



LAOIS  
COUNTY COUNCIL



ARCHAEOLOGICAL  
CONSULTANCY  
SERVICES LTD.



## M7 Portlaoise-Castletown/ M8 Portlaoise-Cullahill Motorway Scheme

Contract 1 Gortnaclea – Oldtown  
Phase 2 - Excavation

Report on the Archaeological Excavation  
of  
**Parknahown 5, Co. Laois**

**Volume 2: Appendices 1 - 17**

Ministerial Directions No.  
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## **VOLUME II**

### **APPENDICES 1–17**

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**Appendix 1-Recorded/ Known Archaeological Monuments in the Area**

Townland	Site Type	Description	Inventory No. and RMP number	Reference
Parknahown	Enclosure	Cropmark of sub-circular, conjoined, enclosures	Inventory no. 495 RMP no: LA 034:023	Sweetman <i>et al</i> 1995, 52
Parknahown	Enclosure	Cropmark of a sub-circular enclosure	Inventory No. 496 RMP no: LA 034:027	Sweetman <i>et al</i> 1995, 53
Parknahown	Ringfort	<i>'Rathkilmurry'</i> Circular area measuring c. 50m in diameter defined by an inner bank, intervening ditch and outer bank. The entrance is located at the west and is defined by a 3m wide causeway. Based on the name 'Rathkillmury', Carrigan has suggested that it once contained a church. He suggested that it was once the residence of an Irish chief who donated it to an early Christian missionary for the site of a church for the Church of the Blessed Virgin Mary, hence the name 'Rathkilmurry' or 'the fort of Mary's Church'	Inventory No. 246 RMP no: LA 034:028-01	Sweetman <i>et al</i> 1995, 30 Carrigan 1905, 240
Parknahown	Ringfort	Sub-circular area marked on the 1841 OS 6'' map. The only visible remains are the remains of a bank from the SW-NW	Inventory No. 247 RMP no: LA 034:029	Sweetman <i>et al</i> 1995, 30
Parknahown	Church (poss)	There is no local tradition of a church in this townland but the possibility is indicated by the association of the name 'Rathkilmurry' with one of the ringforts in the townland (see no. 246 above). There is no indication of a church on the 1841 or 1906 edition of the OS 6'' maps	Inventory No. 786 RMP no: LA 034:028-02	Sweetman <i>et al</i> 1995, 87 Carrigan 1905, 240
Parknahown	Enclosure	Bivallate enclosure identified through aerial photography located in a field to the east of previously recorded conjoined sub-circular enclosures (Inventory No. 495).	Unrecorded: Identified through aerial photography	Courtney 2006



Oldtown	Ringfort	Circular area measuring c.46m in diameter defined by a stone-faced inner bank, intervening fosse and outer bank. There is a causewayed entrance measuring 2.1m at the east.	Inventory no. 243 RMP no: LA 034:034	Sweetman <i>et al</i> 1995, 30
Oldtown	Abbey (site)	Carrigan mentions a church, measuring 12m E-W by 6.3m N-S, located within an enclosure. There are no visible surface traces of this site but it is possibly an early monastic site.	Inventory No. 785 RMP no: LA 034:032-01	Sweetman et al 1995, 87 Carrigan 1905, vol II, 233-4
Oldtown	Enclosure	Site A: One of three enclosures occupying one of three knolls in an otherwise flat field. This enclosure measured 38m by 39m. This was located on the most northerly knoll.	Unrecorded-Identified through aerial photography	Courtney 2006
Oldtown	Enclosure	Site B: This was the most central of three enclosures crowing knolls in this townland. This was a bivallate enclosure measuring 61m by 58m.	Unrecorded-Identified through aerial photography	Courtney 2006
Oldtown	Enclosure	Site C: This was the most southern of three enclosures identified through aerial photography. This was located on a knoll to the south of a univallate and a bivallate enclosure on the knolls to the north.	Unrecorded-Identified through aerial photography	Courtney 2006
Oldtown	Enclosure	Site D: This fourth enclosure was discovered through geophysical survey and was located to the north of site A.	Unrecorded-Identified through geophysical survey	Courtney 2006
Oldtown	Enclosure	Site E: The possible traces or partial remains of a fifth enclosure in this cluster were identified to the north east of site D.	Unrecorded-Identified through geophysical survey	Courtney 2006
Seanbally	Holy Well (site)	Not marked on the 1840 or 1906 editions of OS 6'' maps. Carrigan mentions St. Tierna's Well here although there are no surface traces today.	Inventory No. 871 RMP no: 034: 021	Sweetman et al 1995, 97 Carrigan 1905, vol II, 240
Aghmacart	Linear Features	Linear features visible on aerial photography, but not visible at ground level. These may be the remains of field systems.	Inventory no: 675 RMP no: LA 034:019-11	Sweetman <i>et al</i> 1995, 69

Aghmacart	Mill (site)	Carrigan references a mill here in 1601, but the site is not marked on 1841 or 1906 editions of the OS 6'' maps and it is not visible at ground level.	Inventory no: 1044 RMP no: LA 034: 019-09	Sweetman <i>et al</i> 1995, 129 Carrigan 1905, vol II, 90
Aghmacart	Castle & Priory (in ruins)	A monastery is said to have been founded here in 550. It was apparently burnt in 1156. An Augustinian priory was founded here before 1168 by MacGillpatrick, Lord of Ossory. The only surviving remains are the NE angle of a medieval building with a base-batter with a modern building attached to it.	Inventory no: 689 RMP no: LA 034 19-03	Sweetman <i>et al</i> 1995, 71 Carrigan 1905, vol II, 239
Aghmacart	Tower House	The N wall and the NE angle of a two storey tower house. It has a N-S barrel vault above ground floor, a large ope with a segmental arch on the first floor and the remains of a corbel to the N of this. There is evidence of a bawn to the N and S in the form of a low bank.	Inventory No: 938 RMP no: LA 034:019-02	Sweetman <i>et al</i> 1995, 110
Addergoole	Nunnery	The site is not marked on any OS maps. In 1240 AD a convent was granted to the prioress and nuns of Kilculliheen by David FitzMilo. There is no record of it being occupied after this time, but the nuns still occupied 60 acres of land here in 1541. Carrigan stated that the nunnery was located in 'Kiln Field' to the NW of Belmont House, but there are no visible surface traces.	Inventory No: 687 RMP no: LA 034:022-01	Sweetman <i>et al</i> 1995, 70 Carrigan 1905, vol II, 234-5
Castlequarter	Church	The private church of the Lords of Upper Ossory located 100m W of a tower house (Inventory no. 709). It has been roofless since Cromwellian times and there has been no burial there since the mid 19 <sup>th</sup> century. The ruins consist of a late 16 <sup>th</sup> century nave and chancel church.	Inventory no: 709 RMP no: LA 035:021-01	Sweetman <i>et al</i> 1995, 75
Galesquarter	Tower House	This is classified as a castle in ruins in the RMP records. This tower house was erected by the	Inventory no: 954 RMP no: LA 035:022-01	Sweetman <i>et al</i> 1995, 114

		MacGillapatricks c. 1425 and was damaged by the Cromwellians in the mid 17 <sup>th</sup> century. The remains measure 15m by 12.6m and is five storeys high with a wall walk. Most of the north wall and the doorway is missing. There is a <i>sheela-na-gig</i> on the E wall. Carrigan refers to a draw-well in the courtyard. There is a large seven sided bawn wall enclosing an area of 80m N-S by 60m E-W. There is also an inner wall with angle towers which is close to the tower house, which was destroyed at the N and E.		Carrigan 1905, vol II, 231-3
Galesquarter	<i>Sheela-na-gig</i>	Rude carving in relief of a female figure was located at a height of 13m on the S end of the E wall of Cullahill Castle. The carving is now covered in ivy.	Inventory no: 1014 RMP no: LA 035:22-02	Sweetman <i>et al</i> 1995, 122
Barracksquarter or Ross	Enclosure	Sub-circular area measuring c. 48m in diameter and defined by a low bank. There area several cattle gaps in the bank and there is no recognisable entrance and no evidence of a ditch.	Inventory no: 327 RMP no: LA 035:039	Sweetman <i>et al</i> 1995, 39
Scrub and Glenmacolla	Enclosure (possible)	Cropmark of a sub-circular enclosure visible on aerial photography. Not visible at ground level.	Inventory No. 529 RMP no: LA 034:030	Sweetman et al 1995, 56
Scrub and Glenmacolla	Enclosure	Cropmark of a circular enclosure measuring c. 44m in diameter. Situated on a hill. The site is visible on aerial photography but not at ground level.	Inventory No. 530 RMP no: LA 034:031	Sweetman et al 1995, 56
Scrub and Glenmacolla	Enclosure	Cropmark of the eastern half of a sub-circular enclosure. The site is visible on aerial photography but not at ground level.	Inventory No. 531 RMP no: LA 034:019	Sweetman et al 1995, 56
Scrub and Glenmacolla	Enclosure	Cropmark of a circular enclosure visible on aerial photography. Not visible at ground level.	Inventory No. 532 RMP no: LA 034:20	Sweetman et al 1995, 56



**Appendix 2 Flotation Results****Soil Sample Data Sheet  
General Site Samples**

	Site Name	Record Number	Context	Sample	Soil Weight (g/kg) <i>Pre-sieve</i>	Residue Weight (g/kg)	Flot Weight (g/kg)	Comments
1	Parknahown 5	E2170	230	230	18.000kg	7.500kg	0.034kg	Flot: charcoal.
2	Parknahown 5	E2170	1364	863	2.100kg	0.134kg	0.009kg	Flot: charcoal.
3	Parknahown 5	E2170	290	849	3.800kg	0.419kg	0.006kg	Flot: charcoal.
4	Parknahown 5	E2170	1340	865	2.900kg	0.266kg	0.014kg	Flot: charcoal.
5	Parknahown 5	E2170	1344	869	3.900kg	0.277kg	0.016kg	Flot: charcoal.
6	Parknahown 5	E2170	1366	864	2.100kg	0.169kg	0.027kg	Flot: charcoal.
7	Parknahown 5	E2170	32	808	3.000kg	0.958kg	0.018kg	Flot: charcoal, residue contains: shell, poss. slag, frag. Of bone and poss. hair.
8	Parknahown 5	E2170	1282	756	2.800kg	1.120kg	<0.001kg	Flot: charcoal. Residue contains poss. anomite, frag. of bone.
9	Parknahown 5	E2170	1375	838	1.853kg	0.146kg	0.002kg	Flot: charcoal.
10	Parknahown 5	E2170	7	3	3.700kg	-	0.237kg	Flot: charcoal and shell. No residue.

11	Parknahown 5	E2170	1342	871	2.900kg	0.193kg	0.018kg	Flot: charcoal.
12	Parknahown 5	E2170	922	842	3.000kg	0.524kg	0.004kg	Flot: charcoal.
13	Parknahown 5	E2170	1356	855	1.442kg	0.135kg	0.008kg	Flot: charcoal.
14	Parknahown 5	E2170	974	951	1.559kg	0.345kg	0.012kg	Flot: charcoal and shell. Residue contains frag. of bone.
15	Parknahown 5	E2170	898	398	2.500kg	0.414kg	0.009kg	Flot: charcoal. Residue contains frag. of bone and shell.
16	Parknahown 5	E2170	146	862	4.900kg	0.436kg	0.013kg	Flot: charcoal. Residue contains frag. of bone.
17	Parknahown 5	E2170	976	452	1.298kg	0.299kg	0.006kg	Flot: charcoal.
18	Parknahown 5	E2170	1316	747	0.536kg	0.087kg	0.003kg	Flot: charcoal.
19	Parknahown 5	E2170	273	852	1.178kg	0.232kg	-	Nothing in residue.
20	Parknahown 5	E2170	735	886	2.800kg	0.895kg	0.004kg	Flot: charcoal.
21	Parknahown 5	E2170	296	839	4.000kg	0.389kg	<0.001kg	Flot: charcoal.
22	Parknahown 5	E2170	196	58	4.000kg	1.121kg	0.004kg	Flot: charcoal.
23	Parknahown 5	E2170	88	27	3.000kg	0.471kg	0.007kg	Flot: charcoal. Residue contains frag. of bone and a tooth.

24	Parknahown 5	E2170	207	47	2.500kg	1.161kg	0.004kg	Flot charcoal and plant material. Residue contains frag. of bone.
25	Parknahown 5	E2170	312	217	1.585kg	0.614kg	0.011kg	Flot frag. of bone and small charcoal. Residue contains fragments of bone.
26	Parknahown 5	E2170	86	26	3.200kg	0.456kg	0.015kg	Flot charcoal.
27	Parknahown 5	E2170	749	903	2.800kg	0.746kg	0.005kg	Flot charcoal. Residue contains frag. of bone.
28	Parknahown 5	E2170	228	201	4.400kg	2.500kg	0.010kg	Flot charcoal. Residue contains frag. of bone and poss. anomite.
29	Parknahown 5	E2170	30	7	3.500kg	1.199kg	-	Residue contains poss. anomite.
30	Parknahown 5	E2170	105	93	3.600kg	0.612kg	0.005kg	Flot charcoal and plant material.
31	Parknahown 5	E2170	102	67	3.300kg	0.345kg	0.008kg	Flot charcoal, frag. of wood and seeds. Residue contains frag. of bone.
32	Parknahown 5	E2170	85	36	2.100kg	0.362kg	0.005kg	Flot charcoal.
33	Parknahown 5	E2170	389	847	4.200kg	0.211kg	0.009kg	Flot charcoal.
34	Parknahown 5	E2170	1338	868	3.900kg	0.245kg	0.006kg	Flot charcoal.
35	Parknahown 5	E2170	34	826	3.200kg	0.677kg	0.014kg	Flot charcoal. Residue contains poss. slag and frag. of bone.
36	Parknahown 5	E2170	9	2	3.500kg	-	0.070kg	No residue. Flot charcoal charcoal and shell.



37	Parknahown 5	E2170	165	86	(3 bags) 9.700kg	1.964kg	0.093kg	Flot charcoal. Residue contains frag. of bone.
38	Parknahown 5	E2170	F1	16	2.100kg	0.250kg	0.037kg	Marl charcoal and frag. of wood. Residue contains poss. lime.
39	Parknahown 5	E2170	104	21	4.000kg	1.162kg	0.007kg	Flot charcoal. Residue contains frag. of bone.
40	Parknahown 5	E2170	1352	848	3.200kg	0.294kg	0.021kg	Flot charcoal.
41	Parknahown 5	E2170	1367	870	3.600kg	0.313kg	0.023kg	Flot charcoal.
42	Parknahown 5	E2170	113	828	(2 bags) 8.200kg	1.823kg	0.007kg	Flot charcoal.
43	Parknahown 5	E2170	225	202	1.766kg	0.583kg	0.017kg	Flot charcoal. Residue contains frag. of bone.
44	Parknahown 5	E2170	199	827	(2 bags) 6.800kg	1.141kg	0.005kg	Flot charcoal.
45	Parknahown 5	E2170	78	28	(2 bags) 4.700kg	1.903kg	0.005kg	Flot charcoal.
46	Parknahown 5	E2170	339	89	(2 bags) 8.900kg	2.000kg	0.020kg	Flot charcoal. Residue contains frag. of bone.
47	Parknahown 5	E2170	271	860	4.000kg	1.048kg	0.007kg	Flot charcoal.
48	Parknahown 5	E2170	1206	698	3.500kg	1.199kg	0.007kg	Flot charcoal.
49	Parknahown 5	E2170	271	840	2.500kg	0.627kg	0.005kg	Flot charcoal.
50	Parknahown 5	E2170	421	476	2.900kg	0.871	0.030kg	Flot charcoal. Residue contains frag. of bone and a tooth.

51	Parknahown 5	E2170	1358	857	1.250kg	0.051kg	0.002kg	Flot charcoal.
52	Parknahown 5	E2170	335	821	(2 bags) 7.800kg	1.592kg	0.004kg	Flot charcoal.
53	Parknahown 5	E2170	1350	867	1.900kg	0.134kg	0.006kg	Flot charcoal.
54	Parknahown 5	E2170	1317	751	3.000kg	0.597kg	0.017kg	Flot charcoal.
55	Parknahown 5	E2170	205	46	4.000kg	1.541kg	0.006kg	Flot frag. of wood and plant material.
56	Parknahown 5	E2170	293	851	3.300kg	0.479kg	0.004kg	Flot charcoal.
57	Parknahown 5	E2170	272	859	3.200kg	0.221kg	0.004kg	Flot charcoal.
58	Parknahown 5	E2170	191	68	3.000kg	0.221kg	0.004kg	Flot charcoal and frag. of wood.
59	Parknahown 5	E2170	1210	692	1.640kg	0.776kg	0.003kg	Flot charcoal.
60	Parknahown 5	E2170	270	841	4.000kg	0.770kg	0.007kg	Flot charcoal.
61	Parknahown 5	E2170	180	50	(2 bags) 7.500kg	1.773kg	0.019kg	Flot charcoal. Residue contains frag. of bone.
62	Parknahown 5	E2170	163	34	(2 bags) 8.000kg	1.927kg	0.018kg	Flot charcoal.
64	Parknahown 5	E2170	108	35	(2 bags) 9.200kg	2.750kg	0.014kg	Flot charcoal.
65	Parknahown 5	E2170	37	15	(2 bags) 10.900kg	1.584kg	0.105kg	Flot charcoal, shell and frag. of bone. Residue contains shell, frag. of bone and poss. slag.

66	Parknahown 5	E2170	165	25	(2 bags) 8.700kg	1.500kg	0.046kg	Flot charcoal. Residue contains frag. of bone.
67	Parknahown 5	E2170	127	87	(3 bags) 12.900kg	1.822kg	0.060kg	Flot charcoal. Residue contains frag. of bone.
68	Parknahown 5	E2170	1349	850	2.000kg	0.360kg	0.014kg	Flot charcoal.
69	Parknahown 5	E2170	196	57	4.800kg	1.127kg	0.004kg	Flot charcoal.
70	Parknahown 5	E2170	12	4	2.900kg	-	0.058kg	Flot charcoal, frag. of wood, shell and poss. lime. No residue.
71	Parknahown 5	E2170	145	858	1.707kg	0.314kg	0.004kg	Flot charcoal.
72	Parknahown 5	E2170	1064	528	0.590kg	0.187kg	0.004kg	Flot charcoal.
73	Parknahown 5	E2170	421	344	4.500kg	1.491kg	0.026kg	Flot charcoal. Residue contains poss. slag and frag. of bone.
74	Parknahown 5	E2170	1242	706	4.200kg	1.274kg	0.003kg	Flot charcoal.
75	Parknahown 5	E2170	182	49	(2 bags) 6.800kg	1.292kg	0.008kg	Flot charcoal.
76	Parknahown 5	E2170	158	92	(3 bags) 10.300kg	3.000kg	0.015kg	Flot charcoal and shell. Residue contains frag. of bone.
77	Parknahown 5	E2170	125	88	(3 bags) 10.700kg	2.900kg	0.007kg	Flot charcoal.
78	Parknahown 5	E2170	124	90	(2 bags) 8.000kg	1.961kg	0.028kg	Flot charcoal and frag. of bone. Residue contains frag. of bone.



79	Parknahown 5	E2170	1364	850	1.580kg	0.375kg	-	Nothing in residue.
80	Parknahown 5	E2170	1294	743	1.024kg	0.292kg	0.003kg	Flot charcoal.
81	Parknahown 5	E2170	90	32	2.500kg	0.493kg	0.005kg	Flot: charcoal.
82	Parknahown 5	E2170	284	853	4.000kg	0.870kg	0.003kg	Flot: charcoal.
83	Parknahown 5	E2170	56	44	5.000kg	1.342kg	0.017kg	Flot charcoal and frag. of bone. Residue contains frag. of bone.
84	Parknahown 5	E2170	258	No no.	7.000kg	3.000kg	0.007kg	Flot charcoal and plant material.
85	Parknahown 5	E2170	269	844	4.000kg	0.762kg	-	Nothing in residue.
86	Parknahown 5	E2170	390	845	4.100kg	0.100kg	0.008kg	Flot charcoal.
87	Parknahown 5	E2170	275	862	1.700kg	0.411kg	0.007kg	Flot charcoal.
88	Parknahown 5	E2170	1322	754	2.700kg	0.560kg	0.008kg	Flot charcoal.
89	Parknahown 5	E2170	70	22	(2 bags) 6.900kg	0.710kg	0.090kg	Flot charcoal.
90	Parknahown 5	E2170	978	953	0.625kg	0.158kg	0.016kg	Flot: charcoal.
91	Parknahown 5	E2170	1304	745	0.797kg	0.214kg	0.008kg	Flot: charcoal.
92	Parknahown 5	E2170	10	1	3.000kg	-	0.048kg	Flot: charcoal and shell. No residue.

93	Parknahown 5	E2170	97	41	3.700kg	0.331kg	0.055kg	Flot: charcoal. Residue contains frag. of bone.
94	Parknahown 5	E2170	112	825	(2 bags) 8.900kg	1.707kg	0.006kg	Flot: charcoal.
95	Parknahown 5	E2170	310	69	(3 bags) 11.500kg	1.671kg	0.032kg	Flot: charcoal. Residue contains frag. of bone.
96	Parknahown 5	E2170	186	48	(2 bags) 7.900kg	2.200kg	0.002kg	Flot: charcoal.
97	Parknahown 5	E2170	1272	725	2.200kg	1.006kg	0.004kg	Flot: charcoal.
98	Parknahown 5	E2170	167	33	4.000kg	1.340kg	0.011kg	Flot charcoal and plant material. Residue contains poss. slag and frag. of bone.
99	Parknahown 5	E2170	146	861	3.900kg	0.352kg	0.017kg	Flot charcoal. Residue contains frag. of bone.
100	Parknahown 5	E2170	1300	746	3.000kg	0.597kg	0.006kg	Flot charcoal.
101	Parknahown 5	E2170	96	39	3.000kg	0.288kg	0.006kg	Flot charcoal.
102	Parknahown 5	E2170	230	235	22.000kg	10.000kg	0.047kg	Flot charcoal. Residue contains frag. of bone.
103	Parknahown 5	E2170	6	6	29.500kg	5.200kg	0.037kg	Flot charcoal and plant material.
104	Parknahown 5	E2170	109	91	9.000kg	1.073kg	0.002g	Flot charcoal.
105	Parknahown 5	E2170	1361	854	1.118kg	0.077kg	0.002kg	Flot charcoal.
106	Parknahown 5	E2170	331	879	4.000kg	1.407kg	0.003kg	Flot charcoal and shell. Residue contains frag. of bone.

107	Parknahown 5	E2170	194	56	3.700kg	0.835kg	0.011kg	Flot charcoal.
108	Parknahown 5	E2170	331	878	4.800kg	1.343kg	0.004kg	Flot charcoal. Residue contains frag. of bone.
109	Parknahown 5	E2170	1340	866	3.700kg	0.263kg	0.007kg	Flot charcoal.
110	Parknahown 5	E2170	336	877	5.100kg	1.529kg	0.001kg	Flot charcoal and shell.
111	Parknahown 5	E2170	328	881	5.100kg	1.733kg	0.013kg	Flot charcoal. Residue contains frag. of bone.
112	Parknahown 5	E2170	241	820	(2 bags) 8.300kg	2.000kg	0.084kg	Flot charcoal.
113	Parknahown 5	E2170	133	884	3.200kg	1.842kg	0.002kg	Flot shell.
114	Parknahown 5	E2170	328	880	4.100kg	1.358kg	0.014kg	Flot charcoal. Residue contains frag. of bone.
115	Parknahown 5	E2170	332	882	4.200kg	1.547kg	0.006kg	Flot shell. Residue contains frag. of bone.
116	Parknahown 5	E2170	46	42	3.800kg	1.108kg	0.044kg	Flot charcoal and frag. of bone. Residue contains frag. of bone.
117	Parknahown 5	E2170	332	883	4.300kg	1.694kg	0.003kg	Flot charcoal and shell. Residue contains frag. of bone.
118	Parknahown 5	E2170	28	8	0.764kg	0.248kg	0.026kg	Flot shell. Residue contains frag. of bone.
119	Parknahown 5	E2170	122	29	1.955kg	1.796kg	-	Residue poss. limestones.
120	Parknahown 5	E2170	1581	888	(2 bags) 6.000g	1.592kg	0.094kg	Flot charcoal.



121	Parknahown 5	E2170	133	885	3.200kg	2.000kg	0.003kg	Flot shells.
122	Parknahown 5	E2170	194	55	4.100kg	1.033kg	0.009kg	Flot charcoal.
123	Parknahown 5	E2170	336	876	5.000kg	1.602kg	0.002kg	Flot charcoal and shell.
124	Parknahown 5	E2170	194	54	4.900kg	0.939kg	0.012kg	Flot charcoal.
125	Parknahown 5	E2170	198	829	(2 bags) 5.900kg	0.959kg	0.012kg	Flot charcoal and shell.
126	Parknahown 5	E2170	270	843	3.200kg	0.657kg	0.003kg	Flot charcoal and plant material.
127	Parknahown 5	E2170	F1059, B705	518	3.800kg	1.215kg	0.012kg(bone) 0.001kg(char)	Flot: frag. of bone, inc. teeth and charcoal.
128	Parknahown 5	E2170	F1112, B760	571	3.500kg	1.457kg	0.013kg(bone) <0.001kg(char)	Flot: frag. of bone, inc. teeth, and charcoal.
129	Parknahown 5	E2170	F570, B246	175	0.114kg	0.049kg	0.002kg	Flot: frag. of bone.
130	Parknahown 5	E2170	F623, B307	210	0.887kg	0.117kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
131	Parknahown 5	E2170	F623, B307	211	0.091kg	0.027kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
132	Parknahown 5	E2170	F1401, B854	657	0.262kg	0.083kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
133	Parknahown 5	E2170	F849,	644	1.131kg	0.400kg	<0.001kg(seed)	Flot: frag. of bone, a seed nd

			B484				0.001kg(char) 0.002kg(bone)	charcoal.
134	Parknahown 5	E2170	F1401, B854	658	0.606kg	0.188kg	0.001kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal/ shell.
135	Parknahown 5	E2170	F1442, B954	683	0.107kg	0.40kg	<0.001kg(cha) 0.001kg(bone)	Flot: frag. of bone and charcoal.
136	Parknahown 5	E2170	F410, B018	78	0.493kg	0.077kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
137	Parknahown 5	E2170	F1019, B663	510	0.459kg	0.151kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
138	Parknahown 5	E2170	F453/ B123	109	0.643kg	0.313kg	0.001kg(bone) <0.001kg(cha)	Flot: frag. of bone and charcoal.
139	Parknahown 5	E2170	F633/ B314	222	0.551kg	0.267kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
140	Parknahown 5	E2170	F1407, B863	649	1.047kg	0.518kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
141	Parknahown 5	E2170	F521, B198	147	0.465kg	0.145kg	0.001kg(char) 0.002kg(bone)	Flot: frag. of bone and charcoal.
142	Parknahown 5	E2170	F514, B189	434	1.142kg	0.454kg	0.006kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal/ shells.
143	Parknahown 5	E2170	F636, B237	162	0.435kg	0.069kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
144	Parknahown 5	E2170	N/A	N/A				
145	Parknahown 5	E2170	F1393, B848	558	1.082kg	0.571kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone, charcoal, and a seed.

							<0.001kg(seed)	
146	Parknahown 5	E2170	F1074, B715	540	1.356kg	0.670kg	0.006kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
147	Parknahown 5	E2170	F1409, B865	651	0.101kg	0.023kg	0.004kg	Flot: frag. of bone.
148	Parknahown 5	E2170	F412, B019	81	0.754kg	0.287kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
149	Parknahown 5	E2170	F614, B293	202	0.789kg	0.296kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
150	Parknahown 5	E2170	F1434, B945	674	0.322kg	0.110kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
151	Parknahown 5	E2170	F443, B044	102	0.166kg	0.043kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone/ plant material and charcoal.
152	Parknahown 5	E2170	F1013, B661	581	0.296kg	0.108kg	0.001kg(char) 0.002kg(bone)	Flot: frag. of bone and charcoal.
153	Parknahown 5	E2170	F474, B158	114	0.760kg	0.270kg	0.002kg(bone) 0.001kg(char) <0.001kg(seed)	Flot: frag. of bone, charcoal and a seed.
154	Parknahown 5	E2170	F447, B121	105	0.516kg	0.152kg	0.004kg(bone) <0.001kg(cha)	Flot: frag. of bone and charcoal.
155	Parknahown 5	E2170	F1403, B856	648	0.693kg	0.254kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone, and charcoal.
156	Parknahown 5	E2170	F602, B283	188	0.191kg	0.063kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
157	Parknahown 5	E2170	F602, B283	189	0.486kg	0.202kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
158	Parknahown 5	E2170	F410, B018	71	0.691kg	0.183kg	0.008kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
159	Parknahown 5	E2170	F572, B213	180	3.900kg	0.946kg	0.042kg(bone) 0.002kg(char)	Flot: frag. of bone, inc. tooth, and charcoal.

160	Parknahown 5	E2170	F492, B179	141	0.547kg	0.211kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
161	Parknahown 5	E2170	F556, B234	178	0.725kg	0.240kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
162	Parknahown 5	E2170	F447, B121	104	0.325kg	0.138kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
163	Parknahown 5	E2170	F401, B003	73	1.125kg	0.140kg	0.012kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
164	Parknahown 5	E2170	F403, B007	75	1.292kg	0.491kg	0.008kg(bone) 0.001kg(charc)	Flot: frag. of bone/plant material and charcoal.
165	Parknahown 5	E2170	F619, B300	205	0.211kg	0.095kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
166	Parknahown 5	E2170	F546, B212	185	0.326kg	0.124kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
167	Parknahown 5	E2170	F457, B147	457	0.322kg	0.104kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal/ plant material.
168	Parknahown 5	E2170	F588, B268	200	1.246kg	0.435kg	0.010kg(bone) 0.002kg(char)	Flot: frag. of bone inc. teeth, and charcoal.
169	Parknahown 5	E2170	F614, B293	203	0.180kg	0.099kg	0.002kg	Flot: frag. of bone.
170	Parknahown 5	E2170	F449, B102	106	0.642kg	0.254kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
171	Parknahown 5	E2170	F443, B044	101	0.060kg	0.023kg	0.001kg	Flot: frag. of bone/ plant material.
172	Parknahown 5	E2170	F1447, B168	119	0.412kg	0.194kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
173	Parknahown 5	E2170	F482, B173	129	0.588kg	0.086kg	0.016kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
174	Parknahown 5	E2170	F474, B158	116	0.655kg	0.064kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
175	Parknahown 5	E2170	F502, B182	139	0.275kg	0.080kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

176	Parknahown 5	E2170	F524, B206	149	0.196kg	0.102kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
177	Parknahown 5	E2170	F443, B044	100	0.118kg	0.038kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
178	Parknahown 5	E2170	F562, B240	231	0.159kg	0.038kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
179	Parknahown 5	E2170	F436, B014	107	0.119kg	0.044kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
180	Parknahown 5	E2170	F463, B008	121	0.147kg	0.029kg	0.005kg(bone) <0.01kg(char)	Flot: frag. of bone and charcoal.
181	Parknahown 5	E2170	F590, B270	212	0.019kg	0.009kg	<0.001kg	Flot: frag. of bone.
182	Parknahown 5	E2170	F474, B158	115	0.692kg	0.235kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
183	Parknahown 5	E2170	F598, B278	44	0.084kg	0.042kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
184	Parknahown 5	E2170	F405, B011	76	0.173kg	0.056kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
185	Parknahown 5	E2170	F542, B209	156	0.547kg	0.155kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
186	Parknahown 5	E2170	F506, B192	142	0.159kg	0.048kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
187	Parknahown 5	E2170	F439, B013	85	0.176kg	0.065kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
188	Parknahown 5	E2170	F412, B019	80	0.245kg	0.094kg	<0.001kg	Flot: charcoal.
189	Parknahown 5	E2170	F476, B160	117	0.610kg	0.186kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
190	Parknahown 5	E2170	F490, B023	82	0.111kg	0.033kg	0.002kg	Flot: frag. of bone
191	Parknahown 5	E2170	F467, B154	111	0.101kg	0.022kg	0.001kg	Flot: charcoal/ plant material.



192	Parknahown 5	E2170	F546, B212	184	0.706kg	0.231kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
193	Parknahown 5	E2170	F409, B017	77	0.137kg	0.044kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
194	Parknahown 5	E2170	F498, B099	136	0.584kg	0.156kg	0.006kg <0.001kg(char)	Flot: frag. of bone and charcoal.
195	Parknahown 5	E2170	F538, B224	157	0.300kg	0.073kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal/ plant material.
196	Parknahown 5	E2170	F564, B242	165	0.094kg	0.036kg	<0.001kg	Flot: frag. of bone.
197	Parknahown 5	E2170	F1449, B200	159	0.311kg	0.074kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
198	Parknahown 5	E2170	F494, B177	138	1.355kg	0.426kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
199	Parknahown 5	E2170	F560, B236	167	0.808kg	0.285kg	0.005kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
200	Parknahown 5	E2170	F484, B125	125	0.788kg	0.289kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
201	Parknahown 5	E2170	F548, B221	176	2.000kg	.0906kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
202	Parknahown 5	E2170	F730, B362	302	0.700kg	0.278kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
203	Parknahown 5	E2170	F801, B433	326	0.788kg	0.334kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
204	Parknahown 5	E2170	F969, B610	448	0.431kg	0.112kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
205	Parknahown 5	E2170	F1274, B1028	738	0.322kg	0.122kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
206	Parknahown 5	E2170	F753, B388	297	0.0018kg	0.003kg	0.001kg	Flot: frag. of bone
207	Parknahown 5	E2170	F749, B384	284	0.019kg	0.001kg	<0.001kg	Flot: frag. of bone.

208	Parknahown 5	E2170	F811, B441	345	0.136kg	0.035kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
209	Parknahown 5	E2170	F913, B557	408	0.720kg	0.160kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
210	Parknahown 5	E2170	F715, B350	258	0.887kg	0.404kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
211	Parknahown 5	E2170	F494, B177	138	0.063kg	0.013kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
212	Parknahown 5	E2170	F510, B191	141	0.270kg	0.097kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
213	Parknahown 5	E2170	F 496, B098	122	0.361kg	0.152kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal/plant material.
214	Parknahown 5	E2170	F761, B396	293	0.093kg	0.034kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
215	Parknahown 5	E2170	F1185, B830	634	0.396kg	0.139kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
216	Parknahown 5	E2170	F793, B426	351	0.379kg	0.115kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
217	Parknahown 5	E2170	F1105, B751	561	0.169kg	0.049kg	0.004kg	Flot: frag. of bone
218	Parknahown 5	E2170	F488, B176	488	0.236kg	0.081kg	0.003kg	Flot: frag. of bone
219	Parknahown 5	E2170	F763, B398	307	0.127kg	0.047kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
220	Parknahown 5	E2170	F823, B453	352	0.091kg	0.039kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
221	Parknahown 5	E2170	F1234, B990	711	0.014kg	0.005kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
222	Parknahown 5	E2170	F907, B543	401	0.340kg	0.189kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
223	Parknahown 5	E2170	F1430, B929	672	0.018kg	0.005kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

224	Parknahown 5	E2170	F880, B520	392	0.147kg	0.050kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
225	Parknahown 5	E2170	F1145, B861	660	0.645kg	0.201kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
226	Parknahown 5	E2170	F735, B367	252	0.152kg	0.042kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
227	Parknahown 5	E2170	F1191, B839	629	0.403kg	0.201kg	-	Nothing in residue.
228	Parknahown 5	E2170	F751, B386	294	0.019kg	0.008kg	-	Nothing in residue.
229	Parknahown 5	E2170	F1214, B970	702	0.058kg	0.017kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
230	Parknahown 5	E2170	F733, B363	270	0.346kg	0.106kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
231	Parknahown 5	E2170	F879 / B515	384	0.009kg	0.005kg	<0.001kg	Flot: frag. of bone
232	Parknahown 5	E2170	F781 / B413	310	0.009kg	0.003kg	<0.001kg	Flot: frag. Of bone
233	Parknahown 5	E2170	F937 / B581	925	0.466kg	0.203kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
234	Parknahown 5	E2170	F874, B510	399	0.216kg	0.114kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
235	Parknahown 5	E2170	F1270, B1025	722	0.012kg	0.004kg	-	Nothing in residue.
236	Parknahown 5	E2170	F757, B391	316	0.077kg	0.046kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
237	Parknahown 5	E2170	F1086, B728	543	0.570kg	0.139kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
238	Parknahown 5	E2170	F701, B331	? skull	0.181kg	0.050kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
239	Parknahown 5	E2170	DAR799	585	0.059kg	0.022kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

240	Parknahown 5	E2170	F825, B456	356	0.311kg	0.073kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone inc. tooth and charcoal.
241	Parknahown 5	E2170	F921, B563	419	0.235kg	0.057kg	0.003kg	Flot: frag. of bone inc. teeth.
242	Parknahown 5	E2170	F629, B311	240	1.029kg	0.359kg	0.005kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
243	Parknahown 5	E2170	F1201, B921	668	0.462kg	0.151kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
244	Parknahown 5	E2170	F833, B467	358	0.165kg	0.075kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
245	Parknahown 5	E2170	F707, B340	249	0.269kg	0.061kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
246	Parknahown 5	E2170	F717, B352	278	0.018kg	0.005kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
247	Parknahown 5	E2170	F787, B421	332	0.007kg	-	-	No residue, no flot.
248	Parknahown 5	E2170	F1169, B822	614	1.254kg	0.349kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
249	Parknahown 5	E2170	F861, B498	378	0.134kg	0.032kg	<0.001kg	Flot: charcoal.
250	Parknahown 5	E2170	F643, B320	290	0.011kg	0.004kg	-	Nothing in residue.
251	Parknahown 5	E2170	F767, B401	229	2.500kg	0.273kg	0.012kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
252	Parknahown 5	E2170	F947, B592	437	0.412kg	0.115kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
253	Parknahown 5	E2170	F969, B610	449	0.094kg	0.017kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
254	Parknahown 5	E2170	F955, B598	963	0.371kg	0.109kg	0.011kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
255	Parknahown 5	E2170	F1053, B697	525	0.477kg	0.075kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

256	Parknahown 5	E2170	F783, B418	314	0.039kg	0.008kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
257	Parknahown 5	E2170	F610, B289	190	0.179kg	0.056kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
258	Parknahown 5	E2170	F781, B413	311	0.028kg	0.015kg	-	Nothing in residue.
259	Parknahown 5	E2170	F813, B444	348	0.661kg	0.158kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
260	Parknahown 5	E2170	F892, B535	411	0.267kg	0.045kg	0.002kg	Flot: frag. of bone
261	Parknahown 5	E2170	F610, B289	192	0.078kg	0.035kg	<0.001kg	Flot: frag. of bone
262	Parknahown 5	E2170	F819, B450	342	0.462kg	0.173kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
263	Parknahown 5	E2170	F1141, B761	582	0.615kg	0.210kg	0.010kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
264	Parknahown 5	E2170	F745, B380	288	0.443kg	0.113kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
265	Parknahown 5	E2170	F821, B343	331	0.299kg	0.125kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
266	Parknahown 5	E2170	F707, B340	250	0.221kg	0.095kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
267	Parknahown 5	E2170	F725, B359	265	0.463kg	0.187kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
268	Parknahown 5	E2170	F751, B386	286	0.325kg	0.127kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
269	Parknahown 5	E2170	F1323, B1087	752	0.077kg	0.022kg	0.002kg	Flot: frag. of bone
270	Parknahown 5	E2170	F1173, B795	617	0.225kg	0.039kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
271	Parknahown 5	E2170	F1212, B963	703	0.262kg	0.102kg	0.003kg	Flot: frag. of bone

272	Parknahown 5	E2170	F787, B421	333	0.225kg	0.046kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
273	Parknahown 5	E2170	F1053, B697	494	0.532kg	0.187kg	0.016kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
274	Parknahown 5	E2170	F923, B564	422	0.386kg	0.076kg	0.006kg(bone) 0.002kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
275	Parknahown 5	E2170	F947, B592	436	0.353kg	0.093kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
276	Parknahown 5	E2170	F606, B286	246	0.541kg	0.307kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
277	Parknahown 5	E2170	F606, B286	247	0.807kg	0.194kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
278	Parknahown 5	E2170	N/A	N/A	N/A			
279	Parknahown 5	E2170	F937, B581	926	0.325kg	0.126kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
280	Parknahown 5	E2170	F725, B359	264	0.460kg	0.134kg	0.005kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
281	Parknahown 5	E2170	F1109, B756	563	0.571kg	0.168kg	0.014kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
282	Parknahown 5	E2170	F971, B613	1072	0.487kg	0.157kg	0.004kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
283	Parknahown 5	E2170	B563	418	0.224kg	0.124kg	<0.001kg	Flot: charcoal.
284	Parknahown 5	E2170	B572	933	0.586kg	0.177kg	0.002kg(bone) 0.003kg(char)	Flot: frag. of bone and charcoal.
285	Parknahown 5	E2170	F943/ B574	928	0.525kg	0.153kg	0.006kg	Flot: frag. of bone
286	Parknahown 5	E2170	F1149/ B806	608	1.362kg	0.276kg	0.007kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
287	Parknahown 5	E2170	B717	548	1.184kg	0.463kg	0.009kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
288	Parknahown 5	E2170	B496	385	0.784kg	0.250kg	0.002kg(bone)	Flot: frag. of bone and

							0.004kg(char)	charcoal.
289	Parknahown 5	E2170	B782	588	1.191kg	0.164kg	0.026kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
290	Parknahown 5	E2170	B470	379	1.524kg	0.561kg	0.032kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal/ shells.
291	Parknahown 5	E2170	B976	696	2.100kg	0.639kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
292	Parknahown 5	E2170	B506	380	1.997kg	0.554kg	0.029kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
293	Parknahown 5	E2170	B311	257	0.193kg	0.078kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
294	Parknahown 5	E2170	B384	285	0.200kg	0.117kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
295	Parknahown 5	E2170	B608	444	0.285kg	0.137kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
296	Parknahown 5	E2170	B525	388	0.386kg	0.162kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
297	Parknahown 5	E2170	B593	954	0.167kg	0.053kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
298	Parknahown 5	E2170	B546	935	0.291kg	0.091kg	0.006kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
299	Parknahown 5	E2170	B396	292	0.857kg	0.313kg	0.004kg(bone) 0.003kg(char)	Flot: frag. of bone and charcoal.
300	Parknahown 5	E2170	B467	358	0.182kg	0.04kg	0.001kg(bone) 0.021kg(char)	Flot: frag. of bone and charcoal.
301	Parknahown 5	E2170	F955/B59 9	962	0.705kg	0.234kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
302	Parknahown 5	E2170	B374	272	0.572kg	0.263kg	0.007kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
303	Parknahown 5	E2170	B711	532	0.460kg	0.189kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
304	Parknahown 5	E2170	B707	534	2.200kg	0.873kg	0.010kg(bone)	Flot: frag. of bone and

							<0.001kg(char)	charcoal.
305	Parknahown 5	E2170	F877/B51 4	403	2.300kg	0.791kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
306	Parknahown 5	E2170	F933/ B576	929	3.500kg	1.081kg	0.010kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
307	Parknahown 5	E2170	B446	373	1.400kg	0.546kg	0.002(bone) 0.003kg(char)	Flot: frag. of bone and charcoal.
308	Parknahown 5	E2170	F911/ B555	930	4.000kg	1.490kg	0.026kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
309	Parknahown 5	E2170	B486	374	2.900kg	0.933kg	0.029kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
310	Parknahown 5	E2170	B564	424	2.100kg	0.674kg	0.006kg(bone) 0.002kg(char) <0.001kg(seeds)	Flot: frag. of bone and charcoal and seeds.
311	Parknahown 5	E2170	F1035/ B678	499	0.970kg	0.381kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
312	Parknahown 5	E2170	B694	522	1.926kg	0.874kg	0.003kg(bone) 0.01kg(char)	Flot: frag. of bone and charcoal.
313	Parknahown 5	E2170	B427	343	0.868kg	0.246kg/ 0.007kg poss. slag	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal. Residue contains poss. slag?
314	Parknahown 5	E2170	B362	303	0.429kg	0.142kg	<0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
315	Parknahown 5	E2170	F739/B37 1	274	0.400kg	0.065kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
316	Parknahown 5	E2170	B255	Skull/ inside head	0.133kg	0.010kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
317	Parknahown 5	E2170	B589	cranium	0.576kg	0.184kg	0.006kg(bone) 0.002kg(char)	Flot: frag. of bone inc. teeth and charcoal.
318	Parknahown 5	E2170	B404	306	0.176kg	0.058kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.



319	Parknahown 5	E2170	F777/ B409	353	0.704kg	0.216kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal
320	Parknahown 5	E2170	F965/ B606	946	0.448kg	0.064kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal/ shells
321	Parknahown 5	E2170	F1009/ B656	483	0.801kg	0.396kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
322	Parknahown 5	E2170	F811/B44 1	346	0.708kg	0.184kg	0.009kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
323	Parknahown 5	E2170	B532	395	0.186kg	0.060kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
324	Parknahown 5	E2170	B435	318	0.119kg	0.031kg	<0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
325	Parknahown 5	E2170	B399	301	1.134kg	0.311kg	0.013kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
326	Parknahown 5	E2170	F755/ B390	283	0.173kg	0.080kg	<0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
327	Parknahown 5	E2170	B391	317	0.119kg	0.056kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
328	Parknahown 5	E2170	B707	533	0.340kg	0.127kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
329	Parknahown 5	E2170	B383	277	0.385kg	0.142kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
330	Parknahown 5	E2170	B525	393	0.300kg	0.081kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
331	Parknahown 5	E2170	B549	956	0.224kg	0.038kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
332	Parknahown 5	E2170	B386	295	0.102kg	0.034kg	<0.001kg(bone) <0.01kg(char)	Flot: frag. of bone and charcoal.
333	Parknahown 5	E2170	B566	410	0.421kg	0.074kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
334	Parknahown 5	E2170	B486	441	0.564kg	0.197kg	0.003kg <0.001kg(char)	Flot: frag. of bone inc. a tooth and charcoal.

335	Parknahown 5	E2170	B320	Grave fill under skull	0.025kg	0.010kg	0.001kg	Flot: frag. of bone
336	Parknahown 5	E2170	B505	381	0.236kg	0.078kg	0.002kg	Flot: frag. of bone
337	Parknahown 5	E2170	B684	502	1.126kg	0.457kg	0.017kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
338	Parknahown 5	E2170	F876/ B514	406	0.481kg	0.119kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
339	Parknahown 5	E2170	B446	372	0.842kg	0.255kg	0.0014kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
340	Parknahown 5	E2170	B337	282	0.023kg	0.010kg	<0.001kg	Flot: frag. of bone.
341	Parknahown 5	E2170	B411	309	0.379kg	0.104kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
342	Parknahown 5	E2170	B475	375	0.427kg	0.052kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
343	Parknahown 5	E2170	F937/ B581	427	0.426kg	0.140kg	0.014kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
344	Parknahown 5	E2170	B432	322	0.605kg	0.159kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
345	Parknahown 5	E2170	B788	591	0.955kg	0.345kg	0.012kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
346	Parknahown 5	E2170	B433	327	1.017kg	0.236kg	0.010kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
347	Parknahown 5	E2170	B703	516	0.736kg	0.101kg	0.007kg(bone) 0.001kg(char)	Flot: frag. of bone inc. tooth and charcoal.
348	Parknahown 5	E2170	B556	474	0.697kg	0.189kg	0.007kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
349	Parknahown 5	E2170	B648	938	0.863kg	0.291kg	0.016kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
350	Parknahown 5	E2170	B963	688	0.230kg	0.070kg	-	Nothing in residue.

351	Parknahown 5	E2170	F1143/ B790	605	0.657kg	0.190kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal/ shells.
352	Parknahown 5	E2170	1230/ B986	717	0.124kg	0.036kg	0.003kg	Flot: frag. of bone.
353	Parknahown 5	E2170	B365	264	0.087kg	0.008kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
354	Parknahown 5	E2170	B270	213	0.100kg	0.043kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
355	Parknahown 5	E2170	466/ B168	120	0.421kg	0.087kg	0.014kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
356	Parknahown 5	E2170	B098	123	0.440kg	0.177kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
357	Parknahown 5	E2170	F472/ B156	113	0.169kg	0.085kg	<0.001kg	Flot: frag. of bone.
358	Parknahown 5	E2170	B213	170	0.473kg	0.181kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
359	Parknahown 5	E2170	B167	118	0.061kg	0.021kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
360	Parknahown 5	E2170	B280	Grave sample	0.030kg	0.012kg	0.001kg	Flot: frag. of bone.
361	Parknahown 5	E2170	B014	108	0.227kg	0.053kg	0.004kg	Flot: frag. of bone.
362	Parknahown 5	E2170	482/ B173	128	0.663kg	0.232kg	0.001kg	Flot: frag. of bone.
363	Parknahown 5	E2170	B209	154	0.698kg	0.131kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
364	Parknahown 5	E2170	F568/ B242	174	0.166kg	0.019kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
365	Parknahown 5	E2170	F30	63	0.396kg	0.042kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
366	Parknahown 5	E2170	B218	158	0.515kg	0.047kg	0.001kg(bone)	Flot: frag. of bone and

							<0.001kg(char)	charcoal.
367	Parknahown 5	E2170	F524/B20 6	148	0.034kg	0.0014kg	<0.001kg	Flot: frag. of bone.
368	Parknahown 5	E2170	B514	433	0.335kg	0.117kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
369	Parknahown 5	E2170	B099	135	0.401kg	0.160kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
370	Parknahown 5	E2170	B240	232	0.393kg	0.159kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
371	Parknahown 5	E2170	B234	179	0.401kg	0.134kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
372	Parknahown 5	E2170	F492/ B179	113	0.259kg	0.047kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
373	Parknahown 5	E2170	B099	134	0.490kg	0.142kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
374	Parknahown 5	E2170	B329	234	0.082kg	0.030kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
375	Parknahown 5	E2170	B329	233	0.257kg	0.088kg	<0.001kg	Flot: charcoal.
376	Parknahown 5	E2170	B278	215	0.100kg	0.066kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
377	Parknahown 5	E2170	F544/ B210	155	0.164kg	0.058kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
378	Parknahown 5	E2170	F526/ B205	151	0.113kg	0.026kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
379	Parknahown 5	E2170	B237	163	0.128kg	0.040kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
380	Parknahown 5	E2170	F502/ B182	140	0.632kg	0.287kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
381	Parknahown 5	E2170	F485/ B171	133	0.481kg	0.137kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
382	Parknahown 5	E2170	B285	209	0.224kg	0.095kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

383	Parknahown 5	E2170	F95	40	1.235kg	0.140kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
384	Parknahown 5	E2170	B213	171	0.441kg	0.101kg	0.008kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
385	Parknahown 5	E2170	B274	228	0.483kg	0.042kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
386	Parknahown 5	E2170	F564/ B242	164	0.022kg	0.005kg	<0.001kg	Flot: charcoal.
387	Parknahown 5	E2170	F431/ B034	84	0.890kg	0.370kg	<0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
388	Parknahown 5	E2170	F431/ B034	83	0.626kg	0.185kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
389	Parknahown 5	E2170	F596/ B276	229	0.479kg	0.134kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
390	Parknahown 5	E2170	F403/ B007	74	0.885kg	0.423kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone/ plant material and charcoal.
391	Parknahown 5	E2170	F512/B18 8	grave fill	0.209kg	0.102kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
392	Parknahown 5	E2170	F468/ B155	204	0.675kg	0.191kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
393	Parknahown 5	E2170	B098	124	0.817kg	0.239kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone/ plant material and charcoal.
394	Parknahown 5	E2170	F566/ B244	173	0.181kg	0.045kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
395	Parknahown 5	E2170	B300	205	0.333kg	0.100kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
396	Parknahown 5	E2170	B274	226	0.095kg	0.029kg	<0.001kg	Flot: charcoal.
397	Parknahown 5	E2170	B276	230	2.500kg	0.203kg	0.009kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
398	Parknahown 5	E2170	B226	181	0.300kg	0.098kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
399	Parknahown 5	E2170	B208	150	0.315kg	0.093kg	0.003kg(bone)	Flot: frag. of bone and

							0.001kg(char)	charcoal.
400	Parknahown 5	E2170	F1627/ B308	223	0.297kg	0.123kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
401	Parknahown 5	E2170	F645/ B322	238	0.129kg	0.066kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
402	Parknahown 5	E2170	B316	220	0.100kg	0.055kg	-	Nothing in residue.
403	Parknahown 5	E2170	B777	592	0.653kg	0.265kg	0.002kg	Flot: frag. of bone.
404	Parknahown 5	E2170	B791	596	0.028kg	0.006kg	<0.001kg	Flot: frag. of bone.
405	Parknahown 5	E2170	B921	663	0.290kg	0.085kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
406	Parknahown 5	E2170	B316	218	0.153kg	0.066kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
407	Parknahown 5	E2170	F1187/B8 34	628	0.438kg	0.150kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
408	Parknahown 5	E2170	B820	611	0.466kg	0.244kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
409	Parknahown 5	E2170	B638	476	0.208kg	0.097kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
410	Parknahown 5	E2170	B1037	137	0.107kg	0.032kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
411	Parknahown 5	E2170	B316	219	0.063kg	0.033kg	0.001kg	Flot: frag. of bone.
412	Parknahown 5	E2170	B308	224	0.471kg	0.107kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
413	Parknahown 5	E2170	B285	207	0.264kg	0.101kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
414	Parknahown 5	E2170	B300	206	0.306kg	0.053kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
415	Parknahown 5	E2170	B274	227	0.644kg	0.233kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
416	Parknahown 5	E2170	B285	208	0.417kg	0.135kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

417	Parknahown 5	E2170	F645/ B322	239	0.212kg	0.079kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
418	Parknahown 5	E2170	B980	740	0.261kg	0.072kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
419	Parknahown 5	E2170	B927	pelvic sample	0.632kg	0.266kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
420	Parknahown 5	E2170	B1031	732	0.072kg	0.016kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
421	Parknahown 5	E2170	B795	615	0.800kg	0.299kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
422	Parknahown 5	E2170	B484	367	0.863kg	0.237kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
423	Parknahown 5	E2170	F763/ B398	308	1.198kg	0.415kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
424	Parknahown 5	E2170	F1007/ B658	492	2.500kg	1.028kg	0.005kg(bone) 0.002kg(char)	Flot: frag. of bone inc. a tooth/ shells and charcoal.
425	Parknahown 5	E2170	B527	397	1.140kg	0.337kg	0.008kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
426	Parknahown 5	E2170	B401	304	2.200kg	0.197kg	0.031kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
427	Parknahown 5	E2170	B438	340	2.100kg	0.373kg	0.017kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
428	Parknahown 5	E2170	B311	256	1.278kg	0.394kg	0.001kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
429	Parknahown 5	E2170	B282	187	1.650kg	0.493kg	0.010kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
430	Parknahown 5	E2170	B770	575	0.081kg	0.015kg	-	Nothing in residue.
431	Parknahown 5	E2170	F1043/B6 84	501	0.344kg	0.156kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
432	Parknahown 5	E2170	B235	558	0.261kg	0.079kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
433	Parknahown 5	E2170	B456	355	0.031kg	0.013kg	<0.001kg(bone)	Flot: frag. of bone and

							<0.001kg(char)	charcoal.
434	Parknahown 5	E2170	B968	687	0.114kg	0.028kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
435	Parknahown 5	E2170	B974	694	0.622kg	0.127kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
436	Parknahown 5	E2170	B768	572	0.208kg	0.064kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
437	Parknahown 5	E2170	B273	?, pelvic sample	0.381kg	0.155kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
438	Parknahown 5	E2170	F1179/ B825	626	0.244kg	0.110kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
439	Parknahown 5	E2170	B822	613	0.921kg	0.358kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
440	Parknahown 5	E2170	B475	364	0.729kg	0.211kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
441	Parknahown 5	E2170	B922	665	0.586	0.220kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
442	Parknahown 5	E2170	B779	583	0.321kg	0.100kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
443	Parknahown 5	E2170	B728	542	0.183kg	0.074kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
444	Parknahown 5	E2170	B343	329	2.800kg	0.829kg	0.006kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
445	Parknahown 5	E2170	B772	576	0.075kg	0.027kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
446	Parknahown 5	E2170	B804	621	0.050kg	0.013kg	0.003kg	Flot: frag. of bone and cha
447	Parknahown 5	E2170	B744	556	0.221kg	0.063kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
448	Parknahown 5	E2170	B760	576	0.335kg	0.114kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.



449	Parknahown 5	E2170	B756	563	0.247kg	0.080kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
450	Parknahown 5	E2170	B1026	723	0.017kg	0.005kg	<0.001kg	Flot: charcoal.
451	Parknahown 5	E2170	B1007	708	0.264kg	0.082kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
452	Parknahown 5	E2170	F933/ B574	420	0.108kg	0.012kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
453	Parknahown 5	E2170	B829	632	0.519kg	0.199kg	0.008kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
454	Parknahown 5	E2170	F1262/ B1016	?, pelvic sample	0.469kg	0.128kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
455	Parknahown 5	E2170	F933/ B576	428	0.471kg	0.100kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
456	Parknahown 5	E2170	B777	593	0.241kg	0.069kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
457	Parknahown 5	E2170	B957	700	0.320kg	0.103kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
458	Parknahown 5	E2170	B535	409	0.497kg	0.200kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
459	Parknahown 5	E2170	B474	363	0.531kg	0.153kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
460	Parknahown 5	E2170	B1012	713	0.175kg	0.059kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
461	Parknahown 5	E2170	B124	671	0.625kg	0.221kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
462	Parknahown 5	E2170	B961	685	0.116kg	0.032kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
463	Parknahown 5	E2170	B782	587	0.087kg	0.050kg	0.001kg	Flot: frag. of bone.
464	Parknahown 5	E2170	B931	680	0.184kg	0.068kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
465	Parknahown 5	E2170	B858	739	1.728kg	0.556kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

466	Parknahown 5	E2170	F1411/ B867	659	2.300kg	0.959kg	0.010kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
467	Parknahown 5	E2170	B715	540	0.798kg	0.338kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
468	Parknahown 5	E2170	F1013/ B661	580	0.232kg	0.070kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
469	Parknahown 5	E2170	B1007	716	0.558kg	0.188kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
470	Parknahown 5	E2170	F777/ B409	354	0.058kg	0.013kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
471	Parknahown 5	E2170	B722	538	0.076kg	0.012kg	0.003kg	Flot: frag. of bone.
472	Parknahown 5	E2170	B735	551	0.043kg	0.011kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
473	Parknahown 5	E2170	B608	445	0.035kg	0.013kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
474	Parknahown 5	E2170	B405	535	0.433kg	0.117kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
475	Parknahown 5	E2170	B670	506	0.071kg	0.016kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
476	Parknahown 5	E2170	B705	517	0.274kg	0.083kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
477	Parknahown 5	E2170	B448	335	0.172kg	0.048kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
478	Parknahown 5	E2170	B572	432	0.097kg	0.023kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
479	Parknahown 5	E2170	B564	423	0.104kg	0.020kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
480	Parknahown 5	E2170	F1005/B6 52	490	0.139kg	0.037kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
481	Parknahown 5	E2170	B470	363	0.431kg	0.165kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

482	Parknahown 5	E2170	B1003	707	0.021kg	0.008kg	<0.001kg	Flot: frag. of bone.
483	Parknahown 5	E2170	B462	362	0.515kg	0.153kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
484	Parknahown 5	E2170	B668	486	0.515kg	0.166kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
485	Parknahown 5	E2170	B643	939	0.678kg	0.192kg	0.017kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
486	Parknahown 5	E2170	F1007/ B653	491	0.349kg	0.191kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
487	Parknahown 5	E2170	B550	473	0.558kg	0.253kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
488	Parknahown 5	E2170	B649	480	0.359kg	0.161kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
489	Parknahown 5	E2170	B589	?	0.376kg	0.109kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
490	Parknahown 5	E2170	B667	487	0.259kg	0.101kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
491	Parknahown 5	E2170	B399	299	0.300kg	0.141kg	-	Nothing in residue.
492	Parknahown 5	E2170	B568	413	1.611kg	0.655kg	0.028kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
493	Parknahown 5	E2170	B621	485	3.700kg	1.408kg	0.047kg(bone) 0.002kg(char)	Flot: frag. of bone inc. teeth and charcoal.
494	Parknahown 5	E2170	B462	471	1.793kg	0.955kg	0.006kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
495	Parknahown 5	E2170	B438	341	2.500kg	0.768kg	0.026kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
496	Parknahown 5	E2170	B677	504	0.676kg	0.187kg	0.007kg	Flot: frag. of bone.
497	Parknahown 5	E2170	B527	396	1.040kg	0.351kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
498	Parknahown 5	E2170	B692	519	0.883kg	0.388kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

499	Parknahown 5	E2170	F987/ B673	960	0.223kg	0.083kg	0.001kg	Flot: frag. of bone.
500	Parknahown 5	E2170	B404	305	0.114kg	0.058kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
501	Parknahown 5	E2170	B549	957	0.251kg	0.074kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
502	Parknahown 5	E2170	B522	415	0.170kg	0.039kg	0.001kg	Flot: frag. of bone.
503	Parknahown 5	E2170	B724	545	0.072kg	0.022kg	0.001kg	Flot: frag. of bone.
504	Parknahown 5	E2170	B739	554	0.475kg	0.160kg	0.004kg	Flot: frag. of bone.
505	Parknahown 5	E2170	B596	496	0.437kg	0.140kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
506	Parknahown 5	E2170	B340	248	0.042kg	0.010kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
507	Parknahown 5	E2170	B678	500	0.362kg	0.186kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
508	Parknahown 5	E2170	B255	pelvic sample	0.552kg	0.161kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
509	Parknahown 5	E2170	B418	315	0.020kg	0.006kg	0.001kg	Flot: frag. of bone.
510	Parknahown 5	E2170	B427	325	0.071kg	0.015kg	0.001kg	Flot: frag. of bone.
511	Parknahown 5	E2170	B686	512	0.297kg	0.079kg	<0.001kg	Flot: frag. of bone.
512	Parknahown 5	E2170	F965/ B605	947	0.200kg	0.070kg	<0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
513	Parknahown 5	E2170	F971/ B611	1071	0.586kg	0.310kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
514	Parknahown 5	E2170	B717	529	0.365kg	0.130kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
515	Parknahown 5	E2170	F911/ B555	430	0.158kg	0.051kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
516	Parknahown 5	E2170	B446	321	0.512kg	0.243kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
517	Parknahown 5	E2170	B697	493	0.383kg	0.141kg	0.002kg(bone)	Flot: frag. of bone and

							0.002kg(char) 0.001kg(hazel nut)	charcoal and frag. of burnt hazelnut shells.
518	Parknahown 5	E2170	B697	524	0.051kg	0.010kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
519	Parknahown 5	E2170	B707	523	0.102kg	0.057kg	0.002kg	Flot: frag. of bone.
520	Parknahown 5	E2170	B715	539	0.141kg	0.064kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
521	Parknahown 5	E2170	B797	618	0.176kg	0.058kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
522	Parknahown 5	E2170	B636	961	0.156kg	0.0039kg	0.002kg	Flot: frag. of bone.
523	Parknahown 5	E2170	B480	446	0.357kg	0.112kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
524	Parknahown 5	E2170	F1080/B7 22	537	0.198kg	0.045kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
525	Parknahown 5	E2170	B525	387	0.023kg	0.006kg	0.002kg	Flot: frag. of bone.
526	Parknahown 5	E2170	B779	584	0.568kg	0.234kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
527	Parknahown 5	E2170	B545	405	0.568kg	0.137kg	0.001kg(char) <0.001kg(char)	Flot: frag. of bone and charcoal.
528	Parknahown 5	E2170	B726	549	0.,133kg	0.051kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
529	Parknahown 5	E2170	B572	421	0.172kg	0.038kg	0.002kg	Flot: frag. of bone.
530	Parknahown 5	E2170	B627	495	0.606kg	0.176kg	0.009kg(bone) 0.001kg(char) <0.001kg(hazeln ut)	Flot: frag. of bone and charcoal and frag. of burnt hazelnut.
531	Parknahown 5	E2170	B812	603	0.257kg	0.086kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
532	Parknahown 5	E2170	F817/ B448	336	0.144kg	0.059kg	<0.001kg	Flot: charcoal.

