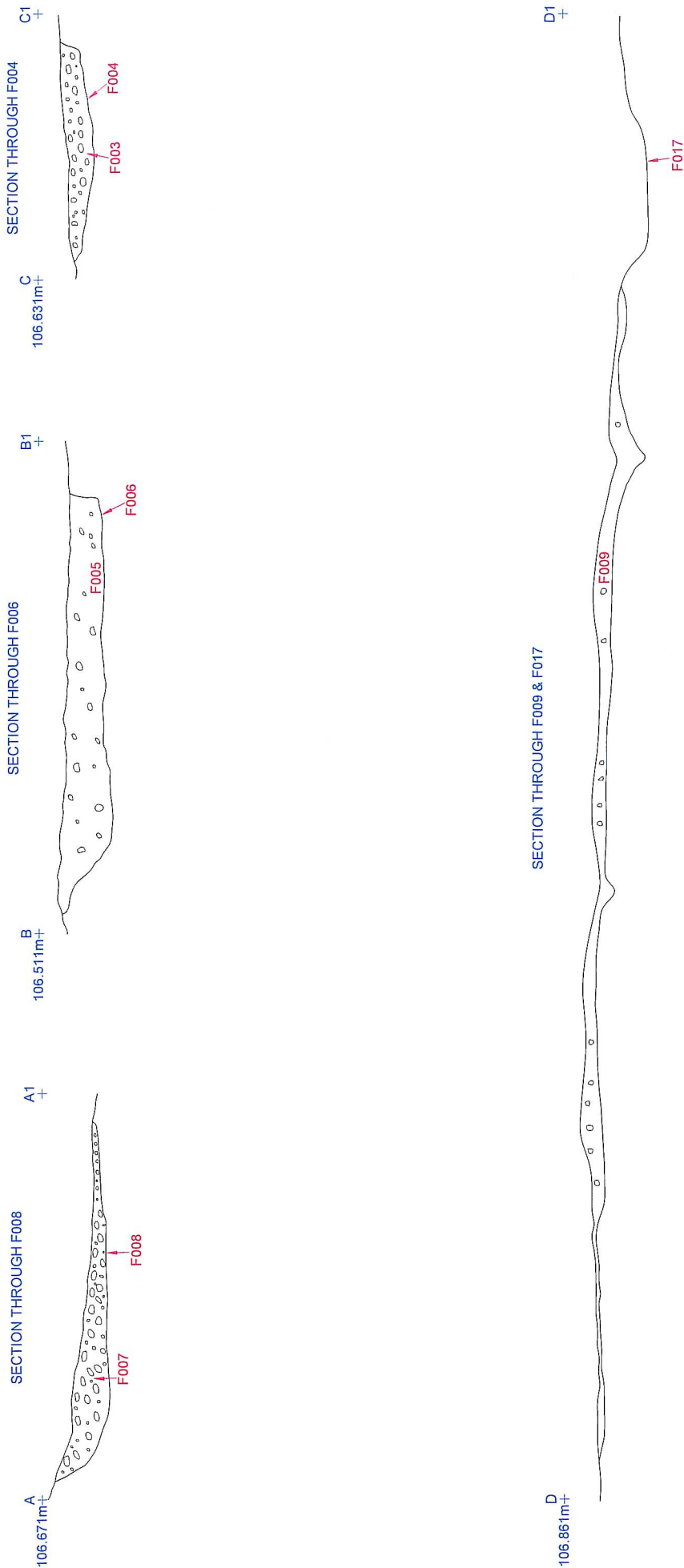
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**Archaeological Consultancy
Services Ltd.** Unit 21, Boyne Business Park,
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Site: M7 Portlaoise to Castletown/IM8 Portlaoise to Cullin Hill
Motorway Scheme, Co. Laois; Contract 2, Boherard 3
Issued for: Archaeological excavation report
Client: Laois County Council

Scale: 1: 60 A4
Date: Nov '08
Origin: ACS Ltd
Drawing no.: 05_09_C7234

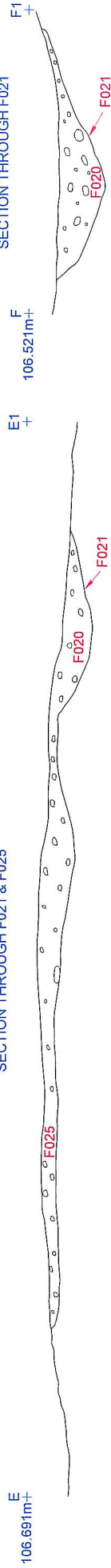
Figure 9: Zone B of Boherard 3



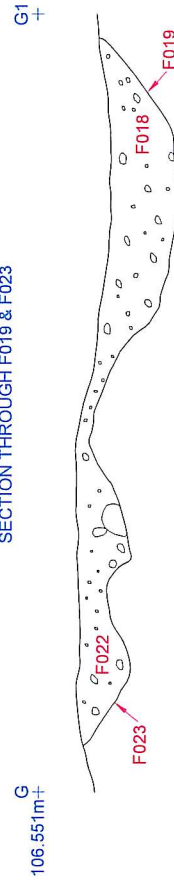
Archaeological Consultancy Services Ltd.		Site: M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, Co. Laois; Contract 2, Bohernad 3	Scale: 1: 32 A4
Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth		Issued for: Archaeological excavation report	Date: Nov '08
		Client: Laois County Council	Origin: ACS Ltd
			Drawing no.: 05_09_C7235

Figure 10: Sections

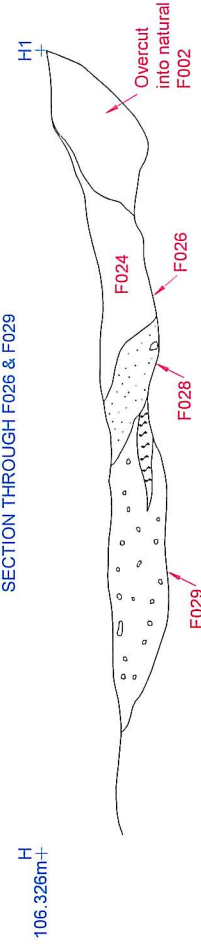
SECTION THROUGH F021 & F025



SECTION THROUGH F019 & F023



SECTION THROUGH F026 & F029



**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, Boherard 3
Issued for: Archaeological excavation report
Client: Laois County Council

Scale: 1: 32 A4
Date: Nov '08
Origin: ACS Ltd
Drawing no.: 05_09_C7236

Figure 11: Sections



Plate 1: Pre-excavation shot of Zone A from north (05_09_CP338_14)



Plate 2: Pre-excavation shot of F5, F6, F3 and F4, Zone A, from north (05_09_CP338_17)



Plate 3: Pre-excavation shot of F7, F8, Zone A, from east (05_09_CP338_18)



Plate 4: Pre-excavation shot of Zone B from south (05_09_CP338_11)



Plate 5: Mid-excavation shot of trough F8 from east (05_09_CP338_22)



Plate 6: Mid-excavation shot of F18 and F22 from east (05_09_CP338_24)



Plate 7: Zone A during excavation from north (05_09_CP338_19)