533	Parknahown 5	E2170	F811/ B441	347	0.184kg	0.060kg	0.002kg(bone)0.0 01kg(char)	Flot: frag. of bone and charcoal.
534	Parknahown 5	E2170	B663	511	0.440kg	0.137kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
535	Parknahown 5	E2170	B774	579	0.179kg	0.079kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
536	Parknahown 5	E2170	F1099/ B742	560	0.497kg	0.297kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
537	Parknahown 5	E2170	F1131/B7 82	586	0.412kg	0.102kg	-	Nothing in residue.
538	Parknahown 5	E2170	B558	414	1.248kg	0.487kg	0.008kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
539	Parknahown 5	E2170	B976	607	1.138kg	0.234kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
540	Parknahown 5	E2170	B717	530	0.866kg	0.226kg	0.004kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
541	Parknahown 5	E2170	B432	323	1.636kg	0.546kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
542	Parknahown 5	E2170	B350	259	0.992kg	0.367kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
543	Parknahown 5	E2170	F829/B46 2	376	1.240kg	0.428kg	0.008kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
544	Parknahown 5	E2170	F836/B47 0	377	3.100kg	0.982kg	0.019kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
545	Parknahown 5	E2170	B777	594	3.500kg	1.200kg	0.014kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
546	Parknahown 5	E2170	B636		3.100kg	1.155kg	0.005kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
547	Parknahown 5	E2170	B789	590	1.293kg	0.644kg	0.016kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
548	Parknahown 5	E2170	B484	368	0.730kg	0.227kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

549	Parknahown 5	E2170	B751	561	0.995kg	0.446kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
550	Parknahown 5	E2170	B986	718	1.919kg	0.828kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
551	Parknahown 5	E2170	B668	489	2.700kg	0.795kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
552	Parknahown 5	E2170	B856	646	4.500kg	1.889kg	0.013kg(bone) 0.002kg(char) <0.001kg(seeds)	Flot: frag. of bone and charcoal and seeds.
553	Parknahown 5	E2170	B829	631	2.100kg	1.008kg	0.007kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
554	Parknahown 5	E2170	B777	595	1.172kg	0.305kg	0.024kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
555	Parknahown 5	E2170	F821/ B451	223	1.126kg	0.427kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
556	Parknahown 5	E2170	B684	503	4.000kg	1.973kg	0.007kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
557	Parknahown 5	E2170	B974	695	1.715kg	0.361kg	0.010kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
558	Parknahown 5	E2170	F1258	714	0.307kg	0.109kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
559	Parknahown 5	E2170	B840	637	0.660kg	0.324kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
560	Parknahown 5	E2170	B826	612	0.601kg	0.229kg	0.012kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
561	Parknahown 5	E2170	B486	442	0.724kg	0.295kg	0.011kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
562	Parknahown 5	E2170	B399	300	0.680kg	0.318kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
563	Parknahown 5	E2170	B772	577	0.552kg	0.226kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
564	Parknahown 5	E2170	B784	534	0.540kg	0.211kg	0.007kg(bone)	Flot: frag. of bone and

							0.002kg(char)	charcoal.
565	Parknahown 5	E2170	B468	360	0.182kg	0.073kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
566	Parknahown 5	E2170	B1020	719	0.625kg	0.163kg	0.009kg(bone) 0.002kg(char)	Flot: frag. of bone inc. teeth and charcoal.
567	Parknahown 5	E2170	B388	298	0.466kg	0.212kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
568	Parknahown 5	E2170	B1007	715	1.194kg	0.113kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
569	Parknahown 5	E2170	B431	334	0.039kg	0.007kg	0.001kg	Flot: frag. of an insect.
570	Parknahown 5	E2170	B124	670	0.456kg	0.145kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
571	Parknahown 5	E2170	B965	?, skull sample	0.247kg	0.123kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
572	Parknahown 5	E2170	B973	691	0.101kg	0.031kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
573	Parknahown 5	E2170	B388	298	0.468	0.213kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
574	Parknahown 5	E2170	F973	967	0.608kg	0.241kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
575	Parknahown 5	E2170	B532	394	0.256kg	0.342kg	0.007kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
576	Parknahown 5	E2170	B543	402	1.493kg	0.563kg	0.011kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
577	Parknahown 5	E2170	B1028	741	1.830kg	0.943kg	0.003kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
578	Parknahown 5	E2170	B1028	739	0.984kg	0.199kg	0.009kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
579	Parknahown 5	E2170	B523	390	0.485kg	0.182kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
580	Parknahown 5	E2170	B649	479	1.067kg	0.546kg	0.001kg(bone)	Flot: frag. of bone and



							0.001kg(char)	charcoal.
581	Parknahown 5	E2170	B686	513	1.450kg	0.485kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
582	Parknahown 5	E2170	B826	624	1.222kg	0.622kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
583	Parknahown 5	E2170	B678	499	1.390kg	0.637kg	0.007kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
584	Parknahown 5	E2170	B922	666	0.614kg	0.207kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
585	Parknahown 5	E2170	N/A	N/A				
586	Parknahown 5	E2170	F1032	750	5.000kg	2.700kg	0.002kg(bone) 0.200kg(char)	Flot: frag. of bone and charcoal.
587	Parknahown 5	E2170	F1385	?	15.000kg	3.900kg	0.004kg	Flot: frag. of bone.
588	Parknahown 5	E2170	F421	344	37.000kg	14.000kg	0.048(bone) 0.029kg(char)	Flot: frag. of bone and charcoal.
589	Parknahown 5	E2170	B948	682	0.461kg	0.221kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
590	Parknahown 5	E2170	F739/ B371	275	0.502kg	0.158kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
591	Parknahown 5	E2170	B1024	721	0.517kg	0.180kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
592	Parknahown 5	E2170	B550	475	0.468kg	0.107kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
593	Parknahown 5	E2170	B433	328	0.486kg	0.127kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
594	Parknahown 5	E2170	F1342/ B1186	738	0.632	0.225kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
595	Parknahown 5	E2170	F877/ B514	389	0.667kg	0.215kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
596	Parknahown 5	E2170	B791	598	0.35kg	0.101kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

597	Parknahown 5	E2170	B244	172	0.227kg	0.059kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
598	Parknahown 5	E2170	B770	574	0.234kg	0.072kg	0.001kg	Flot: frag. of bone.
599	Parknahown 5	E2170	B236	166	1.064kg	0.063kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
600	Parknahown 5	E2170	B1031	733	0.541kg	0.160kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
601	Parknahown 5	E2170	B235		0.713kg	0.161kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
602	Parknahown 5	E2170	B711	531	0.299kg	0.050kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
603	Parknahown 5	E2170	B768	573	0.642kg	0.201kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
604	Parknahown 5	E2170	B124	669	0.525kg	0.185kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
605	Parknahown 5	E2170	B343	330	0.127kg	0.039kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
606	Parknahown 5	E2170	B1020	720	0.567kg	0.200kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
607	Parknahown 5	E2170	B236	186	0.628kg	0.238kg	0.006kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
608	Parknahown 5	E2170	B200	160	0.712kg	0.203kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
609	Parknahown 5	E2170	B221	177	0.582kg	0.247kg	0.013kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
610	Parknahown 5	E2170	B973	690	0.246kg	0.073kg	0.001kg	Flot: frag. of bone.
611	Parknahown 5	E2170	N/A	N/A				
612	Parknahown 5	E2170	B1045	744	0.247kg	0.092kg	<0.001kg	Flot: frag. of bone.
613	Parknahown 5	E2170	B873	653	0.567kg	0.147kg	0.015kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.

614	Parknahown 5	E2170	B927	890	0.600kg	0.075kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
615	Parknahown 5	E2170	B484	366	0.422kg	0.156kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
616	Parknahown 5	E2170	B758	565	0.440kg	0.123kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
617	Parknahown 5	E2170	B918	742	0.109kg	0.041kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
618	Parknahown 5	E2170	B490	604	0.582kg	0.183kg	0.008kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
619	Parknahown 5	E2170	B474	368	0.430kg	0.117kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
620	Parknahown 5	E2170	B226	182	0.517kg	0.133kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
621	Parknahown 5	E2170	F1230/B9 93	705	0.582kg	0.150kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
622	Parknahown 5	E2170	F508/ B187	?, grave fill	0.956kg	0.550kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
623	Parknahown 5	E2170	B234	183	0.725kg	0.152kg	0.023kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
624	Parknahown 5	E2170	B795	616	0.499kg	0.190kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
625	Parknahown 5	E2170	B171	132	0.538kg	0.127kg	0.010kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
626	Parknahown 5	E2170	B797	619	1.074kg	0.451kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal/ shells.
627	Parknahown 5	E2170	B215	152	0.963kg	0.237kg	0.011kg(bone) <0.001kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
628	Parknahown 5	E2170	F1172/B9 20	?, grave fill	0.587kg	0.217kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

629	Parknahown 5	E2170	B792	599	0.218kg	0.112kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
630	Parknahown 5	E2170	B921	664	0.596kg	0.235kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
631	Parknahown 5	E2170	B215	153	0.744kg	0.226kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
632	Parknahown 5	E2170	B029	478	0.541kg	0.117kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
633	Parknahown 5	E2170	B521	146	0.067kg	0.021kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
634	Parknahown 5	E2170	B618	482	0.087kg	0.021kg	<0.001kg(bone) <0.001kg(charcoal)	Flot: frag. of bone and charcoal.
635	Parknahown 5	E2170	B954	687	1.117kg	0.202kg	0.004kg(bone) 0.001kg(char) <0.001kg(seed)	Flot: frag. of bone and charcoal and seeds.
636	Parknahown 5	E2170	B786	589	0.998kg	0.439kg	0.016kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
637	Parknahown 5	E2170	B954	684	0.329kg	0.115kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
638	Parknahown 5	E2170	B870	656	0.069kg	0.009kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
639	Parknahown 5	E2170	F621/ B305	201	0.235kg	0.074kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
640	Parknahown 5	E2170	B966	?, grave fill	0.226kg	0.101kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
641	Parknahown 5	E2170	F1149/B800	609	0.255kg	0.055kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
642	Parknahown 5	E2170	B692	520	0.633kg	0.246kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
643	Parknahown 5	E2170	B850	643	0.562kg	0.091kg	0.008kg(bone) <0.001kg(bone)	Flot: frag. of bone and charcoal.

644	Parknahown 5	E2170	B949	679	0.035kg	0.009kg	-	Nothing in residue.
645	Parknahown 5	E2170	B808	601	0.647kg	0.276kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
646	Parknahown 5	E2170	B610	450	0.559kg	0.129kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
647	Parknahown 5	E2170	B929	673	0.023kg	0.005kg	-	Nothing in residue.
648	Parknahown 5	E2170	B715	540	0.539kg	0.223kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
649	Parknahown 5	E2170	F1179/B8 25	625	0.602kg	0.119kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
650	Parknahown 5	E2170	B029	479	0.629kg	0.207kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
651	Parknahown 5	E2170	B990	712	0.075kg	0.020kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
652	Parknahown 5	E2170	F1159/ B868	654	0.046kg	0.016kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
653	Parknahown 5	E2170	B1078	748	0.417kg	0.138kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
654	Parknahown 5	E2170	B927	?, grave fill	0.620	0.159kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
655	Parknahown 5	E2170	B869	655	0.115kg	0.034kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
656	Parknahown 5	E2170	B850	633	0.673kg	0.202kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
657	Parknahown 5	E2170	B865	652	0.645kg	0.200kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
658	Parknahown 5	E2170	B858	889	0.799kg	0.186kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
659	Parknahown 5	E2170	F1338/B1 077	737	0.868kg	0.372kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
660	Parknahown 5	E2170	F401/	72	1.709kg	0.509kg	0.002kg9bone)	Flot: frag. of bone and

			B003				0.002kg(char)	charcoal.
661	Parknahown 5	E2170	B1031	734	1.034kg	0.292kg	0.007kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
662	Parknahown 5	E2170	B753	567	1.702kg	0.413kg	0.021kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
663	Parknahown 5	E2170	B479	382	0.672kg	0.294kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
664	Parknahown 5	E2170	B735	550	0.815kg	0.121kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
665	Parknahown 5	E2170	F1003/B6 51	481	0.426kg	0.128kg	0.012kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
666	Parknahown 5	E2170	B832	623	0.491kg	0.144kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
667	Parknahown 5	E2170	F488/B17 6	between skull	0.248kg	0.019kg	0.003kg	Flot: frag. of bone.
668	Parknahown 5	E2170	B456	357	0.324kg	0.143kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
669	Parknahown 5	E2170	B839	630	0.248kg	0.107kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
670	Parknahown 5	E2170	B363	271	0.337kg	0.126kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
671	Parknahown 5	E2170	F1262/B1 016	?	0.391kg	0.111kg	0.001kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
672	Parknahown 5	E2170	B724	544	0.437kg	0.118kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
673	Parknahown 5	E2170	B522	416	0.534kg	0.170kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
674	Parknahown 5	E2170	B638	968	0.179kg	0.061kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
675	Parknahown 5	E2170	F1045/ B691	514	0.395kg	0.065kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

676	Parknahown 5	E2170	B549	455	0.539kg	0.151kg	0.002kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
677	Parknahown 5	E2170	F1212	704	0.234kg	0.084kg	0.001kg	Flot: frag. of bone.
678	Parknahown 5	E2170	F1187/B8 34	627	0.719kg	0.261kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
679	Parknahown 5	E2170	B812	607	0.304kg	0.109kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
680	Parknahown 5	E2170	B568	412	1.324kg	0.379kg	0.031kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
681	Parknahown 5	E2170	B777	593	1.394kg	0.337kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
682	Parknahown 5	E2170	B950	736	1.075kg	0.163kg	0.012kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
683	Parknahown 5	E2170	B801	600	0.196kg	0.080kg	<0.001kg(bone) <0.001kg(char) <0.001kg(seed)	Flot: frag. of bone and charcoal and seeds
684	Parknahown 5	E2170	B852	645	1.394kg	0.641kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
685	Parknahown 5	E2170	B670	507	0.092kg	0.024kg	<0.001kg	Flot: frag. of bone.
686	Parknahown 5	E2170	F1208/ B965	699	0.178kg	0.054kg	-	Nothing in residue.
687	Parknahown 5	E2170	B852	645	0.394kg	0.170kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
688	Parknahown 5	E2170	B1038	729	0.273kg	0.091kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
689	Parknahown 5	E2170	B840	636	0.435kg	0.180kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
690	Parknahown 5	E2170	F813/B44 4	349	0.155kg	0.038kg	0.001kg	Flot: frag. of bone.
691	Parknahown 5	E2170	B1087	753	0.107kg	0.038kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
692	Parknahown 5	E2170	B970	701	0.018kg	0.004kg	-	Nothing in residue.

693	Parknahown 5	E2170	B758	566	0.620kg	0.211kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
694	Parknahown 5	E2170	B405	536	0.508kg	0.140kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
695	Parknahown 5	E2170	B312	216	1.381kg	0.465kg	0.004kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
696	Parknahown 5	E2170	B219	2	1.382kg	0.537kg	0.016kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
697	Parknahown 5	E2170	F633/ B314	221	1.594kg	0.742kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
698	Parknahown 5	E2170	F1186/ B967	678	1.382kg	0.465kg	0.004kg(bone) 0.001kg(char) <0.001kg(seed)	Flot: frag. of bone and charcoal and seeds.
699	Parknahown 5	E2170	F1037/B6 82	509	1.829kg	0.666kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
700	Parknahown 5	E2170	B829	632	0.665kg	0.182kg	0.003kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
701	Parknahown 5	E2170	B791	597	0.669kg	0.204kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
702	Parknahown 5	E2170	B733	559	0.239kg	0.083kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
703	Parknahown 5	E2170	B703	515	0.478kg	0.124kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
704	Parknahown 5	E2170	B1016	skull sample	0.378kg	0.137kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
705	Parknahown 5	E2170	F1070/B7 12	546	0.386kg	0.118kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
706	Parknahown 5	E2170	B1029	728	0.595kg	0.158kg	0.008kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
707	Parknahown 5	E2170	B830	635	0.603kg	0.217kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
708	Parknahown 5	E2170	B636	970	0.430kg	0.098kg	0.001kg(bone)	Flot: frag. of bone and



							<0.001kg(char)	charcoal.
709	Parknahown 5	E2170	B1035	731	0.342kg	0.094kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
710	Parknahown 5	E2170	B808	602	0.591kg	0.233kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
711	Parknahown 5	E2170	B520	391	0.246kg	0.074kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
712	Parknahown 5	E2170	B735	552	0.240kg	0.066kg	<0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
713	Parknahown 5	E2170	B1037	735	0.876kg	0.280kg	0.010kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
714	Parknahown 5	E2170	B728	541	0.638kg	0.202kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
715	Parknahown 5	E2170	B863	650	1.844kg	0.543kg	0.014kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
716	Parknahown 5	E2170	B596	497	1.544kg	0.499kg	0.007kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
717	Parknahown 5	E2170	F896/ B538	404	0.830kg	0.304kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
718	Parknahown 5	E2170	B572	934	1.145kg	0.270kg	0.005kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
719	Parknahown 5	E2170	B764	620	0.715kg	0.320kg	0.010kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
720	Parknahown 5	E2170	B677	505	2.500kg	0.893kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
721	Parknahown 5	E2170	B642	472	1.342kg	0.647kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
722	Parknahown 5	E2170	B858	891	2.700kg	0.539kg	0.012kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
723	Parknahown 5	E2170	B804	622	1.282kg	0.607kg	0.018kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
724	Parknahown 5	E2170	F1264/B1	730	2.500kg	0.401kg	0.003kg(bone)	Flot: frag. of bone and

			018				<0.001kg(char)	charcoal.
725	Parknahown 5	E2170	B841	641	1.210kg	0.451kg	0.005kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
726	Parknahown 5	E2170	B739	555	3.000kg	0.915kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
727	Parknahown 5	E2170	B945	676	2.200kg	0.656kg	0.012kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
728	Parknahown 5	E2170	B596	498	1.020kg	0.459kg	0.002kg(bone) 0.002kg(char)	Flot: frag. of bone and charcoal.
729	Parknahown 5	E2170	B845	675	1.616kg	0.501kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
730	Parknahown 5	E2170	F1149/B800	610	0.637kg	0.150kg	0.003kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
731	Parknahown 5	E2170	B287	193	1.347kg	0.213kg	0.004kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
732	Parknahown 5	E2170	B219	1	1.305kg	0.585kg	0.001kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
733	Parknahown 5	E2170	B203	145	1.816kg	0.628kg	0.016kg(bone) 0.001kg(char)	Flot: frag. of bone inc. teeth and charcoal.
734	Parknahown 5	E2170	B184	661	1.301kg	0.402kg	0.009kg(bone) <0.001kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
735	Parknahown 5	E2170	B744	557	2.790kg	0.873kgkg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
736	Parknahown 5	E2170	B810	606	1.480kg	0.592kgkg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.
737	Parknahown 5	E2170	B255	grave fill	0.836kg	0.301kg	0.006kg(bone) <0.001kg(char)	Flot: frag. of bone inc. a tooth and charcoal.
738	Parknahown 5	E2170	F1078	547	1.480kg	0.623kg	0.001kg(bone) 0.001kg(char)	Flot: frag. of bone and charcoal.
739	Parknahown 5	E2170	B933	681	1.260kg	0.360kg	0.002kg(bone) <0.001kg(char)	Flot: frag. of bone and charcoal.

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740	Parknahown 5	E2170	B968	693	1.170kg	0.106kg	0.020kg(bone) <0.001kg(char) <0.001kg(seed)	Flot: frag. of bone and charcoal and seeds.
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### Appendix 3 Radiocarbon Results

**Table of Radiocarbon Results from Parknahown 5**

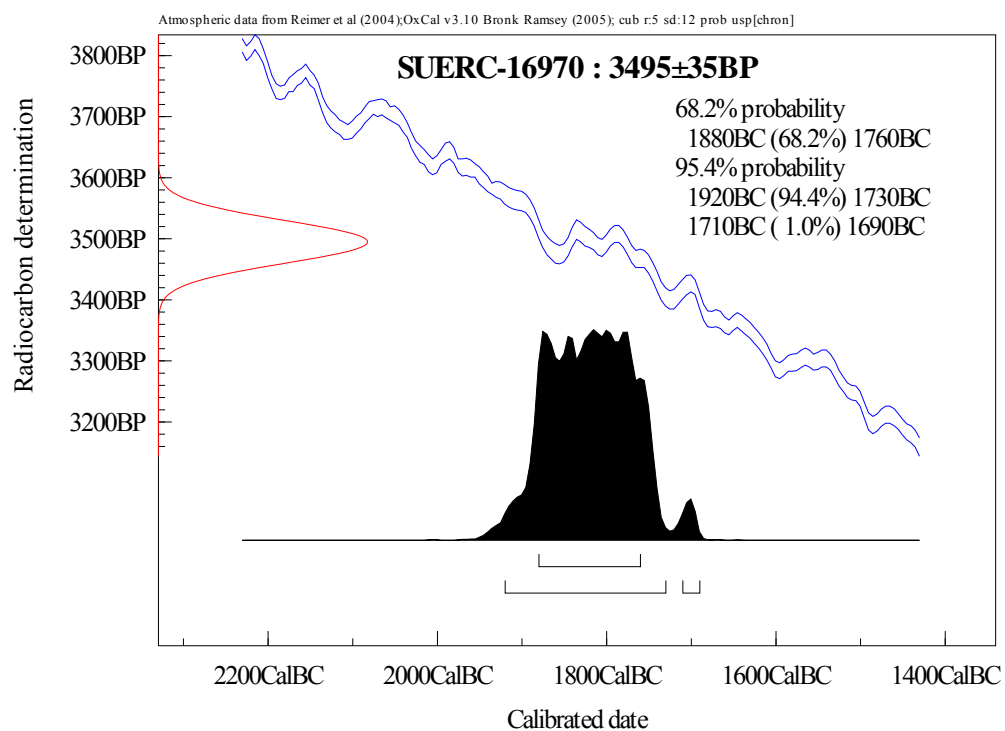
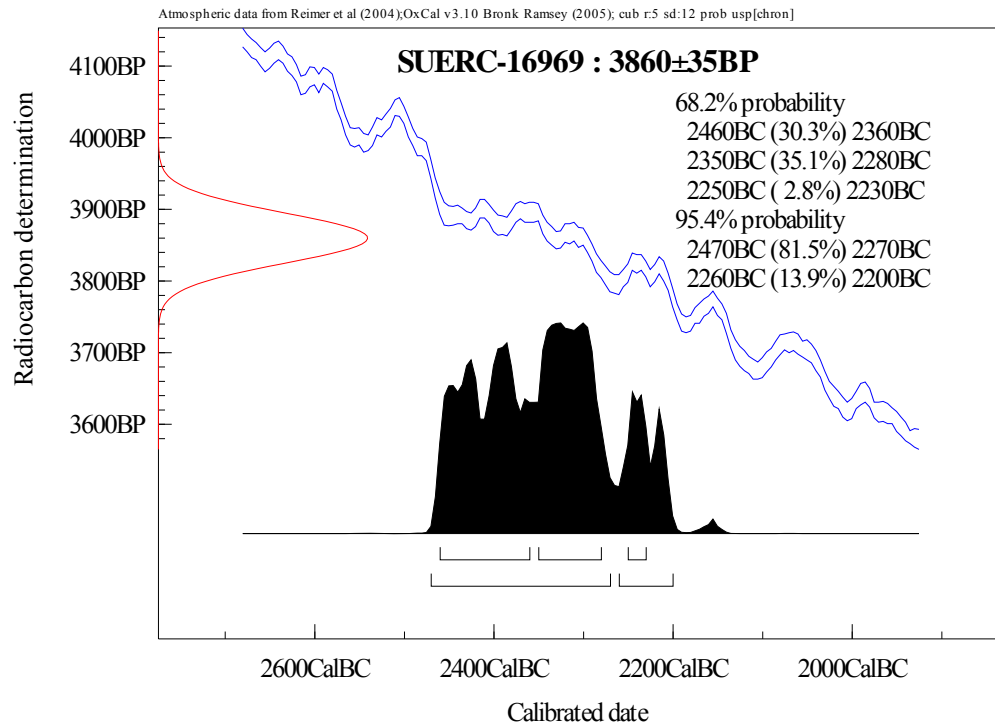
Feature Number	Description	Radiocarbon Result
F009	Burnt Mound Trough	BC 2470–2270
F028	Base fill of enclosure F29	589–655 AD
F033	Top fill of enclosure F29	770–980 AD
F046	Horse Burial	650–820 AD
F122	Top of F257 Bank	420–620 AD
F123	Inner ditch fill F106	420–640 AD
F128	Outer enclosure	650–820 AD
F138	Spread beside structure	760–980 AD
F158	Internal Linear feature	530–660 AD
F199	Internal linear feature	430–650 AD
F230	Pit to north of site	550–670 AD
F234	Bank bottom	530–660 AD
F270	Structure	660–870 AD
F290	Postholes to South of site	BC 1920–1730
F317	Upper fill of enclosure F156	410–600 AD
F342	Base fill of re-cut F391	960–1220 AD
F366	Deposit in re-cut F1452	430–650 AD
F388	Deposit in ditch cut F264	560–680 AD
F1294	Posthole in cemetery area	310–450 AD
F1352	Features at southern extent of site	BC 1220–970
F1385	Main cemetery enclosure	800–1020 AD

**Table of Radiocarbon Results from Human Remains**

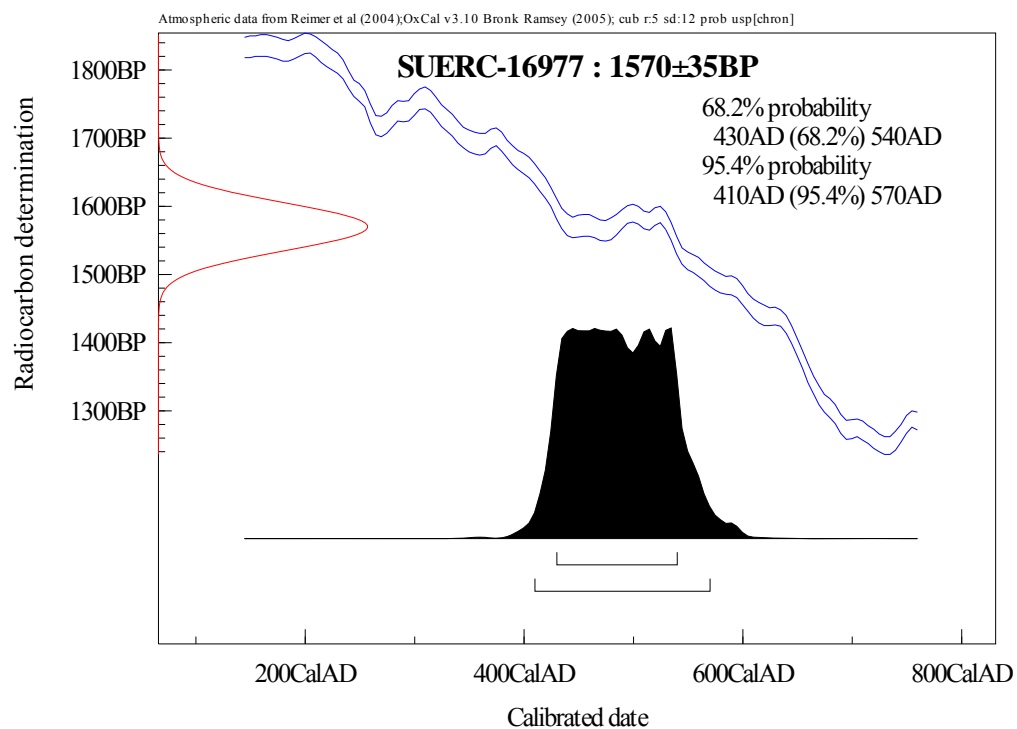
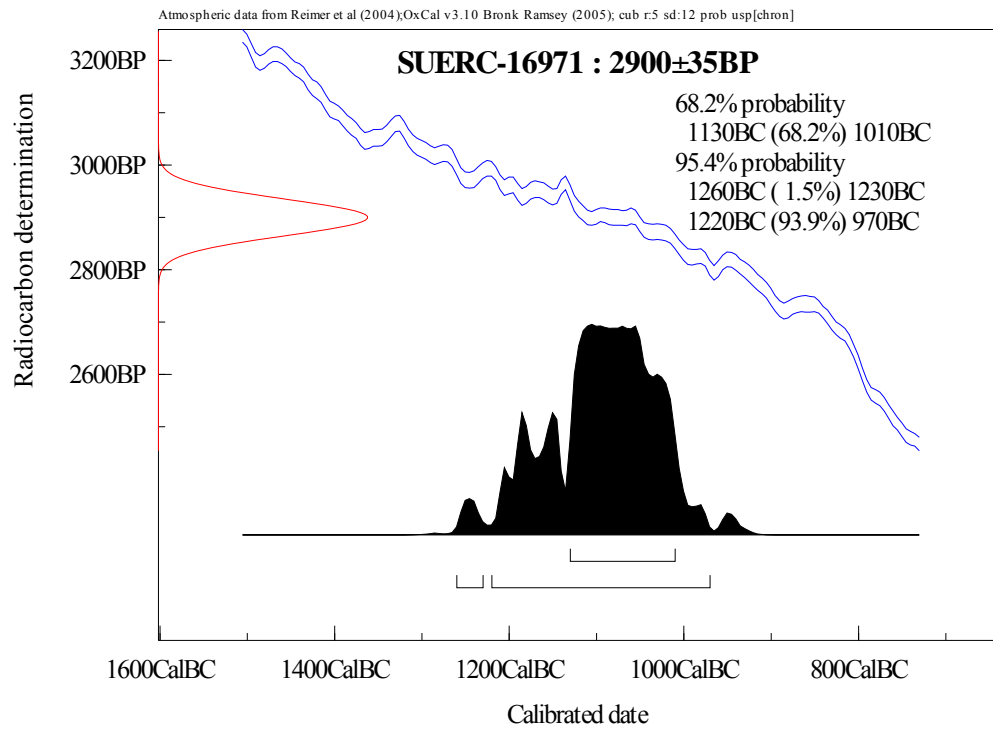
Burial Number	Description	Radiocarbon Result
001	Infant burial within large enclosure F29	
003	Adult female with newborn	575-670 AD
004	Selected by Osteoarchaeologist	600-690 AD
044	Infant burial	890-1030 AD
121	Juvenile double burial	860-1020 AD
145	Infant burial	770-970 AD
149	Infant burial with glass bead	660-870 AD
168	Adult burial crouched	890-1040 AD
177	Adult with range of pathologies	890-1020 AD
213	Adult burial with copper alloy pin	660-830 AD
236	Adult burial with unusual bone structure	890-1020 AD
293	Adult burial with two beads	660-830 AD
311	Adult burial-very robust	890-1020 AD
333	Adult burial	1020-1210 AD
358	Infant burial	880-1020 AD
362	Adult burial associated with quartz	1020-1190 AD
367	Selected by Osteoarchaeologist	760-900 AD
384	Infant burial crouched	680-890 AD
413	Infant burial south-north orientated	890-1020 AD
418	Infant burial	890-1030 AD
432	Juvenile burial	760-900 AD
456	Infant burial	680-900 AD
475	Adult female in double burial	640-720 AD
514	Juvenile burial with jet bracelet	770-980 AD
523	Infant buried between two femurs	530-650 AD
537	Infant burial	780-990 AD
572	Adult burial prone and crouched	990-1160 AD
585	Juvenile with bone bead	680-890 AD
610	Adult with active lesions	420-600 AD
636	Juvenile burial	585-680 AD
645	Adult burial outside of cemetery enclosure	590-690 AD
651	Adult burial	580-675 AD
673	Adult with non-accidental trauma	990-1160 AD
691	Adult burial with active lesion	430-620 AD
707	Juvenile flexed	420-600 AD
744	Juvenile burial	570-665 AD
761	Adult burial	770-970 AD
722	Selected by Osteoarchaeologist	620-710 AD
782	Adult burial	420-600 AD
797	Juvenile burial with iron nail	890-1030 AD
861	Adult burial-very robust	770-980 AD
870	Infant burial with bone bead	810-1020 AD
933	Adult burial	680-900 AD
954	Crouched infant	1020-1180 AD
1012	Infant burial	860-1020 AD
1018	Adult burial cut by cemetery ditch	410-570 AD
1025	Selected by Osteoarchaeologist	860-1000 AD
1026	Double Infant burial	890-1020 AD

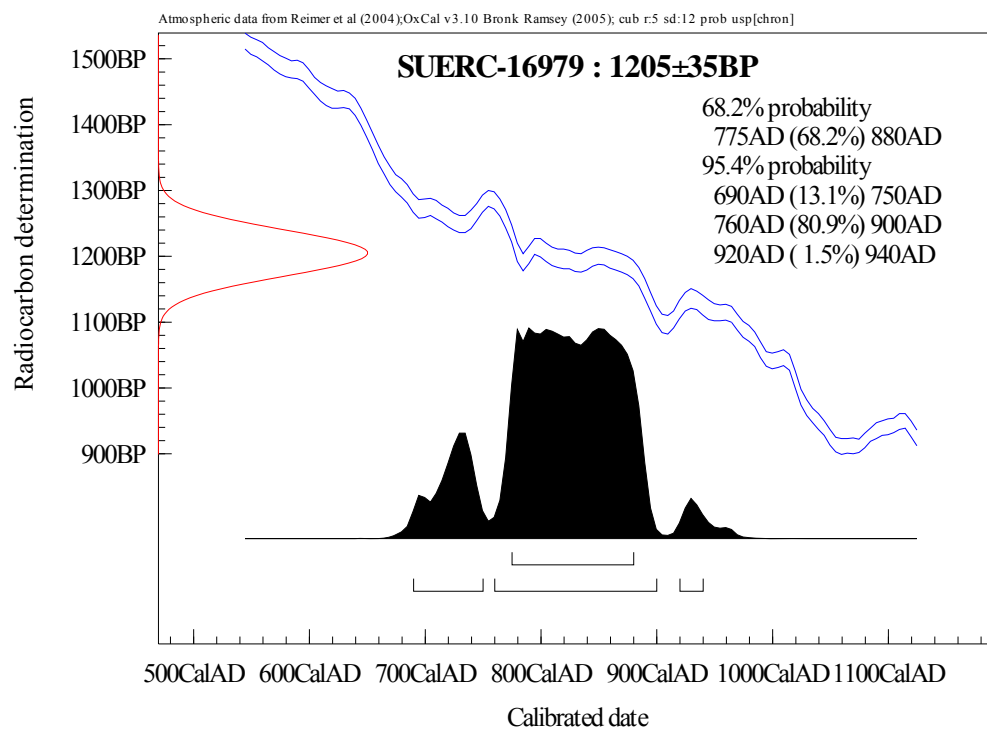
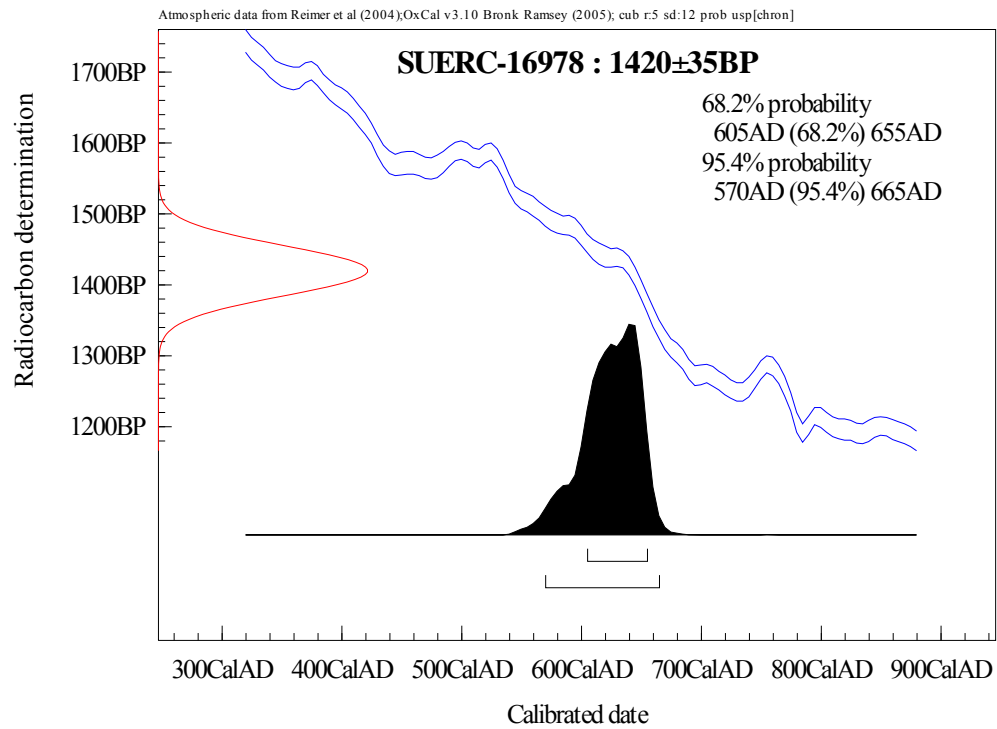
GU No.	Reporting Number	Sample Type	Sample Id	Species Dated	Uncalibrated Date	Calibrated Date 95.4% Probability (2 Sigma)
16361	16969	Charcoal	Parknahown 5:E2170:F9:S2	Ash	3860 ± 35 BP	2470BC (81.5%) 2270BC, 2260BC (13.9%)2200BC
16361	16970	Charcoal	Parknahown 5:E2170:F290:S849	Oak	3495 ± 35 BP	1920BC (94.4%) 1730BC, 1710BC (1%) 1690BC
16361	16971	Charcoal	Parknahown 5:E2170:F1352:S848	Alder and Ash	2900 ± 35 BP	1260BC (1.5%) 1230BC, 1220BC (93.9%) 970BC
16361	16977	Human bone	Parknahown 5:SK1018	Right ribs	1570 ± 35 BP	410AD (95.4%) 570AD
16361	16978	Human bone	Parknahown 5:SK744	Left Ribs	1420 ± 35 BP	570AD (95.4%) 665AD
16361	16979	Human bone	Parknahown 5:Sk432	Left Ribs	1205 ± 35 BP	690AD (13.1%) 750AD, 760AD (80.9%) 900AD, 920AD (1.5%)940AD
16361	16981	Human bone	Parknahown 5:Sk707	Left Ribs	1535 ± 35 BP	420AD (95.4%) 600AD
16361	16986	Human bone	Parknahown 5:Sk691	Left Ribs	1515 ± 35 BP	430AD (95.4%) 620AD
16361	16987	Human bone	Parknahown 5:Sk673	Right Ribs	970 ± 35 BP	990AD (95.4%) 1160AD
16361	16988	Human bone	Parknahown 5:Sk213	Left Ribs	1275 ± 35 BP	660AD (93.3%) 830AD, 840AD (2.1%) 860AD
16361	16990	Human bone	Parknahown 5:Sk149	Right Ribs	1265 ± 35 BP	660AD (95.4%) 870AD
16361	16991	Human bone	Parknahown 5:Sk362	Left Ribs	930 ± 35 BP	1020AD (95.4%) 1190AD
16361	16996	Human bone	Parknahown 5:Sk636	Left Ribs	1395 ± 35 BP	585AD (95.4%) 680AD
16361	16998	Human bone	Parknahown 5:Sk293	Rib Fragments	1270 ± 35 BP	660AD (92.3%) 830AD, 840AD (3.1%) 870AD
16361	17260	Charcoal	Parknahown 5:E2170:F1294:S743	Alder	1660 ± 35 BP	250AD (8.6%) 300AD, 310AD (80.2%) 450AD, 480AD (6.7%) 540AD
16361	17301	Human bone	Parknahown 5:Sk333	Left Rib Fragments	915 ± 35 BP	1020AD (95.4%) 1210AD
16361	17302	Human bone	Parknahown 5 :Sk933	Vert Neural Arch	1215 ± 35 BP	680AD (95.4%) 900AD
16361	17303	Human bone	Parknahown 5 :Sk782	Right Ribs	1535 ± 35 BP	420AD (95.4%) 600AD
16361	17304	Human bone	Parknahown 5 :Sk870	2 R.Rib Fragments and 2 Vert Fragments	1120 ± 35 BP	810AD (95.4%) 1020AD
16361	17308	Human bone	Parknahown 5 :Sk311	Right Ribs	1090 ± 35 BP	890AD (95.4%) 1020AD

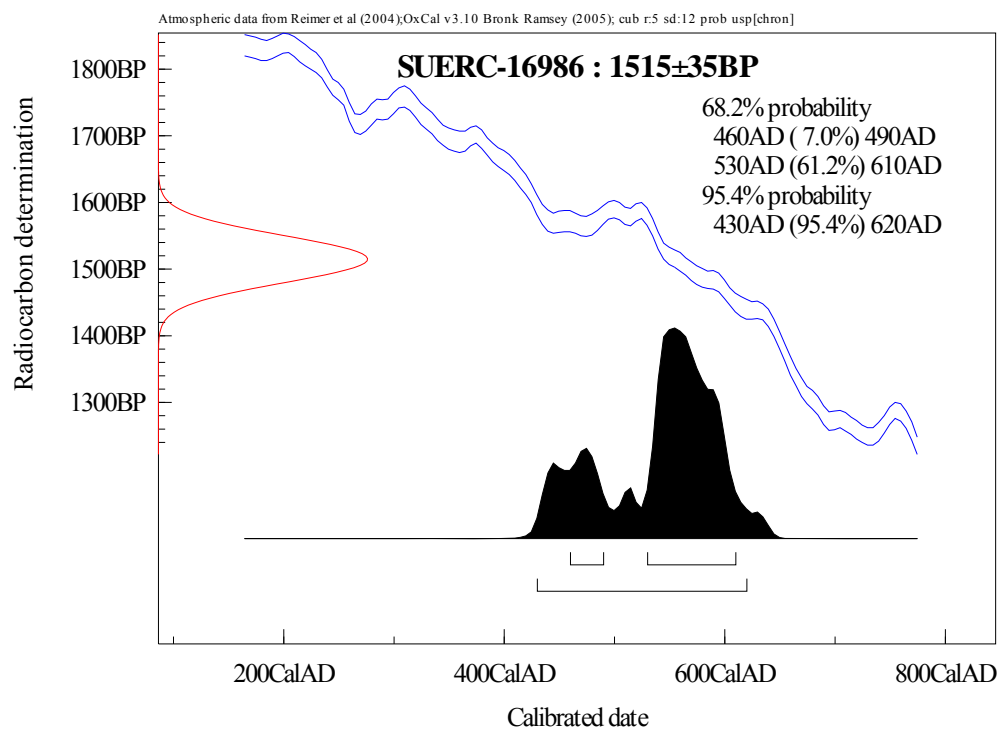
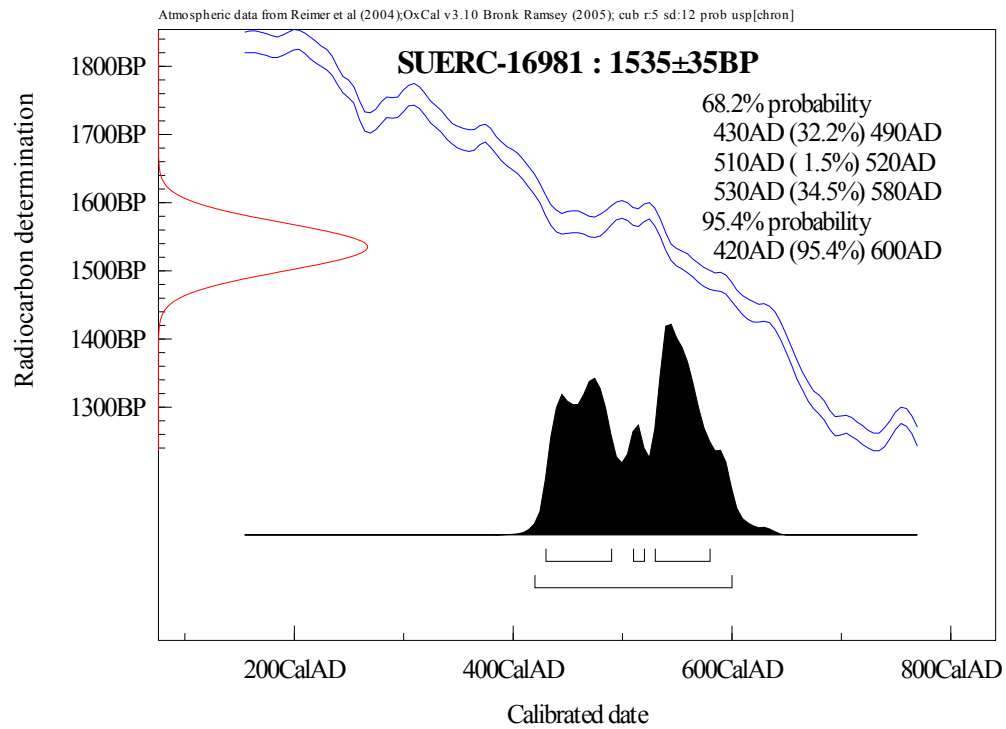
GU No.	Reporting Number	Sample Type	Sample Id	Species Dated	Uncalibrated Date	Calibrated Date 95.4% Probability (2 Sigma)
16361	17309	Human bone	Parknahown 5:Sk145	Left Ribs	1180 ± 35 BP	720AD (2.2%) 740AD, 770AD (93.2%) 970AD
16361	17310	Human bone	Parknahown 5 :Sk645	Right Arm Frag	1380 ± 35 BP	590AD (95.4%) 690AD
16361	17311	Human bone	Parknahown 5 :Sk572	Right Ribs	975 ± 35 BP	990AD (95.4%) 1160AD
16361	17312	Human bone	Parknahown 5:Sk358	Right Ribs	1100 ± 35 BP	880AD (95.4%) 1020AD
16361	17313	Human bone	Parknahown 5:Sk1026	Right Ribs	1090 ± 35 BP	890AD (95.4%) 1020AD
16361	17314	Human bone	Parknahown 5:Sk456	Right Ribs	1210 ± 35 BP	680AD (95.4%) 900AD
16361	17318	Human bone	Parknahown 5:Sk121	Left Ribs	1115 ± 35 BP	820AD (1.8%) 850AD, 860AD (93.6%) 1020AD
16361	17319	Human bone	Parknahown 5:Sk236	Right Rib Fragments	1090 ± 35 BP	890AD (95.4%) 1020AD
16361	17320	Human bone	Parknahown 5:Sk1	Rib Fragments	905 ± 35 BP	1030AD (95.4%)1210AD
16361	17321	Human bone	Parknahown 5:Sk651	Left Ribs	1400 ± 35 BP	580AD (95.4%) 675AD
16361	17322	Human bone	Parknahown 5:Sk418	Rib Fragments	1070 ± 35 BP	890AD (95.4%) 1030AD
16361	17323	Human bone	Parknahown 5:Sk537	Rib Fragments	1135 ± 35 BP	780AD (95.4%) 990AD
16361	17324	Human bone	Parknahown 5:Sk585	Rib Fragments	1230 ± 35 BP	680AD (95.4%) 890AD
16361	17328	Human bone	Parknahown 5 :Sk1012	Left Ribs	1110 ± 35 BP	860AD (95.4%) 1020AD
16361	17329	Human bone	Parknahown 5:Sk3	Left Ribs	1410 ± 35 BP	575AD (95.4%) 670AD
16361	17330	Human bone	Parknahown 5:Sk954	Right Ribs	940 ± 35 BP	1020AD (95.4%) 1180AD
16361	17331	Human bone	Parknahown 5:Sk413	Left Ribs	1080 ± 35 BP	890AD (95.4%) 1020AD
16361	17332	Human bone	Parknahown 5:Sk44	Rib Fragments	1060 ± 35 BP	890AD (95.4%) 1030AD
16361	17333	Human bone	Parknahown 5:Sk523	2 Rib Fragments	1470 ± 35 BP	530AD (95.4%) 650AD
16361	17334	Human bone	Parknahown 5:Sk797	Left Rib Fragments	1055 ± 35 BP	890AD (95.4%) 1030AD
16361	17338	Human bone	Parknahown 5:Sk384	Ribs	1225 ± 35 BP	680AD (95.4%) 890AD
16361	16980	Human bone	Parknahown 5 :Sk861	Left Ribs	1145 ± 35 BP	770AD (95.4%) 980AD
16361	16985	Human bone	Parknahown 5:Sk177	Right Ribs	1085 ± 35 BP	890AD (95.4%) 1020AD
16361	16989	Human bone	Parknahown 5:Sk610	Right Ribs	1535 ± 35 BP	420AD (95.4%) 600AD
16361	16995	Human bone	Parknahown 5:Sk168	Right ribs	1040 ± 35 BP	890AD (95.4%) 1020AD
16361	16997	Human bone	Parknahown 5:Sk761	Right Ribs	1180 ± 35 BP	720AD (2.2%) 740AD, 770AD (93.2%) 970AD

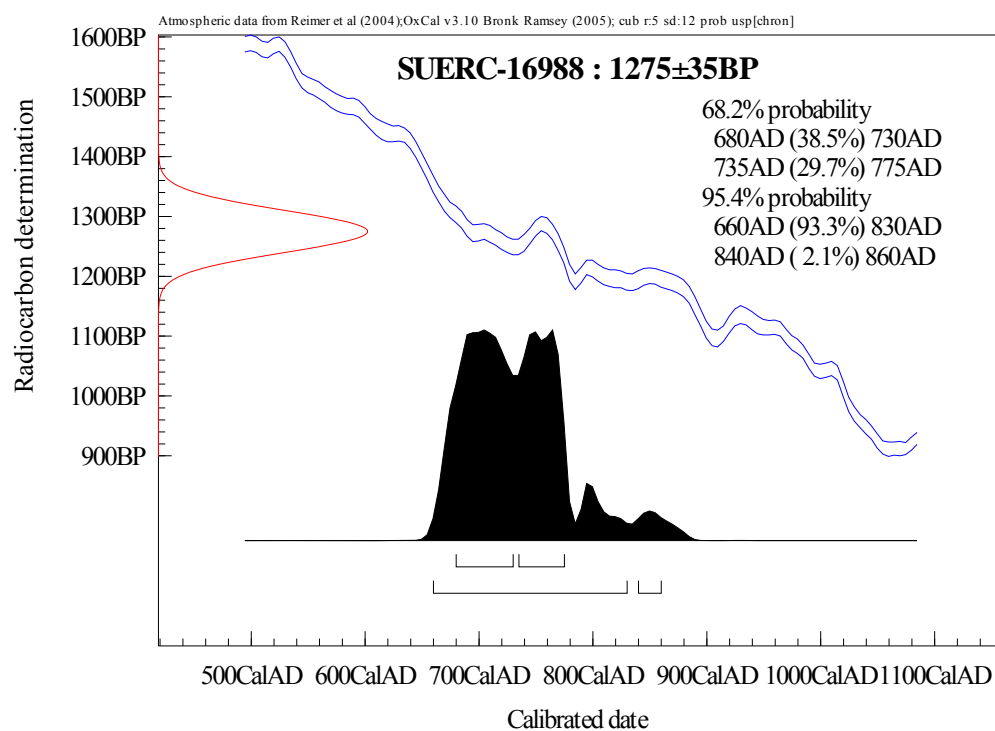
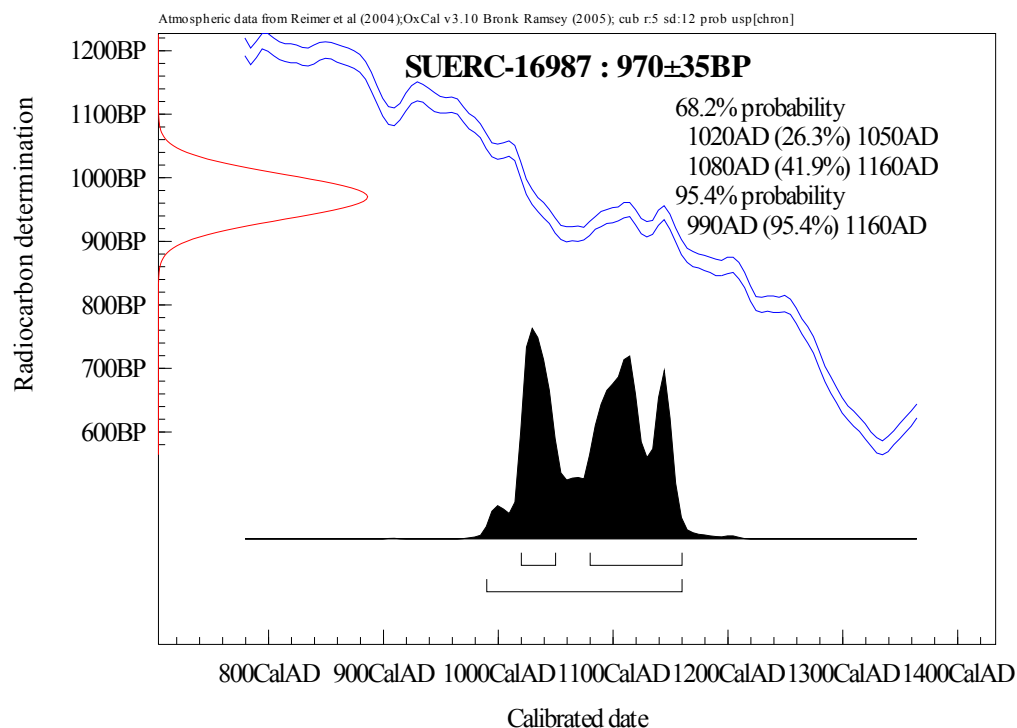


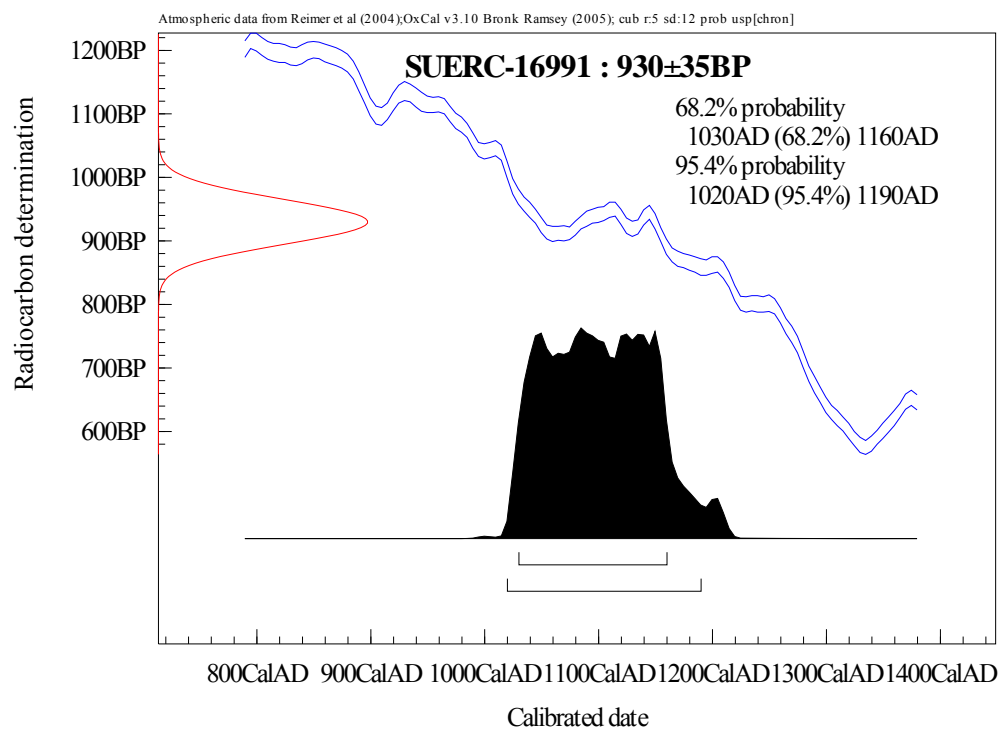
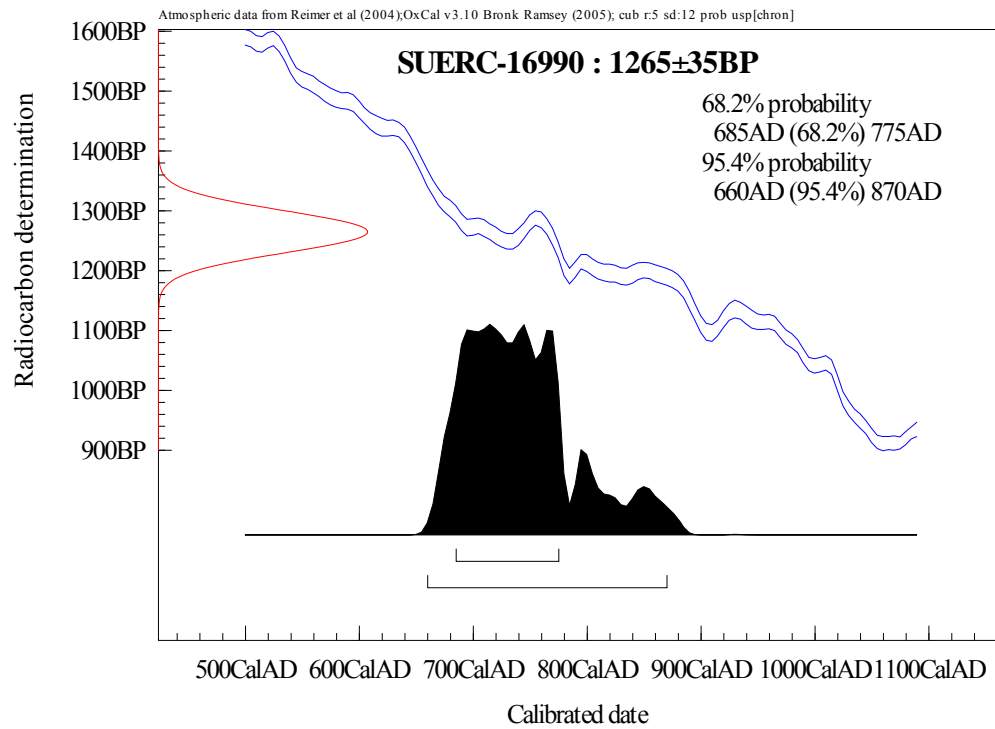


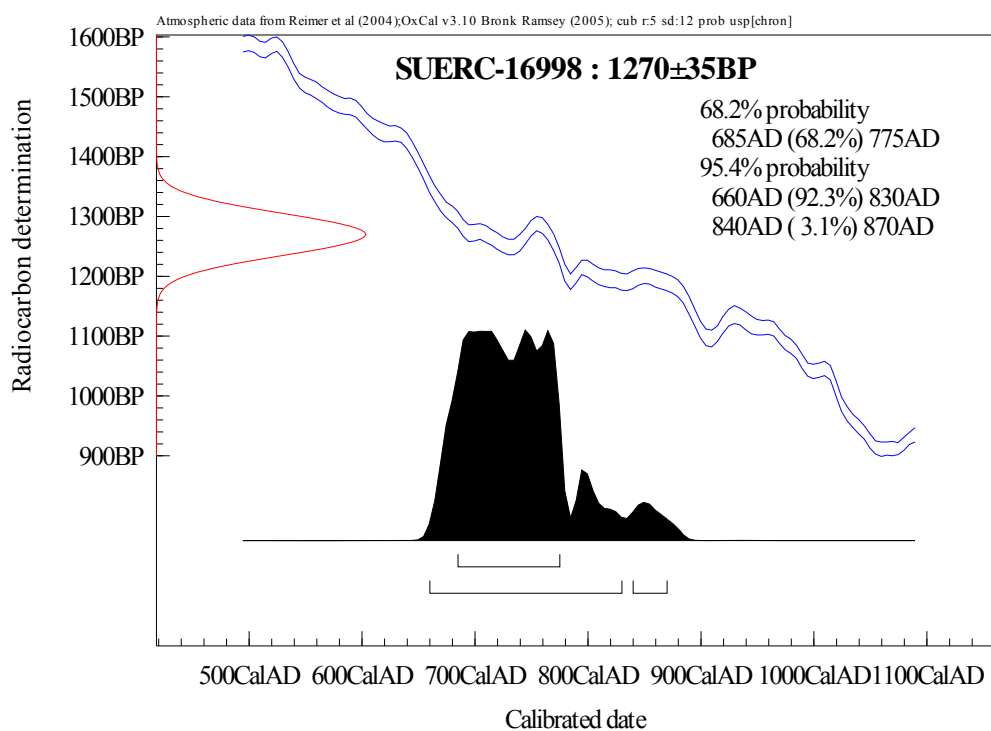
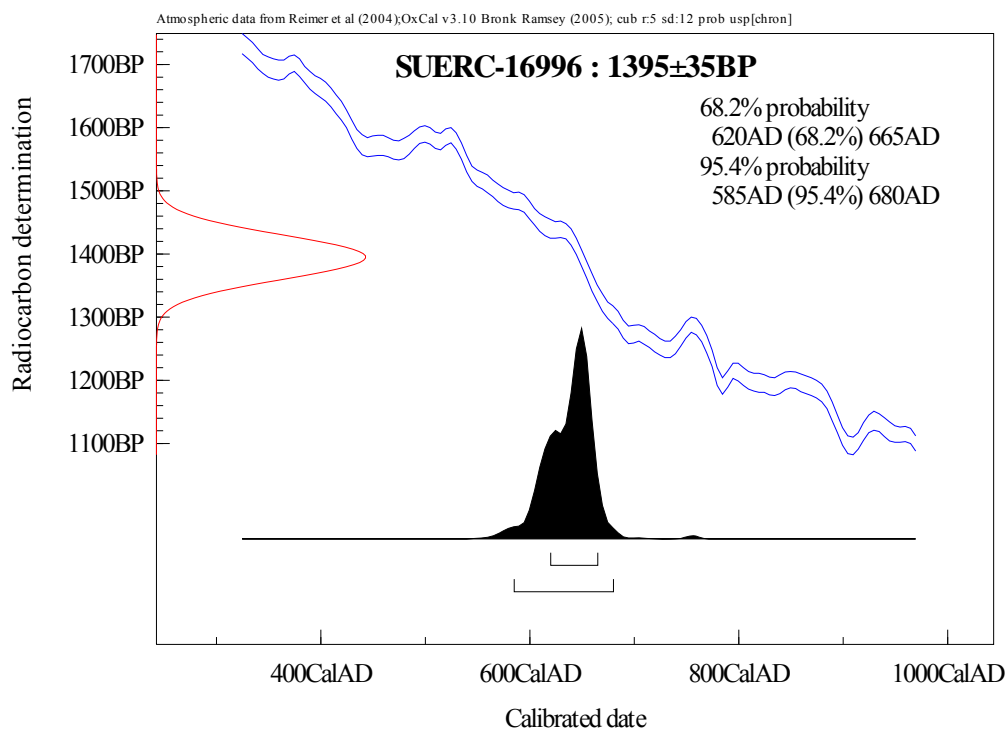


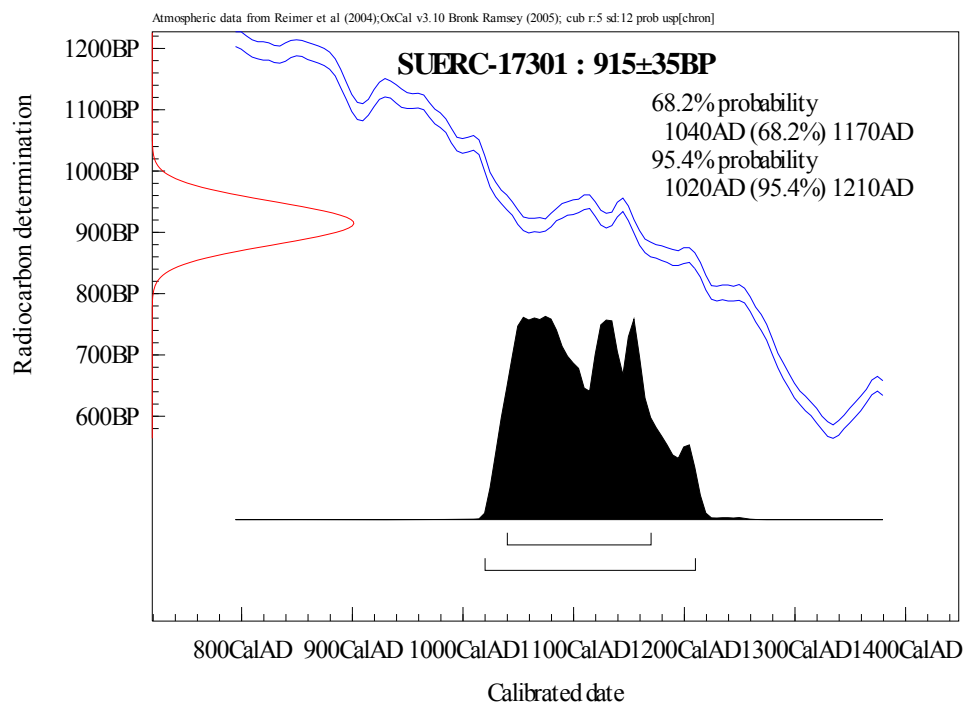
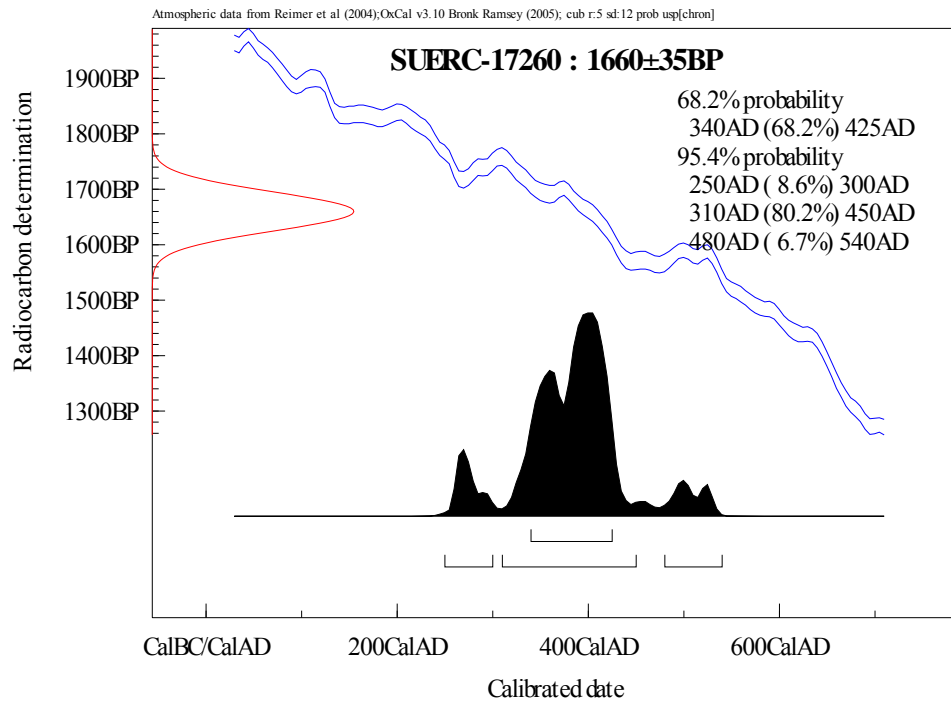


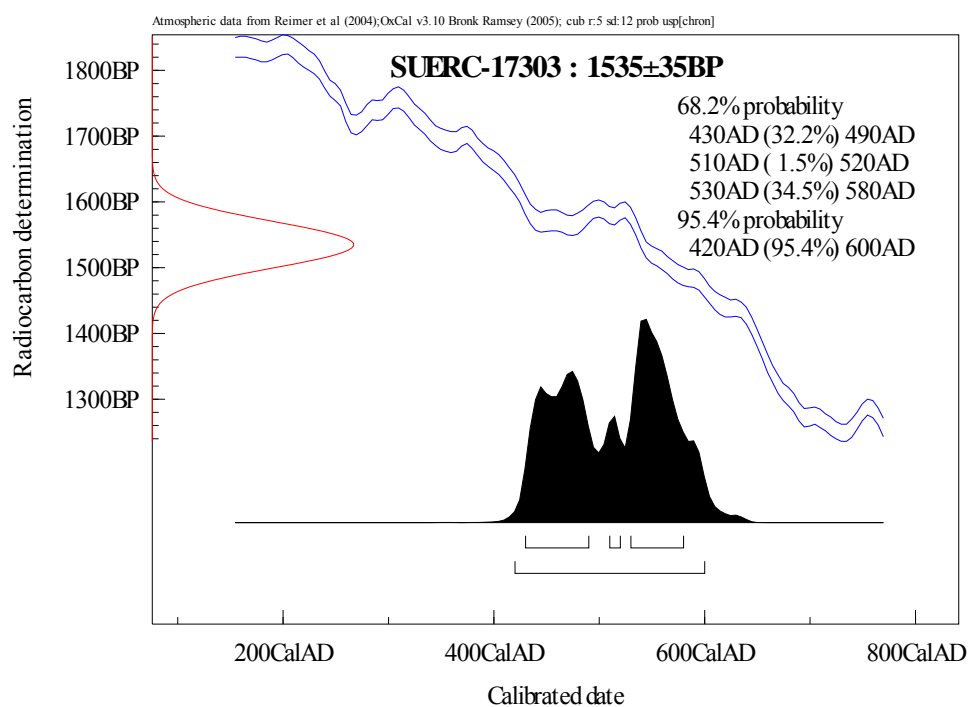
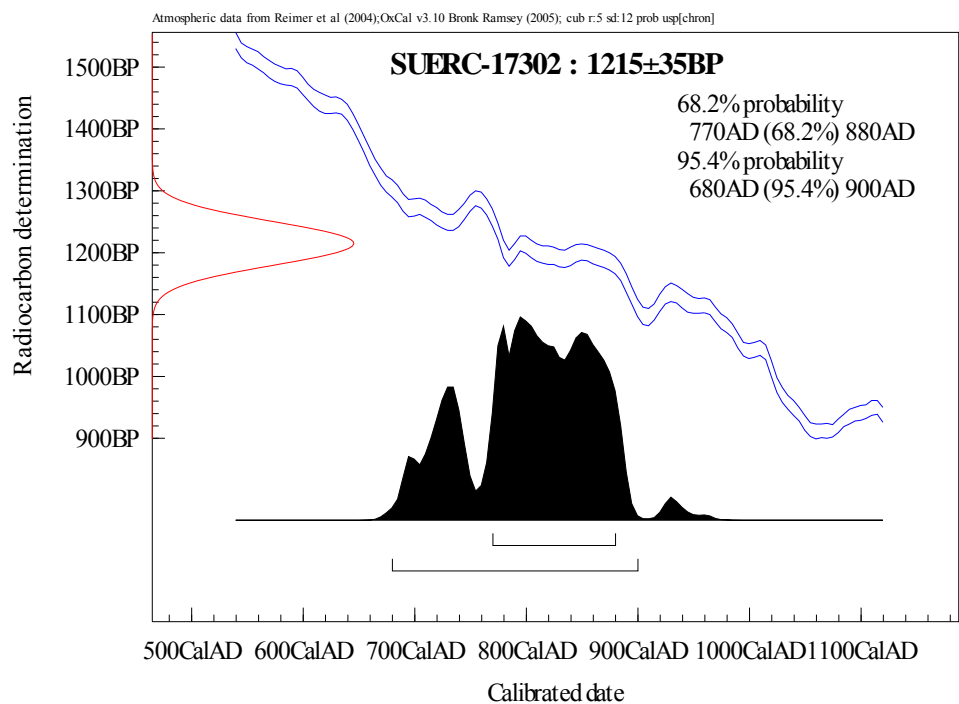




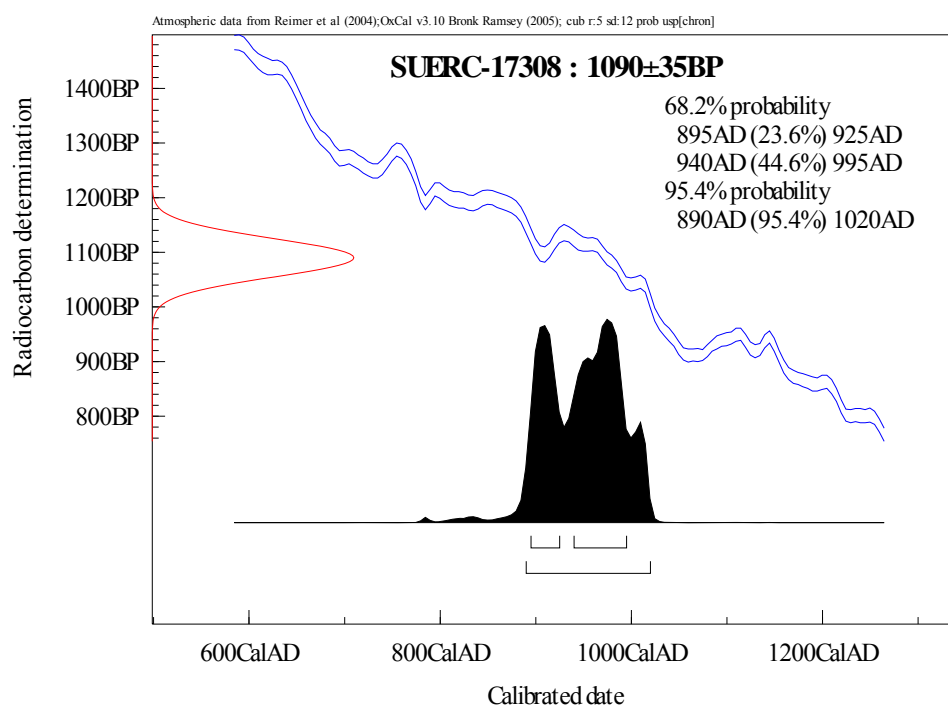
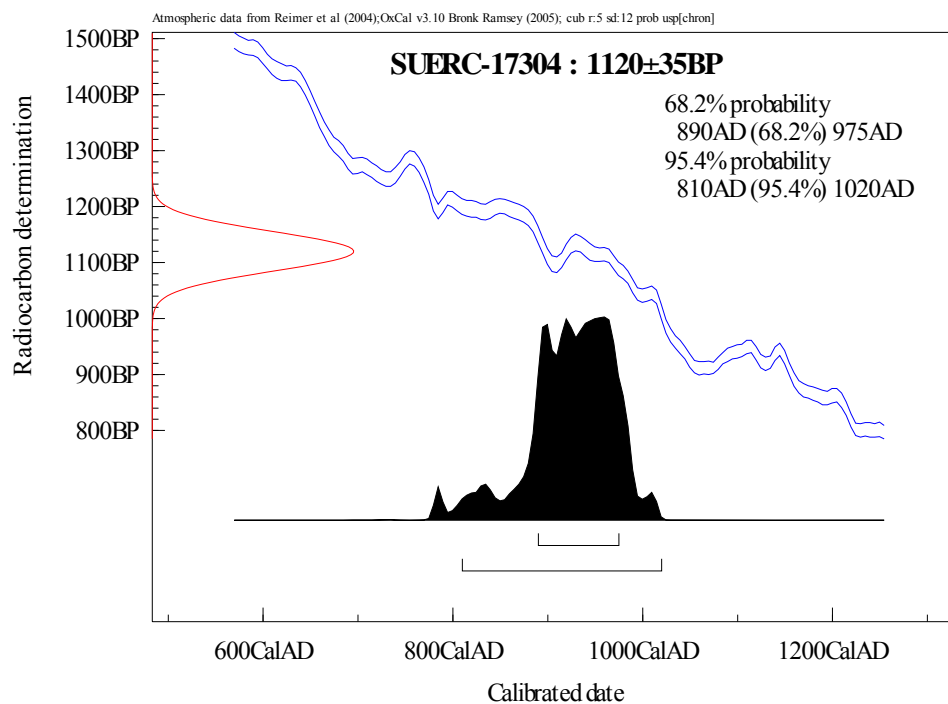


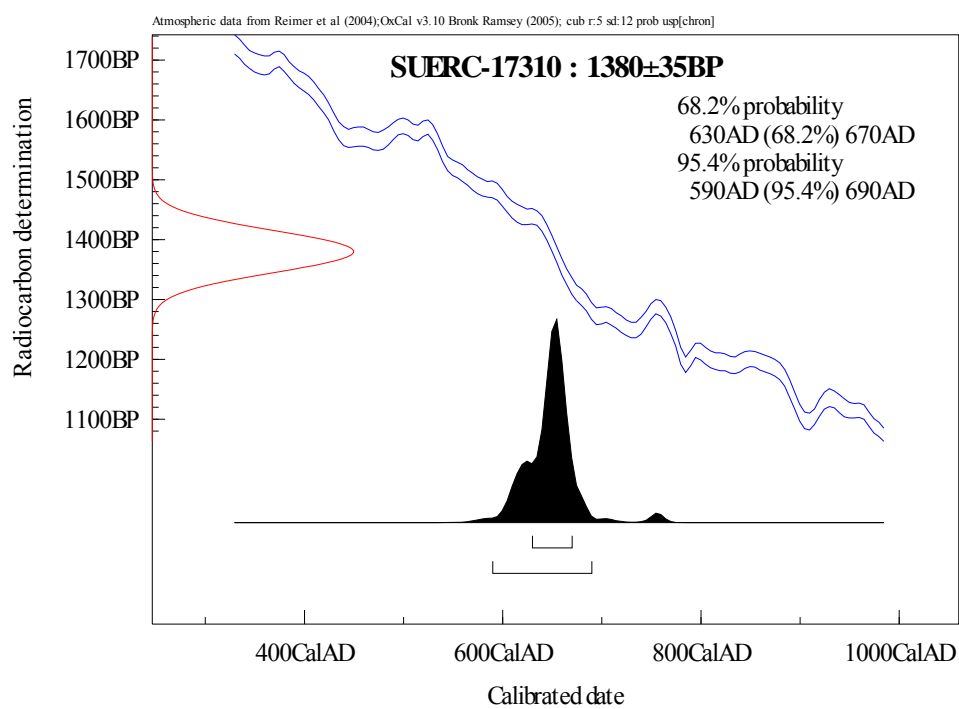
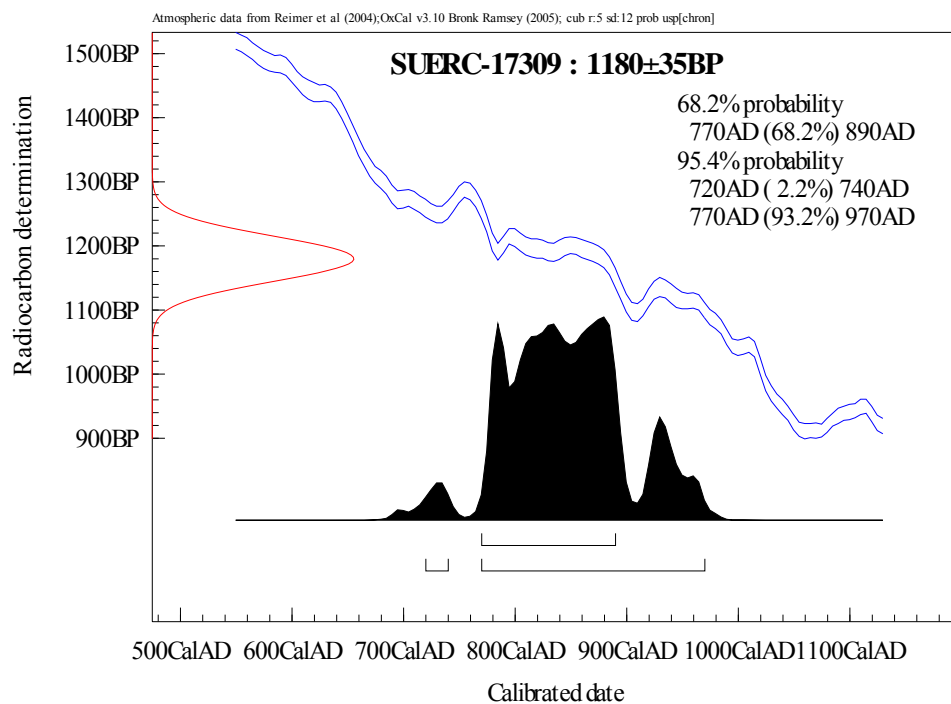


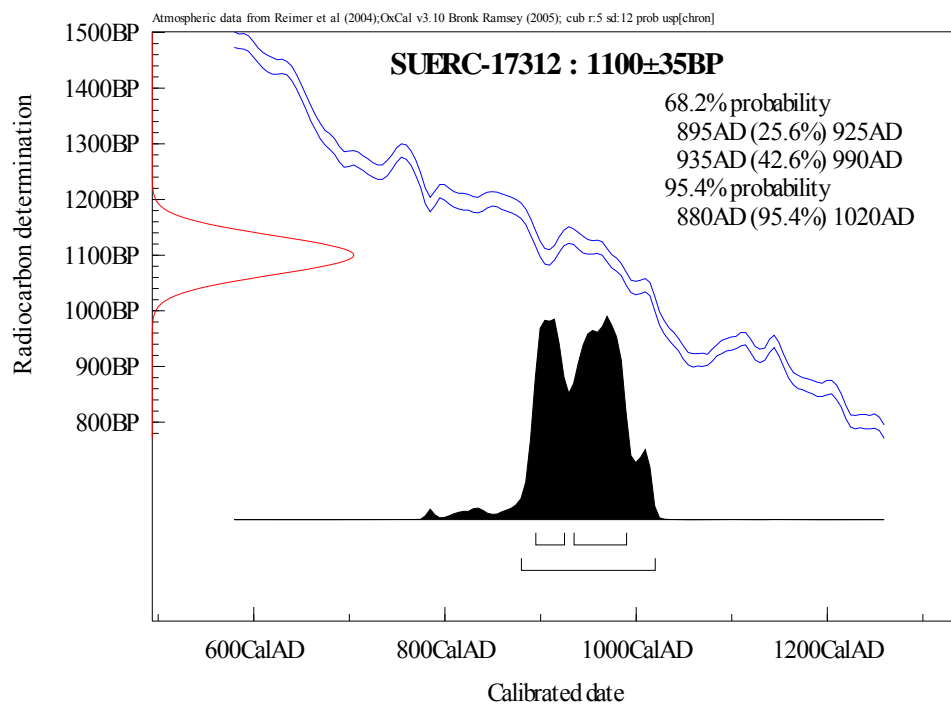
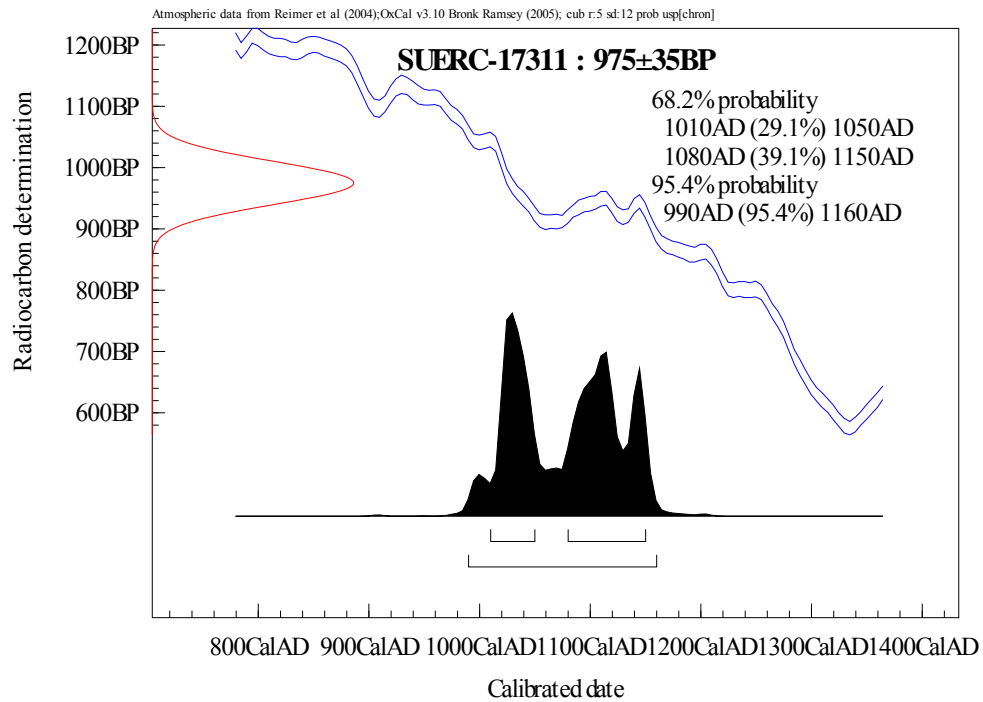


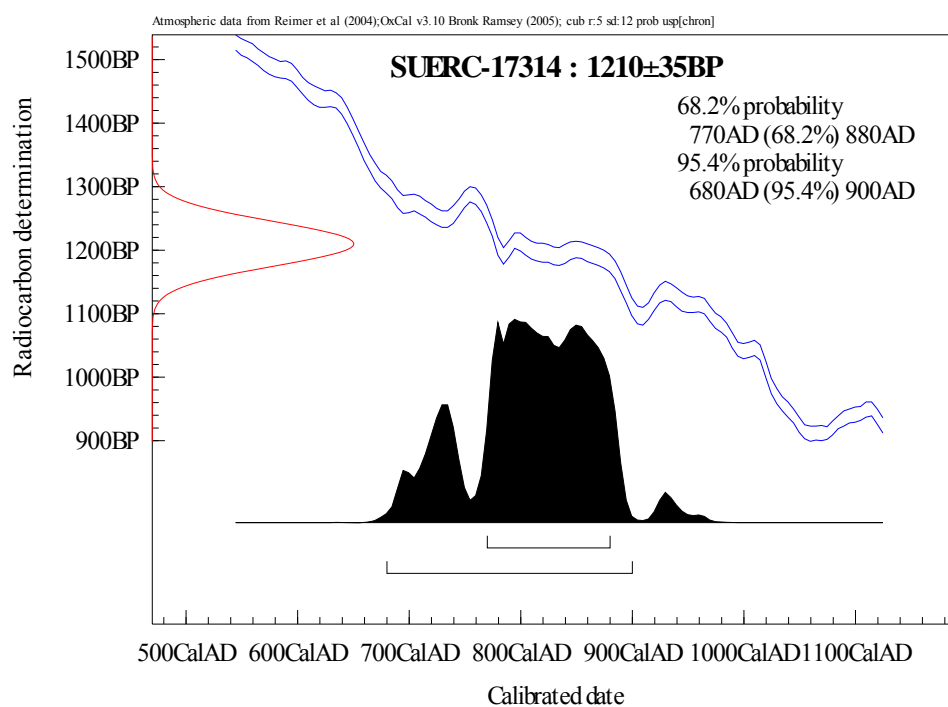
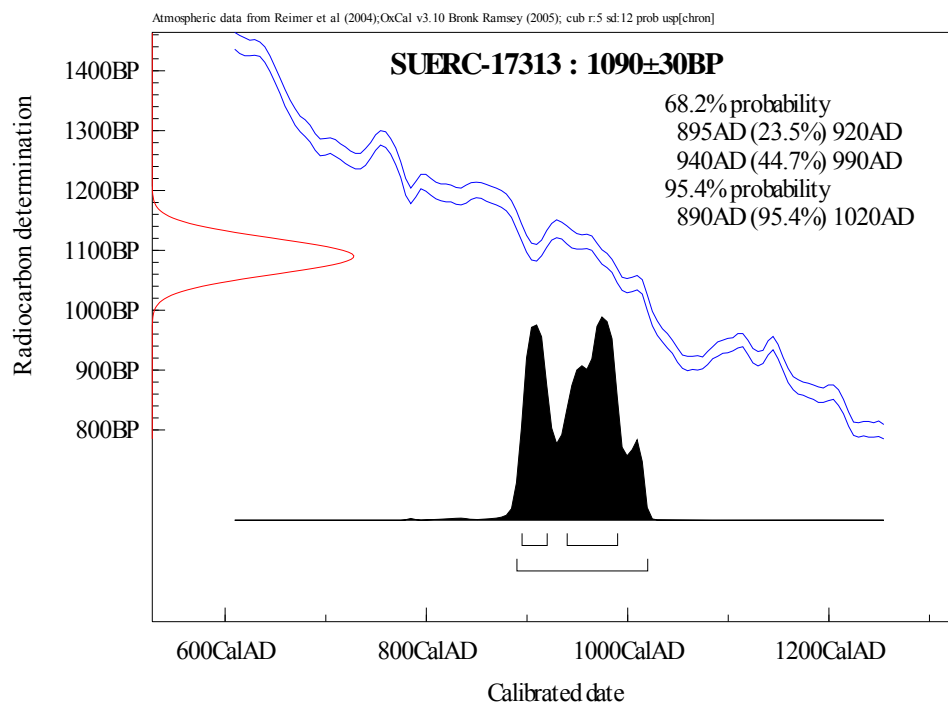


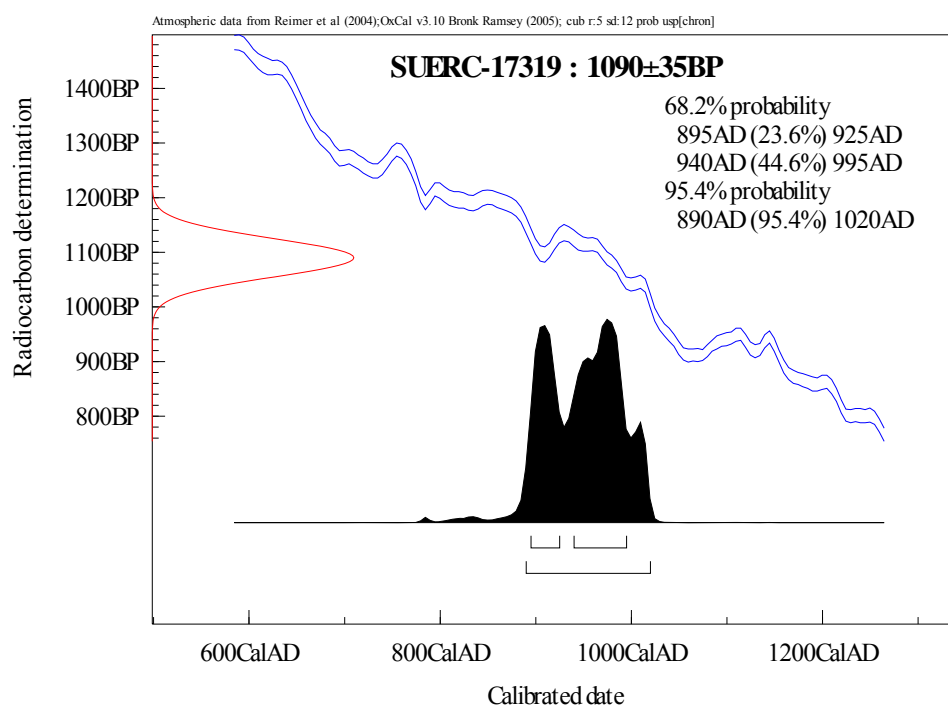
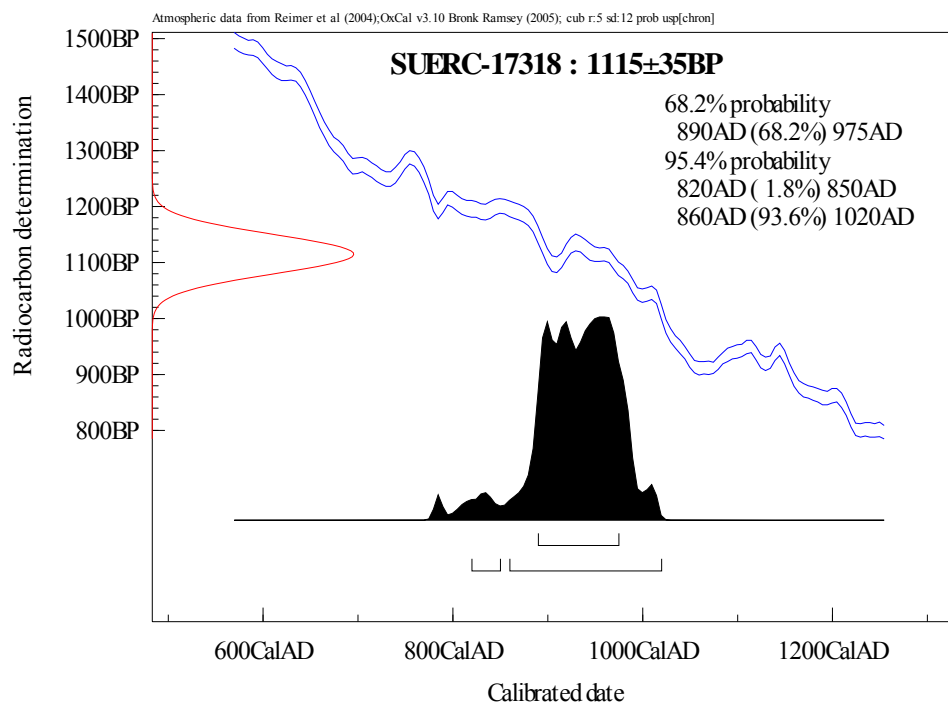


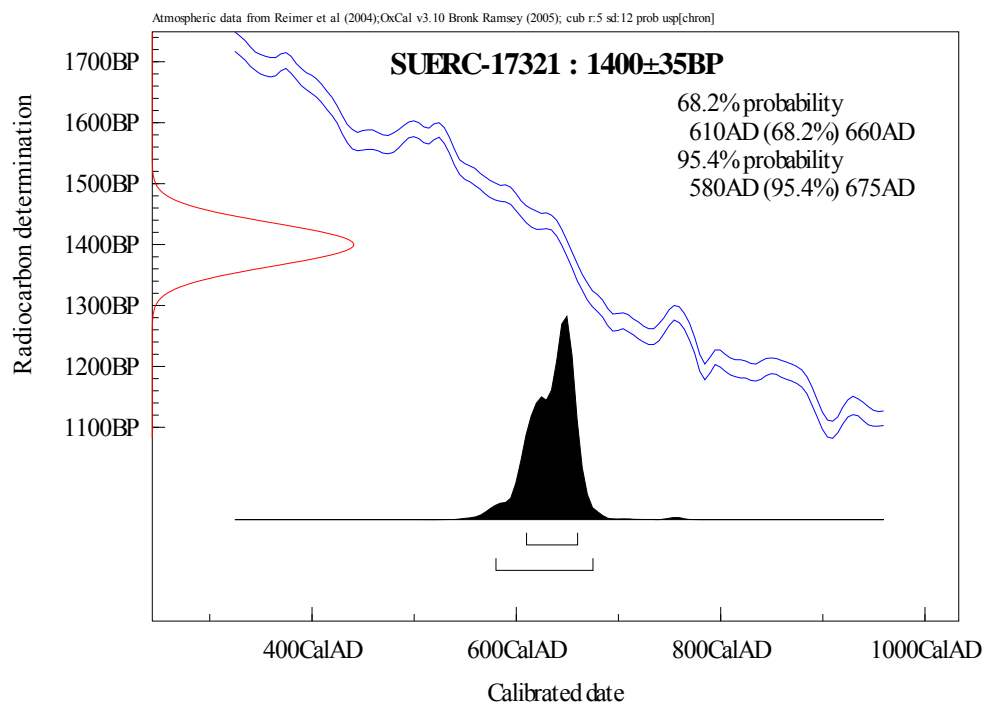
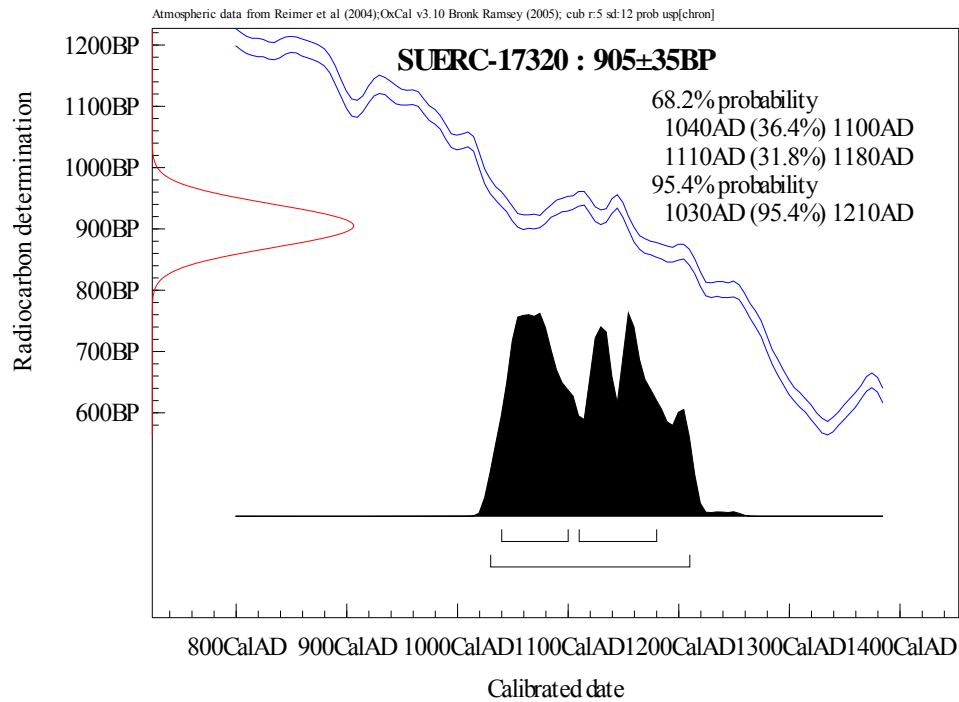


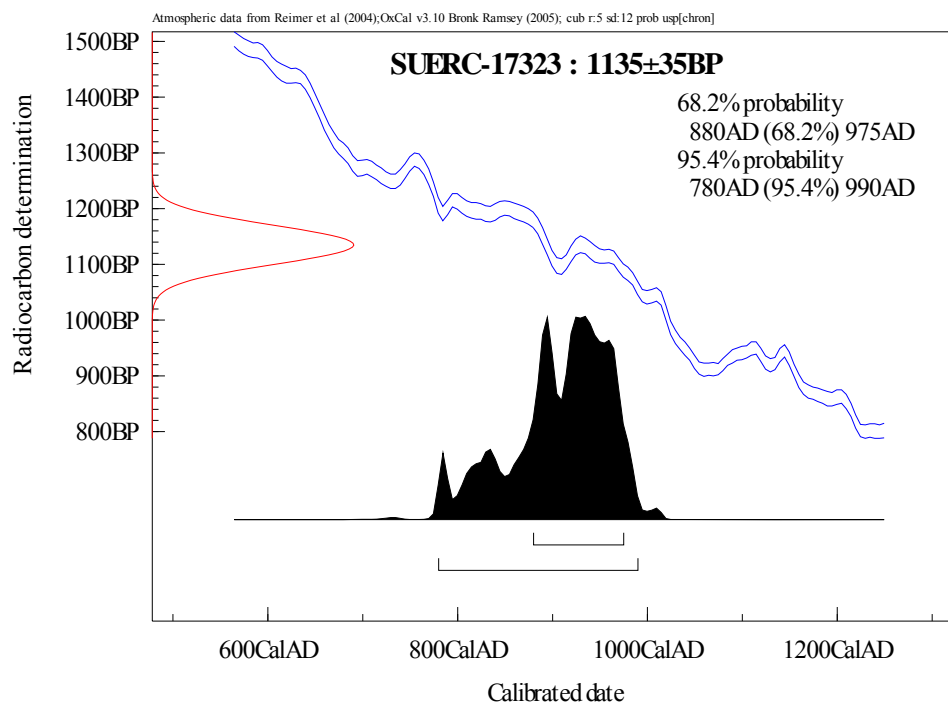
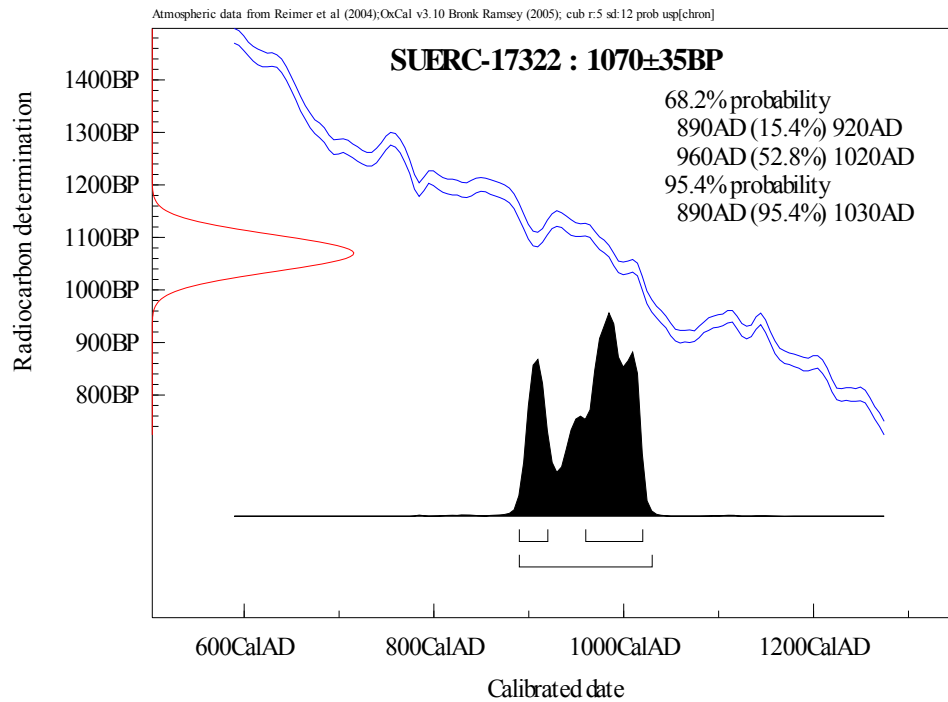


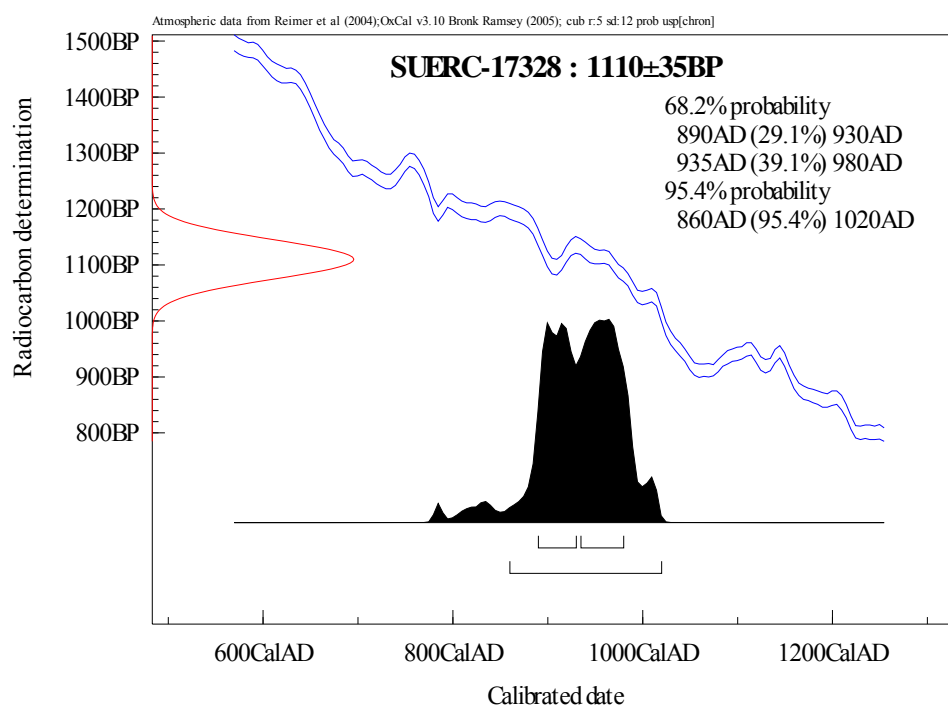
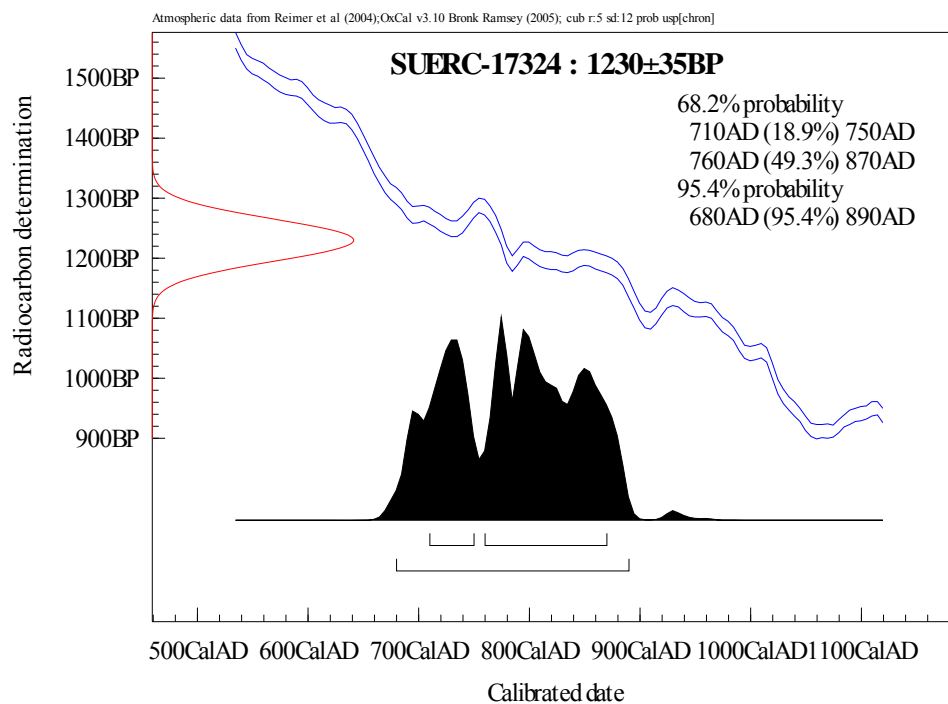




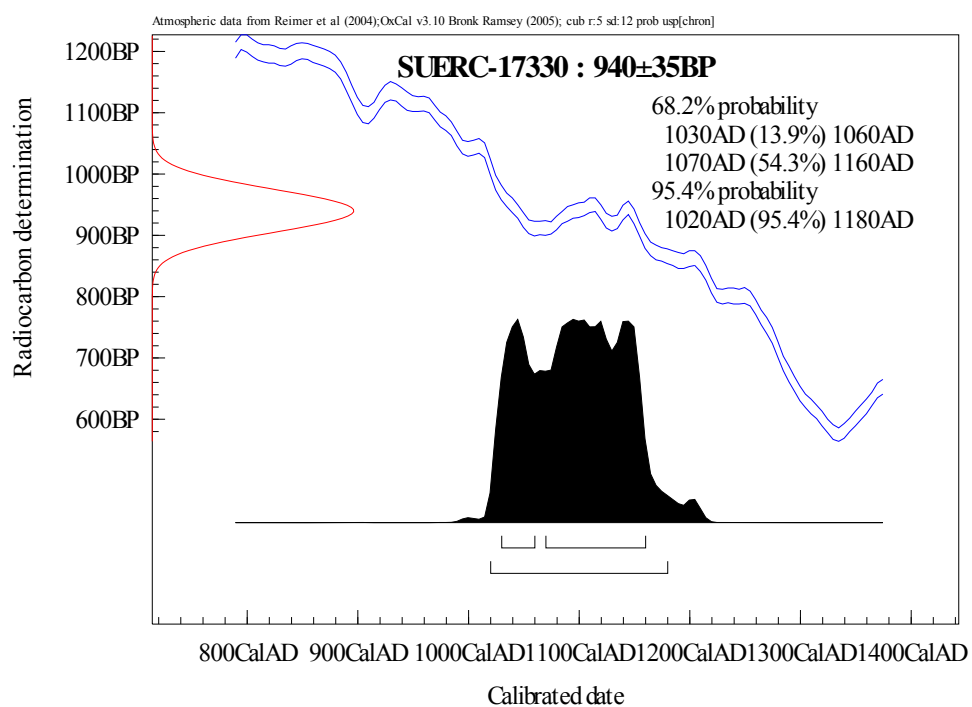
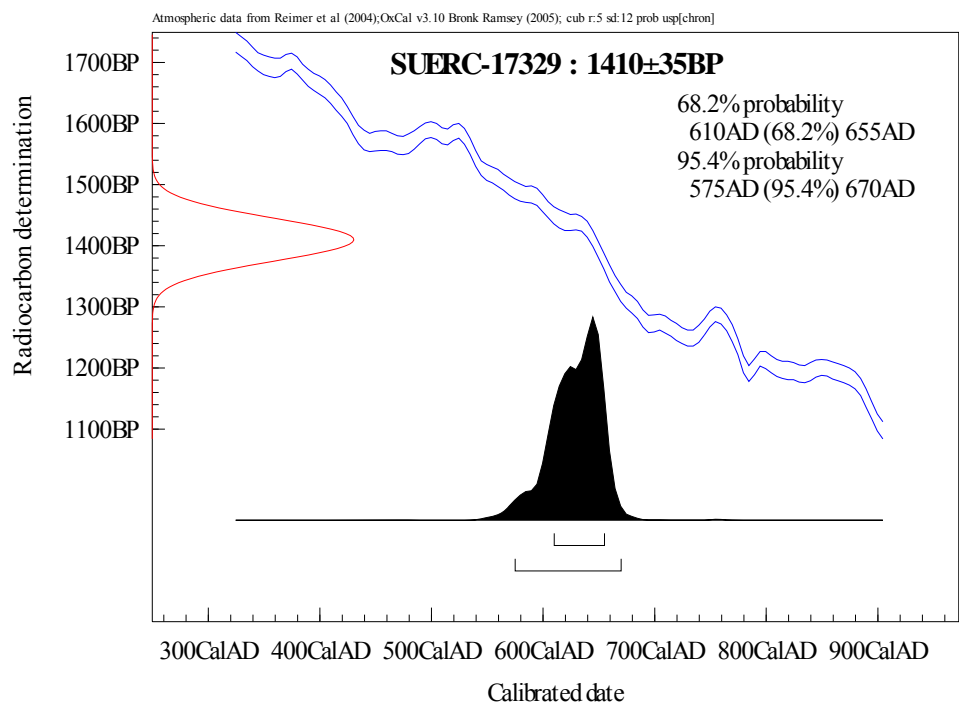


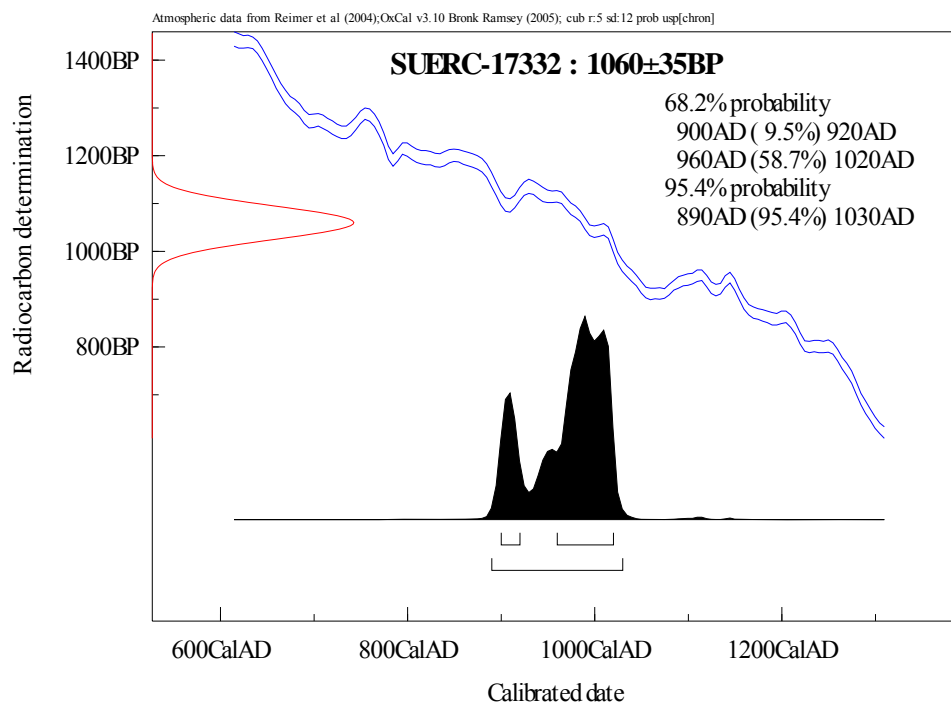
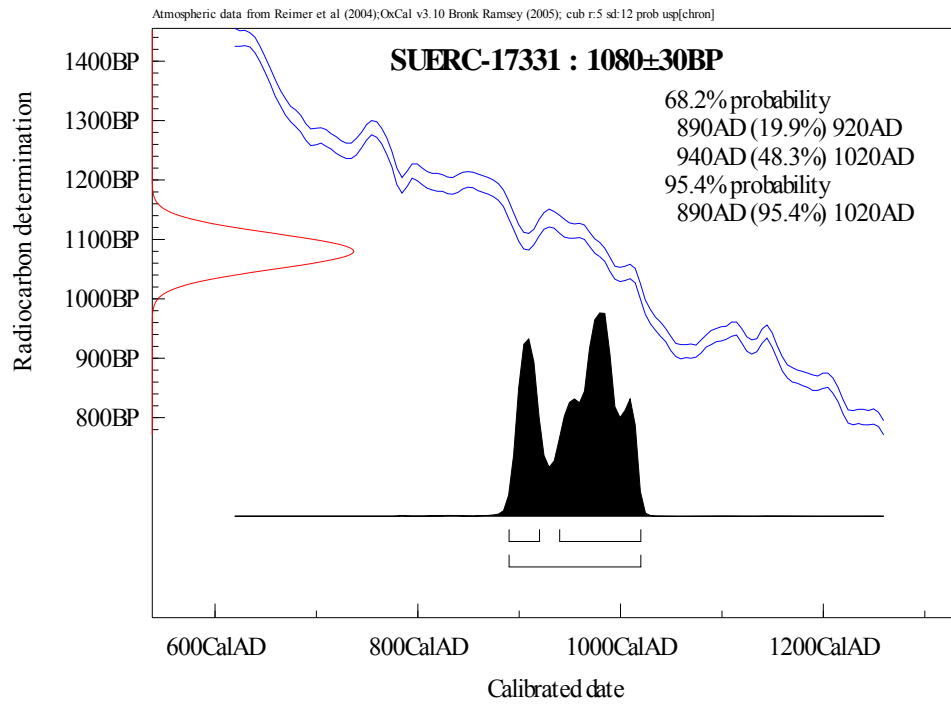


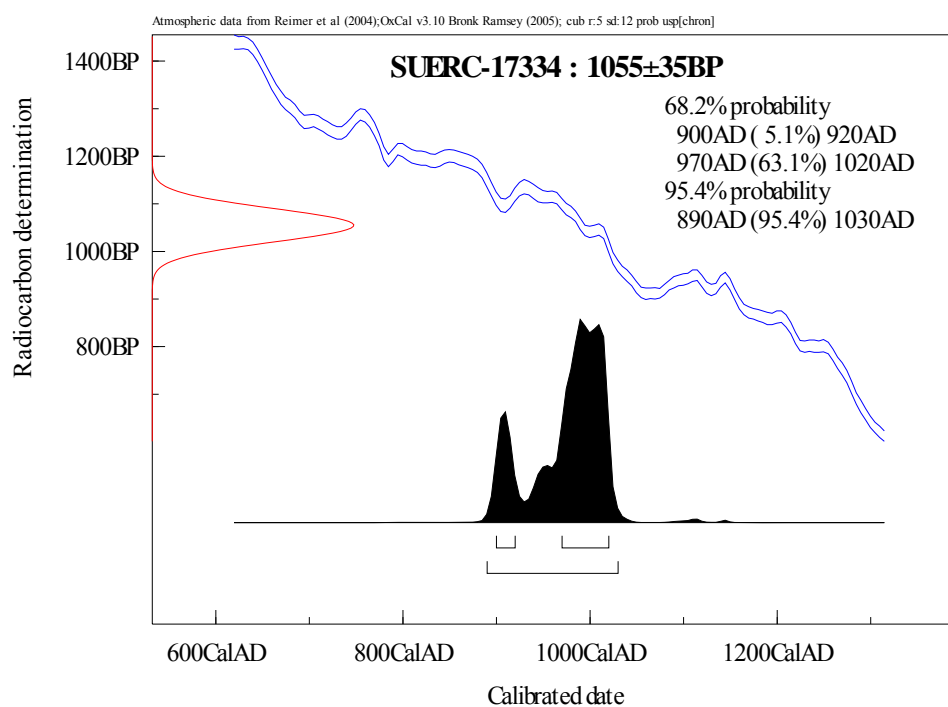
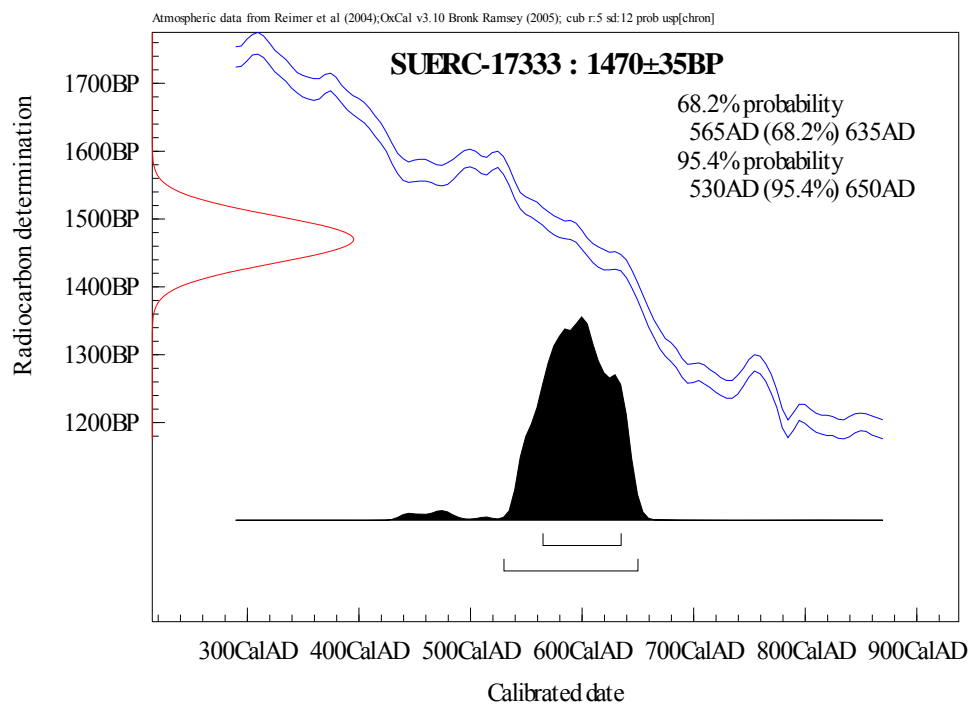


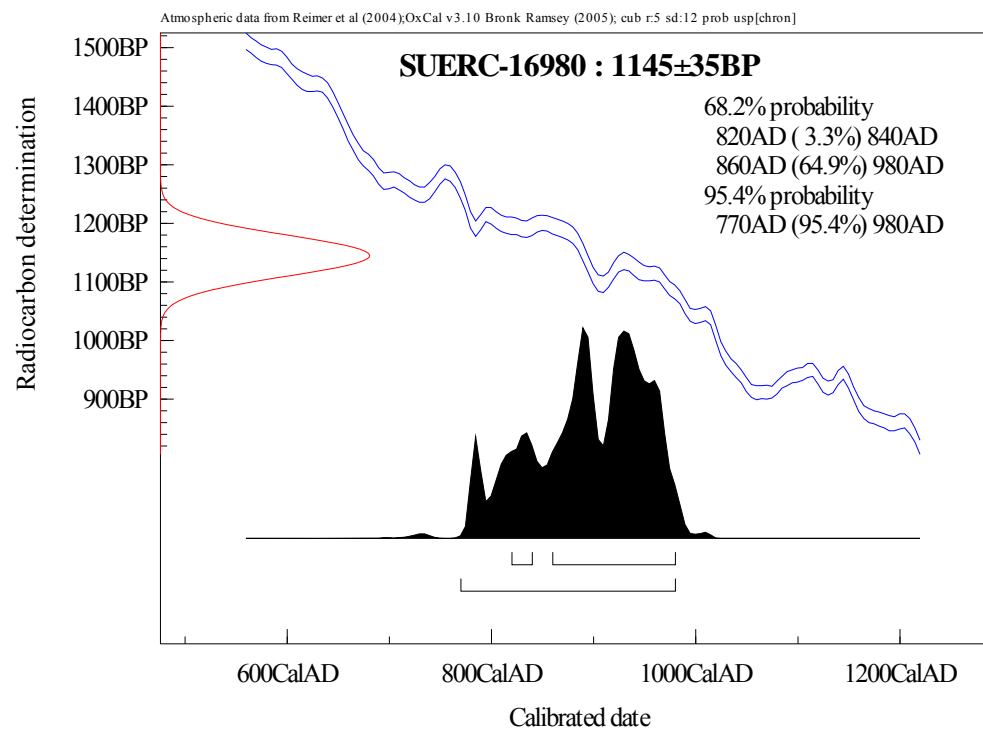
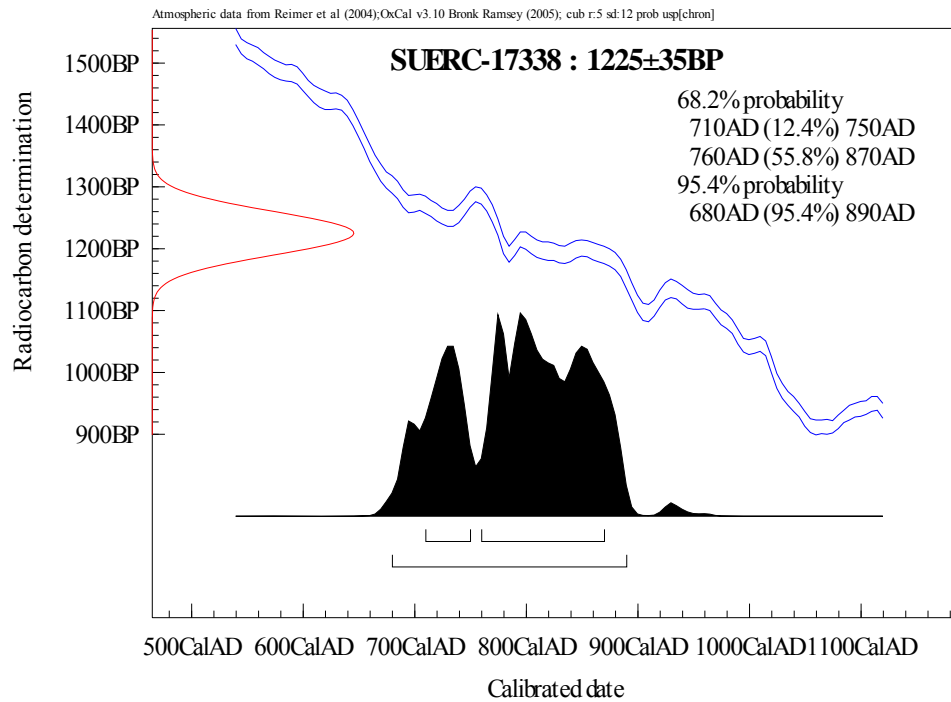


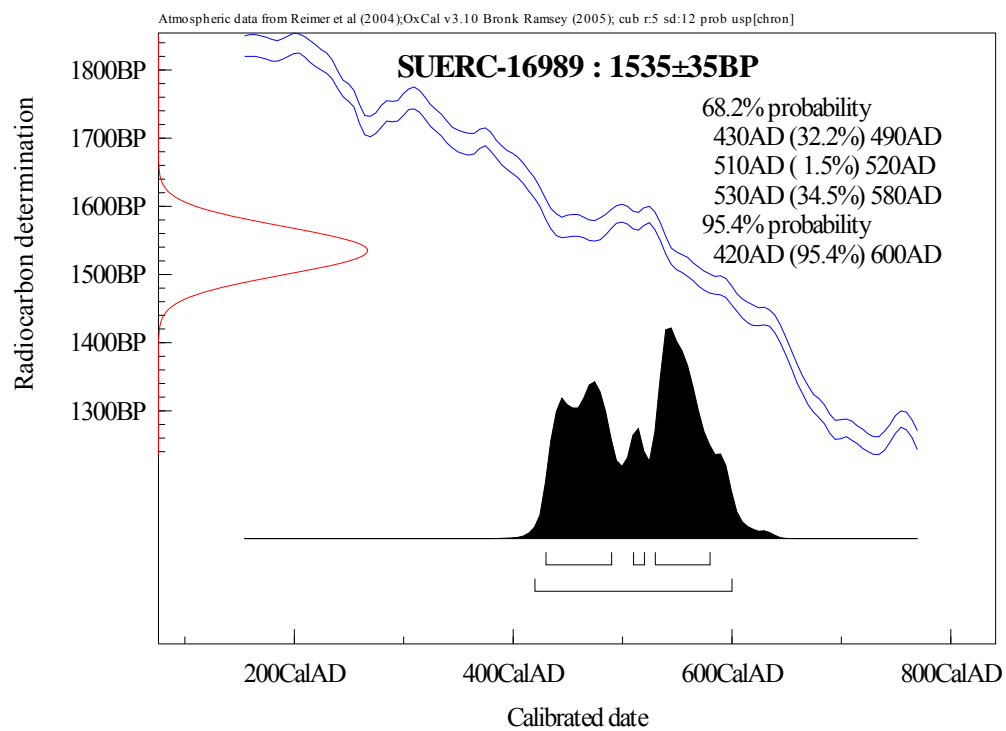
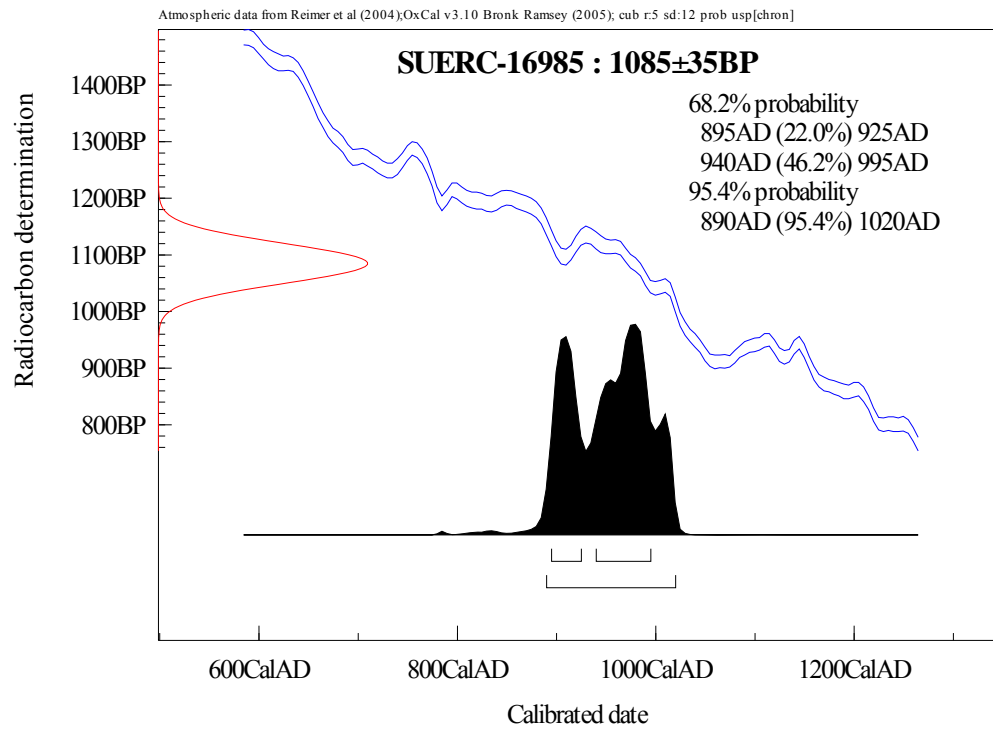


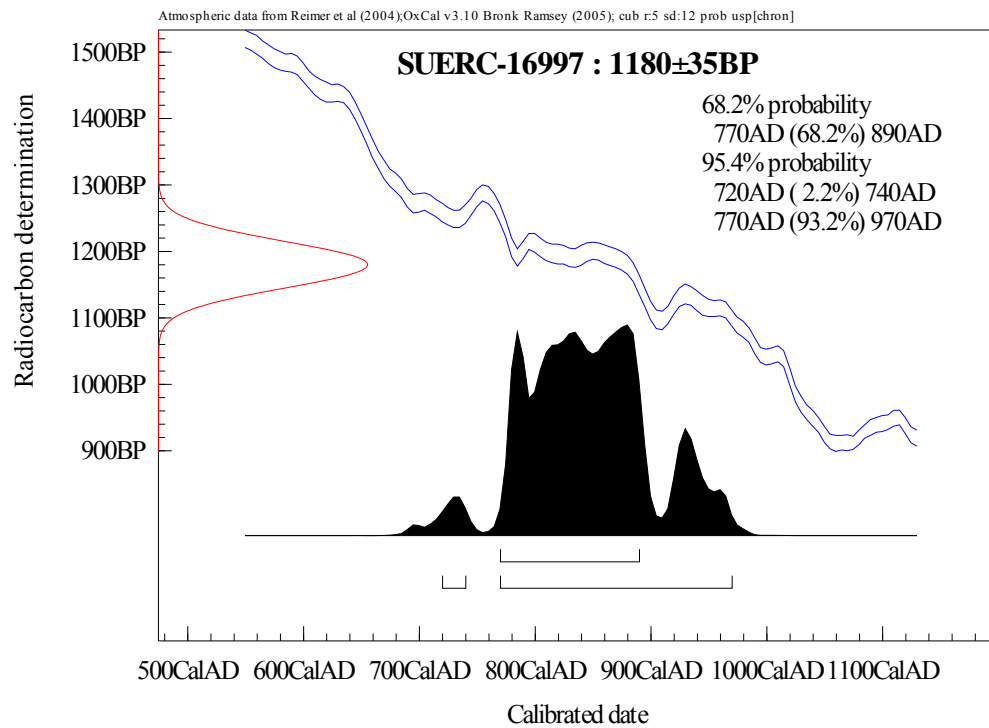
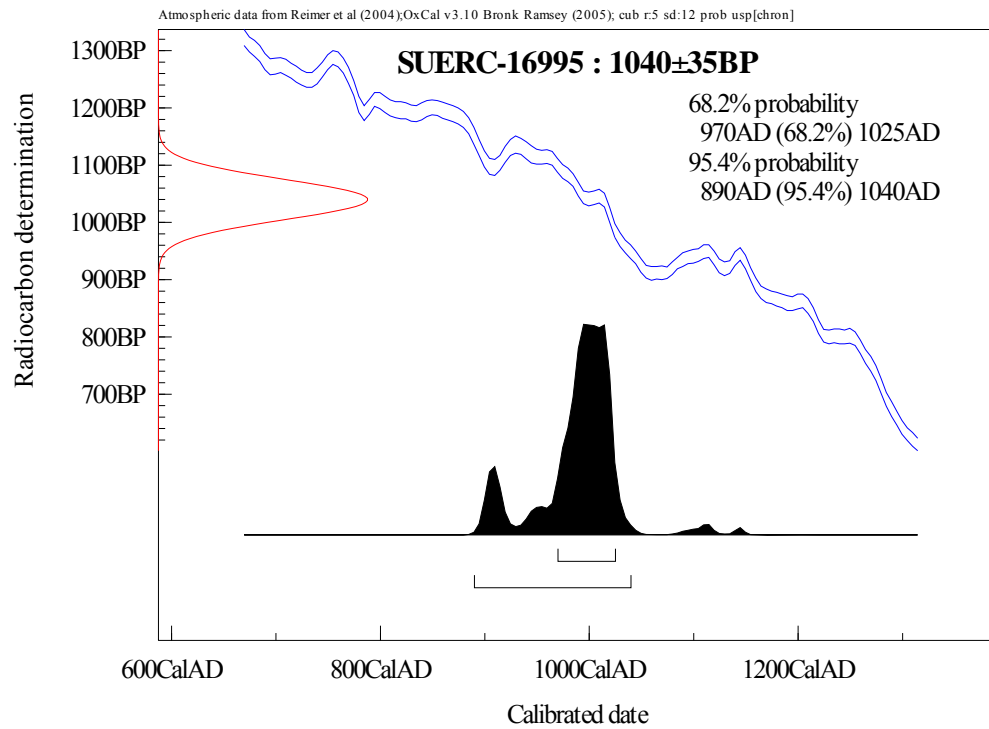












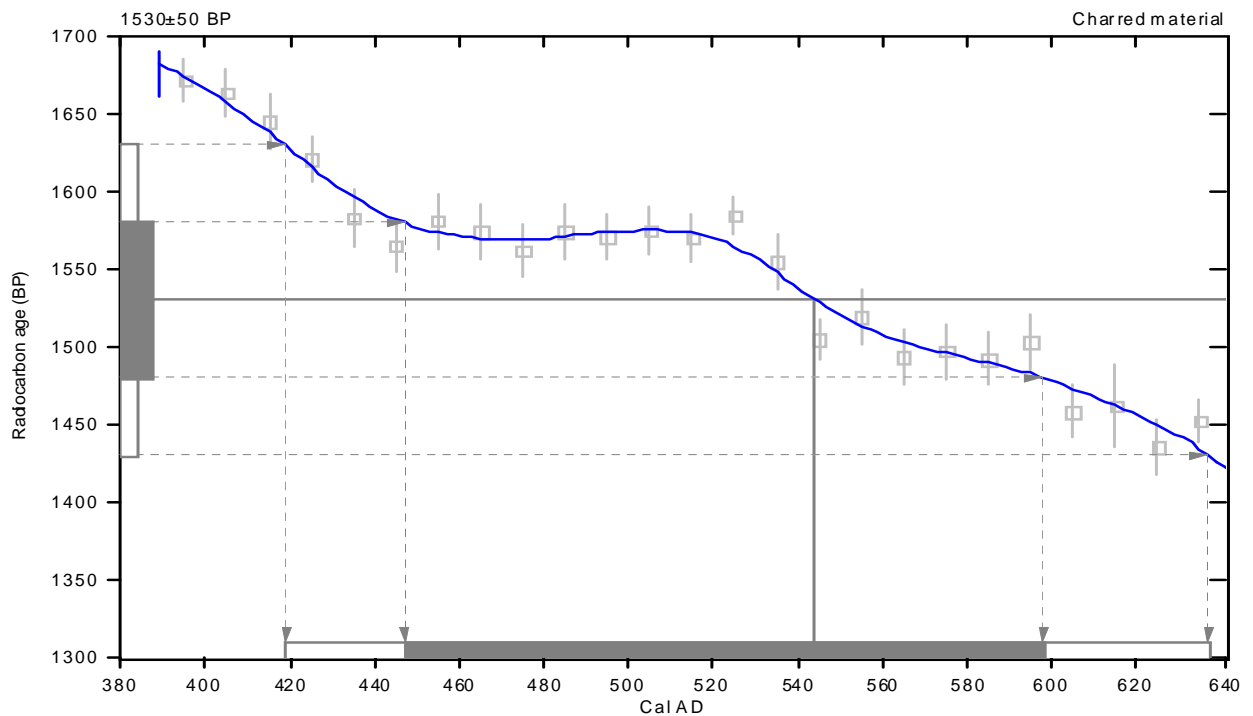
Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 218638 SAMPLE : A015/060:C123:S96 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 420 to 640 (Cal BP 1530 to 1310)	1550 +/- 50 BP	-26.5 o/oo	1530 +/- 50 BP
Beta - 218647 SAMPLE : A015/060:C317:S97 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 410 to 600 (Cal BP 1540 to 1350)	1500 +/- 40 BP	-21.6 o/oo	1560 +/- 40 BP
Beta - 218648 SAMPLE : A015/060:C342:S887 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 960 to 1220 (Cal BP 990 to 730)	990 +/- 70 BP	-26.3 o/oo	970 +/- 70 BP

## CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.5;lab. mult=1)

**Laboratory number: Beta-218638****Conventional radiocarbon age: 1530±50 BP****2 Sigma calibrated result: Cal AD 420 to 640 (Cal BP 1530 to 1310)**  
**(95% probability)**

Intercept data

Intercept of radiocarbon age  
with calibration curve: Cal AD 540 (Cal BP 1410)**1 Sigma calibrated result: Cal AD 450 to 600 (Cal BP 1500 to 1350)**  
**(68% probability)****References:****Database used**

INTCAL98

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

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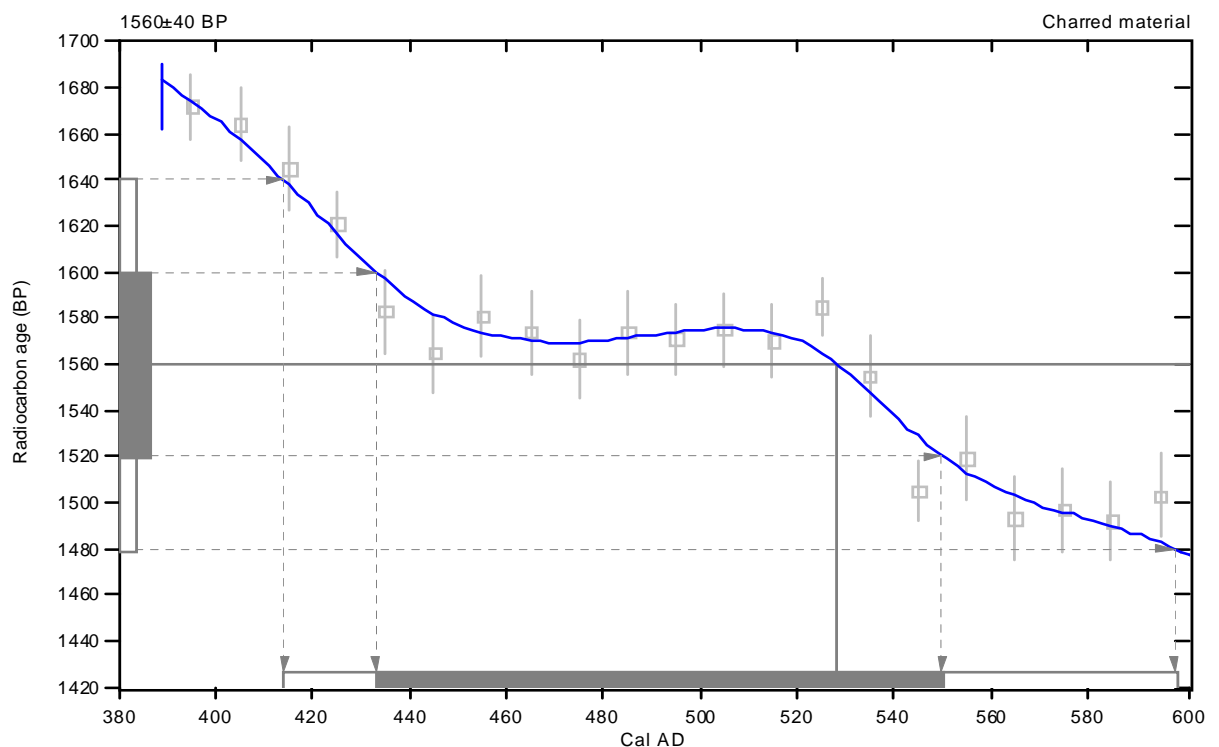


## CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.6;lab. mult=1)

**Laboratory number: Beta-218647****Conventional radiocarbon age: 1560±40 BP****2 Sigma calibrated result: Cal AD 410 to 600 (Cal BP 1540 to 1350)**  
**(95% probability)**

Intercept data

Intercept of radiocarbon age  
with calibration curve: Cal AD 530 (Cal BP 1420)**1 Sigma calibrated result: Cal AD 430 to 550 (Cal BP 1520 to 1400)**  
**(68% probability)**

## References:

*Database used*

INTCAL98

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

### Beta Analytic Radiocarbon Dating Laboratory

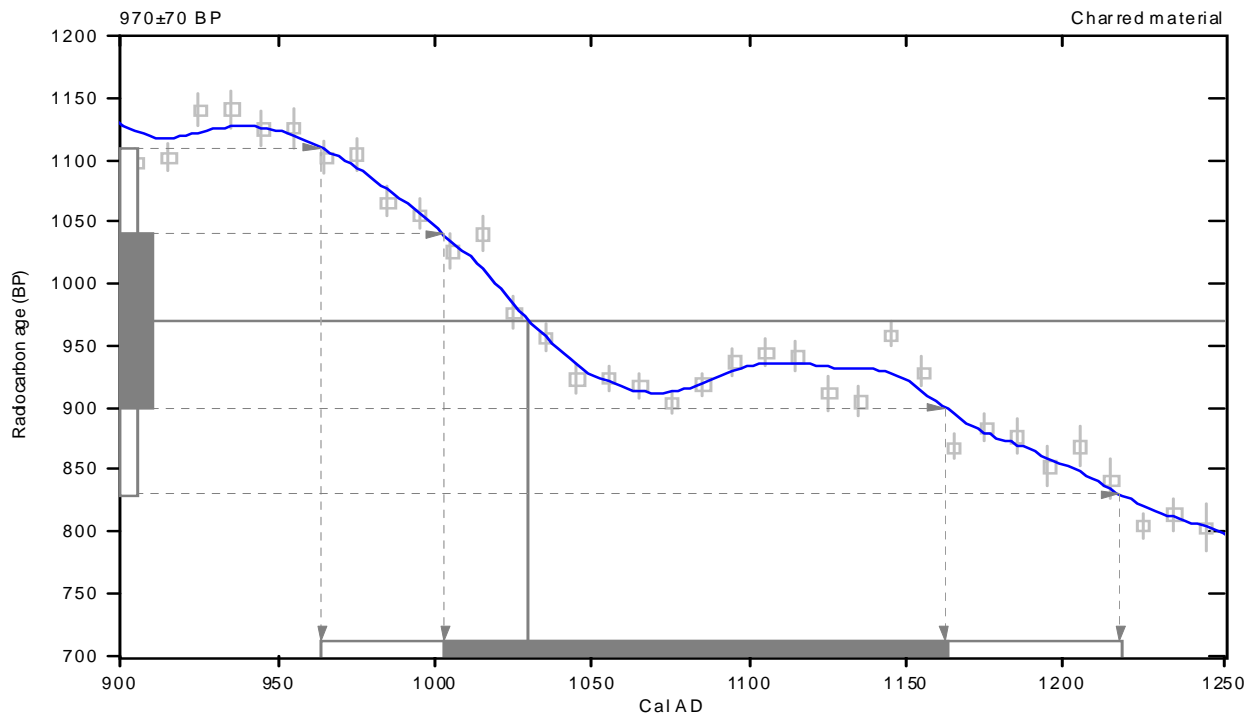
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

## CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.3:lab. mult=1)

**Laboratory number: Beta-218648****Conventional radiocarbon age: 970±70 BP****2 Sigma calibrated result: Cal AD 960 to 1220 (Cal BP 990 to 730)**  
**(95% probability)**

Intercept data

Intercept of radiocarbon age  
with calibration curve: Cal AD 1030 (Cal BP 920)**1 Sigma calibrated result: Cal AD 1000 to 1160 (Cal BP 950 to 790)**  
**(68% probability)****References:****Database used**

INTCAL98

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

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**Appendix 4 Animal Bone Analysis**

**05\_09  
M7 Portlaoise to Castletown /  
M8 Portlaoise to Cullahill Motorway Scheme Project**

**Animal Bone Analysis Report from Parknahown 5, Co. Laois**

**(A015/60, E2170)**

**June 2008**

**By Claudia Tommasino**

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## Summary

This report presents the results of the analysis of the animal bones assemblage from the Parknahown 5 site (A015/60, E2170), excavated as part of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme Project during 2005.

The assemblage consists of 3877 countable fragments, and 382 non countable fragments, an assemblage size that allowed important interpretations to be drawn from diverse zooarchaeological analyses, using a similar methodology to the one employed by McCormick and Murray (2007).

Neolithic and Bronze Age features did not encompass enough zooarchaeological material to allow major interpretations to be done about animal husbandry from these periods. In any case, common species for both periods are present in Parknahown 5 including cattle, deer, sheep and horse.

The Early Medieval Period showed an extensive and intensive occupation of the site, producing a significant zooarchaeological assemblage. Although three different phases were identified within this period, only the Period II Phase 2 could be independently analyzed from the rest of the assemblage. Therefore, two different levels of analyses were done on Early Medieval animal bones: first, the analysis of the Early Medieval assemblage as a whole and second the separate analysis of the Early Medieval Phase 2 (600-800 AD).

Essentially, both levels of analysis resulted in a general trend very similar to the characteristics found in other Early Medieval sites from Ireland, where cattle, pig and sheep are by far the dominant species, followed by horse, dog, deer and cat. Birds, especially domestic fowl are incidental. A slight but important change on cattle and sheep's frequencies are observable between the two levels of analysis, a shift that has been reported for other Early Medieval sites from Ireland.

Cattle and sheep were bred and exploited with diverse uses such as meat, milk, labour and wool. The former is more common in earlier stages, while the latter's frequency is incremented during the phase 2 of this period. This is interpreted as a change in the importance of cattle as wealth and an increase of the value of some sheep product. Pigs were mainly kept for their meat; while deer were hunted mostly to obtain their antler to be used as raw material for tools and other objects. Horses, even if some occasional consumption of their meat could have been taken place, were used for riding and labour, and represented highly valuable animals. Dogs and cats did not represent important species

in the subsistence of the site, although the exploitation of cats for their pelts is practiced to a certain extent. Poultry and wild species were not considerably exploited on the site.

Parknahown 5 shows significant similarities with Early Christian Knowth (McCormick and Murray, 2007) and could be interpreted as a site with high-status characteristics, where changes from mainly rural husbandry practices to urban-related economical activities were taking place around the 600-800 AD.

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**05-09 Parknahown 5 (A015/60, E2170)****Animal Bone Analysis Report****Claudia Tommasino****June 2008****1. Introduction**

The excavation of Parknahown 5 (A015/60, E2170) was done as part of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme Project in July 2005 and lasted for 6 months. The site incorporates a great variety of archaeological features including a double ditched enclosure which cuts an earlier enclosure, a burial ground with a minimum of 425 individuals and domestic and industrial areas, amongst others. The stratigraphy of the site suggests an early occupation during the Neolithic and Bronze Age; a later one in the Medieval period, specifically Early Medieval; and a final Post-Medieval occupation. Radiocarbon dates support this occupation sequence with dates from 2470-2200 BC until 720-980 AD (Oxcal Calibrated Dates. Suerc Laboratory. Glasgow, Scotland).

The analysis of the animal bones retrieved in Parknahown 5 allowed the identification of 3901 countable fragments. The mammal assemblage incorporates cattle (*Bos taurus*), sheep (*Ovis aries*), pig (*Sus sp.*), horse (*Equus caballus*), dog (*Canis familiaris*), deer (*Cervus/Dama*, *Cervus elaphus* and *Capreolus capreolus*). The bird presence in the assemblage was limited, but included some domestic fowl (*Gallus gallus*) and wild birds.

**2. Methodology and analyses****Identification and quantification**

The general methodology applied for the recording and analysis of this assemblage followed the one described by McCormick and Murray (2007). It seeks to prevent the overestimation of the assemblage proportion through a selective approach that would produce NISP (Number of Identifiable Specimens). Therefore, fragments were divided into three categories: 'countable', 'low grade' and 'non-countable'. Fragments where at least 50% of the diagnostic area is present would be countable. The criteria for countable fragments are as follows:

- 
- Long bones and metapodials with one or both epiphyses or metaphyses present in at least 50%.
  - Mandible if at least one of the teeth or alveolus of the dp4-P4/M3 row is present.
  - Scapula whenever the glenoid articulation is present.
  - Ulna if the olecranon process is present.
  - Astragalus if the distal end is present.
  - Calcaneum whenever the sustentaculum is present.
  - Pelvis whenever the ischial or ilial sections of the acetabulum are present.
  - Cranium only if the zygomatic arch or three or more teeth or alveolus of the dp4-P4/M3 row are present.
  - Every loose tooth if occlusal surface is present.
  - Axial carcass only axis and atlas (whenever more than 50% is present).
  - Horn cores and antler if a complete transverse section is present.

On the other hand, ‘non countable’ elements are those which could provide some kind of important information relating pathology, taphonomy or bone work (like pig fibula) but less than 50% of the diagnostic zone is present. Ribs and vertebrae were recorded as non countable, to keep track of the usage or waste patterns in the site, but were not included in the TNF (Total Number of Fragments) or analyses.

Finally, fragments that did not fit into the aforementioned criteria were considered as ‘low grade’. This also included pig and horse lateral metapodials and carpals and tarsals (except carpal 3 and the scaphoid).

‘Countable’ and ‘non-countable’ fragments were recorded in two different forms in one electronic database (in Microsoft Office Access 2003) including information such as: context, species, skeletal element, side, condition, state of fusion, taphonomy, pathology, measurements, ageing, dental wear and observations. The ‘non-countable’ form emphasized aspects including taphonomy, pathology and observations.

Skeletal element, species and laterality were assessed for ‘countable’ and ‘non-countable’ fragments according to the criteria reported by Schmidt (1972), Cornwall (1974), Hillson (1995), and Davis (1987). The few bird bones encountered were identified using Cohen and Serjeantson (1996). The differentiation between sheep and goat was done using criteria mentioned in Boessneck (1969). But no goat fragments were identified in the assemblage. Skeletal elements are expressed in tables and figures by their abbreviation or codes, shown in Appendix table 1.

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For analytical purposes, skeletal elements are divided in four parts of the skeleton: head (skull, mandible); axial carcass (vertebrae); meaty bones (scapulae, pelvis and its respective limb); and feet (metapodials, phalanges and carpals/tarsals). Due to their high preservation, teeth are excluded from this analysis to prevent the overrepresentation of head elements.

Quantification of the assemblage was done by NISP (Number of Identifiable Specimen) and MNI (Minimum Number of Individuals). The first was calculated as the total of fragments attributed to a specific taxon (Grayson, 1984; O'Connor, 2004; Reitz and Wing, 1999). MNI was calculated dividing each element found in pairs in the animal carcass by its laterality, not taking into account loose teeth. Then, MNI is the higher count of one of the elements, either the right or the left side (Grayson, 1984; O'Connor, 2004). NISP and MNI are calculated only with countable fragments.

Survival rates were also calculated for some species following Brain (1969).

### **Ageing**

The ages of the individuals were established by the epiphysial fusion and the dental development or wear stage.

The epiphysial fusion assessment was done using the categories of fused, unfused or fusing for metaphyses, epiphyses or metaphyses and epiphyses. Later on, Silver (1969) and Reitz and Wing (1999) provided the information for assigning chronological age for horses, cattle, sheep, pig, dog and deer, while cat epiphyseal fusion was assessed using Habermehl (1961) and Smith (1969). Cohen and Serjeantson (1996) provided the information for assigning relative age to bird specimens. Survival curves were done consequently using this data grouped into categories or age ranges. The percentage of fused epiphyses corresponding to each group was plotted to produce a curve that expresses the percentage of individuals that survived a given age in a given species.

The eruption and tooth wear were recorded using the method described by Grant (1982) for cattle and pigs and Payne (1973; 1987) for sheep. Consequently, Higham wear stages were assigned only for mandibles and mandibular loose M3 (except when in eruption or not in wear) (Higham, 1967). For horses, on the other hand, both upper and lower incisor rows were assessed as described in Shippen Huidekoper (1982). This analysis allowed the creation of mortality curves using the percentages of individuals that died at the same age stage (expressed in months) and plotting the data into a curve that would express the tendencies in killing patterns for each species.



It is relevant to mention that both survival and mortality curves could only be done in those species which presented a NISP that would ensure a certain degree of reliability of the analysis.

### **Sex determination**

Two methods for assessing sex were applied for two species. The measurement of the distal breadth of metacarpals was used for cattle following the criteria explained by McCormick (1997). Root morphology of canines was evaluated for pig sexing, according to Schmidt (1972) and McCormick (1997). The slenderness index method as described by McCormick (1992) could not be done due to lack of sufficient data.

### **2.4 Taphonomy**

The recognition of any taphonomic factors such as gnawing, burning and butchery marks in the bones was dealt mostly according to Lyman (1994).

Gnawing was classified according to the agent that produced it: carnivore, rodent or/and insect. Burning was assessed by three categories: singed or partially burnt, calcined and burnt/blackened (whenever 90-100% of the bone was affected). Finally, butchery marks were assessed as: sawn, chopped and/or cut.

Meat value calculations were applied for cattle, sheep and pig using the estimated carcass weight and the MNI for each species, as described in McCormick and Murray (2007).

### **2.5 Pathology**

Pathological modifications were recorded in detail and assessed by their effects on the bones, using the criteria of Baker and Brothwell (1980), Fox (1939), Baker (1970) and Siegel (1976). Pictures were taken on occasions where a particular feature would require special attention.

### **2.6 Measurements and osteometry**

Whenever possible, fused specimens were measured following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).

After measurements were taken in suitable fragments, withers heights were calculated for each species according to the factors found in Von Den Driesch and Boessneck (1979). Moreover, bivariate plots were made, whenever possible, using two variables of a same element for a certain species to show size variability within the assemblage. Finally, the log ratio method was used to obtain an overview of the size of cattle population, using length measurements of long bones, following McCormick and Murray (2007).

### 3. Analyses and results

#### Summary of findings: Assemblage Overview

##### Identification and quantification

The animal bone assemblage from Parknahown 5 encompasses 3877 countable fragments and 382 fragments were recorded as non countable. Most of the countable fragments were found in good or fair condition (see Figure 1). Only 8% were poorly preserved due to severe effects of wear and fragmentation. This good-fair preservation of the countable fragments follows the trend of the whole assemblage.

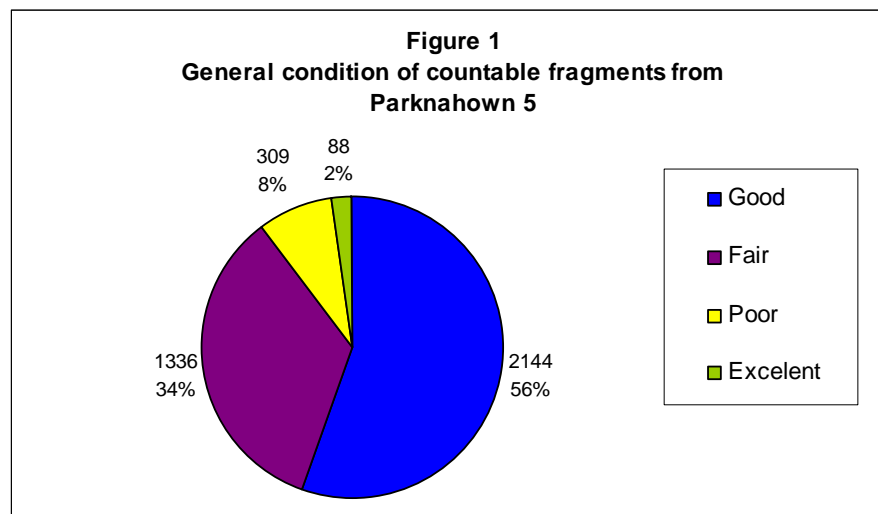
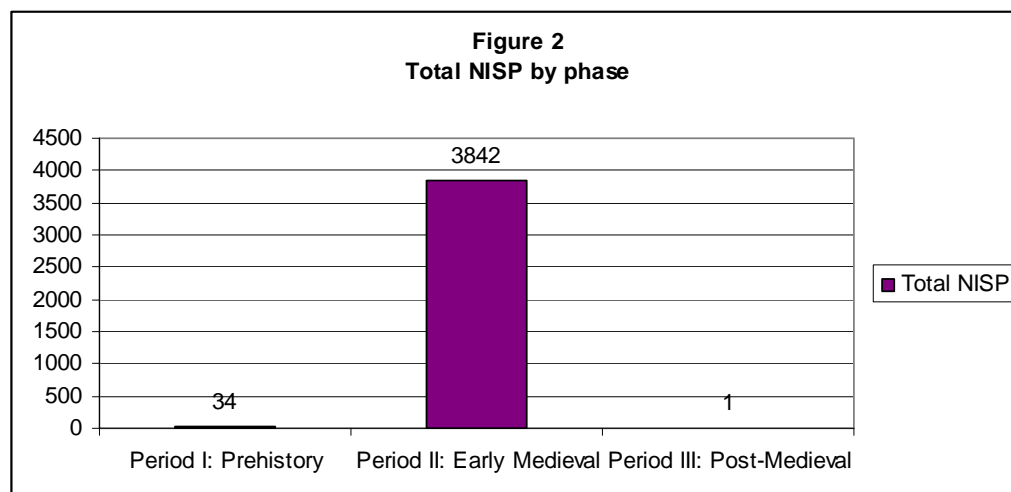
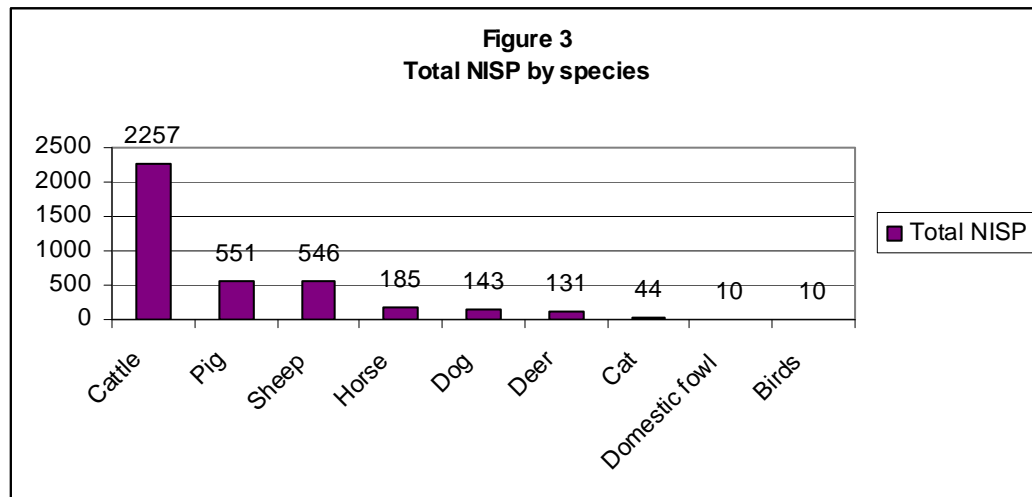


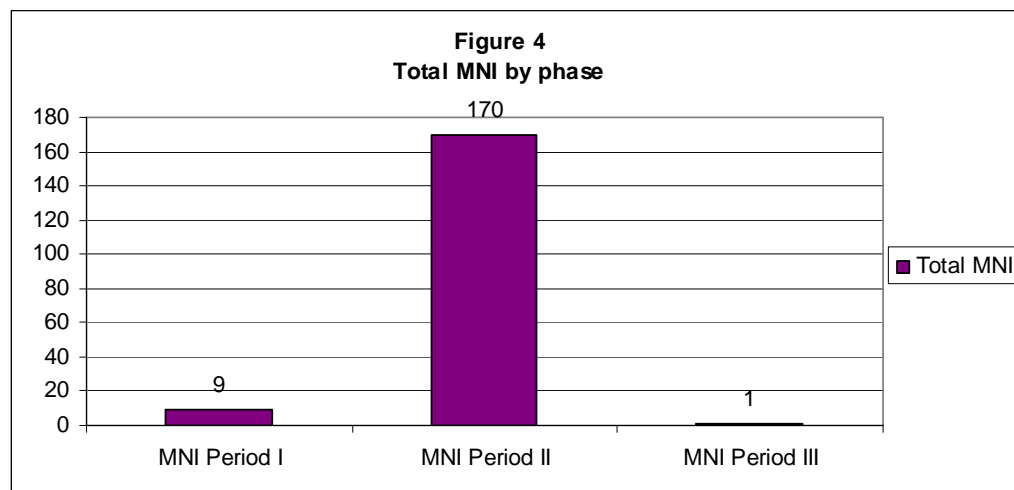
Figure 2 shows the distribution of NISP by phase. Prehistoric and Post-Medieval periods only represent 0.9% of the total specimens recorded, while the vast majority of the fragments come from Early Medieval features (99.1%).



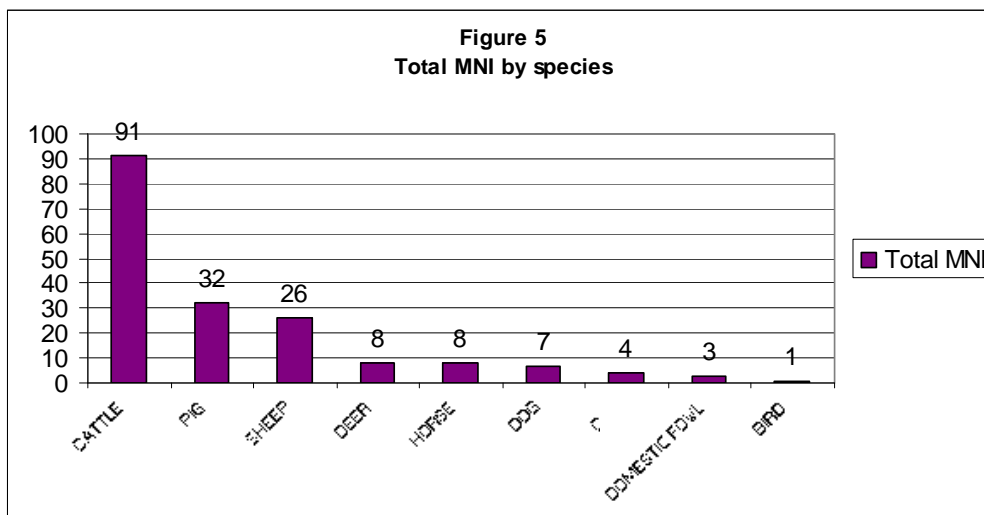
Taxa representation of the site, demonstrated in figure 3, shows the clear dominance of cattle (58.2%), pig (14.2%) and sheep (14.1%) over the rest of the species. Horse (4.8%), dog (3.7%), deer (3.4%) and cat (1.1%) make up the rest of the mammal species on the site, while only 0.6% of the assemblage represents birds (domestic fowl and other unidentified birds).



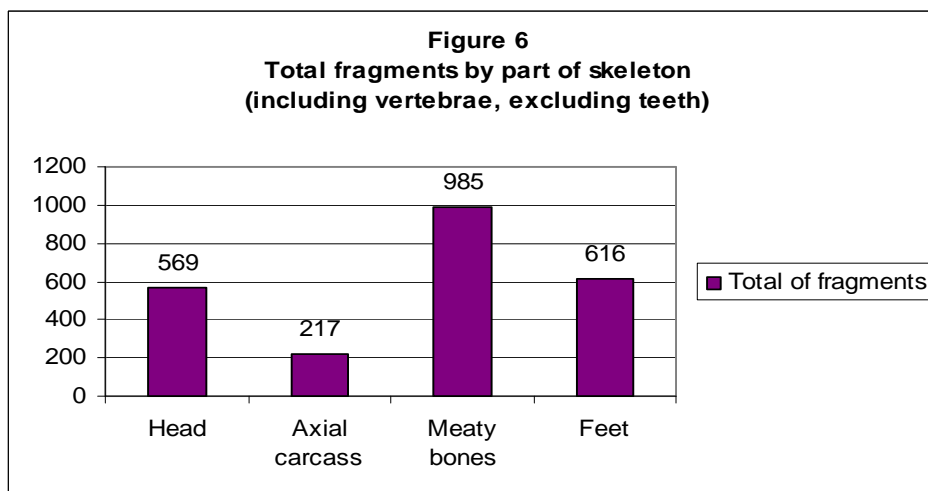
A total of 171 MNI was identified in Parknahown 5. The Early Medieval period (Period II) presents an evidently higher number of MNI (more than 94%) compared to the Prehistoric (Period I) or the Post-Medieval (Period III) periods, as shown in Figure 4.



The analysis of MNI by species, represented in Figure 5, reveal the same trend noticed in the quantification of NISP, where cattle (51.2%), pig (18.8%) and sheep (14.1%) are the prevailing species, followed by dog and horse (4.1% each), deer (3.5%), cat (2.4%) and birds (2.4%).

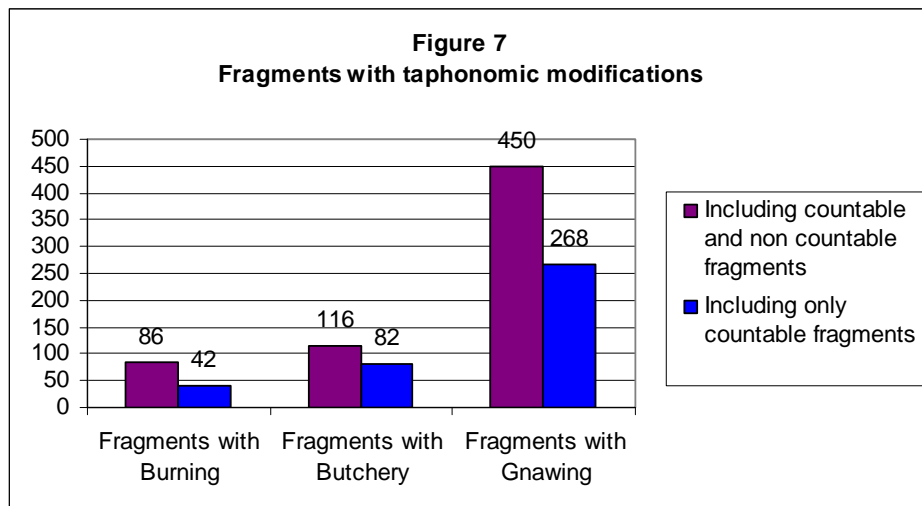


Skeletal elements representation, shown in detail in Appendix Table 2, reveals a significant presence of meaty bones (41.2%) and feet (25.8%), in contrast with head (23.8%) and axial elements (9%). Figure 6 represents these values, excluding teeth in the head category and including vertebrae in the axial carcass (fragments recorded as non countable).

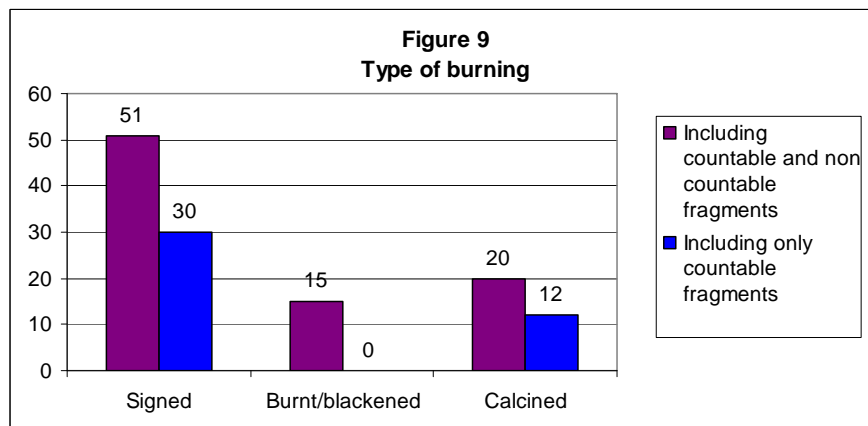


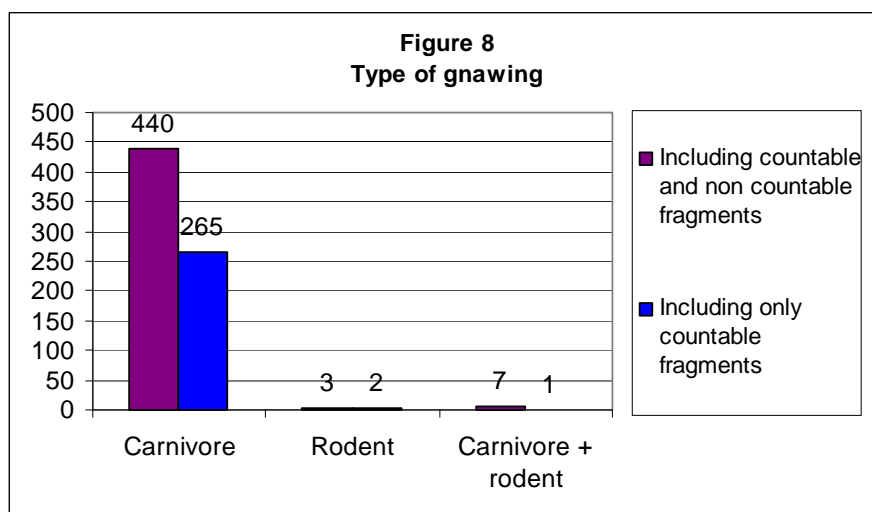
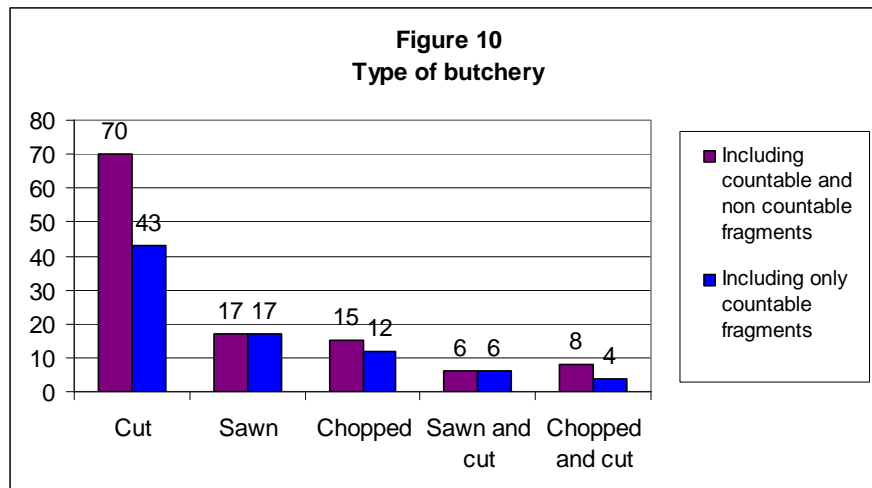
### Taphonomy

Regarding countable and non countable fragments, gnawing is the most common taphonomic modification (up to 10.6% of the assemblage), followed by butchery (2.7%) and burning (2%), as shown in Appendix table 3. Therefore, this tendency expressed in figure 7, is representative of the whole site. Cattle and sheep are the two species with more taphonomic modifications (59.4% and 19.4% respectively), although deer presents a high recurrence of butchery marks (9.4%). Appendix Table 4 states in detail the presence of taphonomic modifications by species.



Gnawing found in Parknahown 5 was a result of carnivores (98.1%) and rodents (0.6%), as shown in figure 8. Figure 9 illustrates the type of burning present in the assemblage, demonstrating that singed burning is the most recurrent (63.2%), although calcined (25%) has an important presence in both countable and non countable fragments. Finally, cuts are the most frequent butchery marks (57%), while sawn (17.1%) and chopped (13.6%) are less common. Combined butchery marks are found in only a few cases (12.1%), as expressed in figure 10.

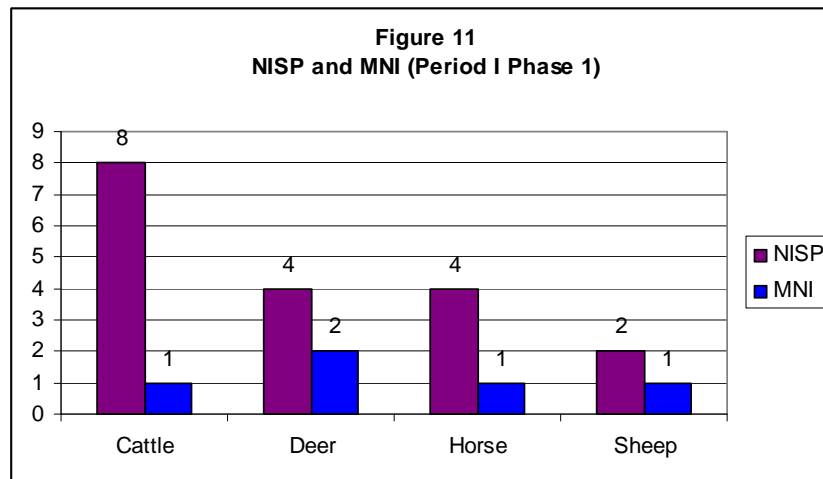




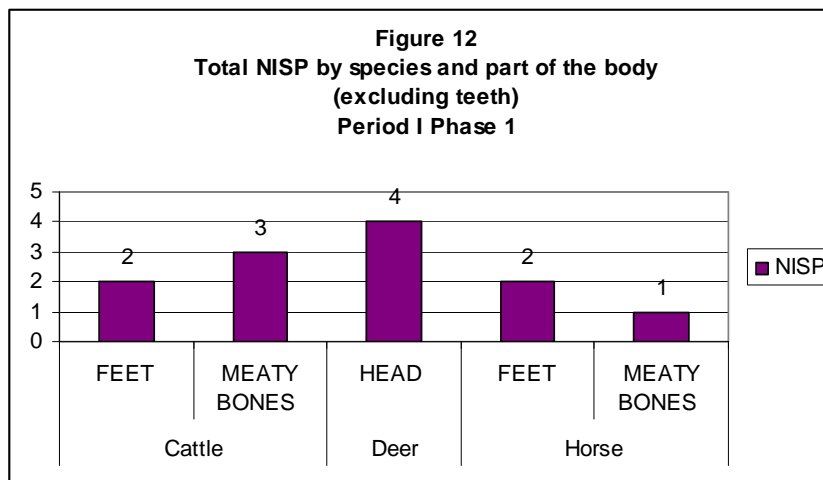
## Period I Phase 1: Neolithic

### Identification and quantification

The countable fragments of animal bone found in Neolithic features at Parknahown 5 encompass 18 NISP and 5 MNI. The four species present for this period are cattle, deer, horse and sheep. Cattle represent the more common species when quantified by NISP (44.4%), and deer is more frequent according to MNI (40%). Within the deer specimens, 2 fragments could be identified as red deer. Sheep is only represented by loose teeth. Figure 11 shows NISP and MNI distribution by species, while Appendix table 5 detailed the total number of specimen by species, skeletal element and side.



Regarding the presence of parts of the carcass, Appendix Table 6 and Figure 12 demonstrate that cattle and horse are represented by meaty and feet bones, while deer only by head elements.



### Ageing

Appendix Table 7 shows the tooth wear stages (Grant, 1982) in loose mandibular teeth and Mandible Wear Stages for M3 (Higham, 1967) by species from Period I Phase 1. Unfortunately, only one specimen could be aged using Higham's method, corresponding to a mature sheep.

According to epiphyses fusion (Reitz and Wing, 1999), expressed in Appendix Table 8, four cattle and one horse could be aged. One cattle specimen lived for a minimum of 42 months, while two other died older than 12-18 months.

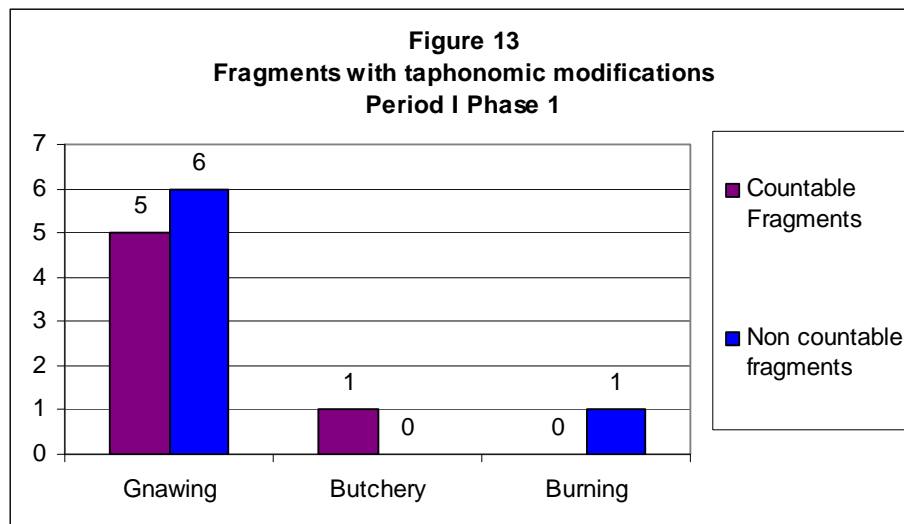
Due to lack of sufficient information, no survival or mortality curves could be done for any species of this phase.

### Sexing

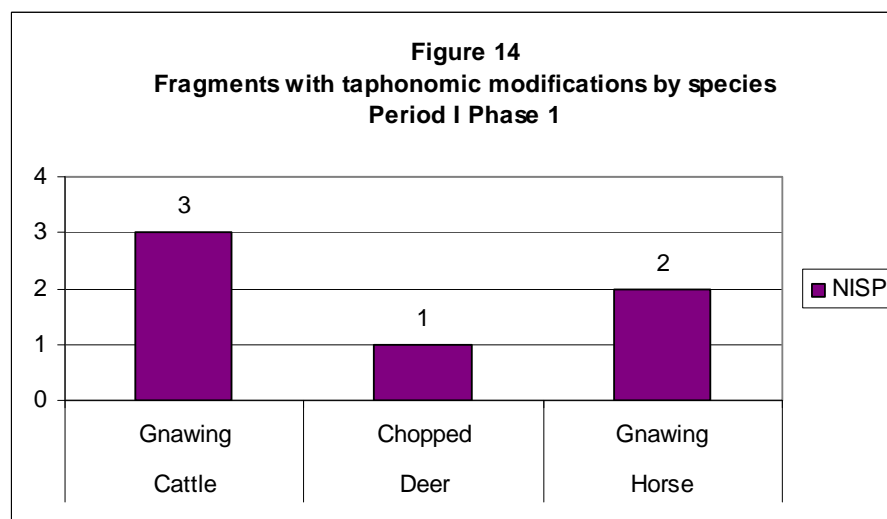
No sexing of cattle specimens could be done for the Neolithic assemblage.

## Taphonomy

The 27 fragments in the Neolithic features (including countable and non-countable fragments) were mostly affected by gnawing of carnivores (40.7%). Only two specimens, as shown in Figure 13, were butchered or burnt.



Only taking into account countable fragments, out of 18 specimens, 6 (33.3%) were taphonomically modified (Appendix Table 9). As mentioned before, gnawing by carnivores is the most common (83.3%) while chopping was observable in only one specimen of a deer.



## Pathology

No pathological specimens were found in the Neolithic features of Parknahown 5.



### Measurements and osteometry

Three specimens from Neolithic features were measured, and their details are presented in Appendix Table 10. This data was not sufficient to carry out any reliable analysis on specimen size.

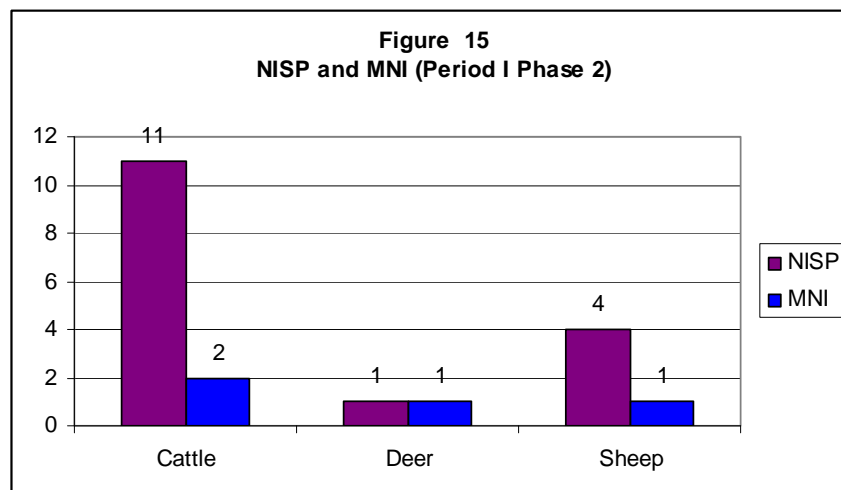
### Livestock economy

It is difficult to make any indisputable affirmations regarding the husbandry or livestock economy of the Period I Phase 1 of Parknahown 5. Overall, the animal bone from the Neolithic is most likely to be food waste and consumption (Davis, 1987), especially regarding non-young cattle specimens and sheep. Deer, on the other hand, does not seem to have been consumed, but their antler could have been collected and used as raw material for tools or other objects.

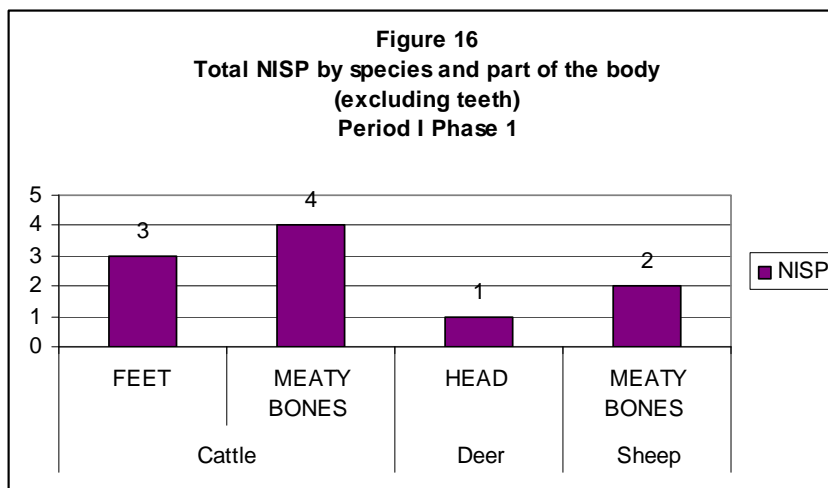
### Period I Phase 2: Bronze Age

#### Identification and quantification

The Bronze Age assemblage from Parknahown 5 consists of 16 NISP and 4 MNI. The most common species is cattle with a NISP of 11 (68.7%) and MNI (2), followed by sheep (25%) and deer (6.25%). Figure 15 shows the values for NISP and MNI for the Bronze Age of Parknahown 5, as Appendix Table 11.



Skeletal representation is detailed in Appendix Table 11 and 12. Cattle are highly represented by meaty bones and feet, while sheep is only characterised by meaty bones. As in the Neolithic, deer is only represented by antler.



### Ageing

No Bronze Age specimen's age could be assessed using Higham's Mandible Wear Stages. Nonetheless, Appendix Table 13 details the Tooth Wear Stages (Grant, 1982) in loose mandibular teeth.

Appendix Table 14 specifies the epiphyseal fusion information for Bronze Age specimens, including 7 cattle and 2 sheep. No unfused or fusing epiphyses were observed in the assemblage, therefore it is difficult to assess maximum age for most fragments. However, it is possible to affirm that most of them survived their infant phase and at least two cattle specimens were adults at the time of death (>33 months old) (Reitz and Wing, 1999).

No survival or mortality curves could be done for any species of this phase.

### Sexing

Sexing in cattle assemblage of Bronze Age Parknahown 5 could not be assessed due to the lack of metacarpals.

### Taphonomy

No taphonomic modifications were observable in the Bronze Age specimens from Parknahown 5.

### Pathology

No pathological specimens were found in the Bronze Age assemblage in the site.

### Measurements and osteometry

Appendix Table 15 shows all the measurements taken in two cattle and one sheep specimens from the Bronze Age. These measurements are not sufficient to carry out any analysis concerning size of animals.

### **Livestock economy**

As for Period I Phase 1, it is difficult to make a definite statement regarding the husbandry practices of the Bronze Age of Parknahown 5. The presence of cattle and sheep, especially meaty and feet bones, can be read as evidence of food consumption and waste. Furthermore, the presence of adult cattle might be an indicator of the usage of these species as a meat source and probably some other secondary uses (Davis, 1987; Hambleton, 1999). On the contrary deer, as in the Neolithic phase, seem more related to antler exploitation than to meat consumption.

### **Period II: Early Medieval**

Three phases were identified in the Early Medieval assemblage from Parknahown 5:

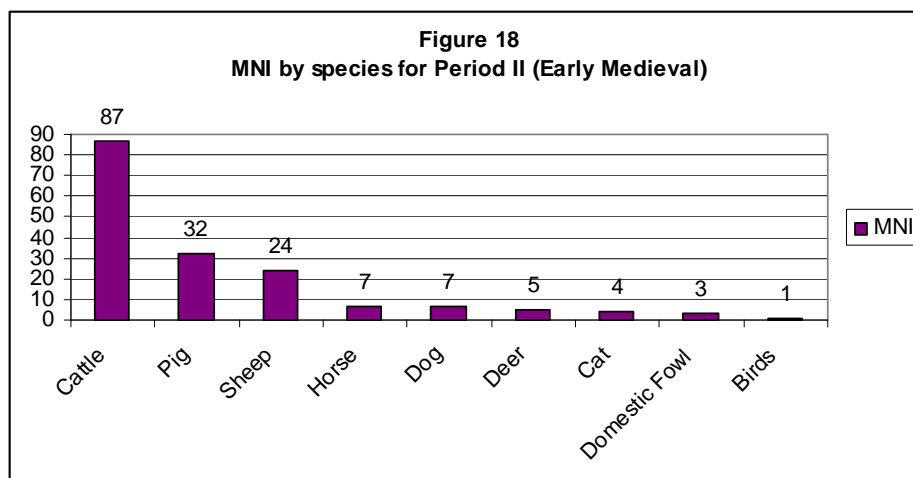
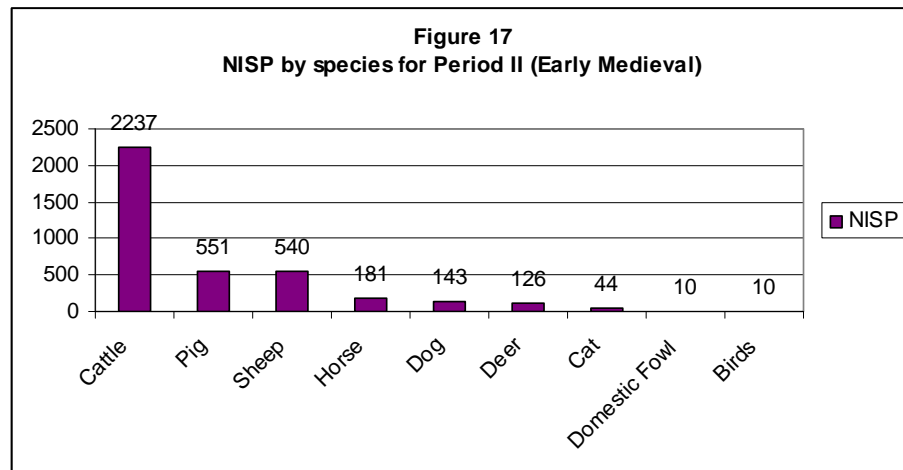
Period II Phase 1: 400-650 AD

Period II Phase 2: 650-850 AD

Period II Phase 3: 850-1300 AD

Only 35% of Early Medieval features could not be given a definite phase and were identified as Period II Phase 1-3. As a consequence, analysis of all 117 Period II (Early Medieval) features will be done by species. Afterwards features that could be related to a specific phase (phases 1 or 2 since no feature was determined as phase 3) will be analysed independently to determine whether these assemblages follow the same animal husbandry practice identified for the general Early Medieval period.

On the whole, Early Medieval features, is the most numerous period of the site (NISP: 3842, 99.1%). Cattle were by far the most common species with 58.2% of NISP and 51.2% of MNI. Pig and sheep are the second and third most important species with close to 14% of NISP and between 14 and 17% of MNI. Horse (4.7%), dog (3.7%), deer (3.3%) and cat (1.1%) compliment the NISP of mammal assemblage of Early Medieval Parknahown 5. Twenty (0.6 % of NISP) domestic fowls and other birds are found. Details on NISP and MNI are expressed in Figures 17 and 18 and Appendix Table 16.



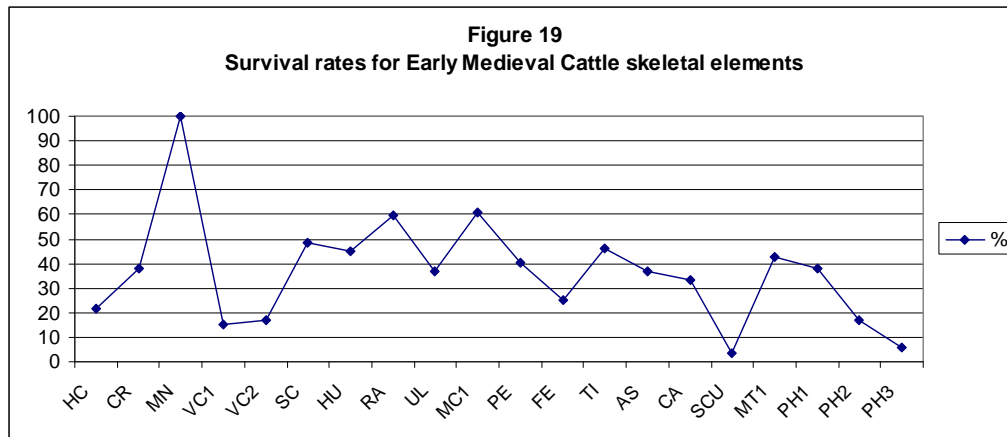
## Early Medieval Cattle

### Identification and quantification

As mentioned before, cattle from Early Medieval Parknahown 5 encompass a NISP of 2237 NISP (58.2% of total Period II NISP) and 87 MNI (51.2% of Early Medieval MNI). Appendix Table 17 states the total of specimens of cattle by element and side for Period II.

This high frequency of cattle might be closely related to the numerous uses and products they can provide, which make this species highly useful to be exploited, as meat, dairying, labour animals and/or leather.

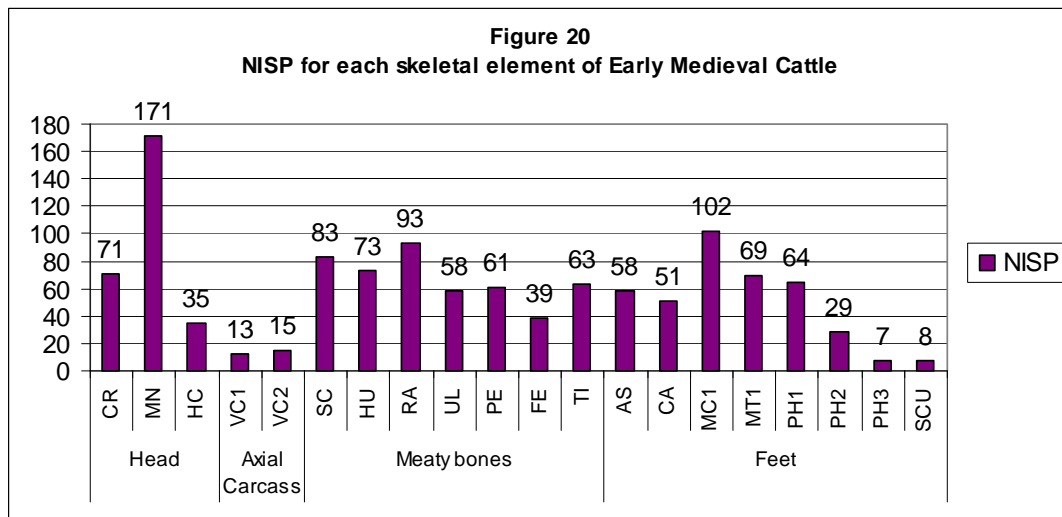
The survival rates for skeletal elements of Early Medieval cattle, illustrated in Figure 19, show a fairly typical distribution according to Brain (1969). Mandibles are by far the most frequent and better preserved element, followed by radius, metapodials and tarsals. These survival rates are closely related to taphonomy, but differences with the typical scheme might be influenced by the use of cattle by the inhabitants of the site.



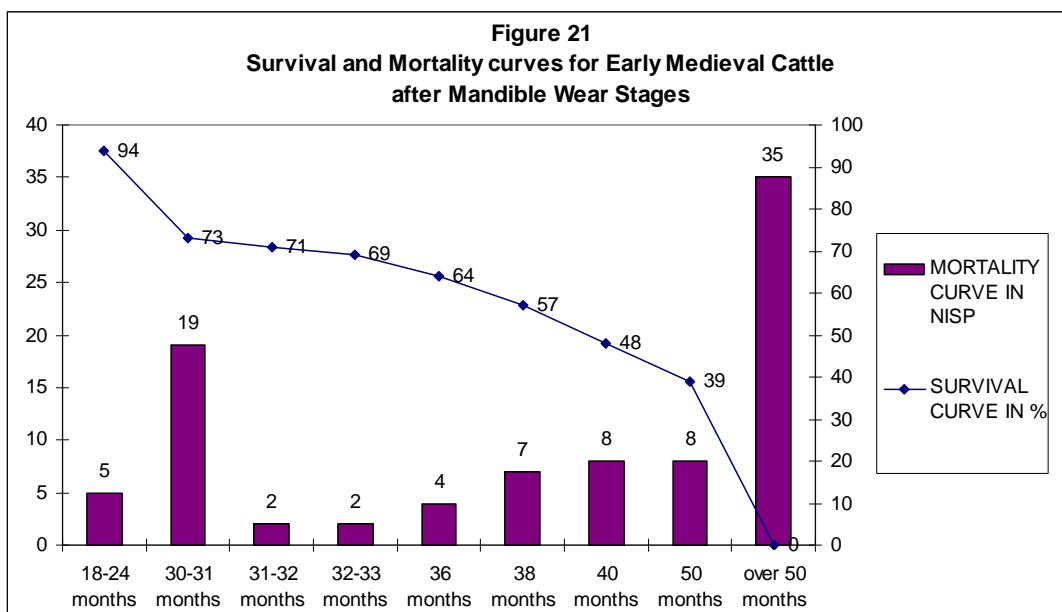
The presence of skeletal elements of cattle shows a distribution where meaty bones (40.4%) and feet (33.3%) are dominant. However, head (23.8%) and axial carcass (2.4%; only counting atlas and axis in the latter case) elements are not completely absent, as revealed in Figure 21. Furthermore, when analysing the presence of each skeletal element the obvious dominant elements are those for which preservation is known to be good. Thus, it is possible to affirm that the whole carcass of cattle was present to a lesser or greater degree (mostly dependable on preservation).

The slightly higher frequency of meaty bones could be related to the use of cattle as meat providers, although this does not appear to have been their only or main use. This trait is also evident on sites where the animals were slaughtered and consumed and bones discarded in the same area. Some slaughter in other areas and the transportation to the site of some skeletal elements could have been done (like meaty bones or feet), but does not seem to have been a regular practice.

Moreover, the identification of groups at the moment of recording the assemblage allowed the recognition of few articulated limbs (especially forelimbs). But the prevalence of unarticulated skeletal elements is evident suggesting a high degree of dismemberment of cattle. Due to the size of cattle specimens, this practice would be required to easily access the meat from the animal carcass.



### Ageing



Appendix Table 18 details the tooth wear stages according to Grant (1982) in loose mandibular teeth and Higham's (1967) mandible wear stages for Early Medieval Cattle. 90 specimens (4% out of total Early Medieval Cattle) could be aged according to Higham's mandible wear stages, which were used to create mortality and survival curves for this species (Appendix Table 19). These analyses (shown in Figure 21) highlight that there are two peaks in killings of cattle from this period, mostly affecting old adults and in a lesser degree sub-adults.

Appendix table 20 (following Reitz and Wing, 1999) specifies the epiphyseal fusion details for this assemblage, demonstrating that 93% of the cattle survived 18 months of age. In the next stage, from 24 to 42 months old the survival of individuals was higher than 72%, suggesting that although duplicated, the killings in this period were not abundant.

This conclusion is similar to the mandible wear stages results. Finally, similarly to the results of Higham's ageing method, an important number of specimens (70%) survived the age of 42-48 months old, indicative of an elevated number of killings after the epiphyseal fusion of cattle was complete (old adults).

According to Hambleton (1999) keeping cattle after 18-42 months old, a perfect age as a meat source, is only justified when specimens are used for secondary uses. Therefore, the incidence of killings between 30 and 31 months old might be closely related to meat supply. Furthermore, this peak can also be associated with the control of breeding stock.

Nevertheless, the cattle assemblage from Early Medieval times is mostly integrated by old adult specimens, with the highest amount of individuals killed only after their fourth year of age. This killing pattern might suggest that secondary uses of cattle were highly appreciated and although several specimens were killed in the perfect age for meat supply, most cattle were slaughtered after being exploited for other uses (as breeding, milking and/or labour).

The low incidence of calf mortality discards the idea of major practice of culling of immature cattle and could be related to natural mortality. This has also been closely related to milking practices, which requires the presence of calves to ensure the production of milk (Hambleton, 1999). Therefore, calves were not killed until weaned, not before 6 months of age. Nevertheless, the presence of calves in the archaeological record proposes that breeding of cattle was a practice on the site, although difficult to determine to what extent.

### **Sexing**

Appendix Table 21 expresses the data on breadth of distal metacarpals which were used for sexing cattle specimens. The results demonstrate a high prevalence of females over males (83 against 17%). These figures suggest that culling of males was practiced for Early Medieval cattle which, associated with killing patterns previously mentioned, is closely related to the stock control with breeding and milking purposes.

### **Taphonomy**

Early Medieval cattle from Parknahown 5 show taphonomic modifications in only 10% of the fragments (NISP: 230). Table 1 specifies the information of taphonomic modifications in cattle, and figure 21 illustrates the incidence of these modifications, which demonstrate the higher occurrence of gnawing (76%), mostly done by carnivores.

Element	Carnivores	Carnivores and rodents	Rodents	Gnawing Total	Chopped	Chopped and cut	Cut	Butchery Total	Calcined	Singed	Burning Total
AS	6	-	-	6	-	-	3	3	-	-	0
CA	17	-	-	17	-	-	1	1	-	1	1
CR	1	-	-	1	-	-	2	2	-	1	1
FE	7	-	-	7	-	-	2	2	-	1	1
HC	2	-	-	2	-	-	4	4	-	-	0
HU	11	-	-	11	-	-	1	1	-	2	0
LMT	1	-	-	1	-	-	-	0	3	2	5
MC1	23	1	-	24	-	-	2	2	-	1	1
MN	8	-	-	8	1	1	2	4	-	3	3
MT1	13	-	1	14	-	-	-	0	-	-	0
PE	19	-	-	19	-	-	-	0	-	-	0
PH1	8	-	1	9	-	-	4	4	-	1	1
RA	7	-	-	7	-	-	1	1	-	-	0
SC	7	-	-	7	-	-	1	1	-	1	1
TI	2	-	-	2	-	-	2	2	-	1	1
UL	37	-	-	37	1	-	1	2	-	-	0
VC2	2	-	-	2	-	-	4	4	-	-	0
LXT	-	-	-	0	-	-	1	1	3	2	5
Grand Total	171	1	2	174	2	1	31	34	6	16	22

**Table 1. Total NISP by element and taphonomic modification for Cattle from Period II Phase 1 (Early Medieval)**

This high frequency of gnawed bones confirms the idea that the site was used as a disposal area for bone waste. Therefore, animals and especially carnivores had access to discarded bones.

Regarding butchery (14.7%), cut marks from a knife are by far the most common in cattle from the Early Medieval period (31 out of 34 NISP). Chopping is only found in three fragments, two of which are mandibles. This fact does not seem to be the result of a recurrent practice, but only a consequence of general dismemberment of the carcass. Cut marks are not as frequent as might be expected on a site with high dependence of cattle for meat (less than 1.4% of the total cattle NISP). However, four skeletal elements show higher occurrence of cut marks: horn core and cranium, which might be related to the removal of the core from the horn; pelvis and femur, associated with the dismemberment of hind limb from the rest of the carcass and filleting of the meat; atlas, consequence of the beheading of the specimens; and metacarpals and tarsal, probably related to skinning of the animals.

Although difficult to correlate butchery marks and age in a relevant number of species, it is evident that most butchery marks are found in adults older than 42-48 months of age. This tendency is associated with the practice mentioned before in which the



majority of cattle were slaughtered after 4 years old, when their utilisation for secondary use is over.

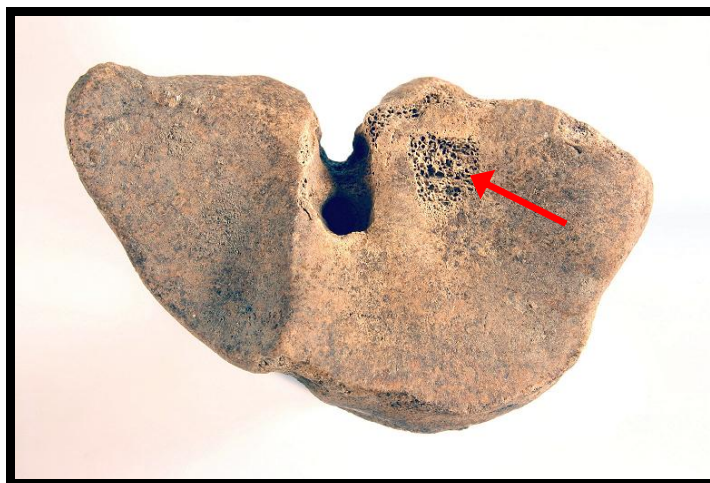
The incidence of burning (0.9% of total cattle NISP from Period II) does not seem to suggest an important trend regarding animal husbandry or consumption. On the contrary, calcined teeth and singed bones are possibly a consequence of general disposal of waste bones.

Meat values were calculated for cattle from the Early Medieval Period. A MNI of 87 cattle specimens multiplied by 225 kg (estimated carcass weight of each specimen) results in a total meat value of 19.575 kg (McCormick and Murray, 2007).

### **Pathology and non-pathological conditions**

39 specimens of Early Medieval Cattle presented some kind of pathology, representing 1.7% of the cattle assemblage from this period.

12 metacarpals presented a circular wear produced by lytic activity in the medial facet from the proximal articular surface (Picture 1). Also, an important loss of the cortical bone of the articular surface of the distal epiphysis was observable in 8 humeri (Picture 2). One metacarpal, besides showing the circular wear previously described, presented an extra facet below the proximal end in its lateral side.



**Picture 1. Cattle metacarpal showing signs of (lytic activity) in the medial facet from the proximal articular surface (Parknahown 5, Feature 165).**



**Picture 2. Cattle humerus showing loss of the cortical bone of the articular surface of the distal epiphysis (Parknahown 5, Feature 213).**

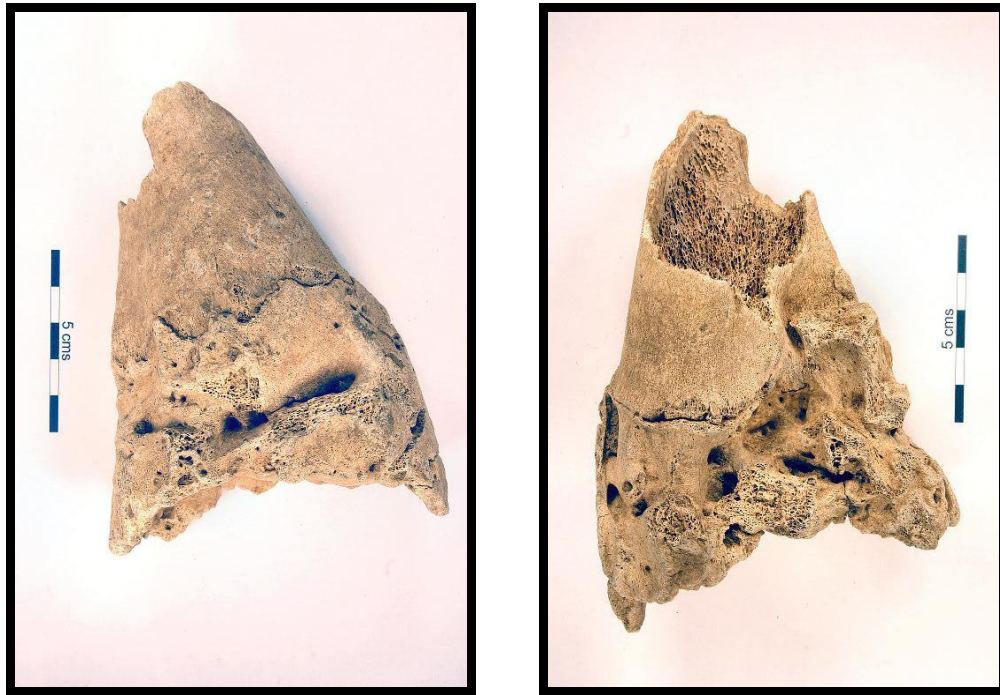
On the other hand, 7 specimens were affected by osteoarthritis (either by eburnation, extra bone growth of exostosis or osteophytes or both), including three proximal end of femora, one glenoid cavity of scapula, one pelvis' acetabulum and two proximal phalanx and their distal and proximal ends.

4 infections and inflammatory processes of ligaments are found in this assemblage of cattle, evidenced by the presence of periosteal reactive bone. Level but active infections are found in a cranium fragment and in the lateral edge of the shaft of a metacarpal. Periostitis composed by lamellar bone, characteristic of advanced processes of infection, is found in one metacarpal and one tibia in areas where ligaments are attached.

A cattle proximal phalange was compressed longitudinally, producing a flat bone. No record of this condition has been found in the zooarchaeological literature.

Most of the conditions previously mentioned might be related to biomechanical stress, which appears to be the most common for Early Medieval cattle in Parknahown 5 (Bartosiewicz, Van Neer and Lentacker, 1997).

One osteosarcoma was present in a cattle radius distal end (Pictures 3 and 4). Most of it was integrated by lamellar bone but some areas with woven bone suggest that the condition was still active at the moment of death. The distal end of the ulna and some carpals were also affected by the sarcoma becoming attached to the radius. This is only a possible diagnosis and further analysis would be recommended to discard other pathological conditions such as Ankylosis.



**Pictures 3-4. Osteosarcoma affecting a cattle's distal end of the radius and ulna and some carpals (Parknahown 5, Feature 106).**

Four specimen's teeth presented oral pathologies. One cattle mandible was affected by a congenital condition in which the third molar was formed by only two cusps instead of three. On the other hand, three molars show an unusual wear process, which produced V-shaped teeth (Pictures 5, 6 and 7). Although difficult to prove, this condition may have been produced by human activity, like bits used for traction work.



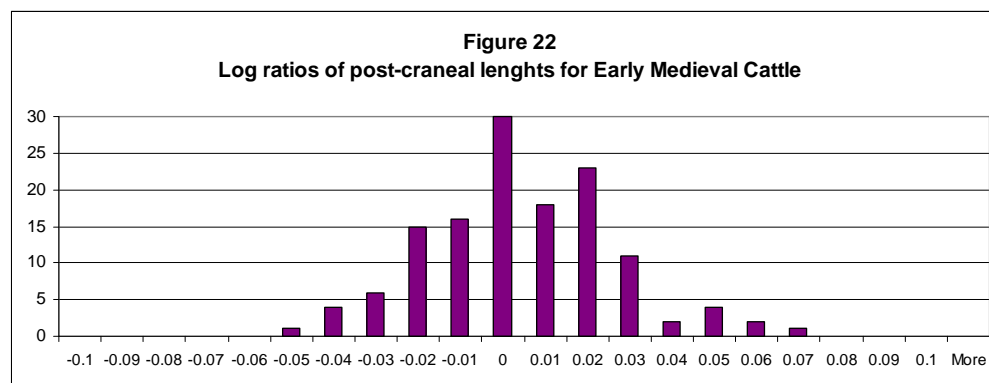
**Pictures 5-7. Cattle molars showing unusual V-shaped wear pattern (Parknahown 5, Feature 149).**

## Measurements and osteometry

347 specimens of Early Medieval Cattle were measured and Appendix Table 23 details the results.

Estimated Withers Heights (EWH) were calculated for 18 cattle from Early Medieval features, and the outcome (Appendix Table 24) presents the smallest specimen around 107 cm, the tallest close to 119 cm and a mean of 113 cm.

Log ratios calculated by length measurements for Early Medieval Cattle, expressed in Figure 22, show a normal distribution of this population.



Three skeletal elements were plotted using length and width measurements to illustrate the homogeneity of the cattle assemblage. Metatarsal 1, phalange 1 and phalange 2 bivariate plots are shown in Appendix Figures 1, 2 and 3, showing a small degree of variation in size of specimens.

All three analyses carried out with measurements of Early Medieval Cattle demonstrate that the assemblage is integrated by a relatively homogeneous population, where some outliers are found but within a normal distribution. This could be an indication of the same origin for the cattle stock found at Parknahown 5.

## Livestock economy

The evidence in the archaeological record for Early Medieval cattle demonstrates that this species was bred in Parknahown 5. Cattle were used for secondary uses (like milk and hard labour). When specimens reached a perfect age for meat supply (between 18-30 months old) an important number of cattle, most probably males, were slaughtered and their meat was consumed. This had the purpose of ensuring stock control. The rest of the specimens kept, predominantly females, were used as milk suppliers and labour animals until the end of their productive life (older than 50 months of age) when they would be slaughtered and their meat consumed.

Killing, butchery and disposal of cattle were probably carried out in the same area. Therefore, most parts of the animal carcass are found in the site, encountering an assemblage with traits of dismemberment, filleting and skinning alongside signs of burning and animal gnawing.

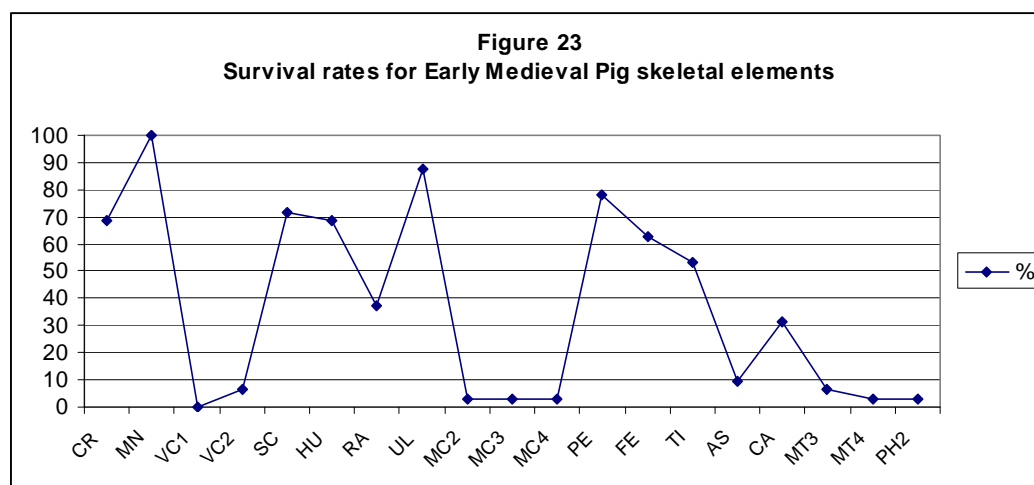
## Early Medieval Pig

### Identification and quantification

Pig is the second most frequent species in the Early Medieval Period of Parknahown 5, with a NISP of 551 (14.3% of Period II NISP) and a MNI of 32 (representing 18.8% of Early Medieval MNI). The details of NISP by skeletal elements and laterality for pig are expressed in Appendix Table 25.

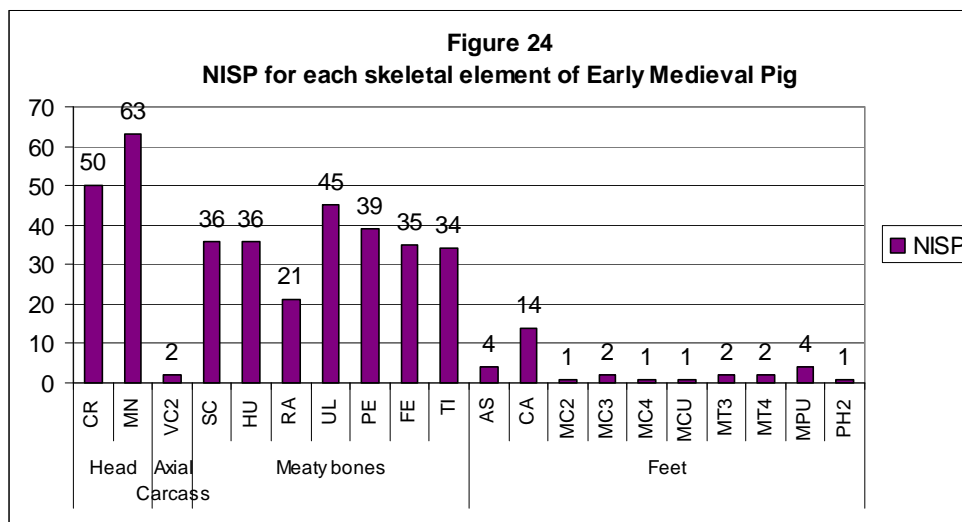
The high recurrence of this species in this site demonstrates that pigs were intensively exploited and consumed. Although much less represented than cattle in terms of NISP and MNI, pig is almost exclusively kept for meat and lard consumption and therefore the importance of its consumption is evident.

Figure 23 demonstrates the survival rates for pigs of Period II, showing an uncommon distribution of skeletal elements, following Brain (1969). This fact suggests that pigs were consumed and disposed of selectively, according to their given use. Obviously, the degree of preservation for each element does influence their recurrence, but other factors seem to be affecting their survival rates.



The values of NISP for each skeletal element when grouped by parts of the carcass might help in understanding the reasons that cause the variation in survival rates (figure 24). There is a clear predominance of meaty bones (62.6%) over other parts of pig's

skeleton. Head has a frequency of 28.8%, while feet only comprise 8.1% of the pig assemblage. The axial carcass only represents 0.5% of the elements.



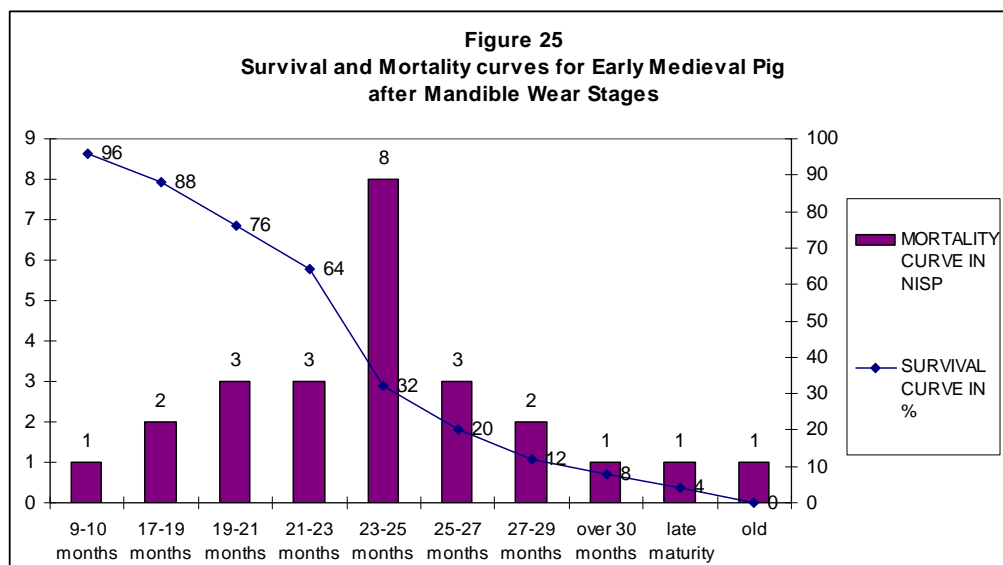
The previously mentioned importance and use of pig exclusively for consumption of meat and lard could be the factor that influenced this presence. Head elements, on the other hand, are well preserved elements, especially mandibles, which may account for their high frequency. Rates of recurrence of feet and axial carcasses suggest that these parts of pigs were not highly exploited and that they were disposed of in different areas to that of consumed bones.

At the time of recording the assemblage only a few articulated bones could be identified. Two of them correspond to forelimbs, while the other was the articulation between tibia and calcaneus. Such a low frequency of articulated bones may support the idea that pigs were highly dismembered and consequently discarded as food waste, indicating their use as a meat source.

### Ageing

The assessment of tooth wear stages according to Grant (1982) in loose mandibular teeth and Higham's (1967) mandible wear stages for Early Medieval pig (detailed in Appendix Table 26) was used to create survival and mortality curves for this species (Appendix Table 27; Figure 25). Although only 25 specimens could be incorporated in these analyses, they demonstrate that most of the pig killings were carried out between 17-29 months old. During a span of a year (1.4 -2.4 years of age) 84% of the specimens were slaughtered, representing the perfect age for pigs to be used as meat. Within this period of time there is a peak of killings around 23-25 months old and this variation can be due to the specific rates of growth for each specimen. Pigs killed after this span of time might represent breeding stock only kept for reproductive purposes.





Appendix Table 28 displays the details for epiphyseal fusion of the Early Medieval assemblage. This analysis demonstrates a higher mortality in young specimens than the mandible wear stages. In this sense, 45% of pigs did not survive the early fusion stage (before birth to 18 months). However, this analysis can be biased due to the presence of an unusual context (Feature 83) that included a MNI of 9 piglets grouped together, most probably representing a litter of piglets that died from natural causes. Although other causes cannot be completely discarded (as high status consumption of piglets or high natural mortality over the hard winter season), this feature provides proof that breeding of pigs was practiced in Parknahown 5.

The epiphyseal fusion analysis also demonstrates an important number of killings between 24 and 30 months of age, an age range that 63% of individuals did not survive beyond. Furthermore, although slightly higher than the mortality rate assessed by MWS, epiphyseal fusion proves that only a few individuals were killed after 36-42 months of age.

Therefore, both age analyses confirm the idea previously stated in which pigs are slaughtered mostly within a period of one year (17-29 months of age) and killings outside this span of time correspond either to natural death or to preservation of breeding stock.

### Sexing

Appendix Table 29 enumerates the proportion of females and males assessed by the morphology of the canine's root. Only 50 specimens (9% of total Early Medieval Pigs) could be sexed with this method, but clearly shows a fairly equitable proportion of males and females. Males represent 56% of the species, while females reach 44%. This analysis proposes that animals were kept as breeding stock without applying any sex bias culling, females and males were being killed in the same ratio when they reached adulthood.

Pig's litters are numerous; therefore, good rates of reproduction do not call for a high proportion of females over males. Likewise, pigs are a species of low maintenance, making it possible to keep more specimens with less effort (compared with cattle for example). Hence, keeping males and females in the same proportion until their adulthood may be related to pig's reproductive rates and their husbandry requirements.

### Taphonomy

	<b>Burning</b>	<b>Gnawing</b>	<b>Butchery</b>
<b>Element</b>	<b>Singed</b>	<b>Carnivores</b>	<b>Cut marks</b>
AS	-	-	-
CA	-	1	-
CR	-	-	-
FE	1	4	-
HU	-	4	-
LMT	1	-	-
LXT	1	-	-
MC2	-	-	-
MC3	-	-	-
MC4	-	-	-
MCU	-	-	-
MN	-	1	-
MPU	-	-	-
MT3	-	-	-
MT4	-	1	-
PE	-	13	-
PH2	-	-	-
RA	-	1	-
SC	-	14	-
TI	1	2	1
UL	-	14	-
VC2	-	-	-
<b>Grand Total</b>	<b>4</b>	<b>55</b>	<b>1</b>

**Table 2. Total NISP by element and taphonomic modification for Pig from Period II Phase 1 (Early Medieval).**

Only three taphonomic modifications were found in the pig assemblage from Early Medieval features. Table 2 details these results and makes obvious that gnawing by carnivores is by far the most common modification (91.6% of modified NISP). Four specimens presented signs of burning (6.6%), while only one butchery mark was observable in pigs (1.6%).

Butchery marks, are not frequent as it would be expected in species mainly exploited for meat (Hambleton, 1999). This low recurrence of butchery marks is explained by the fact that the size of the pigs does not call for the complete dismemberment of the specimens (like would be the case of cattle) as meat could be eaten from the bones (Maltby, 1985).



The high incidence of gnawed pig bones demonstrates that this area was used for food waste, as suggested before when analysing the occurrence of skeletal elements.

The meat values for pigs, calculating that 32 MNI were found in Parknahown 5, reached 2048 kg. of meat.

### **Pathology and non-pathological conditions**

Two specimens of pig presented cases of hypoplasia, one in a lower canine and one in a lower molar. This condition is associated with nutritional and infectious causes that could produce periods of stress in the specimen (Dobney and Ervynck, 1998). Therefore, the origins of this condition may be related to hard winters or problems with nutrition, although it is difficult to determine the definite cause.

### **Measurements and osteometry**

Appendix Table 30 details the measurements taken in pigs from Early Medieval Parknahown 5, but no analyses on size of specimens could be carried out for this assemblage.

### **Livestock economy**

The analyses previously described are sufficient to confirm that pigs were bred on Parknahown 5 and used fundamentally for meat and lard supply. In this sense, the low husbandry requirements of this species allowed the inhabitants of the site to keep specimens until adulthood without having to enforce sex determined culling of young animals, but conserving enough stock for reproductive uses.

Specimens were killed at the perfect age for a meat source (17-29 months old), meaty bones being highly exploited, consumed and discarded in the site. Feet and axial carcass were not very utilised and probably disposed of somewhere other than in the areas of consumption and food waste.

## **Early Medieval Sheep**

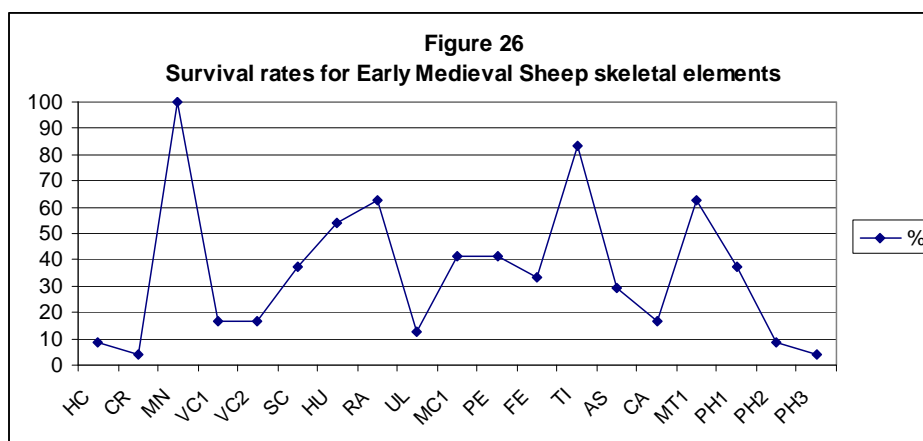
### **Identification and quantification**

Sheep is the third most important species in Early Medieval Parknahown 5, NISP being close to pig with 540 specimens and 24 MNI. Appendix Table 31 accounts for elements and laterality of sheep specimens.

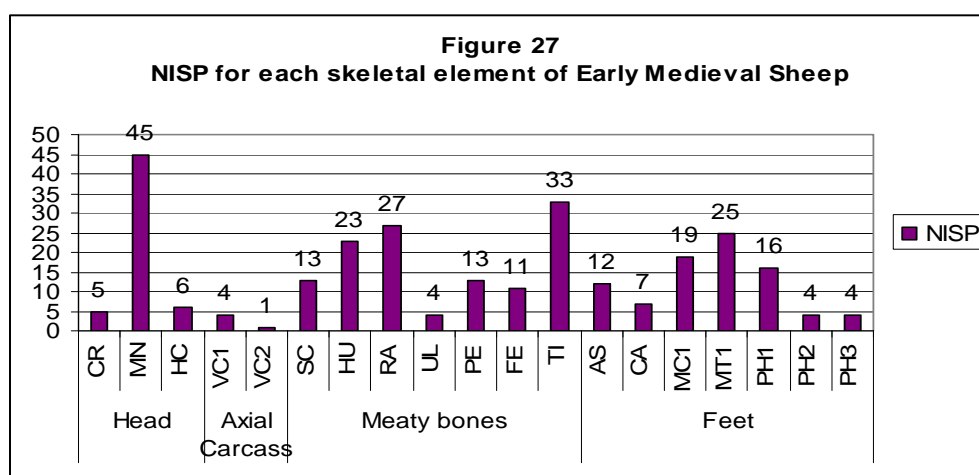
This recurrence of sheep close to 14% of the total NISP and MNI of the animal bone assemblage, suggests that sheep exploitation was important at this site, probably due to the multiple uses that sheep are related to (as suppliers of meat, wool, milk, skins, manure, etc.) and to the small size of sheep, a species that would have required a higher

number of individuals than other species to reach an important position in production of goods (Hambleton, 1999).

The survival rates (Figure 26) for sheep demonstrates some trends similar to Brain (1969), but some differences are obvious, especially regarding some long bones such as radius, humerus and tibia. Such differences propose that survival of elements is influenced by factors such as preservation, but also by sheep husbandry and utilisation.



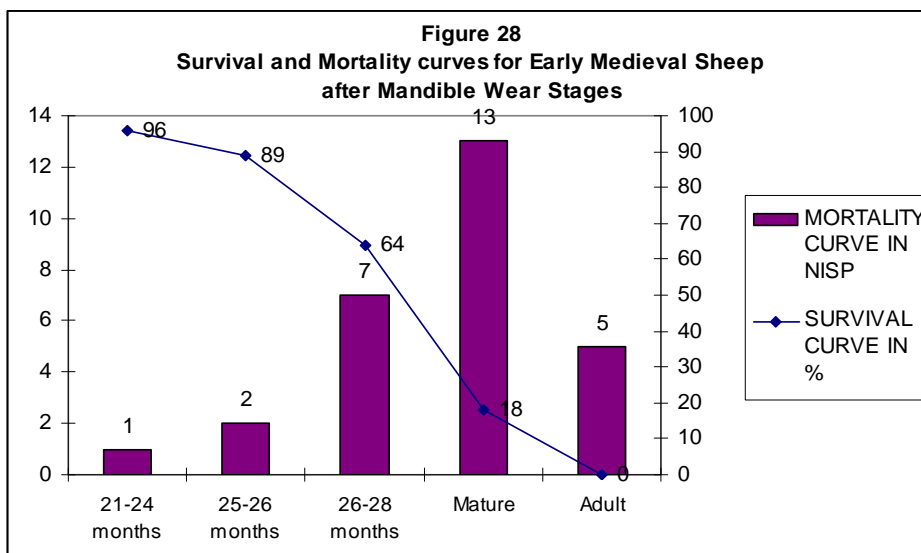
Meaty bones and feet are the most frequent skeletal elements of Early Medieval Sheep (46% and 32%, respectively) as seen in Figure 27. However, head (21%) and axial carcass (2%) elements are present, suggesting that, as for cattle, the whole sheep carcass is represented. Therefore, some skeletal elements that preserve better are dominant, but the sheep husbandry also influences this incidence.



This distribution of skeletal elements implies that, although sheep as a meat source is highly appreciated, secondary uses of this species were practiced on the site. Furthermore, sheep might have been slaughtered, consumed and discarded in the same areas, producing an archaeological record where all elements are represented but with a slight predominance of meaty bones.

While identifying groups, only two articulated forelimbs and two hind limbs were recognised, suggesting that sheep were greatly dismembered in most cases, and that this assemblage might correspond to food waste predominantly.

### Ageing



Tooth wear stages for sheep assessed by Payne (1973; 1987) and Higham's (1967) Mandible Wear Stages are detailed in Appendix Table 33. Only 28 specimens could be aged using Higham's method, a figure that represents 5.2% of the Early Medieval sheep assemblage. The mortality curve (Figure 28) compiled using this data demonstrates that most killings of sheep were carried out after the specimens attained their maturity. Some sheep could be slaughtered some months after or later than this stage, probably depending on their individual development, which could reach the perfect age to be exploited as meat source, after being employed for secondary uses.

The epiphyseal fusion data, detailed in Appendix Table 33, demonstrates that only 9% of the sheep did not survive to 16 months of age. Furthermore, according to this method of ageing, 77% of sheep survived the age between 18-36 months, while 47% of specimens were killed after 42 months.

The incidence of young individuals, although low, implies that sheep were bred on site, whereas milking was not a highly practiced activity.

Taking into account both ageing methods, it is obvious that most sheep were killed after reaching maturity, adulthood or older. According to Hambleton (1999) an economical system based on meat would reflect a high amount of individuals between 18 and 36 months old, while herds kept for wool would show a higher quantity of adults. At the same time, Payne (1973) suggests that sheep killed for meat would be slaughtered around their

third year of age. Therefore, Parknahown 5 Early Medieval sheep could have been kept primarily for meat, which is represented in the elevated number of killings in their maturity, with some older specimens being kept maybe for wool production or breeding stock.

### Sexing

No sex assessments could be carried out for sheep specimens.

### Taphonomy

Taphonomic modifications in Early Medieval sheep were observable in only 48 specimens (8.8% of the total sheep NISP). Table 3 demonstrates the values for each modification found in this assemblage. Gnawing is found in 56% of the fragments, followed by burning (31%) and butchery in only 13% of the modified NISP.

Element	Carnivores	Gnawing	Chopped and cut	Cut	Butchery	Calcined	Singed	Burning
AS	1	1	-	1	1	1	-	1
CA	2	2	-	-	-	-	-	-
CR	-	-	-	-	-	-	-	-
FE	-	-	-	1	1	-	-	-
HC	-	-	1	-	1	-	-	-
HU	3	3	-	-	-	-	-	-
LMT	-	-	-	-	-	3	1	4
LXT	-	-	-	-	-	2	5	7
MC1	3	3	-	-	-	-	-	-
MN	2	2	-	-	-	-	-	-
MT1	4	4	-	-	-	-	-	-
PE	6	6	-	1	1	-	-	-
PH1	1	1	-	-	-	-	-	-
PH2	-	-	-	-	-	-	-	-
PH3	-	-	-	-	-	-	-	-
RA	2	2	-	-	-	-	1	1
SC	1	1	-	-	-	-	-	-
TI	1	1	-	-	-	-	2	2
UL	1	1	-	1	1	-	-	-
VC1	-	-	-	-	-	-	-	-
VC2	-	-	-	1	1	-	-	-
<b>Total</b>	<b>27</b>	<b>27</b>	<b>1</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>9</b>	<b>15</b>

**Table 3. Total NISP by element and taphonomic modification for sheep from Period II Phase 1 (Early Medieval)**

The high occurrence of gnawed bones, entirely by carnivores, suggests that this was used as a waste area, where animals had access to discarded bones.

The incidence of butchery marks in this assemblage was low, but their occurrence exemplifies the butchery practiced on Early Medieval sheep. The only chopped specimen, accompanied by cut marks, represents the utilisation of horn core probably as raw material

for tools. Other cut marks are present on an astragalus (representing skinning), a femur (probably consequence of filleting), pelvis and ulna (result of dismemberment of limbs), and axis (effect of beheading of the specimen).

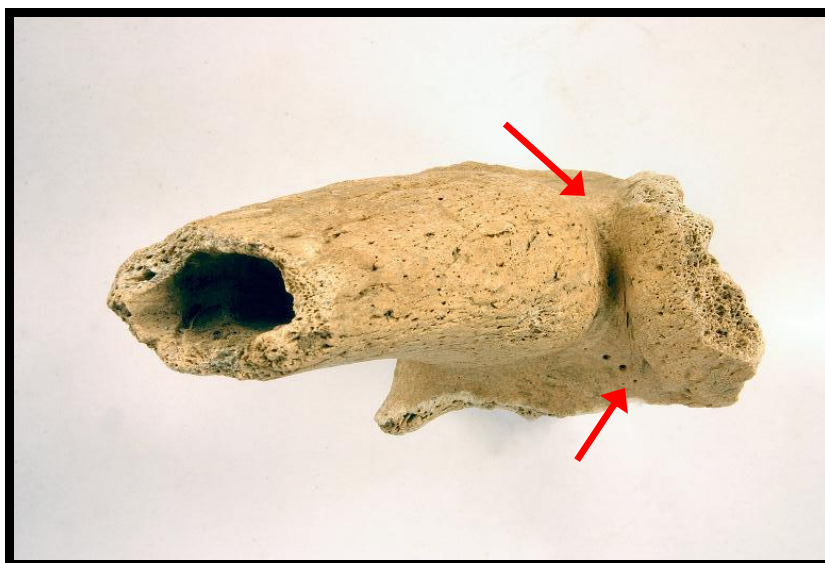
As for cattle, the burned specimens do not seem to suggest any particular husbandry activity, only a consequence of the disposal of these elements (mostly head elements) as waste or fuel for fire. Nonetheless, even though difficult to confirm, this could also be the result of cooking sheep meat on the bones (Maltby, 1985).

Meat value calculations propose that sheep provided 228 kg. of meat for this period on the site, due to the presence of a MNI of 24 assuming that each sheep carcass weighs 9.5 kg (McCormick and Murray, 2007).

### **Pathology and non-pathological conditions**

Two specimens were affected by osteoarthritis in Early Medieval sheep, revealing eburnation of a humerus' trochlea and the change in the shape of the proximal facet's lateral side of a radius (to a more square form). This pathology is related to either biomechanical stress or to age, being common in working animals and old specimens. Sheep are not generally used as working species, so maybe age might have influenced the manifestation of this condition.

Regarding non pathological conditions, two specimens presented a double pair of horn cores instead of the two single horn cores (Picture 8). This feature has been reported for Ireland before, proposing that this breed of sheep was brought on to the island by Nordic sailors (Putelat, 2006).



**Picture 8. Four horned sheep (Parknahown 5, Feature 326).**

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### **Measurements and osteometry**

92 specimens were measured, allowing 143 measurements detailed in Appendix Table 34.

13 Early Medieval sheep measurements permitted the calculation of Estimated Withers Heights (EWH), where the minimum was 48 cm, the maximum 69 cm. and the mean was 55 cm.

Two skeletal elements' length and width measurements of sheep were plotted. Even though the measurements are not too numerous, phalanges and metatarsals demonstrate the presence of two groups. Shown in Appendix Figures 4 and 5, the size differences between specimens could be due to sexual dimorphism, demonstrating that males are less frequent than females (taking into account metatarsal data). This difference (64% over 36%) may be related to the preservation of breeding stock, although the husbandry necessities of sheep do not demand an intense sexual bias culling of specimens as they do for cattle.

### **Livestock economy**

The Early Medieval sheep assemblage from Parknahown 5 displays characteristics that suggest that this species was bred on site and used for meat and wool production. Therefore, most sheep were slaughtered in their maturity, a perfect time to get the most out of each specimen without surpassing their breeding costs. Nonetheless, some specimens were kept for longer, representing wool suppliers and breeding stock, where females could be slightly more recurrent. Other uses for sheep could have been practiced such as milk production, although this is difficult to confirm with the analyses carried out for this assemblage.

Sheep were bred, slaughtered, butchered, consumed and disposed of on the site. As a consequence, the whole of a sheep's carcass was found and traits for diverse butchery practices (as dismemberment, filleting, beheading and skinning) are located together with burning and gnawing signs.

### **Early Medieval Horse**

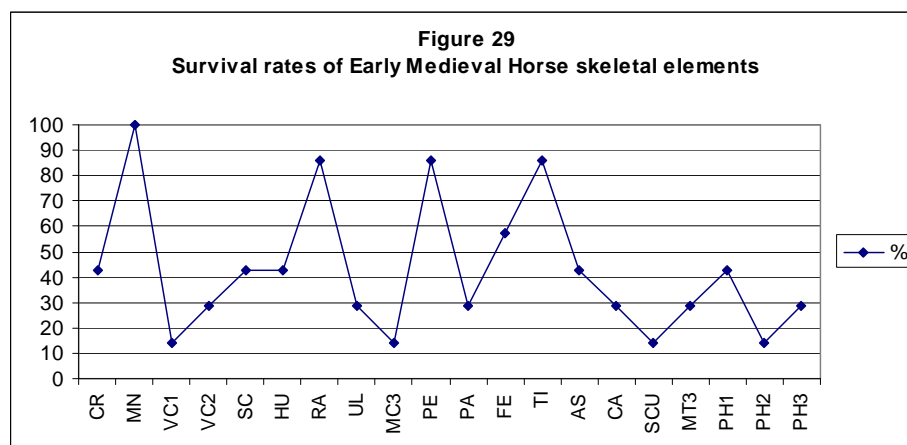
#### **Identification and quantification**

Horse is the fourth most common species in Parknahown 5 with 181 NISP (4.7% of total Early Medieval NISP) and 7 MNI (4.1%). Appendix Table 36 displays figures of horse elements by laterality.

Taking into account that this is a species mostly used as a working animal, whose meat is generally not consumed only occasionally (McCormick, 2007), NISP is elevated and would suggest a certain level of importance of horses within the site.

However, the identification of articulated groups during the recording of the data gives some important information regarding horses from this period. Two major groups of elements were identified as belonging to the same specimens. One of the groups (found in feature number 46) represents the burial of a complete horse, including the right hind limb of another specimen. Details of these specimens are shown in Appendix Table 37. This horse burial and the extra hind limb encompass 35 countable fragments. On the other hand, in feature 149 another group of 8 horse elements were encountered. These elements, particularly the fore and hind limbs, belong to one specimen (Appendix Table 38). Finally, a complete axial carcass including axis (1), cervical (4), thoracic (14), lumbar (6), sacral (4) and cordal (4) vertebrae was found in feature 123 representing another partially articulated horse.

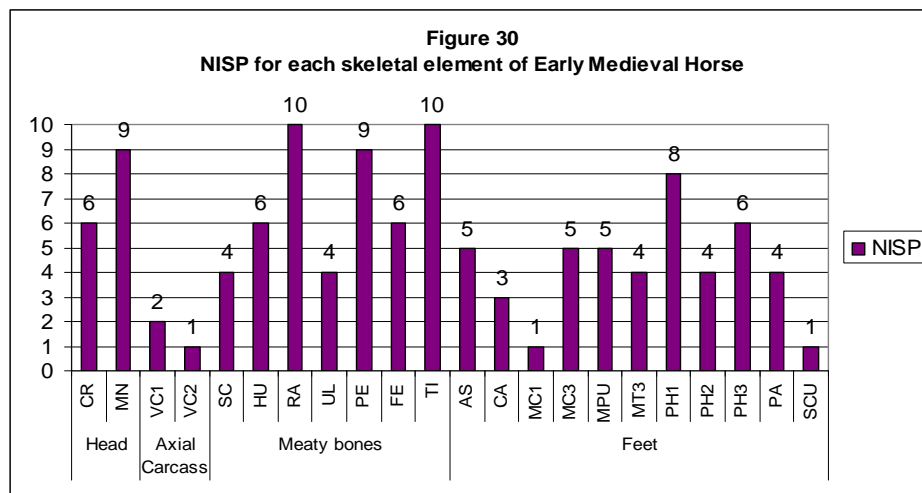
The survival rates for skeletal elements of Early Medieval horses are influenced by the properties of individual elements. As a result, bones most likely to be well preserved are more frequent (mandibles, radius, pelvis and tibia). Figure 29 shows the survival rates for these horses.



Moreover, preservation rates of each element seem to be influencing the presence of skeletal elements of horses (Figure 30). However, the attendance of the different elements does not show exceedingly dominant elements, but a fairly equal distribution (43.3% of meaty bones, 40.7% of feet, 13.2% of head elements and 2.6% of axial carcass). This distribution of skeletal elements complements the idea previously stated that horse assemblages encompass some complete or partial burials and some unarticulated bones discarded as waste in the same areas as other species food waste. This suggests that horses

were mostly used as working animals, together with their occasional consumption (McCormick, 2007).

Furthermore, according to McCormick (2007) this high amount of horse seems to be related to high status sites, since horses were of great value due to their employment for riding and traction. The presence of horse burials could also be an indicator of the importance of horses on the site.



### Ageing

The tooth wear of the upper row of incisors allowed the assessment of age for two specimens of horse according to Shippen Huidekoper (1982). One of the specimens was determined to be 3 years of age, while the second showed an incisor wear stage of a 10 year old horse.

The epiphyseal fusion data, detailed in Appendix Table 39, complements the teeth wear stage, where specimens are not younger than 3 years of age, dying older than 42 months old (Silver, 1969).

The articulated or semi-articulated specimens identified for horse also follows this age trend. The complete horse burial shows complete fused post-cranial bones, except axial carcass elements, where vertebrae articulate surfaces are fusing and sacrum vertebrae and rib heads are unfused. The specimen represented by a complete axial carcass was integrated by fusing or unfused articulate surface of vertebrae and a completely unfused sacrum. It is difficult to ascertain when the axial carcass fully fuses, but they are late fusing elements that could fuse between 5 and 9 years old. Finally, all fore and hind limb elements that encompass the third specimen identified are fully fused, being therefore older than 3.5 years of age.



This horse husbandry can suggest, according to McCormick (2007), that no horses were bred on site, but they were brought from other areas to be employed as work animals and perhaps, but to a much lesser extent, as a meat resource. Horses could have been incorporated into the settlements after maybe 3 years of age, when they start to be useful for heavy work. Afterwards, horses could have been consumed occasionally, especially if food shortage was affecting the population, resulting in some horse bones being discarded alongside waste food. However, the norm would have been not to consume horses but use them instead for traction and riding, producing an archaeological record integrated by adult specimens and some complete or partial horse burials.

### Sexing

Horses could not be sexed in any case.

### Taphonomy

	Gnawing	Butchery	Burning
Element	Carnivores	Cut marks	Singed
AS	-	-	-
CA	-	-	-
CR	-	-	-
FE	1	-	1
HU	1	-	-
LMT	-	-	-
LT	-	-	-
LXT	-	-	-
MC1	-	-	-
MC3	-	-	-
MN	-	-	-
MPU	-	-	-
MT3	1	-	-
PA	-	-	-
PE	1	-	-
PH1	1	-	-
PH2	-	-	-
PH3	-	-	-
RA	-	-	-
SC	-	-	-
SCU	-	-	-
TI	-	1	-
UL	-	-	-
VC1	-	-	-
VC2	-	-	-
<b>Grand Total</b>	<b>5</b>	<b>1</b>	<b>1</b>

**Table 4. Total of specimens by element and taphonomic modification for Horse from Period II Phase 1 (Early Medieval)**

Taphonomic modifications are scarce in the Early Medieval horse assemblage (Table 4), which would be consistent with the previously mentioned idea of horses been consumed only occasionally in Parknahown 5.

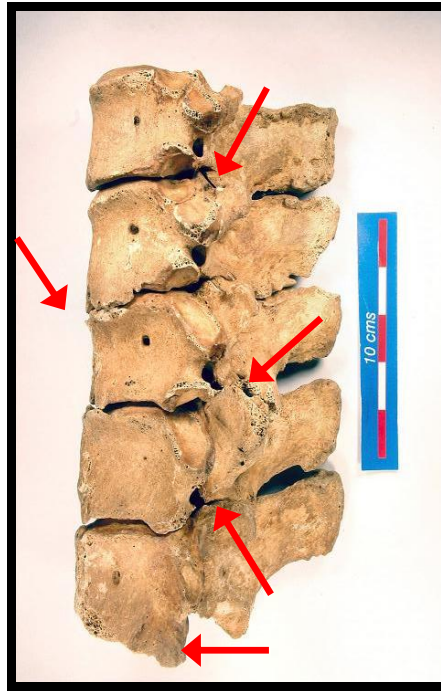
The presence of carnivore gnawing and burning is linked to some discarded bones alongside food waste, while cut marks on a tibia could account for the butchery (probably filleting or skinning) of horses if only limited.

### **Pathology and non-pathological conditions**

Several horse fragments showed signs of some pathological modification, but all of them belonged to the complete buried horse. This specimen presented at least three conditions. The axial skeleton of the specimens was the most affected area revealing osteophytes in the bodies of cervical vertebrae and in the facets joints, bodies and spinal process of thoracic vertebrae (Pictures 9 and 10). Furthermore, the left ligaments of the spine appeared ossified, without causing the fusion of the vertebrae (Pictures 11). This condition seems to correspond with spondylosis or spinal osteoarthritis, which is largely associated with age and biomechanical stress.



**Pictures 9-10. Thoracic vertebra of a horse showing osteophytes in its body and spinal process (Parknahown 5, Feature 46).**



**Picture 11. Thoracic spine of a horse showing osteophytes in bodies and spine process of vertebrae and ossification of ligaments (Parknahown 5, Feature 46).**

The presence of osteoarthritis is not restricted to the spine, although it is the part of the skeleton where the pathology is more advanced. Both metacarpals, the pubic and ischial area of the pelvis and the head and bodies of the ribs showed signs of exostosis and osteophytosis related to osteoarthritis.

Finally, both side proximal and medial phalanges were affected by ankylosis (Pictures 12 and 13), where the excessive presence of exostoses in the epiphyseal area (distal in the first phalange and proximal in the second one) produced the fusion of this articulation (Bartosiewicz, Van Neer and Lentacker, 1997; Baker and Brothwell, 1980).

These advanced pathological conditions are the only examples found in the assemblage, which could account for the way this specimen was buried. These conditions follow the ideas previously stated according to which horse is a species mostly used for work until an advanced age (Bartosiewicz, Van Neer and Lentacker, 1997; Baker and Brothwell, 1980).



**Picture 12-13. Proximal and medial phalanges of a horse affected by osteosarcoma. Anterior and posterior views (Parknahown 5, Feature 46).**

### **Measurements and osteometry**

35 specimens of Early Medieval horse were measured and the outcome is shown in Appendix Table 40.

Estimated Withers Heights (EWH) were assessed for 10 specimens from Early Medieval features, where the smallest specimen was calculated and the outcome (Appendix Table 40) present the smallest specimen in 129 cm, the tallest in 139 cm and the average of 134 cm.

No bivariate plots or log ratios could be calculated for Early Medieval horse, due to the lack of data.

### **Livestock economy**

The analyses previously carried out suggest that horses found in Parknahown 5 were not bred on site. They were probably introduced after 3 years of age when they reached a good age to be used for traction or riding. Sub-adult individuals were probably obtained by redistribution from other sites that did breed horses or by using feral horses.

Regarding culling, most horses' deaths seem to have been natural ones conditioned by age. Nevertheless, some culling could have been practiced on this species after a specimen's useful working life was over. As a result, some pathologies such as osteoarthritis and osteosarcoma occurred in the assemblage, probably relating to a combination of age and working life, such as traction, transport and riding.

Some of these old specimens could have been consumed in rare occasions characterised by severe scarcity of food, producing a few butchery marks and discarding their bones next to other species waste. Moreover, the secondary exploitation of horse's skin can not be completely discarded. On the other hand, specimens that could not be consumed, probably due to pathological conditions or maybe even to exceptional value of the specimen, were completely or partially buried.

## **Early Medieval Dog**

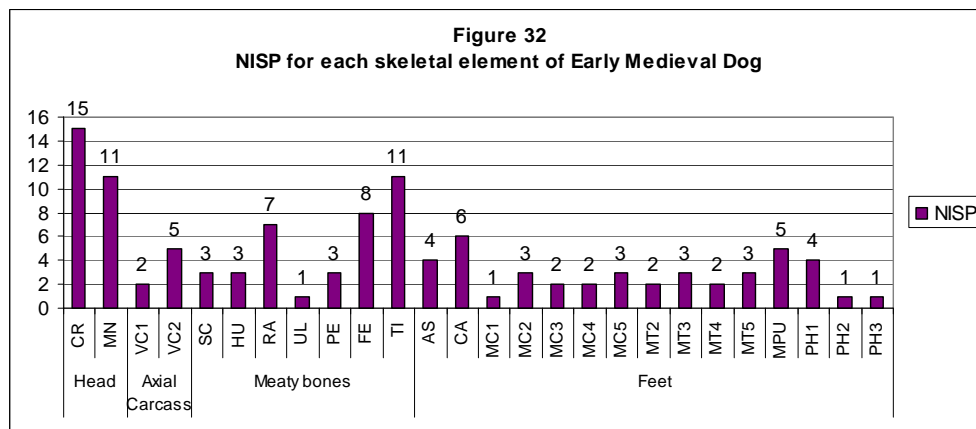
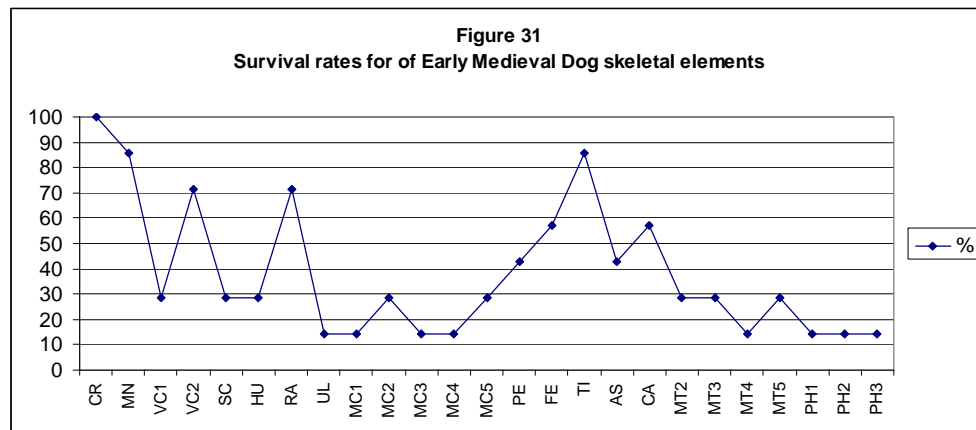
### **Identification and quantification**

Early Medieval dog quantification is close to that of horses, with 143 NISP and 7 MNI or 3.7% of total Early Medieval NISP and 4.7% of MNI. Details of elements and laterality of dog specimens are on Appendix Table 42.

As regarded when analysing horse, the number of fragments of dog identified as groups is high. At least 58 fragments were identified as part of 5 dog specimens, including articulated or semi-articulated limbs, cranial elements and axial carcass. Details on articulated groups are shown in Appendix Table 43.

The presence of these articulated groups amongst food waste of other species proposes that dogs were not consumed but were not buried in separate areas either. Instead, they were completely disposed of with any other waste and the usual post-depositional processes produced that some dog skeletal remains would remain articulated and some would become unarticulated.

The survival rates for dog skeletal elements (Figure 31) reflects a higher survival for elements that usually preserved better such as mandibles, cranium, tibia and radius. Besides survival rates, the presence of skeletal elements also shows a clear influence of preservation rates for each element and probably recovery techniques. Therefore, some skeletal elements show a higher frequency, but in general terms the distribution is fairly equitable (Figure 32).



This distribution and survival rates of elements, which might also be predisposed by recovery techniques of small elements, might account for the fact, previously mentioned, that mostly dogs were thrown away complete, being affected mostly by post-depositional processes.

### Ageing

Appendix Table 44 shows the epiphyseal fusion for Early Medieval dogs, demonstrating that no early deaths (neonatal to 10 months of age) were registered (Silver, 1969). Later, a small amount of specimens died between 11 and 15 months of age, the category in which the specimen from feature 36 is included. Finally, only 25% of individuals did not survive the 18 months category, while 75% died older than this age in their full adulthood.

This age distribution proposes that dogs generally died by natural causes. No culling with any particular husbandry or economical purposes seems to be influencing the age of death of this species.

### Sexing

No analysis for sexing dogs could be carried out.

### **Taphonomy**

Taphonomic modifications for Early Medieval dogs are scarce, being limited to one carnivore gnawing and two butchery marks.

The obvious lack of gnawing modifications suggests that, as mentioned before, dogs were buried probably complete, and the post-depositional processes resulted in only a few bones coming to the surface to the reach of animals to gnaw. Therefore, the disposal of dogs was different to other species, since bones do not seem to have been defleshed previously and were probably buried deeper than simple food waste. This idea is further supported by the absence of any burning in the Early Medieval dog assemblage.

Both butchery marks seem to correspond with skinning traits found in radius and tibia close to the distal end, suggesting that some dog's skin could have been used by the inhabitants of the site occasionally.

### **Pathology and non-pathological conditions**

No pathological or non-pathological conditions were found in the Early Medieval dog assemblage.

### **Measurements and osteometry**

38 measurements were taken in 19 specimens of Early Medieval dog, measurements that are detailed in Appendix Table 47.

Estimated Withers Heights (EWH) were assessed for 2 Early Medieval dogs, with an outcome that shows a minimum value of 35 cm, and maximum of 36 cm.

Due to lack of sufficient data, no bivariate plots or log ratios could be done for Early Medieval dogs.

### **Livestock economy**

Dogs in Early Medieval Parknahown 5 did not have a role in the subsistence of the site, although they might have provided an occasional practical use by the exploitation of their skin and pelt.

Therefore, their deaths were mostly natural ones after they had reached adulthood. Dogs were then disposed of on the same areas used for food waste, being buried without being defleshed.

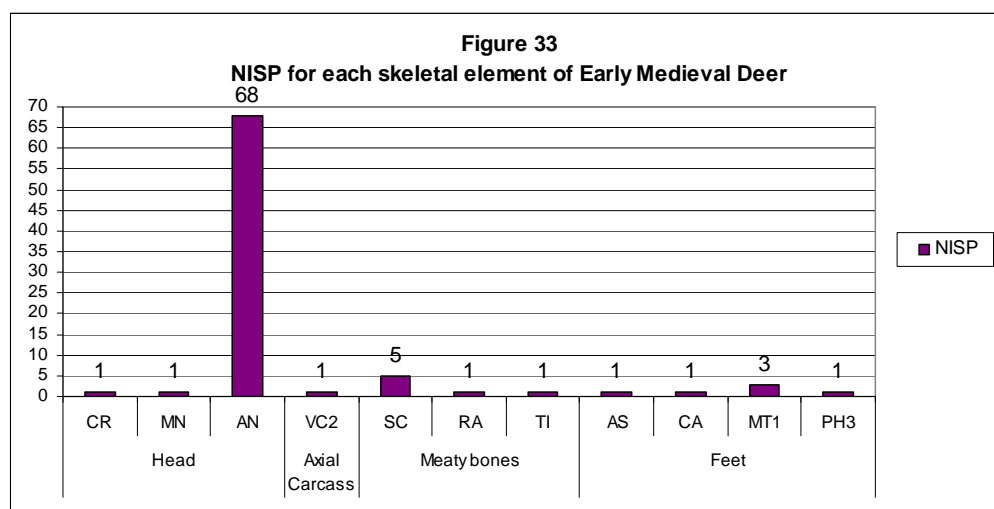
## Early Medieval Deer

### Identification and quantification

126 NISP (3.3% of total Early Medieval NISP) and 5 MNI (2.9% of total Period II MNI) were identified as deer. This category includes Red Deer (*Cervus elaphus*), Roe Deer (*Capreolus capreolus*) and unidentified sub-species of Deer. Appendix Table 48 shows details on skeletal elements and laterality of deer and sub-species of deer.

Survival rates were not possible to assess for this species, but the presence of skeletal elements shows a clear predominance of antler (almost 81%) over the rest of skeletal elements (Figure 33).

This distribution of skeletal elements makes obvious the importance of the use of antler as raw material for tools and objects. The presence of post-cranial elements can suggest that some deer hunting and venison consumption was carried out, although occasionally. Presence of feet and cranial elements complement the previous idea and propose that dismemberment of a complete deer carcass could have taken place on site.



### Ageing

Appendix Table 49 specifies the fusion data available for Early Medieval deer. Although not abundant, the fusion information reveals that only adults were brought to the site.

This would make sense if it is accepted that antler is the most important deer element and therefore adults are the main target for chasing and/or hunting. Consumption of deer would have been more a consequence than a purpose, implying that adults were the specimens most required.



## Sexing

Besides the general assumption that antlers belonged to male specimens, sexing of deer was not possible.

## Taphonomy

The only taphonomic modification observable in deer specimens is related to butchery. Furthermore, 97% of those marks were found on antler or related to obtaining this element. Table 5 shows the broad variety of butchery marks found on antler or cranium, proving how important this industry was.

Species	Element	Sawn	Sawn and cut	Chopped	Chopped and cut	Cut
CAP	RA	-	-	-	-	-
CD	AN	4	1	6	1	-
	AS	-	-	-	-	-
	CA	-	-	-	-	-
	LMT	-	-	-	-	-
	LXT	-	-	-	-	-
	MN	-	-	-	-	-
	MT1	-	-	-	-	-
	PH3	-	-	-	-	-
	SC	-	-	-	-	1
	TI	-	-	-	-	-
	VC2	-	-	-	-	-
CEE	AN	12	5	3	1	1
	CR	1	-	-	-	-
<b>Total Butchery</b>		<b>17</b>	<b>6</b>	<b>9</b>	<b>2</b>	<b>2</b>

**Table 5. Total of specimens by element and taphonomic modification for Deer from Period II Phase 1 (Early Medieval)**

Additionally, antler butchery is characterised by a certain degree of recurrence of the marks:

- Sawn at an angle where the branch meets the main body of the antler.
- Sawn horizontally at the main body or the base of the antler.
- Chopped vertically at the main body of the antler.
- Chopped horizontally at the main body or the base of the antler.
- Cut at the base of the antler.

All these butchery marks are related to the antler working industry to separate the antler from the cranium of the specimen (although some shows signs of falling naturally instead of being intentionally removed by humans), reduce the size of antler to make it more tactile and produce small pieces for objects.

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A cut mark in a scapula follows the proposal made before that occasional consumption of deer was done in Parknahown 5.

### **Pathology and non-pathological conditions**

The only unusual condition observable in a deer fragment was found in a maxillary molar is the extra growth of the enamel in the lingual surface of the tooth next to the gums.

### **Measurements and osteometry**

Appendix Table 50 details the measurements taken in 8 specimens of deer.

No bivariate plots or log ratio analyses were carried out for this species due to a lack of information.

Only one metatarsal allowed the calculation of Estimated Withers Heights according to Von Den Driesch and Boessneck (1979), resulting in a specimen of 111 cm.

### **Livestock economy**

As mentioned before, deer was mostly exploited as a source of antler, a product employed as raw material for tools and other objects. For this, antlers were collected when they had fallen off naturally from the specimens or were removed from the skull of adults after hunting. Afterwards, antlers were worked on using different butchery techniques for specific purposes.

Although primarily killed to obtain their antler, some hunted specimens could have been sporadically brought to the site, dismembered and consumed.

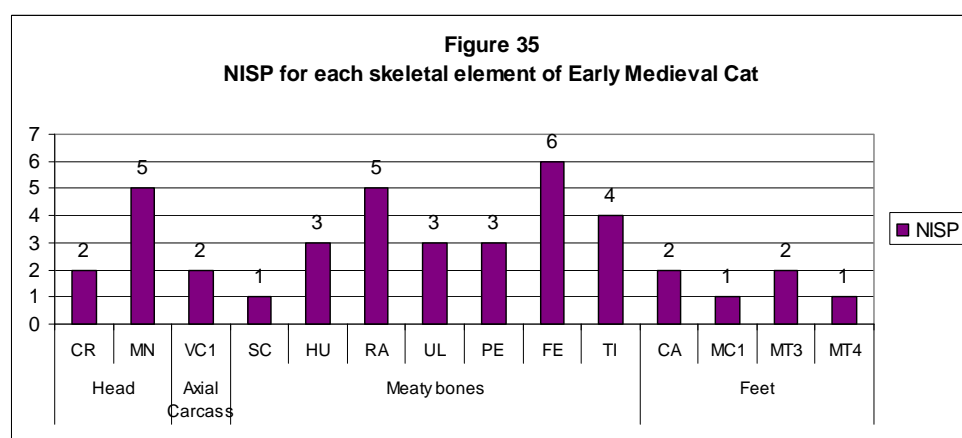
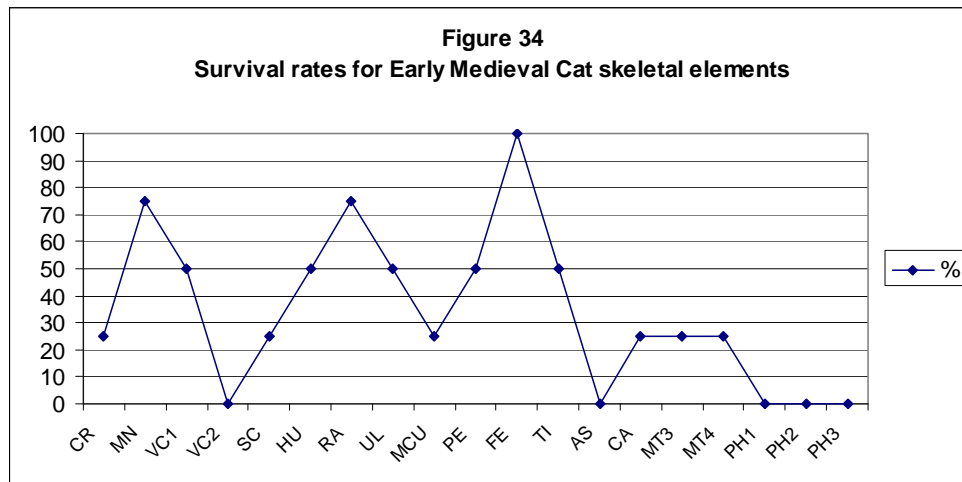
## **Early Medieval Cat**

### **Identification and quantification**

Cat quantification from Early Medieval features reached 44 NISP (1.1% of total Early Medieval NISP) and 4 MNI (2.2% of total Period II MNI). Early Medieval cat's elements and laterality are specified in Appendix Table 51.

3 articulated or semi-articulated groups of cats' limbs were found, comprising 22 skeletal elements. This statistic is similar to what was reported for Early Medieval dogs, proposing that cats were completely buried or disposed of in the food waste areas and post-depositional processes resulted in some unarticulated and some articulated cat bones amongst other species refuse.

As for dogs, survival rates and skeletal elements present for cats (Figures 34 and 35) is clearly influenced by the preservation rates of each element and probably of the recovery techniques, even though a fairly equitable distribution is found, a consequence of the complete disposal of cats, as mentioned before.



## Ageing

Epiphyseal fusion for Early Medieval cat (Appendix Table 52) shows exclusively the deaths of adult specimens (Habermehl, 1961; and Smith, 1969). Therefore, specimens over 20 months old died by natural causes and were, as mentioned before, discarded in the same areas as food waste. Cats did not seem to have any role in the Early Medieval husbandry or economical sphere.

## Sexing

No sexing of cat was possible.

## Taphonomy

Taphonomic modifications for Early Medieval Cats (Appendix Table 53), as for dogs, are limited. Only one carnivore gnawing was observable in this assemblage evidence that cats were disposed without defleshing of the carcass and only as a consequence of post-depositional processes, bones of cats were exposed to the surface and accessed by carnivores.

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One cut mark, found in a radius, as for dogs, can propose the possibility of occasional skinning of cats being practiced on site.

### **Pathology and non-pathological conditions**

No pathological or non-pathological conditions were found in the Early Medieval dog assemblage.

### **Measurements and osteometry**

8 specimens were measured producing 11 measurements that are detailed in Appendix Table 54.

No other analysis could be carried out for this species (Estimated Withers Heights, bivariate plots or log ratios).

### **Livestock economy**

Closely related to dogs, as mentioned before, cats did not have a function in the economical sphere of Parknahown 5, besides some occasional utilisation of the skin.

No culling of cats was practiced; therefore adult cats died of natural causes and were disposed of in food waste areas without being previously defleshed.

### **Early Medieval Birds**

20 NISP of birds were found in Parknahown 5. 10 of them (0.3% of total Early Medieval NISP) belonged to domestic fowl specimens, and 10 to other unidentified birds. Three MNI were identified for domestic fowl (1.8 of total Early Medieval MNI) and 1 for other birds. Appendix Table 55 specifies the skeletal elements and laterality of bird bones.

No major analyses could be carried out in this assemblage, but the fusion of some epiphyses permitted the determination that most bird specimens were adults. No porous bones of birds were recorded for the assemblage, while all present epiphyses were fused, including one carpo-metacarpus of domestic fowl that according to Habermehl (1975 in Cohen and Serjeantson, 1996) fuses around the 14 weeks of age for this species.

The small amount of domestic fowl in the assemblage suggests that this species was not broadly consumed in Parknahown 5, although preservation and recovery techniques may have also influenced this low incidence.

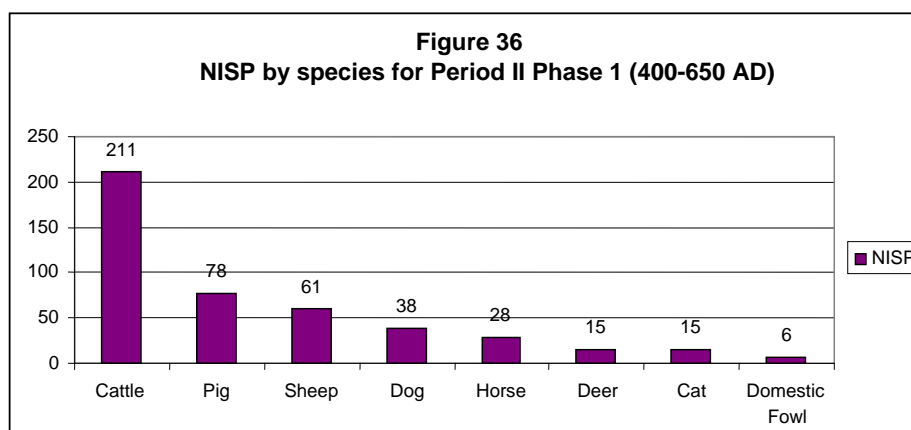
Other bird's frequency may be intrusive in the archaeological record. Even if some of these bones are not intrusive, they do not account for any hunting strategies or consumption of wild bird on the site, but may be more an accidental incidence than a recurrent practice.

## Early Medieval Phases

Although the clear establishment of phases for every Early Medieval feature was not possible, a general comparative analysis of animal husbandry practices for phase 1-3 within the Early Medieval trend should be done to identify whether the economical sphere was consistent in time or varied between phases.

### Early Medieval phase 1 (400-650 AD)

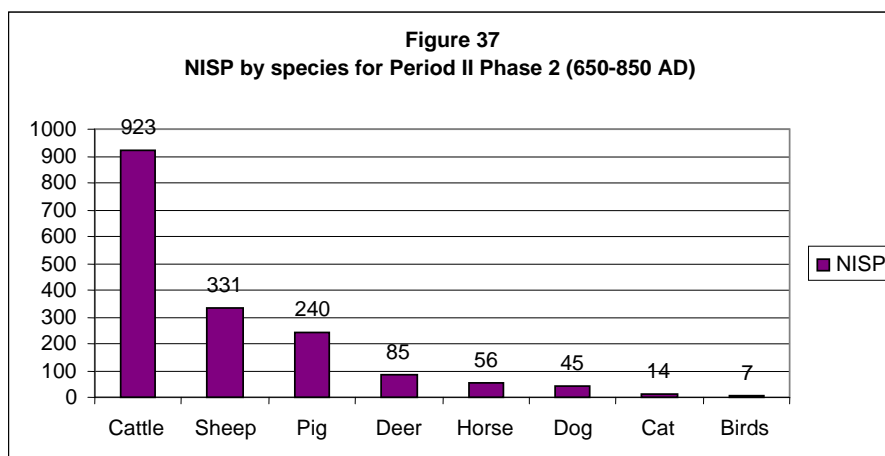
The archaeological features from Parknahown 5 dated from 400 to 650 AD, encompass 12% of the total Early Medieval NISP. Due to this, it is difficult to determine the trend the assemblage from these features follow. Nevertheless, it is obvious that the proportion of each species in phase 1 is similar to the Early Medieval assemblage as a whole. Appendix Table 57 and Figure 36 show the values of NISP by species and skeletal elements for phase 1, where cattle (47%), pig (17%) and sheep (13%) are the dominant species, followed by dogs (8%), horse (6%), deer (3%), cat (3%) and domestic fowl (1%).



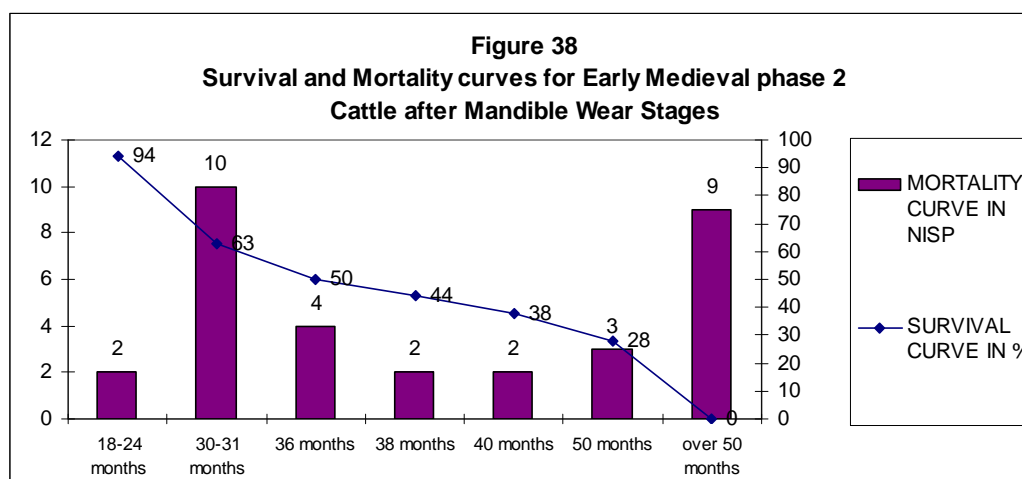
### Early Medieval phase 2 (650-850 AD)

Period II Phase 2 encompasses 44% of the total NISP of the Early Medieval animal assemblage.

The species representation for this phase shows signs of a slight change in species frequency and importance in husbandry practices (Figure 37). Cattle are still the most abundant species, although their incidence is lower than in the whole Early Medieval assemblage (from 58% to 54% of NISP). Furthermore, in phase 2 the percentage lost by cattle is gained by sheep, species that went from 14% to 19% of NISP occurrence. Pig maintained the same 14% of NISP during the whole Early Medieval period. As a consequence, sheep outnumbered pigs. Deer (5%), horse (3%), dog (3%) and cat (1%) represent secondary species as in the whole Early Medieval assemblage.



The use of each species seems as well closely related to the trend for the whole Early Medieval period. Comparing the skeletal elements present it is clear that cattle carcasses were fully exploited, although meaty bones are slightly more frequent than other elements (Appendix; Figure 6). This trend corroborates that cattle were kept for secondary uses, especially labour and meat. Furthermore, survival and mortality curves for this phase show the same age distribution for cattle as the whole Period II assemblage, demonstrating that most specimens were also killed around 30 months of age and over 50 (Figure 38). This age profile guarantees the maintenance of breeding stock and the full profit from cattle as labour beasts and meat suppliers.

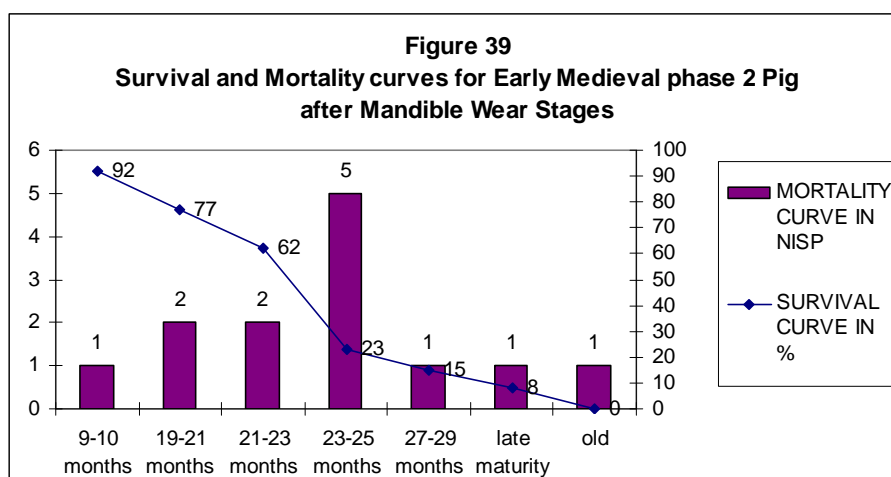


All four butchery practices reported for the Early Medieval assemblage are present in phase 2: Removal of the core from the horn with cut marks in cranium and horn cores; dismemberment of carcass and filleting of meat from meaty bones with cut knife marks in pelvis, femur, tibia, radius and humerus; beheading of specimens as cut marks are present in atlas; and skinning due to the butchery of tarsals. This fact stresses the use of cattle as meat supplier and clearly follows the trend identified for the Early Medieval period.

Sheep are found in a higher proportion than in the whole Period II assemblage, outnumbering pig specimens in Period II phase 2.

The skeletal element representation of sheep is almost identical to the one identified for the whole Early Medieval assemblage (Appendix Figure 7). The whole carcass of sheep is represented in the archaeological record, even if meaty bones and feet bones are more frequent than axial and head elements. This distribution of skeletal elements suggests that sheep were kept mainly as meat suppliers and the presence of cut marks in elements like pelvis, femur, ulna, atlas and astragalus follows the tendency reported for Early Medieval assemblage where sheep were dismembered, filleted, beheaded and skinned on the site.

Pig husbandry, although some proportions of recurrence of skeletal elements varied, seems to also follow the trend observable for the whole Early Medieval assemblage. Meaty bones are obviously dominant while axial carcass and feet elements are not highly exploited (Appendix Figure 8).



Therefore, it is clear that pigs were used almost exclusively as meat and lard suppliers in Period II phase 2. This also corresponds to the mortality and survival curves done for phase 2 (Figure 39), almost identical to the one obtained for the Early Medieval Period. Specimens were mostly killed around their 23-25 months of age, the perfect age to be used as meat suppliers.

Deer and horse, as other species, also follow the trend identified in the Early Medieval assemblage as a whole. Deer antler dominance demonstrates that this species was exploited in phase 2 almost exclusively as raw material source for tools, while the occasional consumption of venison seems to have been a consequence of deer hunting instead of a cause (Appendix Figure 9). Horse skeletal representation (Appendix Figure 10), shows an equitable distribution of elements in phase 2 suggesting that horses were

frequently disposed completely or partially in areas of food waste. Horses were kept mainly to be used as working animals, although some sporadic consumption of their meat could have been done due to the presence of cut marks in a tibia, as in the Early Medieval assemblage as a whole.

Finally, dogs and cats also demonstrated that they had the same treatment in phase 2 as in the general trend of the Early Medieval period (Appendix Figures 11 and 12). Both of these species didn't seem to play any role in the subsistence of the site and were disposed without any defleshing of the carcasses in the same areas as food waste, due to an almost unbiased skeletal representation distribution.

### **Early Medieval phase 3 (850-1300 AD)**

No features could be assessed as belonging exclusively to phase 3. Therefore, no analysis on this phase could be compared with the general Early Medieval trend.

### **Period III: Post-Medieval**

Features of Post-Medieval times from Parknahown 5 only encompass one fragment. This specimen corresponds to a cattle loose maxillary first or second molar.

## **4. Comparisons**

### **Period I Phase 1: Neolithic**

The animal husbandry practices of this period are scarcely known. McCormick and Murray (2007) make a small summary of the Neolithic animal assemblages acknowledged in Ireland, mentioning that quantities of numbers of species vary between sites. In any case, it is common to find cattle, pig and sheep/goat, especially from funerary contexts where animal bones seem to be food waste, sometimes from ritual feasting.

The lack of previous studies and the small amount of animal bones found in our Neolithic features makes it difficult to establish reliable comparisons between Parknahown 5 and other assemblages in Ireland.

### **Period I Phase 2: Bronze Age**

McCormick and Murray (2007) give a general trend of Bronze Age animal husbandry, where quantities of each species vary from site to site but are mainly dominated by cattle, pig and sheep (the latest species apparently increases in later stages of the period). A comparable distribution of species was found in Raynestown 1 (48.5% of cattle,



33.5% of pigs and 6.4% of sheep) (Owen, forthcoming). In Parknahown 5 cattle, and to a lesser amount sheep, are present but no pigs were found. This could be a consequence of the small size of the Bronze Age period from our site and it is hard to establish that no pigs were consumed. This is the same case with other species such as cat, dog and horse, which are not present in Parknahown 5, but do occur in Bronze Age animal bone assemblages.

Regarding wild animals, deer especially red deer is found in Bronze Age assemblages like Haughey's Fort (McCormick and Murray, 2007) and Raynestown 1 (Owen, forthcoming), although in higher percentages than in Parknahown 5.

Although no highly reliable information concerning specimen age could be assessed in Parknahown 5, the presence of cattle older than 33 months of age is clearly dominant in Bronze Age sites such as Newgrange, Mooghaun, Haughey's Fort and Raynestown 1 (McCormick and Murray, 2007; Owen, forthcoming).

No other relevant information regarding Bronze Age assemblages were suitable for comparisons, due to a significant lack of data in Parknahown 5. Nonetheless, the Parknahown 5 animal bones of the Bronze Age were interpreted as food waste with incidental presence of wild animals and possible secondary uses of cattle, the same trends seen in most sites reported by McCormick and Murray (2007) and in Raynestown 1 (Owen, forthcoming).

## **Period I Phase 2: Early Medieval**

### **Early Medieval Cattle**

Cattle are the most common species at Parknahown 5 representing more than 50% of NISP and MNI. This trend is present in sites such as Ballycasey (Boner, 2003b), Blanchfieldsland (Beglane, 2005), Sligo Inner Relief Road Site 2B (Beglane, 2007), Johnstown 1 (Boner, 2003a) and Knowth (McCormick and Murray, 2007), although such a high frequency of cattle NISP and MNI is only reported for Knowth. The interpretation of this trend in all sites was related to the high importance of cattle as multiple use species, even suggesting its role as currency and the ownership of cattle as high-status evidence for the site, especially for Knowth.

In Knowth and Ballycasey the tendency to identify all parts of the cattle carcass is recognised as in Parknahown 5, where no signs or removal of any particular elements is evident. In addition, Knowth and our site show a further similitude in the predominance of meaty bones over feet, head of axial carcass. This suggests, as done for Parknahown 5, that specimens were bred, killed and consumed on site.

Regarding age, most sites compared with Parknahown 5 show two peaks of slaughtering cattle. The first peak varies widely amongst 6 and 30 months of age, but the second peak is evidently limited to specimens over 48-50 months of age. Johnstown 1 and Knowth show the first peak of killing of cattle around 2½ years old, as identified in Parknahown 5. On the other hand, the second age for killing is common for the majority of Early Medieval sites compared, except Ballycasey and Johnstown 1. Therefore, the age profile seen in Parknahown 5 bares a close relationship with other Early Medieval sites, but confirms more similarities with Knowth, although later stages of the Early Medieval period in Knowth demonstrate a decrease of killing around 2½ years and an increase in old specimen killing. Differences in these age slaughter patterns are interpreted as differences in animal husbandry. Ballycasey is the only site where the fundamental role of dairying is explicitly proposed. The other sites confirm the idea that cattle had multiple uses (including milking) and that the first peak of killing corresponds to the optimum age for meat supplement. The second peak confirms that cattle were being used as working animals, as suggested for Parknahown 5.

Female cattle are evidently dominant in Early Medieval sites from Ireland. This trend was recognised in Ballycasey, Knowth and Parknahown 5. Therefore, it is agreed that the first peak of killings was applied mostly on males producing a record high frequency of old females.

The four types of cut marks found in Parknahown 5 are reported for the Early Medieval sites, although there is not much homogeneity. Ballycasey is the only site where no butchery marks were observable. Horn core exploit is the only butchery mark that is common to almost all sites including Blanchfieldsland, Sligo Inner Relief Road Site 2B, Johnstown 1 and Knowth, confirming that the employment of horn core as raw material for tools was widely practiced in Early Medieval sites. Decapitation, evidenced in Parknahown 5, was reported only in Sligo Inner Relief Road Site 2B; while defleshing and dismemberment was apparently only observable in Knowth, although the later practice tended to be carried out by chopping instead of knives as seen in Parknahown 5. Two butchery practices were found in Knowth which is absent in Parknahown 5: splitting axial carcass in two and removing feet, both done by chopping.

Parknahown 5 is the one site from those compared that depended mostly on cattle as a meat supplier (90.4%), while in Knowth and Sligo Inner Relief Road Site 2B it was close to 80% and in Blanchfieldsland 75% of the meat consumed was beef.

Pathologies in cattle are reported for Blanchfieldsland and Knowth, and most of them are related, as for Parknahown 5, with biomechanical stress in working specimen. No osteosarcomas or dental pathologies were reported for any other Early Medieval site compared but Parknahown 5.

The Estimated Withers Heights (EWH) for cattle from Parknahown 5 fit perfectly within the norm reported for the other Early Medieval sites compared. Ballycasey and Johnstown 1's EWH fall within the 107 to 119 cm. calculated for Parknahown 5, while Knowth demonstrates a range of withers heights slightly broader than Parknahown 5's (102-120 cm.).

All these comparisons made clear that excluding some minor differences with some sites, probably due to temporal or spatial factors, Parknahown 5's cattle husbandry fits the standard reported for Early Medieval sites in Ireland, keeping a tighter resemblance with Knowth than with any other site compared.

### **Early Medieval Pigs**

For most sites from Early Medieval times compared with Parknahown 5, pig is the second most important. Furthermore, percentages of NISP and MNI are close to the ones reported for our site although in Sligo Inner Relief Road Site 2B percentages are slightly lower. Therefore, percentages of 14.3% of NISP and 18.8% of MNI registered in Parknahown 5 relate to the figures given for Sligo Inner Relief Road Site 2B, Blanchfieldsland and Knowth which range from 11 to 19%. Only two sites gave information about skeletal representation. Ballycasey demonstrates a fairly equitable distribution without an evident dominance of any part of the carcass. This contrasts with the findings from Parknahown 5 where meaty bones are by far more frequent than any other elements. On the other hand, Knowth distribution also differs from Parknahown 5 since head elements outnumbered postcranial ones. This later characteristic is explained by the author as a consequence of age slaughter patterns, while the former is due to differences in pig slaughter practices. In Parknahown 5 the discarded bones of pigs were differentially discarded depending on their usage, which does not seem to be the case in Ballycasey.

Occurrence of neonatal pigs was reported for sites such as Ballycasey and Knowth, while in Sligo Inner Relief Road Site 2B it is also stated that breeding of pig was carried out although no neonatal deaths are explicitly reported.

The peaks of killing on Early Medieval sites demonstrate differences. While in Parknahown 5 pigs were mostly killed between 17-29 months old (especially 23-25 months

of age), as in Blanchfieldsland and Knowth, in sites such as Ballycasey, Sligo Inner Relief Road Site 2B and Johnstown 1 pigs were killed much younger. This later pattern of not keeping pigs until optimum age for maximizing the meat supply is related to periods of food shortages.

A fairly unbiased sex distribution as found in Parknahown 5 was hard to identify in other sites. Blanchfieldsland and Ballycasey show an important dominance of males, while Knowth shows a trend of killing young males and keeping females. Johnstown 1 is closest to Parknahown 5 sex distribution, where males outnumber females but not by a high percentage.

Regarding taphonomy, only two sites make reference to pigs' butchery marks. In Ballycasey no cut marks were observable, while in Knowth some were identified, mostly relating to defleshing of specimens. This paucity of butchery marks is similar to the trend in Parknahown 5 and might be related to the size of pigs and the ways of preparation. This could also be interpreted as a highly specialised butchery system in Early Medieval times. Pork on Parknahown 5 represented less than 10% of meat consumed on the site, a percentage close to the one calculated for Sligo Inner Relief Road Site 2B (12%) but much lower than on Blanchfieldsland (15-22%).

Although in Knowth dental diseases for pigs were reported they do not correspond to the hypoplasia that was found in Parknahown 5 specimens of this species.

Although no major analysis of metrical data was carried out on Parknahown 5, it is clear that, as in most Early Medieval sites compared, pigs were domestic animals and wild boar was absent from the assemblages and most probably not exploited.

Pig husbandry in the Early Medieval period presented similarities and differences between sites, but in general it is easy to state that all of them bred pigs for the exclusive purpose of exploiting their meat. Major similarities are found between Parknahown 5, Johnstown 1 and Knowth, all of them Medieval enclosure sites.

### **Early Medieval Sheep**

Sheep in general terms are the third most common species found in Early Medieval sites in Ireland. But quantification of sheep assemblages showed a highly important feature: Later stages of the Early Medieval period demonstrate an increase in sheep NISP and MNI, representing then the second most important species after cattle. This trend was reported in Ballycasey and Knowth and was obvious while contrasting the whole Early Medieval assemblage and sheep from Period I Phase 2 of Parknahown 5 (14% against 19%). The

increase in the quantity of sheep appears to be linked to the drop in cattle quantity, which is reflected in Parknahown 5 too. Interpretations regarding loss of value of cattle as high-status species and environmental factors favourable to sheep are given to explain this fact, generating a change in husbandry practices. In any case, this is a trend widely encountered in the Early Medieval period and demonstrates the importance of sheep in all the sites as sources of different uses and products. Furthermore, almost all sites report an almost exclusive exploitation of sheep against goat as observable in Parknahown 5, excluding Johnstown 1, where goat is found in an important percentage.

Knowth skeletal representation is highly similar to the one in Parknahown 5, where meaty bones and feet are slightly dominant but all part of the carcass are present. This suggests that for both sites animals were bred or brought to the site, killed and discarded in the same areas.

The data for ageing sheep is to some extent difficult to compare. Johnstown 1 shows the closest age profile to Parknahown 5, where even with a limited ageing data, most specimens were killed after 18 months of age. Knowth, on the other side, presented a peak in killing between 12 and 28 months of age, animals being slaughtered significantly younger than in Parknahown 5. Johnstown 1 and Parknahown 5's age distribution is more biased towards the multiple uses of sheep (for milk or wool), with some specimens being kept until their maturity and adulthood, while Knowth is more intensive towards the exploitation of meat, due to a low incidence of sheep older than 28 months old.

The previous statement of the multiple uses of sheep in Parknahown 5 is corroborated by the low importance of mutton in Parknahown 5, which is hardly 1% while in Sligo Inner Relief Road Site 2B it reaches 4% and in Knowth varies between 1.7 and 2.4%. These comparisons suggest that in Parknahown 5 wool was as important (or slightly more important) than sheep as meat suppliers, compared with other Early Medieval sites.

Butchery marks were as scarce in other sites as in Parknahown 5. Knowth also presents traces of horn cores used as raw material, skinning and defleshing. Burnt teeth were also present in Sligo Inner Relief Road Site 2B as in Parknahown 5, while postcranial elements were found burnt in Knowth suggestive of the practice of cooking sheep on the bone.

In Knowth sheep specimens affected by osteoarthritis were also reported, but to a lesser degree than that encountered in Parknahown 5.

Estimated Withers Heights (EWH) for Parknahown 5 sheep fit within the norm of the Early Medieval times. Our estimated mean of EWH of 55 cm therefore matches up with

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the range of sheep size reported for Ballycasey and Knowth estimated between 50 and 62 cm.

Sheep breeding in Parknahown 5 has similarities especially with Knowth and Johnstown 1, both Medieval enclosures. But significant differences regarding age killing profiles propose that the role of wool in Parknahown 5 might have been more significant than in Blanchfieldsland, Johnstown 1 and Knowth. Mutton, nonetheless, was consumed in Parknahown 5 and slaughter practices are related to the ones carried out in the Early Medieval period in Ireland.

### **Early Medieval Horses**

Percentages of horse on Early Medieval sites are similar to the 4% found in Parknahown 5, such as 6% in Blanchfieldsland and 3% in Sligo Inner Relief Road Site 2B. The equitable distribution of skeletal elements was reported for Ballycasey, Johnstown 1 and Knowth, which is explicitly related (especially for Johnstown 1) to the attendance of articulated or semi-articulated specimens that were buried or ditched without any defleshing being done. Furthermore, articulated limbs separate from other parts of the body were also present in Johnstown 1, a trait reported in Parknahown 5 too.

Knowth showed an increase of horse frequency related to the diminution and substitution of cattle by horse as working animals in later stages of Early Medieval times.

The majority of horse specimens in Parknahown 5, Blanchfieldsland, Sligo Inner Relief Road Site 2B, Knowth, Ballycasey and Johnstown 1 are adults aged between 12 and 15, although some specimens died between 6-10 years. The last two sites mentioned also presented some immature specimens not older than 3 years of age as found in Parknahown 5. This demonstrates homogeneity in horse husbandry, where they most probably died of natural causes after a lifetime as working animals. Some young animals could have been killed or died out of natural causes due to illness or other reasons such as starvation.

The only Early Medieval site where butchery marks were reported was Knowth, these included taphonomic modifications that were restricted to the limbs and feet as in Parknahown 5. These signs are interpreted for both sites as incidental consumption or skinning of horses. McCormick and Murray (2007) propose that the consumption of horse meat could have been done by humans or used to feed dogs.

Furthermore, Knowth and Parknahown 5 share similarities regarding pathological modification in horse. Both sites presented specimens with osteoarthritis, although in

Knowth this seems to be much less frequent than in Parknahown 5. No cases of osteosarcoma were documented for any Early Medieval sites compared.

Johnstown 1, Knowth and Parknahown 5 reported similar Estimated Withers Heights (EWH) for horses, all specimens being in the range calculated for Knowth within 121 and 141 cm. This reveals the homogeneity in the horse population for all these sites. Despite this, according to McCormick (2007: 95) the presence of horses taller than 137 cm is only observed in royal sites, this was the case observed in Parknahown 5 for two specimens.

Horse population and exploitation in the Early Medieval period of Ireland is almost identical on all sites, making clear the importance of horses as working animals which were exploited, in most cases, until their useful lifetime was over.

### **Early Medieval Dogs**

Presence of dog bones was common on all Early Medieval sites compared. Percentages are not explicitly given in some of the sites, but it seems that the frequency of dogs in Parknahown 5 follows the trend of the other sites, except in Blanchfieldsland where this species was much more frequent than in our site.

All sites demonstrate a highly equitable distribution of skeletal elements, which would correspond to the idea that dogs were buried without defleshing them before being discarded. Blanchfieldsland reports the presence of articulated or semi-articulated specimens, while in Knowth it is explicit that only small bones are absent, both traces also observable in Parknahown 5.

Similar to the age profile found in horses, Parknahown 5, Ballycasey, Johnstown 1 and Knowth do not seem to have a culling practice and most deaths of dogs were by natural causes of adult specimens. A few immature deaths do not represent any particular practice, but again natural deaths of animals.

No butchery marks are reported in sites like Ballycasey and Knowth. Although scarce, Parknahown 5 does present skinning marks in a few specimens, a feature also described for Johnstown 1. This is related to the idea of dogs' skins and pelts exploited in some sites from the Early Medieval period.

Two specimen's Estimated Withers Heights (EWH) in Parknahown 5 were calculated. These represent two dogs of 35-36 cms. tall, sizes reported in dogs from Knowth. Lap dogs (with EWH around 26 cms.) are considered high-status animals that would only be encountered in Early Medieval high-status sites (McCormick and Murray,

2007: 99). The absence of these lap dogs in Parknahown 5 coincides with Early Medieval Knowth. These lap-dogs were reported for Ballycasey and Johnstown 1.

### **Early Medieval Deer**

All Early Medieval sites compared evidenced the same pattern of deer distribution. 3% of the total assemblage was commonly composed of deer, red deer being the most frequent. The only site where deer encompass a larger amount than 3% is Sligo Inner Relief Road Site 2B with almost 11% of deer elements.

Furthermore, the majority of deer specimens are represented by antlers, while postcranial elements are found but in a considerably small degree. This suggests that the incidental consumption of venison was carried out on all sites, but the exploitation of antlers was the main use for deer. Collection of shed antler and hunting of deer are reported in Knowth and Johnstown 1 as in Parknahown 5. Butchery of antler is described for Johnstown 1 and Knowth, but the working antler techniques could not be compared between these two sites and Parknahown 5.

Due to the importance of the antler industry, deer assemblages are encompassed on all sites by male adult specimens.

### **Early Medieval Cat**

Cat bones are reported for Blanchfieldsland and Knowth, although the quantity of this species is more frequent in the former (8%) and less common in the later (0.7%) than in Parknahown 5.

In both sites compared, cat bones are characterised by articulated or semi-articulated specimens and as reported for Knowth and Parknahown 5, skeletal element's present are influenced by recovery techniques instead of subsistence reasons. Therefore, as for dogs, cats on Early Medieval sites were discarded without defleshing the specimens.

The age distribution and butchery practices in Knowth and Parknahown 5 are the same, where only adults that most probably died of natural causes are represented and a few skinning marks are observable. In Johnstown 1, on the other hand, some skinning marks are found on immature bones. Therefore, it seems plausible to think that in Knowth and Parknahown 5 cat's pelts were occasionally extracted after their natural deaths, while in Johnstown 1 it is reported that immature cats were killed for their pelts.



## 5. Conclusions

Parknahown 5's animal bone assemblage is an important case of subsistence practice especially animal husbandry during the Early Medieval period.

The Neolithic and Bronze Age assemblages did not allow an exhaustive analysis of the husbandry practices and although the species represented seem to be common in other sites from the same periods in Ireland, it is difficult to make reliable establishment of patterns in animal husbandry practices.

The Early Medieval assemblage, on the other hand, was well preserved and abundant, allowing the analysis and interpretation of different aspects of animal husbandry for the main domestic animals and some wild animals. The site shows distinctive features of ordinary waste of domestic food, except for horses, dogs and cats. No kitchen or specialized butchery areas were identified at the site.

Early Medieval Parknahown 5 follows closely the pattern identified in other Early Medieval sites in Ireland, where cattle is the main bred species due to the quantity of meat that contributed to its inhabitants and the various secondary uses that could be exploited, such as labour, dairying or tanning. According to McCormick and Murray (2007:105) a frequency of cattle close to 50% could be considered as a high status site, since “...*faunal assemblages are reflecting a national value system in which cattle, particularly dairying cows, are the basis of wealth*” (Ibid:106). Therefore, Parknahown 5 seems to be a high status site according to the level of ownership of cattle. The period of time between 650 and 850 AD demonstrate a slight decrease in cattle quantities, a normal trend in other Early Medieval sites and “*While the change does not reflect a radical change in the livestock economy, it does indicate a decline in the importance of cattle in the tenth-eleventh centuries*” (Ibid:106). Furthermore, the age profile of Parknahown 5 dominated by the killing of old specimens is considered characteristic of urban sites where inhabitants procured their meat supply from rural sites (Ibid:116). In spite of this, it is difficult to interpret Parknahown 5 as an urban site, especially taking into account the skeletal representation and survival rates of elements on the site, but it is a possibility that should not be discarded.

Pigs and sheep are the next most important species in the site. The former was exclusively bred for the consumption of its meat and lard and were commonly bred in rural sites and scarce in urban sites (McCormick and Murray, 2007). On the other hand, sheep shows an increase in frequency during some later periods of the Early Medieval phase, a

trend seen in almost every contemporary site of Ireland. The sheep husbandry intensification is closely related to the decrease in importance of cattle as high-status species and is possibly linked to the rise of craftworking or trade in later stages of Early Medieval Ireland (McCormick and Murray, 2007: 116). This importance of craftworking, possibly associated to the production of wool, is consistent with the fact that no goats were identified in the assemblage, a tendency clearly dominant in sites from the Early Medieval Period (McCormick and Murray, 2007: 105).

Although some horse bones were discarded as food waste, which would account for a probable food shortage (McCormick, 2007: 92), the presence of horses seems to represent a highly important species mainly used for traction and riding. Therefore, Parknahown 5 horse assemblage is closely related to high-status sites, taking into account the abundance and characteristics of the horse assemblage similar to what have been described as royal sites (McCormick, 2007: 95), and significant value reported for horses: *“The law tracts indicate that horses were regarded as being of much greater value than milk cows...”* (Kelly, 2005 in McCormick, 2007: 93).

The dog assemblage contrasts with some previously mentioned high-status characteristics. Lap dogs are absent in Parknahown 5, animals also missing in Knowth, a site considered as high-status or royal (McCormick, 2007: 95; McCormick and Murray, 2007).

The assemblage of cats is closely related to the one reported for Knowth, as for other species already described. The treatment of cats as pets was characteristic of rural sites, while the commercial exploitation of these animals for their pelts was related to urban areas (McCormick and Murray, 2007). *“Evidence of the skinning of domestic cats has not previously been noted on Early Christian rural sites; therefore the occurrence of skinning during Stage 9 at Knowth indicates that the cat’s role as a treasured pet was being superseded by commercial considerations”* (McCormick and Murray, 2007: 116). This feature is also marked in Parknahown 5 where, although not frequent, skinning of cats was practiced.

Birds and wild animals are infrequent on Parknahown 5, a tendency common on all Early Medieval sites, only limited to some keeping of domestic fowl and a small role of hunting, fowling and fishing (McCormick and Murray, 2007: 104). The role of hunting was almost restricted to deer, a species that was exploited almost exclusively for the use of antler as raw material.

Parknahown 5 shows an occupation that starts in the Neolithic and continues up until the Post-Medieval period. The Neolithic and Bronze Age animal bone assemblages are limited but can be placed within the variation noted in husbandry practices in Ireland during these periods (McCormick and Murray, 2007).

The Early Medieval period was the most intense time of occupation, when Parknahown 5 reveals some characteristics associated with high-status sites, especially regarding the ownership of cattle and horses. Other aspects found in Parknahown 5, particularly cattle slaughter patterns, late sheep husbandry practices and exploitation of cats for economical purposes, relate this site with urban activities. All of these characteristics are significantly analogous to those reported for other Early Medieval enclosures, mainly Knowth, a site that was suggested as being evidence of a royal site (McCormick, 2007: 95) that reflects signs of economical change: *“The changes show a movement away from an economy where the value system was based on livestock, specifically the milk cow, to one where a more varied wealth-based system emerges...”* (McCormick and Murray, 2007: xx). Therefore, it is possible to interpret Parknahown 5 as a site with important high-status qualities that illustrates a transitional state from essentially rural husbandry practices to a more urban-related economy, changes that were gradually reflected in the animal bone assemblage.

## **6. Recommendations**

Further archaeological studies with contextual approaches and better defined phasing of the site would allow complementing and supporting interpretations about the nature and importance of Parknahown 5 during the Early Medieval times, which represents an outstanding archaeological collection from the Early Medieval period in Ireland.

Therefore, the author as the bone specialist suggests that countable and non-countable animal bones should be kept in case more contextual information is obtained for the site, allowing further analyses. The assemblage should be stored under methods approved by National Museum of Ireland that would guarantee low-acid conditions to ensure its preservation. The ‘low grade’ fragments could be discarded. Nevertheless, the final decision should be made by the National Museum of Ireland in agreement with the licence holder.

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## Bibliography

1. Baker, J. R. 1970. The differential diagnosis of bone disease. In: **Research problems in zooarchaeology**. D. R. Brothwell, K. D. Thomas and J. Clutton-Brook (eds.). London: Institute of Archaeology.
2. Baker, J. R. and D. Brothwell. 1980. **Animal Diseases in Archaeology**. New York: Academic Press.
3. Bartosiewicz, L., W. Van Neer and A. Lentacker. 1997. **Draught cattle: Their osteological identification and history**. Annales Sciences Zoologiques, Vol. 28. Tervuren, Belgique: Musée Royal de l'Afrique Central.
4. Beglane, F. 2005. **Report on Faunal Material from Kilkenny Blanchfieldsland**. Unpublished report.
5. Beglane, F. 2007. Report on Faunal Material from Sligo Inner Relief Road Site 2B. In **Monumental Beginnings: The archaeology of the N4 Sligo Inner Relief Road**, E. Danaher (ed.), pp. 1-33 (CD part of publication only). Dublin: The National Roads Authority.
6. Boessneck, J. 1969. Osteological differences between sheep (*Ovis aries* Linné) and goat (*Capra hircus* Linné). In **Science in Archaeology**, D. R. Brothwell and E. S. Higgs (eds.), pp. 331-358. London: Thames & Hudson.
7. Boner, C. 2003a. **Analysis of Mammal Bones Johnstown 1, Enfield, Co. Meath**. Unpublished report.
8. Boner, C. 2003b. Analysis of Faunal Remains Ballycasey, Co. Clare. In: **Excavation of an Archaeological Complex at Ballycasey More County Clare**, T. O'Neill (ed.), Appendix 1. Unpublished report.
9. Brain, C. K. 1969. The contribution of Namib desert Hottentots to an understanding of Australopithecine bone accumulations. In: **Scient. Pap. Namib Desert Res. Stn. 39**, pp. 13-22.
10. Cohen, A. and D. Serjeantson. 1996. **A manual for the identification of bird bones from archaeological sites**. London: Archaeotype Publication Ltd.
11. Cornwall, I. W. 1974. **Bones for the archaeologists**. London: JM Dent & Sons LTD.
12. Davis, S. 1987. **The archaeology of animals**. London: BT Batsford LTD.

13. Davis, S. 1992. A rapid method for recording information about mammal bones from archaeological sites. In: **Ancient Monuments Laboratory Research Report 19/92**. London: English Heritage.
14. Dobney, K. and A. Ervynck. 1998. A protocol for recording linear enamel hypoplasia on archaeological pig teeth. In: **International Journal of Osteoarchaeology**, 8, pp. 263-273.
15. Fox, H. 1939. Chronic arthritis in wild mammals. In **Transactions of the American Philosophical Society**. XXXI, part II. Philadelphia: The American Philosophical Society.
16. Grant, A. 1982. The use of tooth wear as a guide to the age of domestic ungulates. In **Ageing and sexing animal bones from archaeological sites**, Wilson, B; C. Grigson and S. Payne (eds.), pp. 91-108. Oxford: British Series 109.
17. Grayson, D. 1984. **Quantitative Zooarchaeology**. Washington: Academic Press Inc.
18. Grigson, C. 1982. Sex and age determination of some bones and teeth of domestic cattle: a review of literature. In **Ageing and sexing animal bones from archaeological sites**, Wilson, B; C. Grigson and S. Payne (eds.), pp. 7-24. Oxford: BAR British Series 109.
19. Habermehl, F. 1961 **Die Altersbestimmung bei Haustieren, pelztieren und beim jagdbaren Wild**. Berlin: Paul Parey.
20. Hambleton, E. 1999. **Animal Husbandry Regimes in Iron Age Britain**. Oxford: BAR British Series 282.
21. Harcourt, R. 1974. The dog in prehistoric and early historic Britain. **Journal of Archaeological Science**. 1, pp. 151-175.
22. Higham, C. 1967. Stockrearing as a cultural factor in prehistoric Europe. In: **Proceedings of the prehistoric society**. 33, pp. 84-106.
23. Hillson, S. 1995. **Mammal bones and teeth**. London: UCL.
24. Lyman, R. 1994 **Vertebrate Taphonomy**. Cambridge: Cambridge Manuals in Archaeology.
25. Maltby, J. 1985. The animal bones. In: **The Prehistoric settlement of Winnall Down, Winchester**. P.J. Fasham (ed.), pp. 97 -112. M3 Archaeological Rescue Committee Report No. 8, Hampshire Field Club and Archaeological Society Monograph 2. Hampshire: Hampshire Field Club and Archaeological Society.
26. McCormick, F. 1992. Early Faunal Evidence for Dairying. In: **Oxford Journal of Archaeology**. 11 (2), pp. 201-210.

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27. McCormick, F. 1997. The animal bones. In: **Late Viking Age and Medieval Waterford Excavations 1986-1992**, Hurley, M.; O. Scully and S. McCutcheon (eds.), 819-853. Waterford: Waterford Corporation.
  28. McCormick, F. 2007. The horse in Early Ireland. In: **Anthropozoologica**. 42 (1), pp. 85-104.
  29. McCormick, F. and E. Murray. 2007. **Knowth and the Zooarchaeology of Early Christian Ireland**. Dublin: Royal Irish Academy.
  30. O'Connor, T. 2004. **The archaeology of animal bones**. Great Britain: Sutton Publishing Limited.
  31. Owen, J. Forthcoming. Raynestown 1. Animal Bone Report. In: **Final Report on Archaeological Excavations at Raynestown 1, Co. Meath**. Elderan and Ginn (eds.). NRA Monographs.
  32. Payne, S. 1973. Kill off patterns in sheep and goats: the mandible from Asvan Kale. In: **Anatolian Studies**. 23, pp. 281-303.
  33. Payne, S. 1987. Reference codes for wear states in the mandibular cheek teeth of sheep and goats. In: **Journal of Archaeological Science**. 14, pp. 609-614.
  34. Payne, S. and G. Bull. 1988. Components of variation in measurements to distinguish wild from domestic pig remains. In: **Archaeozoologica**. II (1-2), pp. 27-66.
  35. Putelat, O. 2006. Early Middle Age and Polycerate Sheep. In: **ICAZ 2006 International Conference. Exploitation of Coastal Resources: New and Old World Perspectives**.
  36. Reitz, E. and E. Wing. 1999. **Zooarchaeology**. Cambridge: Cambridge University Press.
  37. Schmidt, E. 1972. **Atlas of animal bones**. London: Elsevier Publishing Company.
  38. Shippen Huidekoper, R. 1892. **Age of the domestic animals**. Philadelphia: F.A. Davis.
  39. Siegel, J. 1976. Animal Paleopathology: possibilities and problems. **Journal of Archaeological Science**. 3, pp. 349-384.
  40. Silver, I. 1969. The aging of domestic animals. In **Science in Archaeology**, D. R. Brothwell and E. S. Higgs (eds.), pp. 283-302. London: Thames & Hudson.
  41. Smith, R. 1969 Fusion ossification centres in the cat. In **Journal of small Animal Practice**. 10, pp. 523-530.
  42. Von Den Driesch, A. 1976. **A guide to the measurements of animal bones from archaeological sites**. USA: Peabody Museum Bulletins, Harvard University, Peabody Museum of Archaeology and Ethnology.

43. Von Den Driesch, A. and J. Boessneck. 1979. Kritische Anmerkungen zur Widerristhohenberechnung aus Langenmanben vor- und fruhgeschichtlicher Tierknochen. In **Saugetierkundliche Mitteilungen**, vol. 4, pp. 325-348. Munich: BLV-Verlagsgesellschaft.

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## Appendix

**Table 1. Skeletal elements and their abbreviation**

<b>Abbreviation</b>	<b>Element</b>
AN	Antler
AS	Astragalus
CA	Calcaneus
CR	Cranium
FE	Femur
HC	Horn Core
HU	Humerus
LMT	Loose Mandibular Tooth
LT	Loose tooth
LXT	Loose Maxillary Tooth
MC1	Metacarpal 1
MC2	Metacarpal 2
MC3	Metacarpal 3
MC4	Metacarpal 4
MC5	Metacarpal 5
MCU	Metacarpal Unidentified
MN	Mandible
MPU	Metapodial Unidentified
MT1	Metatarsal 1
MT2	Metatarsal 2
MT3	Metatarsal 3
MT4	Metatarsal 4
MT5	Metatarsal 5
MTU	Metatarsal Unidentified
NC	Coracoid
PA	Patella
PE	Pelvis
PH1	Phalange 1
PH2	Phalange 2
PH3	Phalange 3
RA	Radius
SC	Scapula
SCU	Scafocuboid
TI	Tibia
UL	Ulna
VC1	Atlas
VC2	Axis



**Table 2. NISP and MNI by species and elements for Parknahown 5**

Element	Cattle	Pig	Sheep	Horse	Dog	Deer	Cat	Domestic Fowl	Other birds	Total
Antler						73				73
Astragalus	58	4	12	5	4	1				84
Calcaneus	51	14	7	4	6	1	2			85
Cranium	71	50	5	6	15	1	2			150
Femur	40	35	11	6	8		6	1	2	109
Horn Core	35		6							41
Humerus	75	36	24	6	3		3	4	2	153
Loose Mandibular Tooth	643	121	164	45	21	11	4			1009
Loose tooth				7						7
Loose Maxillary Tooth	439	37	108	17	11	31				643
Metacarpal 1	102		19	1	1					123
Metacarpal 2		1			3					4
Metacarpal 3		2		5	2					9
Metacarpal 4		1			2					3
Metacarpal 5					3					3
Metacarpal Unidentified		1					1			2
Mandible	171	63	45	9	11	1	5			305
Metapodial Unidentified		4		5	3			1		13
Metatarsal 1	71		25			3				99
Metatarsal 2					2					2
Metatarsal 3		2		5	3		2			12
Metatarsal 4		2			2		1			5
Metatarsal 5					3					3
Metatarsal Unidentified					2				1	3
Coracoid								1		1
Patella				4						4
Pelvis	62	39	13	9	3		3			129
Phalange 1	67		16	8	4					95
Phalange 2	29	1	4	4	1					39
Phalange 3	7		4	6	1	1				19
Radius	94	21	27	10	7	1	5	1	2	168
Scapula	85	36	14	4	3	5	1			148
Scafoecuboid	8			1						9
Tibia	63	34	33	10	11	1	4			156
Ulna	58	45	4	5	1		3	2	3	121
Atlas	13		4	2	2		2			23
Axis	15	2	1	1	5	1				25
<b>NISP</b>	<b>2257</b>	<b>551</b>	<b>546</b>	<b>185</b>	<b>143</b>	<b>131</b>	<b>44</b>	<b>10</b>	<b>10</b>	<b>3877</b>
NISP %	58.2	14.2	14.1	4.8	3.7	3.4	1.1	0.3	0.3	100
<b>MNI</b>	<b>91</b>	<b>32</b>	<b>24</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>180</b>
MNI%	50.6	17.8	14.4	4.4	3.9	4.4	2.2	1.7	0.6	100

**Table 3. Presence of taphonomical modifications**

<b>Taphonomical modification</b>	<b>Including countable and non countable fragments</b>	<b>%</b>	<b>Including only countable fragments</b>	<b>%</b>
Fragments with Burning	86	2.0	42	1.1
Fragments with Butchery	116	2.7	82	2.1
Fragments with Gnawing	450	10.6	268	6.9
<b>Total</b>	<b>4259</b>	<b>100</b>	<b>3877</b>	<b>100</b>

**Table 4. Presence of taphonomical modifications by species in countable fragments**

<b>Species</b>	<b>Burning</b>	<b>%</b>	<b>Butchery</b>	<b>%</b>	<b>Gnawing</b>	<b>%</b>	<b>Total</b>	<b>%</b>
Cattle	22	52.4	34	41.5	177	66.0	233	59.4
Pig	4	9.5	1	1.2	27	10.1	32	8.2
Sheep	15	35.7	6	7.3	55	20.5	76	19.4
Horse	1	2.4	1	1.2	7	2.6	9	2.3
Dog	0	0.0	2	2.4	1	0.4	3	0.8
Deer	0	0.0	37	45.1	0	0.0	37	9.4
Cat	0	0.0	1	1.2	1	0.4	2	0.5
<b>Total</b>	<b>42</b>	<b>100.0</b>	<b>82</b>	<b>100.0</b>	<b>268</b>	<b>100.0</b>	<b>392</b>	<b>100.0</b>

**Table 5. Total of specimens by species, element and side for Period I Phase 1 (Neolithic)**

Species	Element	Side	Total
Cattle	FE	R	1
	FE Total		1
	HU	R	1
	HU Total		1
	LMT	L	2
		R	1
	LMT Total		3
	MT1	R	1
	MT1 Total		1
	PE	R	1
	PE Total		1
	PH1	L	1
	PH1 Total		1
Cattle Total			8
Deer	AN	U	2
	AN Total		2
Deer Total			2
Red Deer	AN	U	2
	AN Total		2
Red Deer Total			2
Horse	CA	L	1
	CA Total		1
	LMT	L	1
	LMT Total		1
	MT3	R	1
	MT3 Total		1
	UL	R	1
	UL Total		1
Horse Total			4
Sheep	LMT	L	1
		R	1
LMT Total		2	
Sheep Total			2
Grand Total			18

**Table 6. Total of specimens by species, part of skeleton and element (excluding teeth) for Period I Phase 1 (Neolithic)**

Species	Part of the body	Skeletal Elements	Total
Cattle	FEET	MT1	1
		PH1	1
	FEET Total		2
	MEATY BONES	FE	1
		HU	1
		PE	1
MEATY BONES Total		3	
Cattle Total			5
Deer	HEAD	AN	4
	HEAD Total		4
Deer Total			4
Horse	FEET	CA	1
		MT3	1
	FEET Total		2
	MEATY BONES	UL	1
	MEATY BONES Total		1
Horse Total			3
Grand Total			12

**Table 7. Tooth Wear Stages (Grant, 1982; Payne, 1973; 1987) in loose mandibular teeth and Mandible Wear Stages for M3 (Higham, 1967) by species from Period I Phase 1 (Neolithic)**

		Payne TWS for sheep Grant TWS for cattle						Higham MWS	Estimated Age in months
Species	Element	dp4	P4	M1	M2	M12	M3		
Sheep	LMT	-	-	-	-	-	9G	16	Mature
Sheep	LMT	-	-	-	-	9A	-	-	-
Cattle	LMT	1	-	-	-	-	-	-	-
Cattle	LMT	-	-	-	-	f	-	-	-
Cattle	LMT	-	-	-	-	f	-	-	-

**Table 8. Ageing by the fusion of the epiphyses (Silver, 1969) by species from Period I Phase 1 (Neolithic).**

Species	Element	Fusion proximal	Fusion distal	Estimated Minimum Age
Cattle	FE	F	-	> 42 months
Cattle	PH1	F	F	>18 months
Cattle	HU	-	F	>12-18 months
Cattle	MT1	F	-	>0
Horse	MT3	F	-	>0

**Table 9. Total of specimens by species, element and taphonomical modification for Period I Phase 1 (Neolithic)**

Species	Element	Gnawing	Burning	Butchery	Total
Cattle	HU	Carnivore	-	-	1
	MT1	Carnivore	-	-	1
	PE	Carnivore	-	-	1
<b>Cattle Total</b>					<b>3</b>
Deer	AN	-	-	Chopped	1
<b>Deer Total</b>					<b>1</b>
Horse	CA	Carnivore	-	-	1
	UL	Carnivore	-	-	1
<b>Horse Total</b>					<b>2</b>
<b>Grand Total</b>					<b>6</b>

**Table 10. Total of specimens measured for Period I Phase 1 (Neolithic)**

Species	Element	Measurements	
		Bp	Bd
Cattle	HU	-	73.2
Cattle	PH1	-	25.4
Horse	MT3	45.2	-

**Table 11. Total of specimens by species, element and side for Period I Phase 2 (Bronze Age)**

Species	Element	Side	Total
Cattle	HU	R	1
	HU Total		1
	LMT	L	2
		R	2
	LMT Total		4
	MT1	L	1
	MT1 Total		1
	PH1	L	1
		R	1
	PH1 Total		2
	RA	L	1
	RA Total		1
SC	R	2	
SC Total		2	
Cattle Total			11
Deer	AN	U	1
	AN Total		1
Deer Total			1
Sheep	HU	L	1
	HU Total		1
	LXT	L	1
		R	1
	LXT Total		2
	SC	L	1
SC Total		1	
Sheep Total			4
Grand Total			16

**Table 12. Total of specimens by species, part of skeleton and element (excluding teeth) for Period I Phase 2 (Bronze Age)**

Species	Part of the body	Element	Total
Cattle	FEET	MT1	1
		PH1	2
	FEET Total		3
	MEATY BONE	HU	1
		RA	1
		SC	2
MEATY BONE Total		4	
Cattle Total			7
Deer	HEAD	AN	1
	HEAD Total		1
Deer Total			1
Sheep	MEATY BONE	HU	1
		SC	1
	MEATY BONE Total		2
Sheep Total			2
Grand Total			10

**Table 13. Tooth Wear Stages (Grant, 1982) in loose mandibular teeth and Mandible Wear Stages for M3 (Higham, 1967) by species from Period I Phase 2 (Bronze Age)**

Species	Element	Grant TWS						Higham MWS
		dp4	P4	M1	M2	M12	M3	
Cattle	LMT	-	-	-	-	-	a	-
Cattle	LMT	-	-	-	-	g	-	-
Cattle	LMT	-	-	-	-	c	-	-
Cattle	LMT	-	-	-	-	f	-	-

**Table 14. Ageing by the fusion of the epiphyses (Silver, 1969) by species from Period I Phase 2 (Bronze Age)**

Species	Element	Fusion proximal	Fusion distal	Estimated Minimum Age
Cattle	PH1	F	-	> 0 months
Cattle	SC	F	-	> 7-10 months
Cattle	SC	F	-	> 7-10 months
Cattle	HU	-	F	> 12-18 months
Cattle	PH1	F	F	> 18 months
Cattle	RA	F	-	> 42-48 months
Cattle	MT1	-	F	> 33-36 months
Sheep	SC	F	-	> 6-8 months
Sheep	HU	-	F	> 10 months

**Table 15. Total of specimens measured for Period I Phase 2 (Bronze Age)**

Species	Element	Measurements							
		GLPe	Bp	SD	Bd	BFdm	BFdl	Ddm	Ddl
Cattle	MT1	-	-	-	37	16.7	15.6	25.6	24.8
Cattle	PH1	52.6	25.4	22	23.7	-	-	-	-
Sheep	SC	-	29.4	-	-	-	-	-	-

**Table 16. NISP and MNI by species and elements for Period II (Early Medieval)**

Element	Cattle	Pig	Sheep	Horse	Dog	Deer	Cat	Domestic Fowl	Birds	Grand Total
AN						68				68
AS	58	4	12	5	4	1				84
CA	51	14	7	3	6	1	2			84
CR	71	50	5	6	15	1	2			150
FE	39	35	11	6	8		6	1	2	108
HC	35		6							41
HU	73	36	23	6	3		3	4	2	150
LMT	636	121	162	44	21	11	4			999
LT				7						7
LXT	438	37	106	17	11	31				640
MC1	102		19	1	1					123
MC2		1			3					4
MC3		2		5	2					9
MC4		1			2					3
MC5					3					3
MCU		1					1			2
MN	171	63	45	9	11	1	5			305
MPU		4		5	3			1		13
MT1	69		25			3				97
MT2					2					2
MT3		2		4	3		2			11
MT4		2			2		1			5
MT5					3					3
MTU					2				1	3
NC								1		1
PA				4						4
PE	61	39	13	9	3		3			128
PH1	64		16	8	4					92
PH2	29	1	4	4	1					39
PH3	7		4	6	1	1				19
RA	93	21	27	10	7	1	5	1	2	167
SC	83	36	13	4	3	5	1			145
SCU	8			1						9
TI	63	34	33	10	11	1	4			156
UL	58	45	4	4	1		3	2	3	120
VC1	13		4	2	2		2			23
VC2	15	2	1	1	5	1				25
<b>Total NISP</b>	<b>2237</b>	<b>551</b>	<b>540</b>	<b>181</b>	<b>143</b>	<b>126</b>	<b>44</b>	<b>10</b>	<b>10</b>	<b>3842</b>
<b>% NISP</b>	<b>58.2</b>	<b>14.3</b>	<b>14.1</b>	<b>4.7</b>	<b>3.7</b>	<b>3.3</b>	<b>1.1</b>	<b>0.3</b>	<b>0.3</b>	<b>100.0</b>
<b>Total MNI</b>	<b>87</b>	<b>32</b>	<b>24</b>	<b>7</b>	<b>7</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>170</b>
<b>% MNI</b>	<b>51.2</b>	<b>18.8</b>	<b>14.1</b>	<b>4.1</b>	<b>4.1</b>	<b>2.9</b>	<b>2.4</b>	<b>1.8</b>	<b>0.6</b>	<b>100.0</b>

**Table 17. Total of specimens of cattle by element and side for Period II (Early Medieval)**

Species	Element	Side	Total
Cattle	AS	L	26
		R	32
	AS Total		58
	CA	L	29
		R	22
	CA Total		51
	CR	L	33
		R	29
		U	9
	CR Total		71
	FE	L	8
		R	22
		U	9
	FE Total		39
	HC	L	19
		R	4
		U	12
	HC Total		35
	HU	L	33
		R	39
		U	1
	HU Total		73
	LMT	L	305
		R	324
		U	7
	LMT Total		636
	LXT	L	196
		R	240
		U	2
	LXT Total		438
	MC1	L	53
		R	43
		U	6
	MC1 Total		102
	MN	L	82
		R	87
		U	2
	MN Total		171
	MT1	L	37
		R	31
		U	1
	MT1 Total		69
	PE	L	25
		R	35
		U	1
	PE Total		61
	PH1	L	30
		R	33
		U	1
	PH1 Total		64
	PH2	L	15



		R	14
	PH2 Total		29
	PH3	L	5
		R	2
	PH3 Total		7
	RA	L	52
		R	39
		U	2
	RA Total		93
	SC	L	41
		R	42
	SC Total		83
	SCU	L	3
		R	1
		U	4
	SCU Total		8
	TI	L	22
		R	40
		U	1
	TI Total		63
	UL	L	32
		R	26
	UL Total		58
	VC1	U	13
	VC1 Total		13
	VC2	U	15
	VC2 Total		15
	Cattle Total		2237
	Grand Total		2237

**Table 18. Tooth Wear Stages (Grant, 1982) in loose mandibular teeth and Mandible Wear Stages for M3 (Higham, 1967) for Early Medieval Cattle.**

Element	NISP (N=560, %=25)	dp4	P4	M1	M2	M12	M3	Higham MWS	Estimated Age in Months
LMT	2	-	-	-	-	-	-	-	-
LMT	6	-	-	-	-	-	a	-	-
LMT	13	-	-	-	-	-	b	15	30-31 months
LMT	2	-	-	-	-	-	c	16	31-32 months
LMT	1	-	-	-	-	-	d	17	32-33 months
LMT	4	-	-	-	-	-	e	18	36 months
LMT	7	-	-	-	-	-	f	19	38 months
LMT	5	-	-	-	-	-	g	20	40 months
LMT	7	-	-	-	-	-	j	22	50 months
LMT	12	-	-	-	-	-	k	23	over 50 months
LMT	6	-	-	-	-	-	l	23	over 50 months
LMT	6	-	-	-	-	-	m	23	over 50 months
LMT	43	-	-	-	-	a	-	-	-
LMT	38	-	-	-	-	b	-	-	-
LMT	24	-	-	-	-	c	-	-	-
LMT	7	-	-	-	-	d	-	-	-

LMT	6	-	-	-	-	e	-	-	-
LMT	52	-	-	-	-	f	-	-	-
LMT	66	-	-	-	-	g	-	-	-
LMT	4	-	-	-	-	h	-	-	-
LMT	19	-	-	-	-	j	-	-	-
LMT	34	-	-	-	-	k	-	-	-
LMT	15	-	-	-	-	l	-	-	-
LMT	6	-	-	-	-	m	-	-	-
LMT	5	-	-	-	-	n	-	-	-
LMT	1	-	-	-	f	-	-	-	-
LMT	2	-	-	-	g	-	-	-	-
LMT	4	-	-	-	k	-	-	-	-
LMT	1	-	-	-	l	-	-	-	-
LMT	1	-	-	-	m	-	-	-	-
LMT	1	-	-	c	-	-	-	-	-
LMT	1	-	-	d	-	-	-	-	-
LMT	1	-	-	j	-	-	-	-	-
LMT	1	-	-	k	-	-	-	-	-
LMT	3	-	-	l	-	-	-	-	-
LMT	2	-	-	m	-	-	-	-	-
LMT	1	-	-	n	-	-	-	-	-
LMT	13	-	a	-	-	-	-	-	-
LMT	5	-	b	-	-	-	-	-	-
LMT	3	-	c	-	-	-	-	-	-
LMT	1	-	d	-	-	-	-	-	-
LMT	1	-	e	-	-	-	-	-	-
LMT	13	-	f	-	-	-	-	-	-
LMT	9	-	g	-	-	-	-	-	-
LMT	2	-	h	-	-	-	-	-	-
LMT	1	-	j	-	-	-	-	-	-
LMT	1	e	-	-	-	-	-	-	-
LMT	2	f	-	-	-	-	-	-	-
LMT	6	h	-	-	-	-	-	-	-
LMT	19	j	-	-	-	-	-	-	-
LMT	11	k	-	-	-	-	-	-	-
LMT	2	l	-	-	-	-	-	-	-
LMT	2	m	-	-	-	-	-	-	-
LMT	1	n	-	-	-	-	-	-	-
MN	2	-	-	-	-	-	b	15	30-31 months 40 months over 50 months over 50 months over 50 months
MN	1	-	-	-	-	-	g	20	
MN	1	-	-	-	-	-	k	23	
MN	2	-	-	-	-	-	l	23	
MN	1	-	-	-	-	-	m	23	
MN	1	-	-	-	b	-	-	-	-
MN	1	-	-	-	c	-	-	-	-
MN	1	-	-	-	f	-	-	-	-
MN	1	-	-	-	f	-	a	11	18-24 months
MN	1	-	-	-	k	-	-	-	
MN	1	-	-	g	f	-	-	-	-
MN	1	-	-	k	g	-	b	15	30-31 months

MN	1	-	-	m	-	-	-	-	-
MN	2	-	-	m	l	-	-	-	-
MN	1	-	-	m	l	-	k	23	over 50 months
MN	1	-	-	n	-	-	m	23	over 50 months
MN	1	-	a	-	-	-	-	-	-
MN	1	-	c	j	-	-	-	-	-
MN	1	-	c	k	g	-	d	17	32-33 months
MN	2	-	e	l	k	-	g	20	40 months
MN	1	-	f	l	k	-	j	22	50 months
MN	1	-	g	k	h	-	-	-	-
MN	1	-	g	l	k	-	k	23	over 50 months
MN	2	-	g	m	l	-	l	23	over 50 months
MN	1	-	h	n	m	-	l	23	over 50 months
MN	1	-	j	o	m	-	m	23	over 50 months
MN	1	h	-	d	-	-	-	-	-
MN	4	j	-	-	-	-	-	-	-
MN	1	j	-	b	-	a	-	-	-
MN	1	j	-	e	-	-	-	-	-
MN	4	j	-	f	-	-	-	-	-
MN	1	j	-	f	a	-	-	-	-
MN	1	j	-	f	b	-	-	-	-
MN	1	j	-	g	-	-	-	-	-
MN	1	j	-	g	b	-	a	11	18-24 months
MN	1	k	-	-	-	-	-	-	-
MN	1	k	-	g	-	-	-	-	-
MN	1	k	-	g	-	c	-	-	-
MN	1	k	-	g	b	-	-	-	-
MN	1	k	-	g	b	-	a	11	18-24 months
MN	1	k	-	g	c	-	-	-	-
MN	1	k	-	g	c	-	a	11	18-24 months
MN	1	k	-	g	f	-	b	15	30-31 months
MN	1	k	-	h	-	-	-	-	-
MN	1	k	-	h	-	-	a	11	18-24 months
MN	1	l	-	g	c	-	-	-	-
MN	1	l	-	g	f	-	b	15	30-31 months
MN	1	n	-	j	f	-	b	15	30-31 months

**Table 19. NISP and survived NISP of Early Medieval Cattle by estimated age in months after Mandible Wear Stages by Higham (1967).**

Estimated Age in Months	MORTALITY CURVE		SURVIVAL CURVE	
	NISP	%	SURVIVED NISP	%
18-24 months	5	6	85	94
30-31 months	19	21	66	73
31-32 months	2	2	64	71
32-33 months	2	2	62	69
36 months	4	4	58	64
38 months	7	8	51	57
40 months	8	9	43	48
50 months	8	9	35	39
over 50 months	35	39	0	0
Total	90	100		

**Table 20. NISP of fused (fused and fusing) and unfused Early Medieval Cattle classified under early, middle or late-fusing stages following Reitz and Wing (1999).**

Fusion in Cattle	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	MC1 prox	before birth	74	0
	MT1 prox	before birth	63	1
	PH1 prox	before birth	50	12
	PH2 prox	before birth	27	1
	PE prox	6-10 months	53	8
	SC prox	7-10 months	78	3
	HU dist	12-18 months	59	6
	RA prox	12-18 months	68	4
	<b>Total Early Fusing</b>		<b>472</b>	<b>35</b>
	<b>Total Early Fusing %</b>		<b>93</b>	<b>7</b>
Middle Fusing	MC1 dist	24-30 months	29	14
	TI dist	24-30 months	42	6
	MT1 dist	33-36 months	13	6
	CA	36-42 months	15	12
	<b>Total Middle Fusing</b>		<b>99</b>	<b>38</b>
	<b>Total Middle Fusing %</b>		<b>72</b>	<b>28</b>
Late Fusing	HU prox	42-48 months	7	0
	RA dist	42 months	18	8
	UL ole	42-48 months	11	7
	FE prox	42-48 months	16	8
	FE dist	42-48 months	8	7
	TI prox	42-48 months	14	2
	<b>Total Late Fusing</b>		<b>74</b>	<b>32</b>
	<b>Total Late Fusing %</b>		<b>70</b>	<b>30</b>

**Table 21. Measurements of Distal Breadth of Metacarpal 1 for Early Medieval Cattle with assessment of sex McCormick (1997).**

<b>Bd of MC1</b>	<b>Sex assessment</b>
47.3	Female
47.9	Female
48.1	Female
48.3	Female
50.5	Female
50.7	Female
51.1	Female
51.6	Female
51.7	Female
51.7	Female
51.8	Female
52	Female
52.8	Female
52.9	Female
53.1	Female
53.1	Female
53.5	Female
53.8	Female
53.9	Female
55.2	Female
59.1	Male
66.5	Male
66.5	Male
66.7	Male
<b>Females</b>	<b>20</b>
<b>Females %</b>	<b>83</b>
<b>Males</b>	<b>4</b>
<b>Males %</b>	<b>17</b>
<b>Measured Bd of MC1</b>	<b>24</b>

**Table 22. Correlation between minimum age of specimens and butchery marks in Cattle from Period II Phase 1 (Early Medieval)**

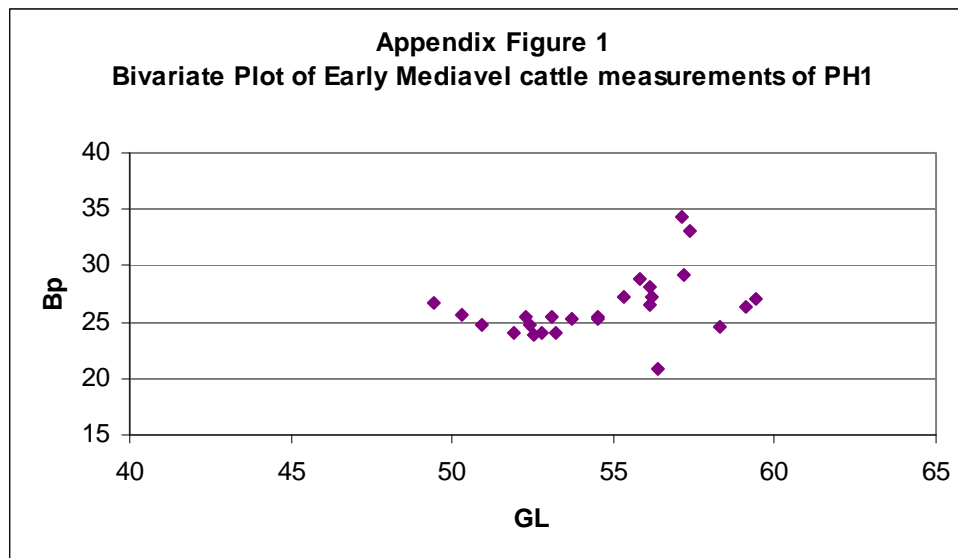
<b>Element</b>	<b>Fusion proximal</b>	<b>Fusion distal</b>	<b>Cut Marks</b>	<b>Minimum Age in months</b>
CA	F	F	1	36-42 months
FE	F	X	1	42-48 months
	J	X	1	42-48 months
HU	X	F	1	12-18 months
MC1	F	X	2	before birth
PH1	F	F	1	18 months
RA	F	X	1	12-18 months
TI	F	X	2	42-48 months
Grand Total			10	

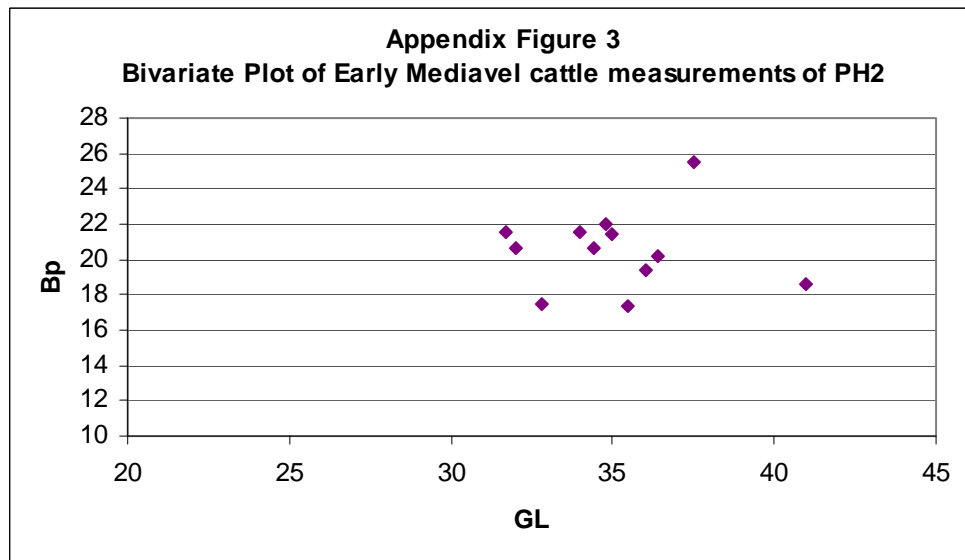
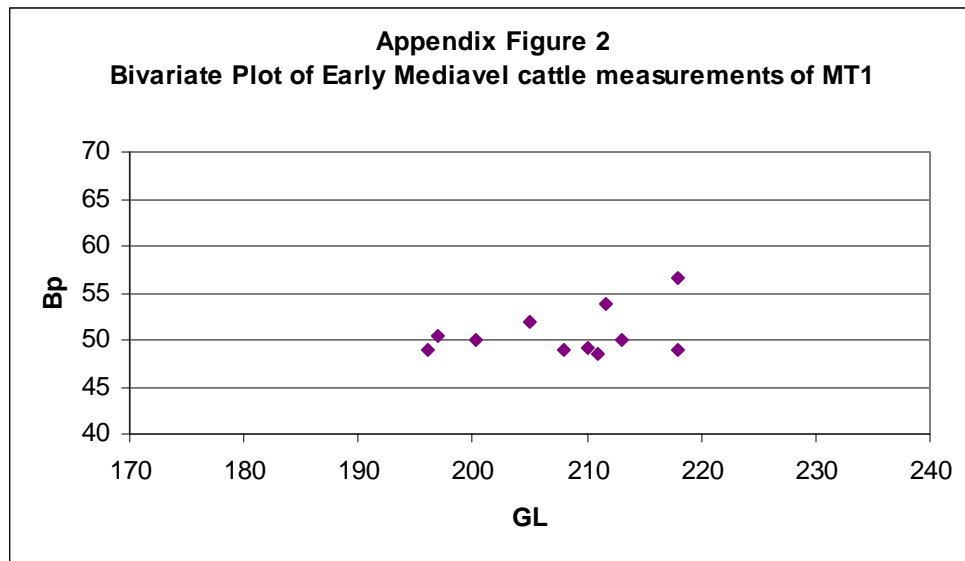
**Table 23. Details of measurements (in mm.) by skeletal elements for Early Medieval cattle following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Element	Measurement	Min	Max	N	Mean	St dev
RA	GL	257	257	1	257	-
	SD	36.3	38.6	2	37.4	6.47
	Bp	54.3	83	29	70.6	1.62
	Bd	59.6	61.1	2	60.3	1.06
CA	GL	110.4	132.1	3	119.9	11.08
HC	Wmin	25.7	43.9	20	34.7	4.01
	Wmax	39.6	61.9	20	47.1	5.99
MC1	GL	178	194.4	5	186.6	6.58
	SD	26.5	36.2	9	28.4	3
	BFdm	23.7	26.9	6	25	1.09
	BFdl	23	25.2	7	24.1	1
	Ddm	27.6	31.4	6	29.2	1.41
	Ddl	27.9	30.5	6	28.8	1.03
	Bp	35.4	62.7	38	49.8	4.71
	Bd	47.3	66.7	23	53.1	4.95
MT1	GL	196	218	11	207.9	7.64
	SD	23.4	28.1	12	24.8	1.41
	Bp	34.1	48.2	40	41.8	2.8
	Bd	48.6	56.7	12	50.7	2.4
SC	Bp	49.8	75.1	33	62.7	4.92
	GLP	60.2	63.5	2	61.8	2.33
PE	LA	39.4	49.1	9	46.3	3.71
AS	GLl	52.1	67.6	37	61	2.92
	GLm	49.4	60.2	34	54.4	2.54
	Bd	35.6	43.7	30	38.7	2.45
	Dm	26.9	35	26	31.7	2.26
	DI	28.3	36.8	35	34.2	2.07
HU	BT	46.8	77.1	31	66.4	6.8
	Bd	55.9	90.6	26	70	6.91
	HCT	27.2	34.1	5	30.7	2.54
TI	GL	316	316	1	316	-
	Bp	71.4	71.4	1	71.4	-
	Bd	50.2	62.8	28	55.6	3.07

**Table 24. Calculations of Estimated Withers Heights (in cm.) by skeletal elements for Early Medieval cattle following Von Den Driesch and Boessneck (1979).**

Element	GL	EWB
MC1	178	109
MC1	184	113
MC1	185	113
MC1	192	118
MC1	194.4	119
MT1	196	107
MT1	197	107
MT1	200.3	109
MT1	205	112
MT1	208	113
MT1	210	114
MT1	211	115
MT1	211.6	115
MT1	213	116
MT1	218	119
MT1	218	119
RA	257	111
TI	316	109
<b>Min: 107    Max: 119    Mean: 113</b>		

**Figures 1-3. Bivariate plots illustrating correlation between length and width of three skeletal elements for Early Medieval Cattle**

**Table 25. Total of specimens of Pig by element and side for Period II (Early Medieval)**

Species	Element	Side	Total
Pig	AS	L	1
		R	3
	AS Total		4
	CA	L	4
		R	10
	CA Total		14
	CR	L	22
		R	21
		U	7
	CR Total		50
	FE	L	15
		R	20
	FE Total		35
	HU	L	14
		R	22
	HU Total		36
	LMT	L	47



	R	35
	U	39
LMT Total		121
LXT	L	10
	R	10
	U	17
LXT Total		37
MC2	R	1
MC2 Total		1
MC3	L	1
	R	1
MC3 Total		2
MC4	R	1
MC4 Total		1
MCU	U	1
MCU Total		1
MN	L	29
	R	32
	U	2
MN Total		63
MPU	U	4
MPU Total		4
MT3	R	2
MT3 Total		2
MT4	L	1
	R	1
MT4 Total		2
PE	L	25
	R	14
PE Total		39
PH2	L	1
PH2 Total		1
RA	L	7
	R	12
	U	2
RA Total		21
SC	L	13
	R	23
SC Total		36
TI	L	16
	R	17
	U	1
TI Total		34
UL	L	17
	R	28
UL Total		45
VC2	U	2
VC2 Total		2
S Total		551
Grand Total		551

**Table 26. Tooth Wear Stages (Grant, 1982) in loose mandibular teeth and Mandible Wear Stages for M3 (Higham, 1967) for Early Medieval Pig.**

Element	NISP (N=95, %=17.2)	dp4	P4	M1	M2	M12	M3	Higham MWS	Estimated Age in Months
LMT	5	-	-	-	-	-	a	-	-
LMT	4	-	-	-	-	-	c	21	23-25 months
LMT	1	-	-	-	-	-	d	-	-
LMT	2	-	-	-	-	-	e	23	27-29 months
LMT	1	-	-	-	-	-	f	24	over 30 months
LMT	1	-	-	-	-	-	h	26	late maturity
LMT	2	-	-	-	-	a	-	-	-
LMT	1	-	-	-	-	c	-	-	-
LMT	4	-	-	-	-	d	-	-	-
LMT	2	-	-	-	-	e	-	-	-
LMT	1	-	-	-	-	f	-	-	-
LMT	2	-	-	-	-	k	-	-	-
LMT	1	-	-	-	c	-	-	-	-
LMT	1	-	-	-	d	-	-	-	-
LMT	1	-	-	c	-	-	-	-	-
LMT	1	-	-	k	-	-	-	-	-
LMT	1	-	b	-	-	-	-	-	-
LMT	1	-	b	e	c	-	a	19	19-21 months
LMT	1	-	d	-	-	-	-	-	-
LMT	1	-	d	n	g	-	c	21	23-25 months
LMT	8	a	-	-	-	-	-	-	-
LMT	1	h	-	-	-	-	-	-	-
LMT	1	j	-	-	-	-	-	-	-
MN	5	-	-	-	-	-	-	-	-
MN	1	-	-	-	-	-	a	18	17-19 months
MN	1	-	-	-	-	-	b	20	21-23 months
MN	1	-	-	-	-	-	c	21	23-25 months
MN	1	-	-	-	-	-	j	27	Old
MN	1	-	-	-	-	d	-	-	-
MN	1	-	-	-	b	-	-	-	-
MN	1	-	-	-	d	-	-	-	-
MN	1	-	-	-	d	-	b	20	21-23 months
MN	1	-	-	-	e	-	c	21	23-25 months
MN	1	-	-	-	g	-	c	21	23-25 months
MN	2	-	-	e	b	-	-	-	-
MN	1	-	-	e	b	-	b	20	21-23 months
MN	1	-	-	e	c	-	-	-	-
MN	1	-	-	f	c	-	a	11	9-10 months
MN	1	-	-	j	-	-	d	22	25-27 months
MN	1	-	-	j	d	-	a	18	17-19 months
MN	1	-	-	j	e	-	-	-	-
MN	1	-	-	l	d	-	-	-	-
MN	1	-	b	-	-	-	-	-	-
MN	1	-	b	-	d	-	-	-	-
MN	2	-	b	e	c	-	-	-	-
MN	1	-	b	f	c	-	-	-	-
MN	1	-	b	g	c	-	-	-	-
MN	1	-	b	g	c	-	a	19	19-21 months

MN	2	-	b	h	d	-	-	-	-
MN	1	-	b	j	-	-	-	-	-
MN	1	-	b	j	e	-	-	-	-
MN	1	-	c	-	-	-	a	19	19-21 months
MN	1	-	d	h	e	-	d	22	25-27 months
MN	1	-	e	h	f	-	d	22	25-27 months
MN	1	-	f	m	-	-	-	-	-
MN	1	-	g	n	k	-	-	-	-
MN	4	a	-	-	-	-	-	-	-
MN	1	c	-	-	-	-	-	-	-
MN	1	d	-	-	-	-	-	-	-
MN	1	f	-	-	-	-	-	-	-
MN	1	f	-	b	-	-	-	-	-
MN	1	g	-	-	-	-	-	-	-
MN	2	k	-	g	a	-	-	-	-

**Table 27. NISP and survived NISP of Early Medieval Pig by estimated age in months after Mandible Wear Stages by Higham (1967).**

Estimated Age in Months	MORTALITY CURVE		SURVIVAL CURVE	
	NISP	%	SURVIVED NISP	%
9-10 months old	1	4	24	96
17-19 months old	2	8	22	88
19-21 months old	3	12	19	76
21-23 months old	3	12	16	64
23-25 months old	8	32	8	32
25-27 months old	3	12	5	20
27-29 months old	2	8	3	12
over 30 months old	1	4	2	8
late maturity	1	4	1	4
old	1	4	0	0
Total	25	100		

**Table 28. NISP of fused (fused and fusing) and unfused Early Medieval Pig classified under early, middle or late-fusing stages following Reitz and Wing (1999).**

Fusion in Pig	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	MC prox	before birth	4	0
	MT prox	before birth	4	0
	MP prox	before birth	0	4
	PH2 prox	12 months	0	1
	PE prox	12 months	0	17
	SC prox	12 months	25	10
	HU dist	12-18 months	19	13
	RA prox	12 months	11	7
	<b>Total Early Fusing</b>		<b>63</b>	<b>52</b>
	<b>Total Early Fusing %</b>		<b>55</b>	<b>45</b>
Middle Fusing	MC dist	24-27 months	2	1
	TI dist	24 months	16	15
	MT dist	24-27 months	0	3
	MP dist	24-27 months	0	4
	CA	24-30 months	2	11
	<b>Total Middle Fusing</b>		<b>20</b>	<b>34</b>
	<b>Total Middle Fusing %</b>		<b>37</b>	<b>63</b>
Late Fusing	HU prox	42 months	1	13
	RA dist	42 months	0	9
	UL ole	36-42 months	5	20
	FE prox	42 months	1	23
	FE dist	42 months	3	24
	TI prox	42 months	1	11
	<b>Total Late Fusing</b>		<b>11</b>	<b>100</b>
	<b>Total Late Fusing %</b>		<b>10</b>	<b>90</b>

**Table 29. Sex assessment of Early Medieval pig by morphology of canine's roots according to Schmidt (1972) and McCormick (1997).**

Element	Sex	Total
LMT Canine	F	13
LXT Canine	F	4
MN Canine	F	5
<b>Total Females</b>		<b>22</b>
<b>% of females</b>		<b>44</b>
LMT Canine	M	14
LXT Canine	M	5
MN Canine	M	5
CR Canine	M	4
<b>Total Males</b>		<b>28</b>
<b>% of males</b>		<b>56</b>
<b>Grand Total</b>		<b>50</b>

**Table 30. Details of measurements (in mm.) by skeletal elements for Early Medieval pig following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Element	Measurement	Min	Max	N	Mean	St dev
RA	Bp	24.1	28.4	6	27.3	1.6
CA	GL	76.3	76.3	1	76.3	-
MC4	GL	67.5	67.5	1	67.5	-
SC	Bp	31.4	36.6	7	34.1	1.55
PE	LA	23	30	13	28.2	1.81
HU	BT	45.9	26	7	31.1	6.71
	SD	15.5	15.5	1	15.5	-
TI	Bd	25.7	41.5	8	29.3	5.18

**Table 31. Total of specimens of Sheep by element and side for Period II (Early Medieval)**

Species	Element	SIDE	Total
Sheep	AS	L	5
		R	7
	AS Total		12
	CA	L	3
		R	4
	CA Total		7
	CR	L	1
		R	1
		U	3
	CR Total		5
	FE	L	8
		R	3
	FE Total		11
	HC	L	1
		R	2
		U	3
	HC Total		6
	HU	L	13
		R	10
	HU Total		23
	LMT	L	69
		R	91
		U	2
	LMT Total		162
	LXT	L	49
		R	56
		U	1
	LXT Total		106
	MC1	L	9
		R	10
	MC1 Total		19
	MN	L	24
		R	21
	MN		45

Total		
MT1	L	15
	R	10
MT1 Total		25
PE	L	10
	R	3
PE Total		13
PH1	L	6
	R	9
	U	1
PH1 Total		16
PH2	L	2
	R	2
PH2 Total		4
PH3	L	1
	R	1
	U	2
PH3 Total		4
RA	L	12
	R	15
RA Total		27
SC	L	4
	R	9
SC Total		13
TI	L	20
	R	13
TI Total		33
UL	L	1
	R	3
UL Total		4
VC1	U	4
VC1 Total		4
VC2	U	1
VC2 Total		1
OVA Total		540
Grand Total		540

**Table 32. Tooth Wear Stages Payne (1973; 1987) in loose mandibular teeth and Mandible Wear Stages for M3 (Higham, 1967) for Early Medieval Sheep.**

Element	NISP	dp4	P4	M1	M2	M12	M3	Higham MWS	Estimated age in months
LMT	1	-	-	-	-	-	-	-	-
LMT	2	-	-	-	-	-	10G	16	Mature
LMT	8	-	-	-	-	-	11G	17	Adult
LMT	3	-	-	-	-	-	12G	17	Adult
LMT	2	-	-	-	-	-	2A	14	25-26 months
LMT	2	-	-	-	-	-	4A	14	25-26 months
LMT	1	-	-	-	-	-	5A	14	25-26 months
LMT	1	-	-	-	-	-	6G	15	26-28 months
LMT	2	-	-	-	-	-	9G	16	Mature
LMT	2	-	-	-	-	-	0	-	-
LMT	2	-	-	-	-	10A	-	-	-
LMT	1	-	-	-	-	11G	-	-	-
LMT	3	-	-	-	-	12A	-	-	-
LMT	1	-	-	-	-	14A	-	-	-
LMT	1	-	-	-	-	15A	-	-	-
LMT	3	-	-	-	-	2A	-	-	-
LMT	2	-	-	-	-	4A	-	-	-
LMT	4	-	-	-	-	5A	-	-	-
LMT	5	-	-	-	-	6A	-	-	-
LMT	5	-	-	-	-	7A	-	-	-
LMT	11	-	-	-	-	8A	-	-	-
LMT	28	-	-	-	-	9A	-	-	-
LMT	3	-	-	-	-	0	-	-	-
LMT	3	-	-	-	-	2A	-	-	-
LMT	1	-	-	-	-	9A	-	-	-
LMT	1	-	-	-	2A	-	-	-	-
LMT	2	-	-	-	9A	-	-	-	-
LMT	1	-	-	-	0	-	-	-	-
LMT	1	-	-	12A	-	-	-	-	-
LMT	4	-	-	9A	-	-	-	-	-
LMT	4	-	12S	-	-	-	-	-	-
LMT	1	-	15A	-	-	-	-	-	-
LMT	1	-	9A	-	-	-	-	-	-
LMT	1	-	0	-	-	-	-	-	-
LMT	1	13L	-	-	-	-	-	-	-
LMT	2	14L	-	-	-	-	-	-	-
LMT	3	16L	-	-	-	-	-	-	-
LMT	2	17L	-	-	-	-	-	-	-
LMT	3	18L	-	-	-	-	-	-	-
LMT	1	22L	-	-	-	-	-	-	-
MN	1	-	-	-	-	-	2A	14	25-26 months
MN	1	-	-	-	-	-	5A	-	-
MN	1	-	-	-	9A	-	11G	-	-
MN	1	-	-	-	9A	-	11G	17	Adult
MN	1	-	-	-	9A	-	9G	16	Mature
MN	1	-	-	11A	-	10A	11G	17	Adult
MN	1	-	-	9A	-	8A	2A	14	25-26 months
MN	1	-	-	9A	6A	-	-	-	-

MN	1	-	15A	14A	9A	-	-	-	-
MN	1	-	7A	9A	8A	-	-	-	-
MN	2	-	9A	10A	-	-	-	-	-
MN	1	-	9A	10A	9A	-	7G	15	26-28 months
MN	1	-	9A	9A	8A	-	-	-	-
MN	2	16L	-	4A	-	-	-	-	-
MN	1	16L	-	6A	-	-	-	-	-
MN	1	17L	-	-	-	-	-	-	-
MN	2	18L	-	-	-	-	-	-	-
MN	1	18L	-	10A	-	-	-	-	-
MN	1	18L	-	9A	2A	-	-	-	-
MN	1	22L	-	7A	2A	-	-	-	-
MN	1	23L	-	9A	7A	-	-	-	-
MN	1	23L	-	9A	7A	-	0	13	21-24 months
MN	1	7M	-	-	-	-	-	-	-

**Table 33. NISP of fused (fused and fusing) and unfused Early Medieval Sheep classified under early, middle or late-fusing stages following Reitz and Wing (1999).**

Fusion in Sheep	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	MC prox	before birth	16	0
	MT prox	before birth	25	0
	PH1 prox	6-16 months	10	5
	PH2 prox	6-16 months	3	1
	SC prox	6-8 months	11	0
	HU dist	3-10 months	17	2
	RA prox	3-10 months	17	2
	<b>Total Early Fusing</b>		<b>99</b>	<b>10</b>
	<b>Total Early Fusing %</b>		<b>91</b>	<b>9</b>
Middle Fusing	MC dist	18-28 months	5	3
	TI dist	15-24 months	26	3
	MT dist	18-28 months	6	4
	CA	30-36 months	3	2
	<b>Total Middle Fusing</b>		<b>40</b>	<b>12</b>
	<b>Total Middle Fusing %</b>		<b>77</b>	<b>23</b>
Late Fusing	HU prox	36-42 months	2	2
	RA dist	36-42 months	5	6
	UL ole	36-42 months	1	2
	FE prox	30-42 months	5	2
	FE dist	36-42 months	1	4
	TI prox	36-42 months	4	4
	<b>Total Late Fusing</b>		<b>18</b>	<b>20</b>
	<b>Total Late Fusing %</b>		<b>47</b>	<b>53</b>

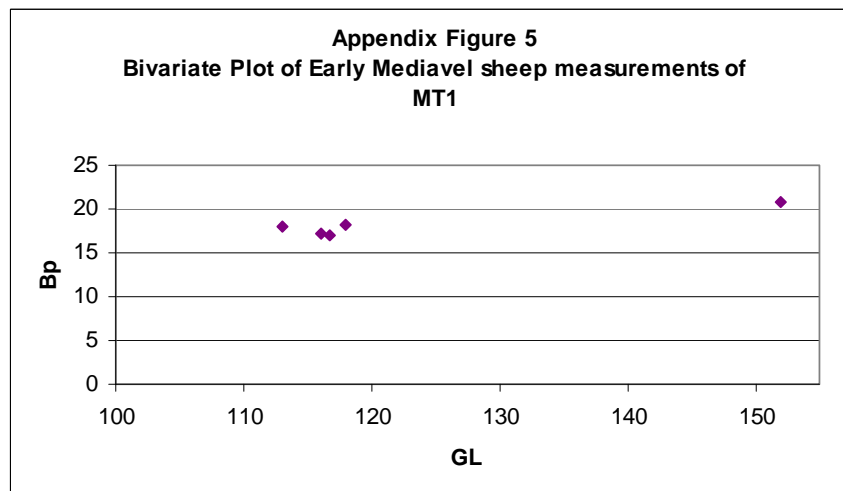
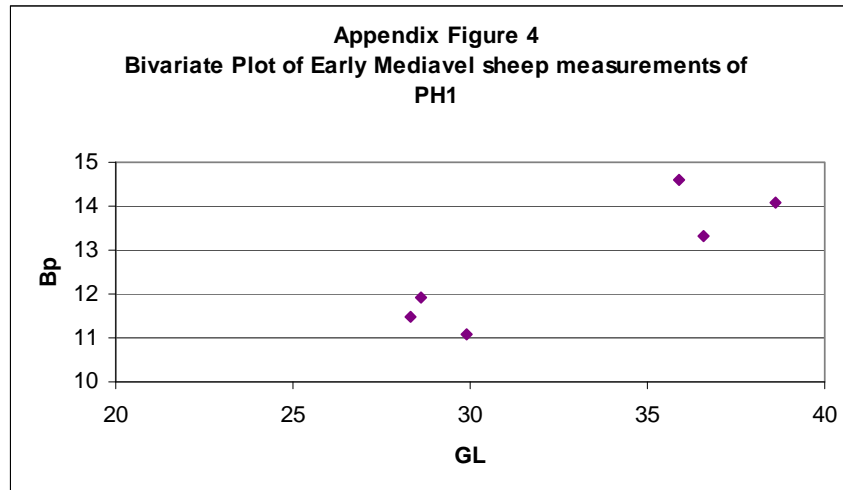


**Table 34. Details of measurements (in mm.) by skeletal elements for Early Medieval sheep following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Element	Measurement	Min	Max	N	Mean	St dev
FE	SD	13.7	13.7	1	13.7	-
	Bp	35.2	35.2	1	35.2	-
RA	GL	141.7	141.7	1	141.7	-
	Bp	22.6	28.6	7	25.6	2.13
	Bd	21.3	23.3	2	22.3	1.41
HC	Wmin	17	23.9	4	20.8	3
	Wmax	25.1	30.5	4	27.8	2.3
MC1	GL	116.6	124.2	2	120.4	5.37
	SD	11.3	13.8	8	12.8	0.87
	BFdm	10.6	13.5	3	12	2.05
	BFdl	9.8	9.8	1	9.8	-
	Ddm	14.3	14.3	1	14.3	-
	Ddl	14.2	14.2	1	14.2	-
	Bp	18.5	22.3	12	20.8	1.03
	Bd	21.5	23.8	5	22.8	0.9
MT1	GL	113	117.9	4	115.9	2.1
	SD	9.6	12.7	5	11.1	1.1
	BFdm	9.8	9.8	1	9.8	-
	BFdl	8.5	8.5	1	8.5	-
	Ddm	13.4	13.4	1	13.4	-
	Ddl	13.1	13.1	1	13.1	-
	Bp	16.5	20.9	18	18.2	1.07
	Bd	20.7	25	4	22	2
SC	Bp	30	30	1	30	-
AS	GLl	23	26.3	5	24.9	1.38
	GLm	22.3	24.6	5	23.5	1.11
	Bd	11.6	17.8	5	15.5	2.42
	Dm	13.8	16.3	5	14.8	0.93
	DI	12.8	15.2	5	14.1	1.13
HU	BT	24	28.8	13	25.8	1.99
	Bd	24.1	29.1	11	27.4	1.6
	HCT	13.2	13.2	1	13.2	-
TI	SD	12.3	12.3	1	12.3	-
	Bd	20.5	25.4	17	23.4	4.54

**Table 35. Calculations of Estimated Withers Heights (in cm.) by skeletal elements for Early Medieval sheep following Von Den Driesch and Boessneck (1979).**

Element	GL	GLI	EWH
AS	-	23	48
AS	-	24	50
AS	-	25.7	54
AS	-	25.7	54
AS	-	26.3	55
MC1	116.6	-	57
MC1	124.2	-	61
MT1	113	-	51
MT1	116.1	-	53
MT1	116.8	-	53
MT1	117.9	-	54
MT1	152	-	69
RA	141.7	-	57
Min: 48    Max: 69    Mean: 55			

**Figures 4-5. Bivariate plots illustrating correlation between length and width of two skeletal elements for Early Medieval sheep**

**Table 36. Total of specimens of horse by element and side for Period II (Early Medieval)**

Species	Element	Side	Total
Horse	AS	L	2
		R	3
	AS Total		5
	CA	L	2
		R	1
	CA Total		3
	CR	L	3
		U	3
	CR Total		6
	FE	L	2
		R	4
	FE Total		6
	HU	L	3
		R	2
		U	1
	HU Total		6
	LMT	L	10
		R	10
		U	24
	LMT Total		44
	LT	L	2
		R	2
		U	3
	LT Total		7
	LXT	L	2
		R	2
		U	13
	LXT Total		17
	MC1	U	1
	MC1 Total		1
	MC3	L	1
		R	1
		U	3
	MC3 Total		5
	MN	L	2
		R	7
	MN Total		9
	MPU	U	5
	MPU Total		5
	MT3	L	2
		R	2
	MT3 Total		4
	PA	L	2
		R	2
	PA Total		4

PE	L	3
	R	6
PE Total		9
PH1	L	3
	R	2
	U	3
PH1 Total		8
PH2	L	1
	R	1
	U	2
PH2 Total		4
PH3	L	2
	R	2
	U	2
PH3 Total		6
RA	L	6
	R	4
RA Total		10
SC	L	1
	R	3
SC Total		4
SCU	U	1
SCU Total		1
TI	L	4
	R	6
TI Total		10
UL	L	2
	R	2
UL Total		4
VC1	U	2
VC1 Total		2
VC2	U	1
VC2 Total		1
EQ Total		181
Grand Total		181

**Table 37. Total of skeletal elements and laterality for horse burial (feature 46).**

Element	NISP	Side
AS	1	L
AS	1	R
CA	1	L
CA	1	R
CR	1	L
FE	1	L
HU	1	L
HU	1	R
MC3	1	L
MC3	1	R
MT3	1	L
MT3	1	R
PA	1	R
PE	1	L
PE	1	R
PH1	2	L
PH1	2	R
PH2	1	L
PH2	1	R
PH3	2	L
PH3	2	R
RA	1	L
RA	1	R
SC	1	L
SC	1	R
TI	1	L
TI	1	R
UL	1	L
UL	1	R
VC1	1	U
Carpals and tarsals	Non countable	U
Vertebrae: cervical, thoracic, lumbar and cordal	Non countable	U
Rib cage	Non countable	U

**Table 38. Total of skeletal elements and laterality for horse burial (feature 149).**

Element	NISP	Side
FE	1	R
HU	1	L
MC3	1	U
PA	1	L
PE	1	L
PE	1	R
RA	1	R
TI	1	L

**Table 39. NISP of fused (fused and fusing) and unfused Early Medieval Horse classified under early, middle or late-fusing stages following Silver (1969).**

Fusion in Horse	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	MC3 prox	before birth	2	0
	MT3 prox	before birth	4	0
	PH1 prox	before birth	8	0
	PH2 prox	before birth	4	0
	SC prox	12 months	4	0
	HU dist	15-18 months	5	0
	RA prox	15-18 months	6	0
	MC3 dist	15-18 months	5	0
	MT3 dist	16-20 months	3	0
	<b>Total Early Fusing</b>		<b>41</b>	<b>0</b>
	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>
Middle Fusing	PE prox	18-24 months	3	0
	TI dist	20-24 months	10	0
	CA	36 months	2	0
	<b>Total Early Fusing</b>		<b>15</b>	<b>0</b>
	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>
Late Fusing	HU prox	36-42 months	4	0
	FE prox	36-42 months	5	0
	FE dist	36-42 months	1	0
	TI prox	36-42 months	4	0
	RA dist	42 months	8	0
	UL ole	42 months	3	0
	<b>Total Early Fusing</b>		<b>25</b>	<b>0</b>
	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>

**Table 40. Details of measurements (in mm.) by skeletal elements for Early Medieval horse following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Element	Measurement	Min	Max	N	Mean	St dev
FE	GL	367	367	1	367	-
	Bp	113.6	113.6	1	113.6	-
	Bd	85.5	85.5	1	85.5	-
RA	GL	323	325	2	324	1.41
	GLI	304	304	1	304	-
	SD	35.4	37.4	2	36.4	1.41
	Bp	73.4	80.8	4	75.5	6.04
	Bd	58.4	74.8	5	65.6	7.54
CA	GL	103.1	104.9	2	104	1.27
MC3	GL	214	214	2	214	-
	GLI	210	210	2	210	-
	SD	31.3	31.3	2	31.6	0.35
	Bp	49.8	50.5	2	50.2	0.49
	Bd	43.1	48.9	4	45.8	2.88
MT3	GL	254	255	2	254.5	0.7
	GLI	249	250	2	249.5	0.7
	SD	30.1	30.9	2	30.5	0.56
	Bp	38.2	49.8	4	45.8	5.33
	Bd	47.7	48.1	2	47.9	0.28
PE	LA	52.6	75.7	3	60.9	12.8
AS	BFd	48.8	49.1	2	48.9	0.21
HU	GL	276	280	2	278	2.82
	GLI	273	275	2	274	1.41
	SD	32.1	33.6	3	32.8	0.75
	Bp	88.7	88.4	2	88.5	0.21
	Bd	78.7	74.9	4	76.4	1.78
	BT	67.8	75.2	5	70.4	3.01
TI	GL	333	337	3	334.3	2.3
	GLI	317	318	2	317.5	0.7
	Bp	88.8	91.7	3	90.3	1.45
	Bd	60.6	73.8	8	70	4.46

**Table 41. Calculations of Estimated Withers Heights (in cm.) by skeletal elements for Early Medieval horse following Von Den Driesch and Boessneck (1979).**

Element	GL	GLI	EWI
FE	367	0	129
HU	276	275	134
HU	280	273	133
MC3	214	210	135
MC3	214	210	135
MT3	254	249	133
MT3	255	250	133
RA	323	304	132
TI	333	317	138
TI	333	318	139
<b>Min: 129    Max: 139    Av: 134</b>			

**Table 42. Total of specimens of dog by element and side for Period II (Early Medieval)**

Species	Element	SIDE	Total
Dog	AS	L	1
		R	3
	AS Total		4
	CA	L	2
		R	4
	CA Total		6
	CR	L	5
		R	7
		U	3
	CR Total		15
	FE	L	4
		R	3
		U	1
	FE Total		8
	HU	L	1
		R	2
	HU Total		3
	LMT	L	15
		R	6
	LMT Total		21
	LXT	L	5
		R	6
	LXT Total		11
	MC1	L	1
	MC1 Total		1
	MC2	L	1
		R	2
	MC2 Total		3
	MC3	L	1
		R	1
	MC3 Total		2
	MC4	L	1
		R	1
	MC4 Total		2
	MC5	L	1
		R	2
	MC5 Total		3
	MN	L	6
		R	5
	MN Total		11
	MPU	U	3
	MPU Total		3
	MT2	L	1
		R	1
	MT2 Total		2
	MT3	L	2
		R	1
	MT3 Total		3
	MT4	L	1
		R	1
	MT4 Total		2



MT5	L	2
	R	1
MT5 Total		3
MTU	U	2
MTU Total		2
PE	R	3
PE Total		3
PH1	R	1
	U	3
PH1 Total		4
PH2	U	1
PH2 Total		1
PH3	U	1
PH3 Total		1
RA	L	5
	R	2
RA Total		7
SC	L	1
	R	2
SC Total		3
TI	L	5
	R	6
TI Total		11
UL	L	1
UL Total		1
VC1	U	2
VC1 Total		2
VC2	U	5
VC2 Total		5
CAF Total		143
Grand Total		143

**Table 43. Total of skeletal elements and laterality for articulated groups of dog.**

Context	Element	Count Of Element	Side
36	AS	1	L
	AS	1	R
	CA	1	R
	FE	1	L
	LMT	6	L
	MC1	1	L
	MC2	1	L
	MC3	1	L
	MC4	1	L
	MC4	1	R
	MC5	1	L
	MC5	1	R
	MN	1	L
	MN	2	R
	MT2	1	R
	MT3	1	L
	MT3	1	R
	MT4	1	L

	MT4	1	R
	MT5	1	L
	MT5	1	R
	PH1	1	U
	PH2	1	U
	PH3	1	U
	RA	1	L
	RA	1	R
	TI	1	L
	TI	1	R
231	AS	1	R
	FE	1	L
	FE	1	R
	MPU	2	U
	PE	1	R
	TI	1	L
	TI	1	R
37	AS	1	R
	FE	1	U
	MTU	1	U
	PH1	1	R
	TI	1	R
61	CR	1	R
	MT2	1	L
	MT3	1	L
	VC2	1	U
179	CR	1	L
	CR	1	R
	HU	1	L
	LXT	1	R
	MN	1	L
	SC	1	L
	VC1	1	U

**Table 44. NISP of fused (fused and fusing) and unfused Early Medieval Dog classified under early, middle or late-fusing stages following Silver (1969).**

Fusion in Dog	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	MC prox	before birth	11	0
	MT prox	before birth	10	0
	PH1 dist	before birth	3	0
	PH2 dist	before birth	1	0
	SC prox	6-7 months	3	0
	PH2 prox	7 months	1	0
	MC dist	8 months	9	0
	HU dist	8-9 months	2	0
	MT dist	10 months	5	0
	<b>Total Early Fusing</b>		<b>45</b>	<b>0</b>

	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>
Middle Fusing	RA dist	11-12 months	1	2
	RA prox	11-12 months	4	0
	PH1 prox	12 months	3	0
	TI dist	13-16 months	5	2
	CA	15 months	2	0
	HU prox	15 months	3	0
	<b>Total Early Fusing</b>		<b>18</b>	<b>4</b>
	<b>Total Early Fusing %</b>		<b>81.8</b>	<b>18.1</b>
Late Fusing	FE prox	18 months	6	1
	FE dist	18 months	3	2
	TI prox	18 months	6	2
	<b>Total Early Fusing</b>		<b>15</b>	<b>5</b>
	<b>Total Early Fusing %</b>		<b>75</b>	<b>25</b>

**Table 45. Total of specimens by element and taphonomical modification for dogs from Period II Phase 1 (Early Medieval)**

<b>Element</b>	<b>Butchery Cut Marks</b>	<b>Gnawing Carnivore</b>	<b>Burning</b>
AS	-	-	-
CA	-	1	-
CR	-	-	-
FE	-	-	-
HU	-	-	-
LMT	-	-	-
LXT	-	-	-
MC1	-	-	-
MC2	-	-	-
MC3	-	-	-
MC4	-	-	-
MC5	-	-	-
MN	-	-	-
MPU	-	-	-
MT2	-	-	-
MT3	-	-	-
MT4	-	-	-
MT5	-	-	-
MTU	-	-	-
PE	-	-	-
PH1	-	-	-
PH2	-	-	-
PH3	-	-	-
RA	1	-	-
SC	-	-	-
TI	1	-	-
UL	-	-	-
VC1	-	-	-
VC2	-	-	-

**Table 46. Calculations of Estimated Withers Heights (in cm.) by skeletal elements for Early Medieval dog following Harcourt (1974).**

Element	GL	EWB
HU	109.5	35
TI	120.3	36
<b>Min: 35</b>	<b>Max: 36</b>	<b>Av: 35.5</b>

**Table 47. Details of measurements (in mm.) by skeletal elements for Early Medieval dog following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Element	Measurement	Min	Max	N	Mean
MC2	GL	70.9	70.9	1	70.9
MC3	GL	79.3	79.3	1	79.3
MC4	GL	69.3	69.3	1	69.3
MC5	GL	58.5	62.1	3	59.7
MT5	GL	28.4	28.4	1	28.4
SC	Bp	36.8	36.8	1	36.8
PE	LA/LAR	23.4	23.4	1	23.4
HU	GL	109.5	109.5	1	109.5
	SD	7.6	7.6	1	7.6
	BT	13.4	22.2	2	17.8
	Bp	40.3	40.3	1	40.3
	Bd	19.1	32.8	2	25.9
FE	SD	12.6	12.6	1	12.6
	Bp	35.9	35.9	1	35.9
TI	GL	120.3	120.3	1	120.3
	SD	7.7	7.7	1	7.7
	Bp	19	19	1	19
	Bd	13.8	13.8	1	13.8

**Table 48. Total of specimens of deer by element and side for Period II (Early Medieval)**

Species	Element	Side	Total
Deer	AN	U	30
	AN Total		30
	AS	R	1
	AS Total		1
	CA	R	1
	CA Total		1
	LMT	L	6
		R	5
	LMT Total		11
	LXT	L	10
		R	21
	LXT Total		31
	MN	L	1
	MN Total		1
	MT1	L	2
		R	1
	MT1 Total		3
	PH3	L	1
	PH3 Total		1
	SC	L	2
		R	3
	SC Total		5
	TI	R	1
	TI Total		1
	VC2	U	1
	VC2 Total		1
Deer Total			86
Deer Total %			68%
Red Deer	AN	U	38
	AN Total		38
	CR	U	1
	CR Total		1
Red Deer Total			39
Red Deer Total %			31%
Roe Deer	RA	L	1
	RA Total		1
Roe Deer Total			1
Roe Deer Total %			1%
Grand Total			126

**Table 49. NISP of fused (fused and fusing) and unfused Early Medieval Deer classified under early, middle or late-fusing stages following Reitz and Wing (1999).**

Fusion in Deer	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	MC1 prox	before birth	-	-
	MT1 prox	before birth	2	0
	PH1 prox	17-20 months	-	-
	PH2 prox	11-17 months	-	-
	PE prox	8-11 months	-	-
	HU dist	12-20 months	-	-
	RA prox	5-8 months	1	0
	<b>Total Early Fusing</b>		-	-
	<b>Total Early Fusing %</b>		-	-
Middle Fusing	MC1 dist	26-29 months	-	-
	TI dist	20-23 months	1	0
	MT1 dist	26-29 months	2	0
	CA	26-29 months	1	0
	<b>Total Early Fusing</b>		-	-
	<b>Total Early Fusing %</b>		-	-
Late Fusing	HU prox	>42 months	-	-
	UL ole	26-35 months	-	-
	FE prox	32-42 months	-	-
	FE dist	26-42 months	-	-
	TI prox	26-42 months	-	-
	<b>Total Early Fusing</b>		-	-
	<b>Total Early Fusing %</b>		-	-

**Table 50. Details of measurements (in mm.) by skeletal elements for Early Medieval deer following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Species	Element	Measurement	Min	Max	N	Mean	St dev
CD	SC	Bp	54.2	62.2	3	59.2	4.38
	AS	Bd	30.9	30.9	1	30.9	-
	CA	GL	108.3	108.3	1	108.3	-
	MT1	GL	272	272	1	272	-
		SD	21.3	21.3	1	21.3	-
		Bp	33.3	31.5	2	32.4	1.27
		Bd	38.5	38.5	1	38.5	-
	TI	Bd	45	45	1	45	-

**Table 51. Total of specimens of cat by element and side for Period II (Early Medieval)**

<b>Element</b>	<b>SIDE</b>	<b>Total</b>
CA	L	1
	R	1
CA Total		2
CR	L	1
	R	1
CR Total		2
FE	L	4
	R	2
FE Total		6
HU	L	2
	R	1
HU Total		3
LMT	L	3
	R	1
LMT Total		4
MCU	U	1
MCU Total		1
MN	L	2
	R	3
MN Total		5
MT3	L	1
	R	1
MT3 Total		2
MT4	L	1
MT4 Total		1
PE	L	1
	R	2
PE Total		3
RA	L	3
	R	2
RA Total		5
SC	R	1
SC Total		1
TI	L	2
	R	2
TI Total		4
UL	L	2
	R	1
UL Total		3
VC1	U	2
VC1 Total		2
Grand Total		44

**Table 52. NISP of fused (fused and fusing) and unfused Early Medieval Cat classified under early, middle or late-fusing stages following Habermehl (1961) and Smith (1969).**

Fusion in Cat	Skeletal Elements/Zones	Age in months	Period II Phase 1: Early Medieval	
			No. Fused	No. Unfused
Early Fusing	PE prox	8.5 months	2	0
	SC prox	8.5 months	1	0
	HU dist	8.5 months	1	0
	RA prox	8.5 months	3	0
	CA	8.5 months	2	0
	FE prox	8.5 months	4	0
	<b>Total Early Fusing</b>		<b>13</b>	<b>0</b>
	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>
Middle Fusing	MC prox	10-11 months	1	0
	UL ole	10-11 months	3	0
	MT prox	10-11 months	3	0
	<b>Total Early Fusing</b>		<b>7</b>	<b>0</b>
	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>
Late Fusing	HU prox	11.5-20 months	3	0
	RA dist	11.5-20 months	3	0
	MC dist	11.5-20 months	1	0
	MT dist	11.5-20 months	3	0
	FE dist	11.5-20 months	4	0
	TI dist	11.5-20 months	4	0
	TI prox	11.5-20 months	4	0
	<b>Total Early Fusing</b>		<b>22</b>	<b>0</b>
	<b>Total Early Fusing %</b>		<b>100</b>	<b>0</b>



**Table 53. Total of specimens by element and taphonomical modification for cat from Period II Phase 1 (Early Medieval)**

Element	Butchery Cut Marks	Gnawing Carnivore	Burning
AS	-	-	-
CA	-	-	-
CR	-	-	-
FE	-	-	-
HU	-	-	-
LMT	-	-	-
LXT	-	-	-
MC1	-	-	-
MC2	-	-	-
MC3	-	-	-
MC4	-	-	-
MC5	-	-	-
MN	-	-	-
MPU	-	-	-
MT2	-	-	-
MT3	-	-	-
MT4	-	-	-
MT5	-	-	-
MTU	-	-	-
PE	-	1	-
PH1	-	-	-
PH2	-	-	-
PH3	-	-	-
RA	1	-	-
SC	-	-	-
TI	-	-	-
UL	-	-	-
VC1	-	-	-
VC2	-	-	-

**Table 54. Details of measurements (in mm.) by skeletal elements for Early Medieval deer following Von Den Driesch (1976), Payne and Bull (1988) and Davis (1992).**

Element	Measurement	Min	Max	N	Mean	St Dev
MT3	GL	50	50	1	50	-
MT4	GL	51.2	51.2	1	51.2	-
HU	Bp	14.3	14.3	1	14.3	-
FE	GL	102.3	102.3	1	102.3	-
	SD	5.8	5.8	1	5.8	-
	Bp	18	18	1	18	-
PE	LA/LAR	10.1	10.6	2	10.3	0.35
TI	GL	111.3	111.3	1	111.3	-
	Bp	18.5	18.5	1	18.5	-
	Bd	13.8	13.8	1	13.8	-

**Table 55. Total of specimens of birds by element and side for Period II (Early Medieval)**

Species	Element	Side	Total
Domestic Fowl	FE	L	1
	FE Total		1
	HU	L	3
		R	1
	HU Total		4
	Carpometacarpus	U	1
	Carpometacarpus Total		1
	Coracoid	L	1
	Coracoid Total		1
	RA	R	1
	RA Total		1
	UL	L	1
		R	1
	UL Total		2
Domestic Fowl Total			10
Other Birds	FE	L	1
		R	1
	FE Total		2
	HU	R	1
		U	1
	HU Total		2
	Tarso-metatarsus	U	1
	Tarso-metatarsus Total		1
	RA	L	1
		R	1
	RA Total		2
	UL	R	1
		U	2
	UL Total		3
Other birds Total			10
Grand Total			20

**Table 56. Epiphyseal fusion details for skeletal elements of domestic fowl and other birds.**

Species	Element	Fusion proximal	Fusion distal	Total
Domestic Fowl	FE	F	F	1
		F Total		1
	FE Total			1
	HU	F	F	2
			X	2
		F Total		4
	HU Total			4
	Carpo-metacarpus	F	F	1
		F Total		1
	Carpo-metacarpus Total			1
	Coracoid	F	X	1
		F Total		1
	Coracoid Total			1
	RA	F	F	1
		F Total		1
	RA Total			1
	UL	F	F	2
		F Total		2
	UL Total			2
Domestic Fowl Total				10
Other Birds	FE	F	X	1
		F Total		1
		X	F	1
		X Total		1
	FE Total			2
	HU	F	X	2
		F Total		2
	HU Total			2
	Tarso-metartarsus	X	F	1
		X Total		1
	Tarso-metartarsus Total			1
	RA	X	F	2
		X Total		2
	RA Total			2
	UL	F	F	1
			X	1
		F Total		2
		X	F	1
	X Total			1
UL Total			3	
Other Birds Total				10
Grand Total				20

**Table 57. Total of specimens by element of each species for Period II Phase 1 (400-600 AD)**

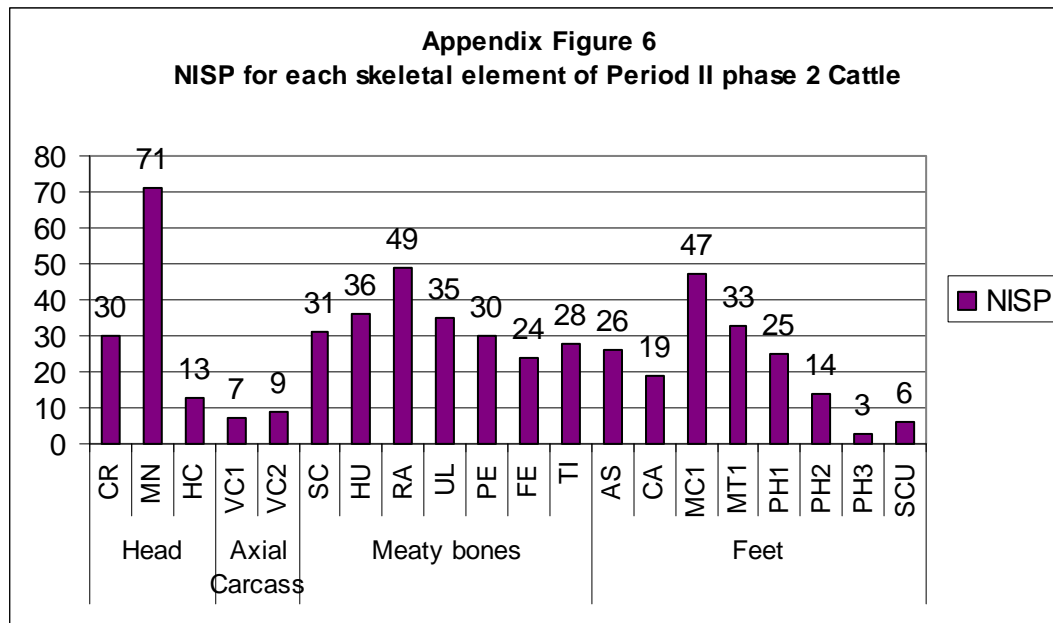
Species	Element	NISP
Cattle	AS	7
	CA	5
	CR	13
	FE	4
	HC	7
	HU	9
	LMT	22
	LXT	23
	MC1	12
	MN	18
	MT1	7
	PE	14
	PH1	8
	PH2	3
	PH3	1
	RA	15
	SC	14
	SCU	1
	TI	10
	UL	12
	VC1	4
	VC2	2
<b>Cattle Total</b>		<b>211</b>
<b>Cattle total %</b>		<b>47</b>
Pig	AS	1
	CA	4
	CR	6
	FE	3
	HU	1
	LMT	10
	LXT	4
	MC2	1
	MC3	1
	MN	12
	MPU	1
	PE	5
	RA	3
	SC	8
	TI	6
	UL	10
	VC2	2
<b>Pig Total</b>		<b>78</b>
<b>Pig Total %</b>		<b>17</b>
Sheep	AS	2
	CA	1
	CR	2
	FE	2
	HC	2
	HU	2
	LMT	15
	LXT	7
	MC1	2

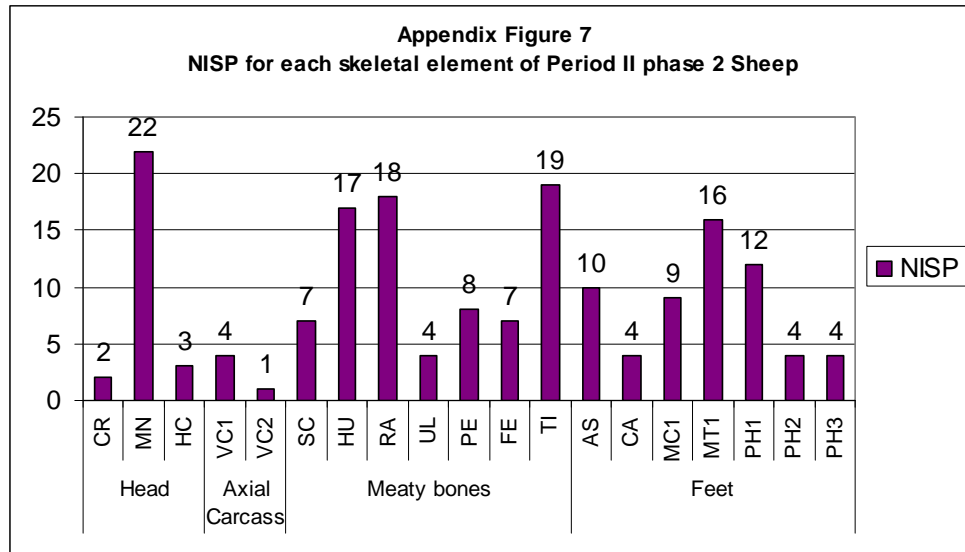
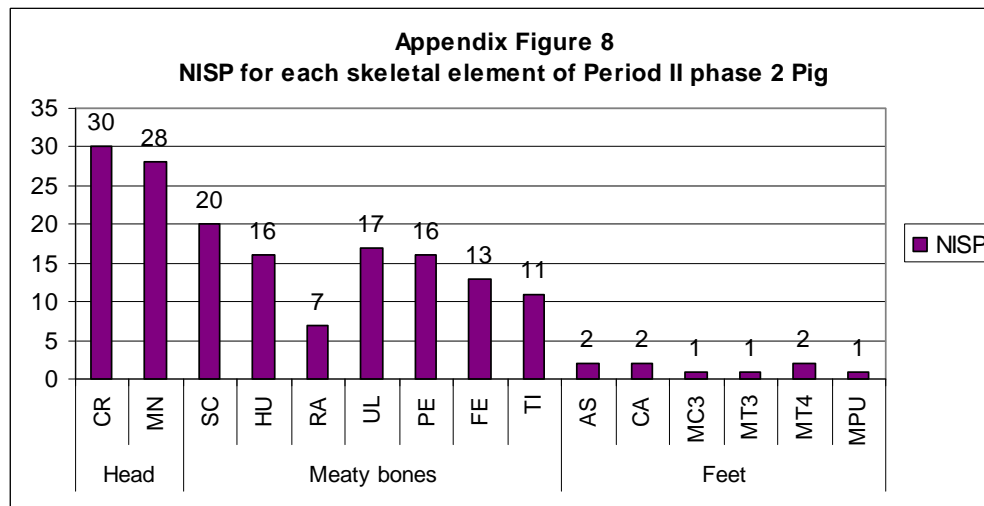
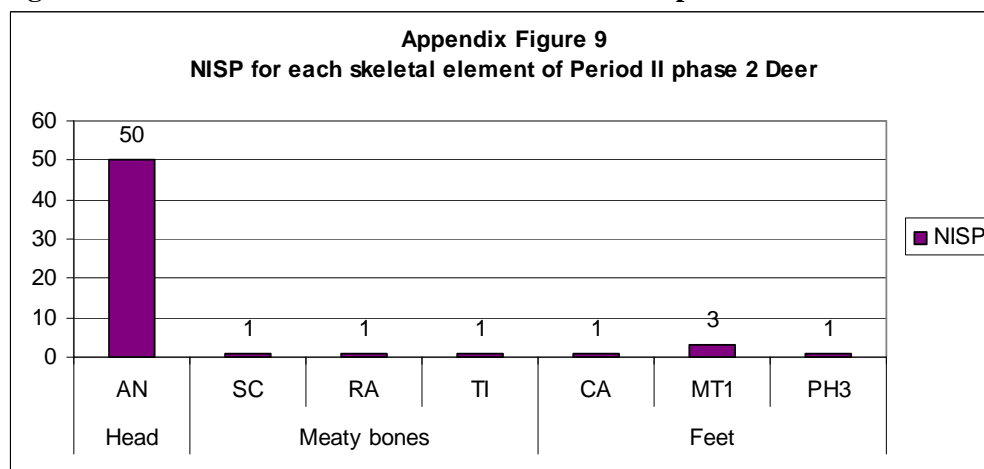
	MN	12
	MT1	2
	PE	2
	PH1	1
	RA	2
	SC	4
	TI	3
<b>Sheep Total</b>		<b>61</b>
<b>Sheep Total %</b>		<b>13</b>
Horse	AS	1
	CA	1
	CR	1
	FE	1
	HU	1
	LMT	1
	LXT	1
	MC3	1
	MN	3
	MPU	1
	MT3	1
	PA	1
	PE	1
	PH1	1
	PH2	1
	PH3	1
	RA	2
	SC	1
	TI	3
	UL	1
	VC1	2
	VC2	1
<b>Horse Total</b>		<b>28</b>
<b>Horse total %</b>		<b>6</b>
Dog	AS	2
	CA	2
	CR	2
	FE	2
	HU	1
	LMT	3
	LXT	1
	MC1	1
	MC2	1
	MC3	1
	MC4	1
	MC5	1
	MN	2
	MPU	1
	MT2	1
	MT3	1
	MT4	1
	MT5	2
	MTU	1
	PE	1
	PH1	2

	PH2	1
	PH3	1
	RA	2
	TI	3
	VC2	1
<b>Dog Total</b>		<b>38</b>
<b>Dog total %</b>		<b>8</b>
Deer	AN	6
	AS	1
	LMT	1
	LXT	3
	SC	3
	VC2	1
<b>Deer Total</b>		<b>15</b>
<b>Deer total %</b>		<b>3</b>
Cat	CR	1
	FE	1
	HU	1
	LMT	1
	MN	2
	MT3	1
	MT4	1
	PE	2
	RA	2
	TI	2
	UL	1
<b>Cat Total</b>		<b>15</b>
<b>Cat total %</b>		<b>3</b>
Domestic Fowl	FE	1
	HU	1
	MPU	1
	RA	1
	UL	2
<b>Domestic Fowl Total</b>		<b>6</b>
<b>Domestic Fowl Total %</b>		<b>1</b>
<b>Total Phase 1</b>		<b>452</b>
<b>Total Phase 1 % on Period II</b>		<b>12</b>

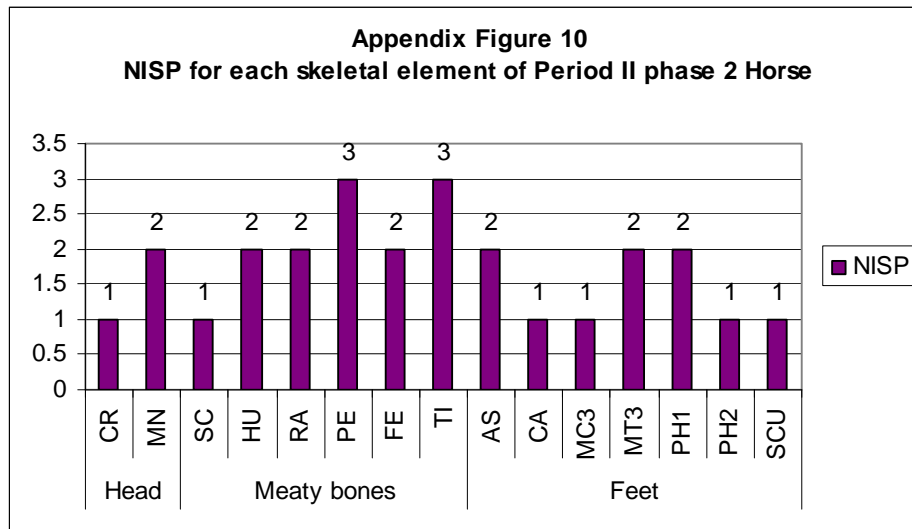
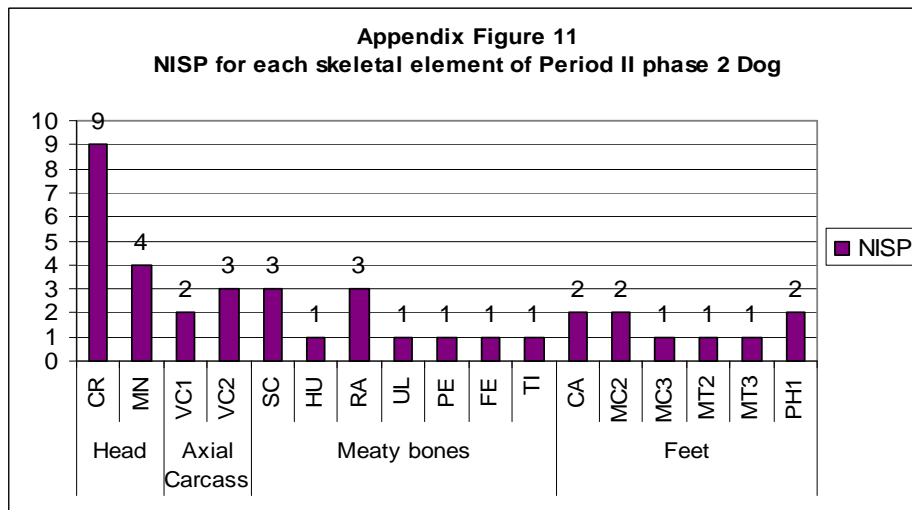
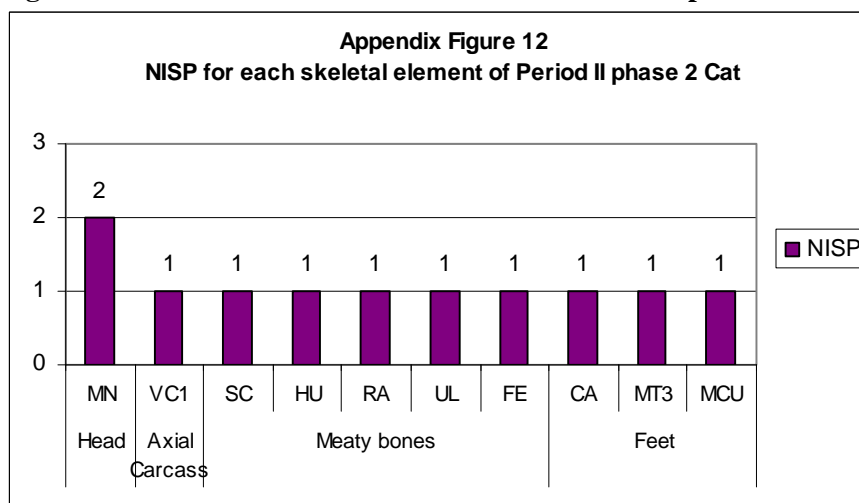
**Table 58. Total of specimens of each species for Period II Phase 2 (600-800 AD)**

Species	NISP	MNI
Cattle	923	40
Cattle %	54	49.4
Sheep	331	12
Sheep %	19	14.8
Pig	240	15
Pig %	14	18.5
Deer	85	4
Deer %	5	4.9
Horse	56	2
Horse %	3	2.5
Dog	45	4
Dog %	3	4.9
Cat	14	1
Cat %	1	1.2
Domestic Fowl	3	2
Domestic Fowl %	0.2	2.5
Birds	4	1
Birds %	0.2	1.2
<b>Total</b>	<b>1701</b>	<b>81</b>
<b>Total Phase 1 % on Period II</b>	<b>44.2</b>	<b>47.6</b>

**Figure 6. NISP for each skeletal elements of Period II phase 2 Cattle**

**Figure 7. NISP for each skeletal elements of Period II phase 2 Sheep****Figure 8. NISP for each skeletal elements of Period II phase 2 Pig****Figure 9. NISP for each skeletal elements of Period II phase 2 Deer**



**Figure 10. NISP for each skeletal elements of Period II phase 2 Horse****Figure 11. NISP for each skeletal elements of Period II phase 2 Dog****Figure 12. NISP for each skeletal elements of Period II phase 2 Horse**

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## **Appendix 5 Wood Identification Report**

### **M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Contract 1**

Charcoal & Wood Report for E2170

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Figure 15: Wood taxa present at the Late Bronze Age sites excavated

Figure 16: Taxa present in the Iron Age

Figure 17: Wood taxa identified from the early Medieval periods

Figure 19: All wood taxa identified from sites that produced wood

### Plates

Plate 1: Cuffsborough 3: Hazel artefact.

Plate 2: Cuffsborough 3: Hazel artefact.

*Appendix: Information relating to wood taxa identified from the assemblage*

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## 1. Introduction

Two thousand seven hundred and ten charcoal fragments from sixty two contexts relating to twenty seven archaeological sites were analysed from excavations along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill road scheme, contract 1. Contract 1 covers a length of approx 31 km and includes numerous *fulacht fiadh* sites, iron working sites, enclosures, ditches, house and palisade structures, barrows, pits, postholes and one possible cow-horn processing site.

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 also 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/M8 Cullahill to Cashel will add important information to the rapidly expanding database of environmental indicators particularly in relation to the

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 are required for a complete and full understanding of the immediate environment. Keepax suggest 50 samples in a European temperate climate. Charcoal is also analysed 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 on. 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 analysed 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 fuel 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 KEK, 2008) highlighting the wetter environments in the particular areas of Ireland. 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 Pre-Historic and Medieval periods and comprises *fulacht* sites dating to the Bronze Age period as well as some charcoal production pits dating to the Iron Age and the Early Medieval period, Iron Age waste pits, slag pits, enigmatic pits, kilns, structures/slot trenches, postholes, barrow features and ditch/enclosure fills from the Bronze Age, Iron Age and Medieval periods.

The analysis presented here concentrates on species identification, species selection and the composition of the local woodland during the Bronze Age, Iron Age and Medieval periods along the route of the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill. 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 drawn from was also noted and recorded. Each piece of wood was also examined for blade signatures.

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In general the charcoal analysed was quite fragmented and iron stained with few large brushwood or roundwoods with pith to bark charcoal samples were encountered. As a consequence determining ring width growths and ring counts on the charcoal samples was not completed for the majority of the samples.

## **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 micro-anatomical 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. The growth rates for some samples varied significantly therefore these samples were classified as slow to moderate, moderate to fast and so on.

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**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 micro-anatomical 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 analysed 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 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>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 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.
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<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. Description of the feature types and landscape**

Charcoal was identified from the fill of various troughs, the fill of pits, from burnt mound spreads and postholes/stakeholes associated with excavated *fulachta fiadh*. These were from Addergoole 1, Addergoole 2, Aghmacart 1, Ballycuddahy 1, Cannonswood 2, Cuffsborough 1, Cuffsborough 3, Curragh 1, Curragh 2, Oldglass 1, 2 & 3, Oldtown 1, Parknahown 5 and Tintore 1. Charcoal analysed from charcoal pits and bowl furnaces which are most likely associated with metalworking activities were from Cuffsborough 4, Parknahown 4 and Tintore 4, Leap 2 and Parknahown 5. Charcoal analysed from a kiln were from the Early medieval period at Parknahown 5. Charcoal analysed from pits and fill of well/pit were excavated at Cuffsborough 1 and 2, Cannonswood 1, Cross 1, Parknahown 4 and Tintore 2 and were identified to determine possible function and fuel type used at the pits. Waste pits dated to the Iron Age were also analysed from Leap 1. Possible structural wood used at the site were analysed from charcoal associated with postholes from a C shaped structure and slot trenches at Cuffsborough 4. Charcoal from postholes were analysed from Parknahown 5 and Tintore 2. Ditch and enclosure fills examined were sampled from Parknahown 2, Tintore 2 and Curragh 2. The fill of a slump possibly associated with a cow horning site was analysed from Gortnagroagh 1 and charcoal from Barrow fills were identified from Oldglass 1 and 4.

Wood timbers were identified from Addergoole 2, Cuffsborough 1, Cuffsborough 3, Cuffsborough 4 and Parknahown 5. The wood from Addergoole 2 is most likely

associated with a natural oak tree trunk as is the oak and yew wood identified from Parknahown 5. The oak, alder and hazel wood uncovered from a well feature at Cuffsborough 3 may have served as a lining to the well as the alder wood was split and the hazel brushwood was pointed. A carved 'S' shaped type artefact was also identified from the wood collection at Cuffsborough 3. Pine wood identified from Cuffsborough 1 was very hard and is probably modern in origin.

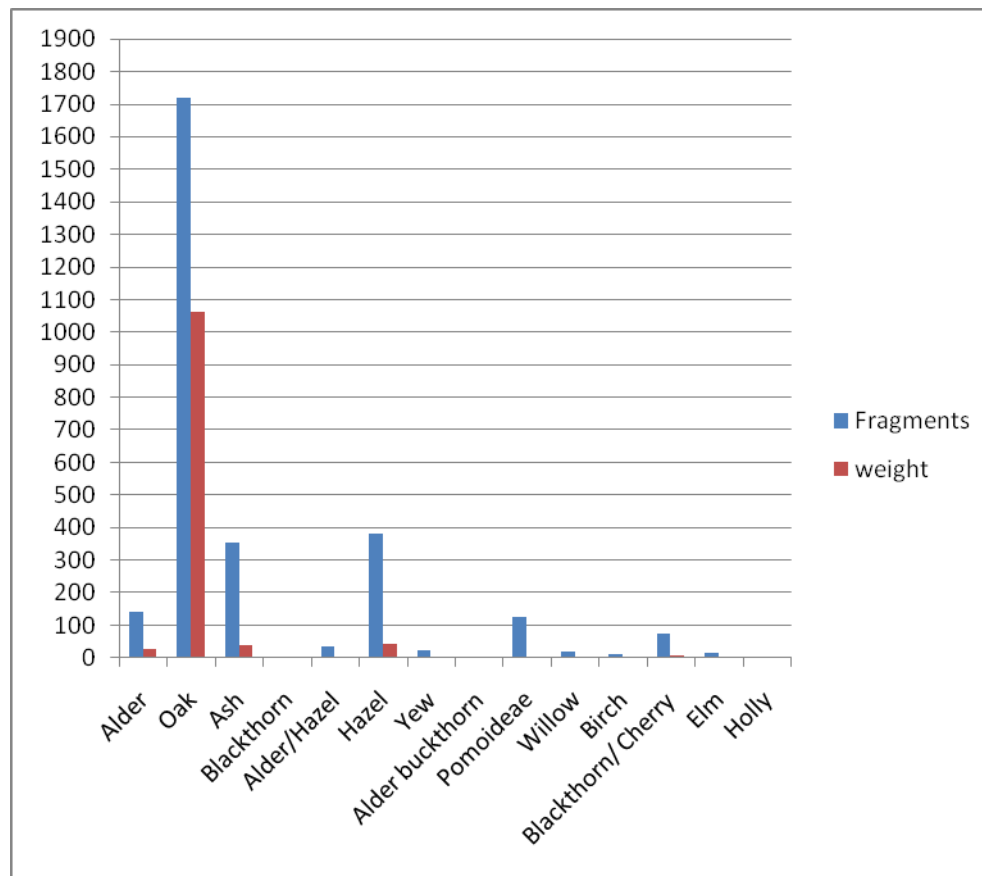
In the General Soil Map (1980) the soils in the Portlaoise - Mountrath - Castletown area are characterised as 90% groundwater clays with 10% grey brown podsolics, derived from limestone glacial till, with a small area of sandstone-derived clays around Ballyfin.

## 5. Results & Analysis

### Charcoal

A total of 62 charcoal samples from trough fills, pit fills, post holes, burnt mound spreads, burnt spreads, waste pits, kilns, slag pits, charcoal pits, slot trenches, structural features, barrow features, fill of a slump and enclosure/ditch fills. The weight and fragment count identified from each taxon type at each site analysed is represented below in Figure 1 and Table 1.

Thirteen taxa were identified from the charcoal assemblage retrieved from the sites and features excavated from Contract 1, M7/M8. These were oak (*Quercus* sp), hazel (*Corylus avellana*), ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), Pomoideae (apple type), blackthorn/cherry (*Prunus* spp), yew (*Taxus baccata*), willow (*Salix* spp), birch (*Betula* sp), holly (*Ilex aquifolium*), elm (*Ulmus* sp) and alder buckthorn (*Frangula alnus*) in order of representation. The charcoal is mainly representative of fuel collection policies at the Bronze Age *fulacht*, kilns and iron working sites although charcoal from structural features were identified from Cuffsborough 4 (Table 10) and posthole fills were analysed from Curragh 2 (Table 12), Parknahown 5 (Table 23) and Tintore 2 (Table 27) dating to the Middle and Late Bronze Age and High Medieval periods. The fills of the ditches, enclosures and barrow sites are more difficult to attribute a function to. They are most likely related to various burning episodes on site and deposition through various formation processes on the site.

**Charcoal assemblage, all sites****Figure 1:** All taxa identified from sites analysed. Weight in grams.

**Charcoal assemblage results by site****Parknahown 5, Structural, slag pit, enclosure and trough Iron Age and Early medieval**

Table 1: Wood taxa present at Parknahown 5

Site	E number	Feature type	Context	Sample no	Date	Identifications	Comment
<b>Parknahown 5,</b>	E2170	inner cemetery Ditch	F1294		Early Medieval	Oak (0.05g, 5 f) Ash (0.1g, 1f) Pomoideae (0.1g, 5f)	
<b>Parknahown 5,</b>		Posthole	F290		Early Medieval	Oak (6g, 20f)	
<b>Parknahown 5,</b>		Slag pit	F1352		Iron age	Alder (0.1g, 3f) Oak (2.1g, 40f) Ash (0.1g, 6f) Pomoideae (0.1g, 2f) Willow (0.05g, 1f) Yew (0.1g, 3f)	
<b>Parknahown 5,</b>	E2170	Trough	F9			Ash (0.2g, 4f)	
<b>Parknahown 2,</b>	E2196	Kiln	F76		430AD-610AD Early Medieval	Oak (1.7g, 15f) Ash (1.5g, 10f) Hazel (0.9g, 8f)	

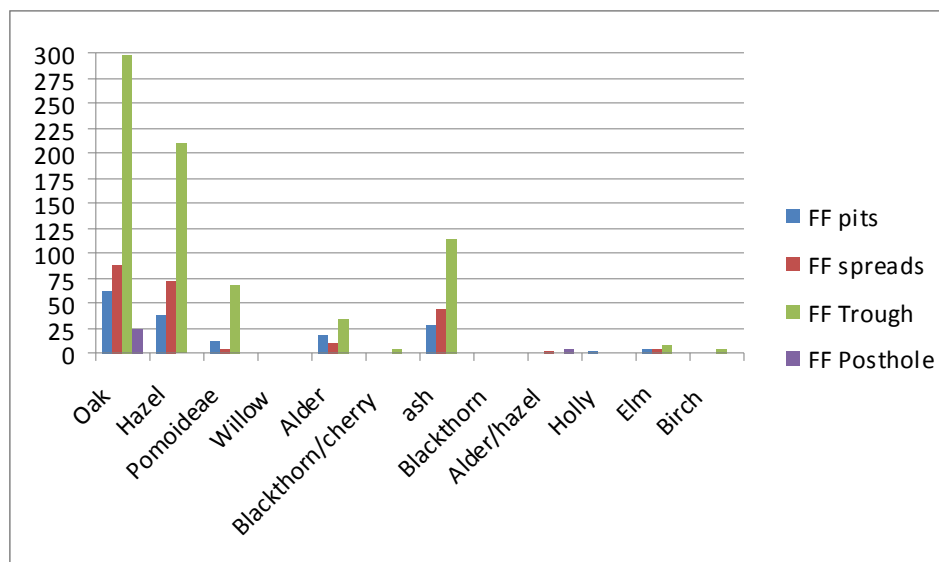
Oak was the dominant taxon identified from all features dating to the Iron Age and Early Medieval features at Parknahown 5 except the trough. Oak was specifically selected for use as a post at **F290**. Not surprisingly oak was also present in large quantities from the slag pits, postholes and the inner cemetery enclosure although other taxa including yew were also present. Oak, ash and hazel all dryland taxa were identified from kiln activity.

**Results by feature/site types****Fulacht fiadh sites**

Twenty four samples from features associated with *fulacht* sites were analysed from Contract 1. These samples were retrieved from Addergoole 1 & 2, Aghmacart 1, Ballycuddahy 1, Cannonswood 2, Cuffsborough 1 & 3, Curragh 1 & 2, Leap 2, Oldglass 2 & 3, Oldtown 1, Parknahown 5 and Tintore 1. Eleven taxa were identified and these were mainly represented by oak (*Quercus* spp), ash (*Fraxinus excelsior*) and hazel (*Corylus avellana*), dryland taxa. Smaller amounts of alder (*Alnus glutinosa*), pomoideae (apple

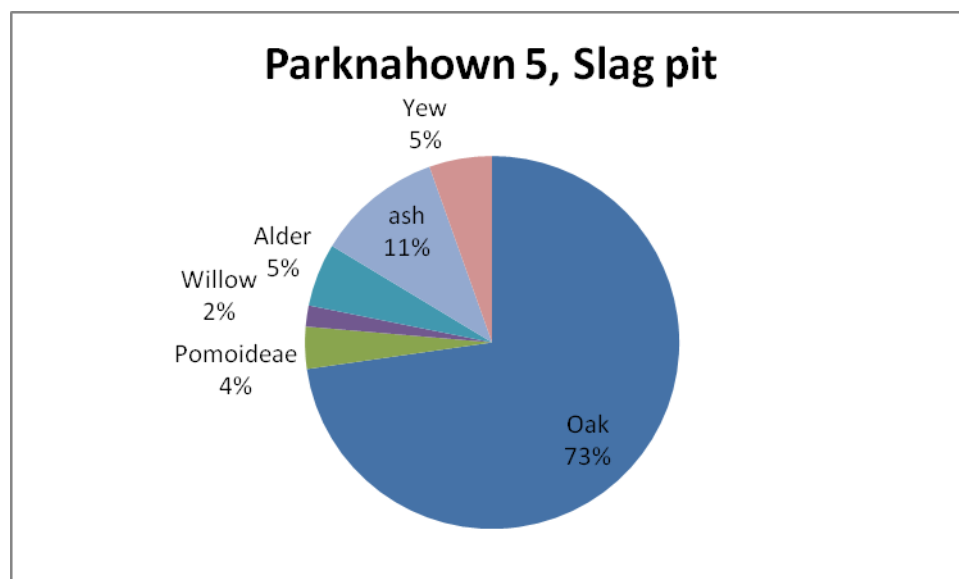
type), holly (*Ilex aquifolium*), willow (*Salix* sp), birch (*Betula* sp), elm (*Ulmus* sp), blackthorn (*Prunus spinosa*) and cherry (*Prunus padus/avium*) were also identified.

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



When all the taxa are graphed in relation to feature types it is clear that there is very little difference in wood selection between different feature types excavated at these ubiquitous *fulacht* sites. Does this indicate that similar functions were being carried out at the pits and troughs and the burnt spreads are related to all burning activities at the site? Oak is more prevalent in the identifications from the postholes which may suggest that oak was being used as post material at these sites.

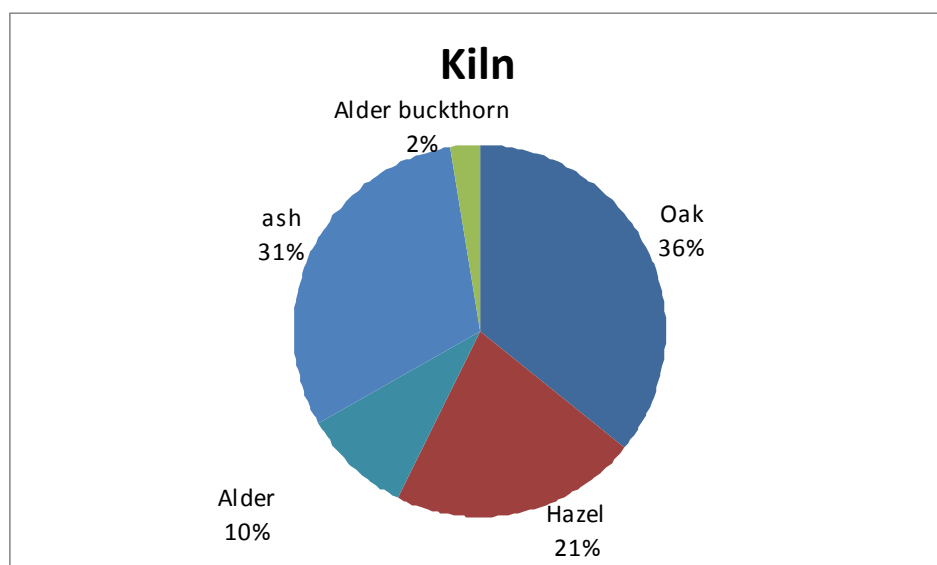
**Figure 3:** Wood taxa identified from Parknahown 5, slag pit



Oak was the preferred taxa for use within this slag pit at Parknahown 5. Other taxa present were ash, yew, alder, pomoideae and willow. The presence of yew is interesting as yew is a wood taxon associated with precious artifacts and is not generally identified for use as fuel.

Oak wood was specifically collected and used in association with the iron age slag pit at Parknahown 5. Oak is a dense wood and is very suitable for charcoal production and by inference metal working activities as seen here at Parknahown 5. It also makes good firewood when dried and will grow in wetland areas when conditions are dry. Oak also has unique properties of great durability and strength. The oak identified suggests that there was a supply of oak in the surrounding environment during the Iron Age. The oak was possibly selected from a coppiced area. A coppice tree is where the tree is cut down at its base and as a consequence several new shoots or straight growing trees will grow out of this one stump. The use of quickly renewable oak coppiced trees would have been the most efficient method of sustaining a continuous supply of fuel for use in these charcoal production pits.

Figure 4: Wood taxa identified from kiln fills, Parknahown 5

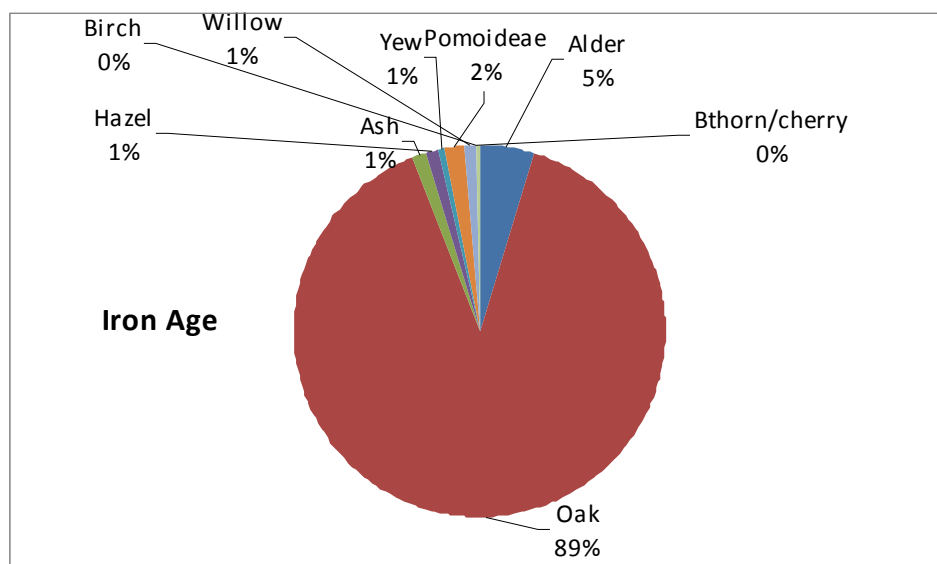


A variety of taxa were identified from the kiln material at Parknahown 5. Oak, ash and hazel, all dryland taxa, were the dominant taxa identified. The taxa may either be associated with fuel used at the kiln site or may be associated with some structural wood pertaining to the use of the kilns. It was impossible to tell from the stratigraphic information whether the charcoal was from a firespot or possible structural wood associated with specific features at the kiln site. Wetland taxa identified were alder and alder buckthorn.

### Wood and charcoal present in each period of use

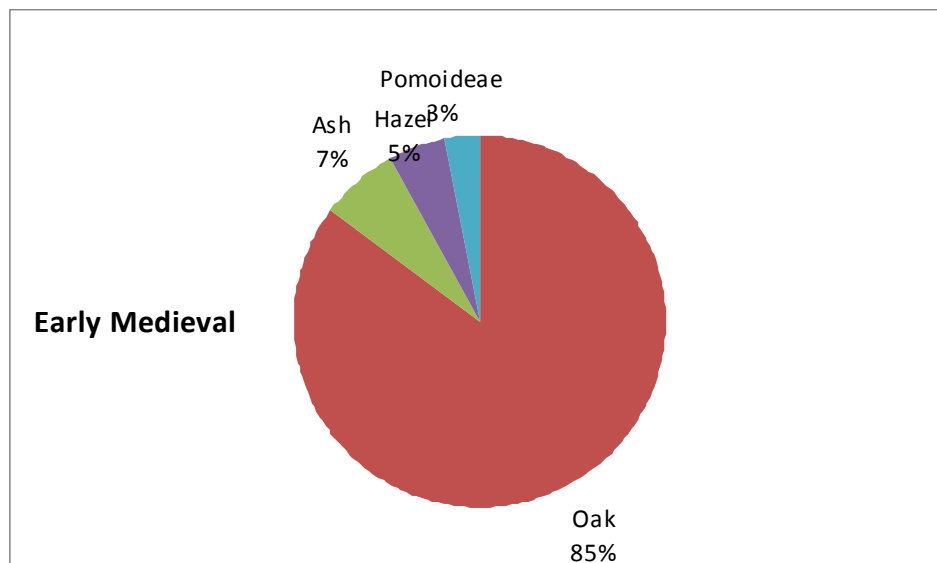
It is presumed that firewood used at sites in the Pre-historic period would be collected from close to the sites. This may be in contrast to the wood selection policies where particular trees were favoured for particular constructional functions. The wood and charcoal were compared chronologically against each other to determine which trees were being selected during each time period excavated along the route of Contract 1 M7/M8. This was completed to determine if there was any differences between woodland cover during the Bronze Age, Iron Age and Medieval periods. A note of caution must be observed here as the sample and fragment counts from each site was low and trends can only really be recorded rather than highlighting actual specific events occurring. It would be beneficial to compare these charcoal results with any pollen cores completed in the area.

**Figure 5:** Taxa present in the Iron Age



Oak, alder, pomoideae, hazel, yew, ash, willow, birch and blackthorn/cherry were identified from 6 sites along this section of the road and all dating to the Iron Age. The sites examined were Cuffsborough 4 (charcoal pit & slot trench), Leap 1 (waste pits), Oldglass 1 and 4 (Barrows), Parknahown 5 (slag pit), Parknahown 2 (entrance feature). Oak is by far the most dominant taxon present from the analysis which is related to the amount of structural features and iron working related features excavated from the Iron Age along this road scheme. Oak may have been prevalent in the area during this period as pollen records show from Ireland that there was very little change or 'noise' in the environment during the iron age.

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**Figure 6: Wood taxa identified from the early Medieval periods**

Two sites produced charcoal from the early Medieval periods. These were Cannonswood 2 (hearth) and Parknahown 5 (cemetery enclosure, postholes and kiln). Oak again dominates the assemblage here while ash, hazel and pomoideae were also present in lesser quantities. The dominance of oak is related to the nature of the features examined from this period and can not really be a reflection of woodland cover and type in the early Medieval periods of Co. Laois.

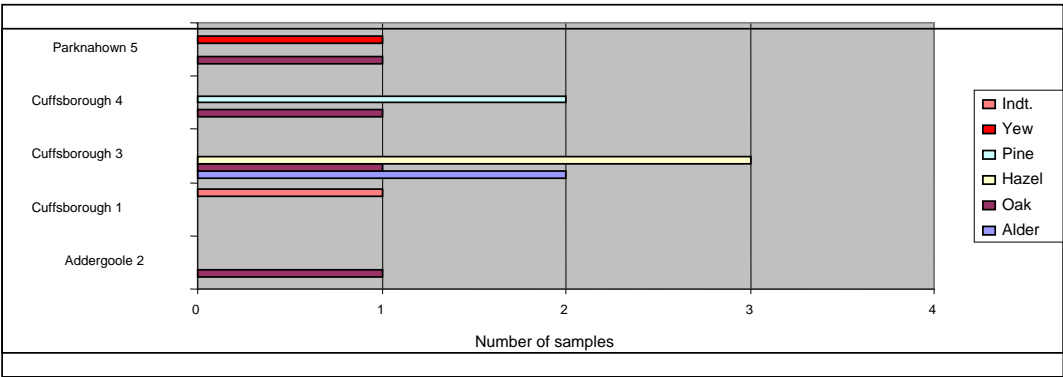


**Table 2: Wood identified from Contract 1**

Site	Site type	E number	Sample number	Context	Date	Identifications	Comment	Length	Width x Depth/ Diameter	Age	Woodworking evidence	Recommendations
Addergoole 2		E2213		23	EBA	<i>Quercus</i> tree trunk	naturally hollowed in centre	24cm	8cm	50yrs	No	Discard
Cuffsborough 1		E2184		24	BA	<i>Indt.</i>	mushy and dessicated.				No	Discard
Cuffsborough 3	Well fill	E2184	26	F64	LBA	<i>Alnus glutinosa</i>	Split wood /dessicated	12cm	6 x 3cm		No	Discard
Cuffsborough 3	Well fill	E2184	24	F64	LBA	<i>Alnus glutinosa</i>	Split wood /dessicated				No	Discard
Cuffsborough 3	Well fill	E2184	2	F64	LBA	<i>Corylus avellana</i>	worked wood	8.6cm	3 x 2.3cm (max)	Indt.	Yes. Carved with tiny facets (1cm wide and wide u shaped) at top of artefact.Sub-circular at one end and a shaft/handle carved from the rounded end . Broken at shapt end.	Photo, draw and conserve
Cuffsborough 3	Well fill	E2184	17	F64	LBA	<i>Corylus avellana</i>	Brushwood		2.2cm	16yrs	No	Discard
Cuffsborough 3	Fulacht /trough	E2184	18	F42	LBA	<i>Corylus avellana</i>	Brushwood		3cm	12yrs	No	Discard

Site	Site type	E number	Sample number	Context	Date	Identifications	Comment	Length	Width x Depth/ Diameter	Age	Woodworking evidence	Recommendations
Cuffsborough 3	Fulacht /trough	E2184	3	F67	LBA	<i>Quercus spp</i>	Charred			16yrs	No	Discard
Cuffsborough 4	Houses and palisaded structures	E2184		F210	BA	Organics and 3 fragments of oak charcoal						Discard
Cuffsborough 4	Houses and palisaded structures	E2184		F133	BA	<i>Pinus sylvestris</i>	Hard wood/possibly modern	2cm	1 x 0.5cm	Indt.	No	Discard
Cuffsborough 4	Houses and palisaded structures	E2184		F166	BA	<i>Pinus sylvestris</i>	Hard wood/possibly modern	3	1 x 0.5cm	Indt.	No	Discard
Parknahown 5		E2170	1	23	Medieval/Iron age	<i>Quercus spp</i>	Root? Very hard wood	30cm	20cm	60yrs	No	Discard
Parknahown 5		E2170	2		Medieval/Iron age	<i>Taxus Bacatta</i>	Tree stumps. Hard wood	42cm	12cm	Indt.	No	Discard

Figure 7: All wood taxa identified from sites that produced wood along Contract 1



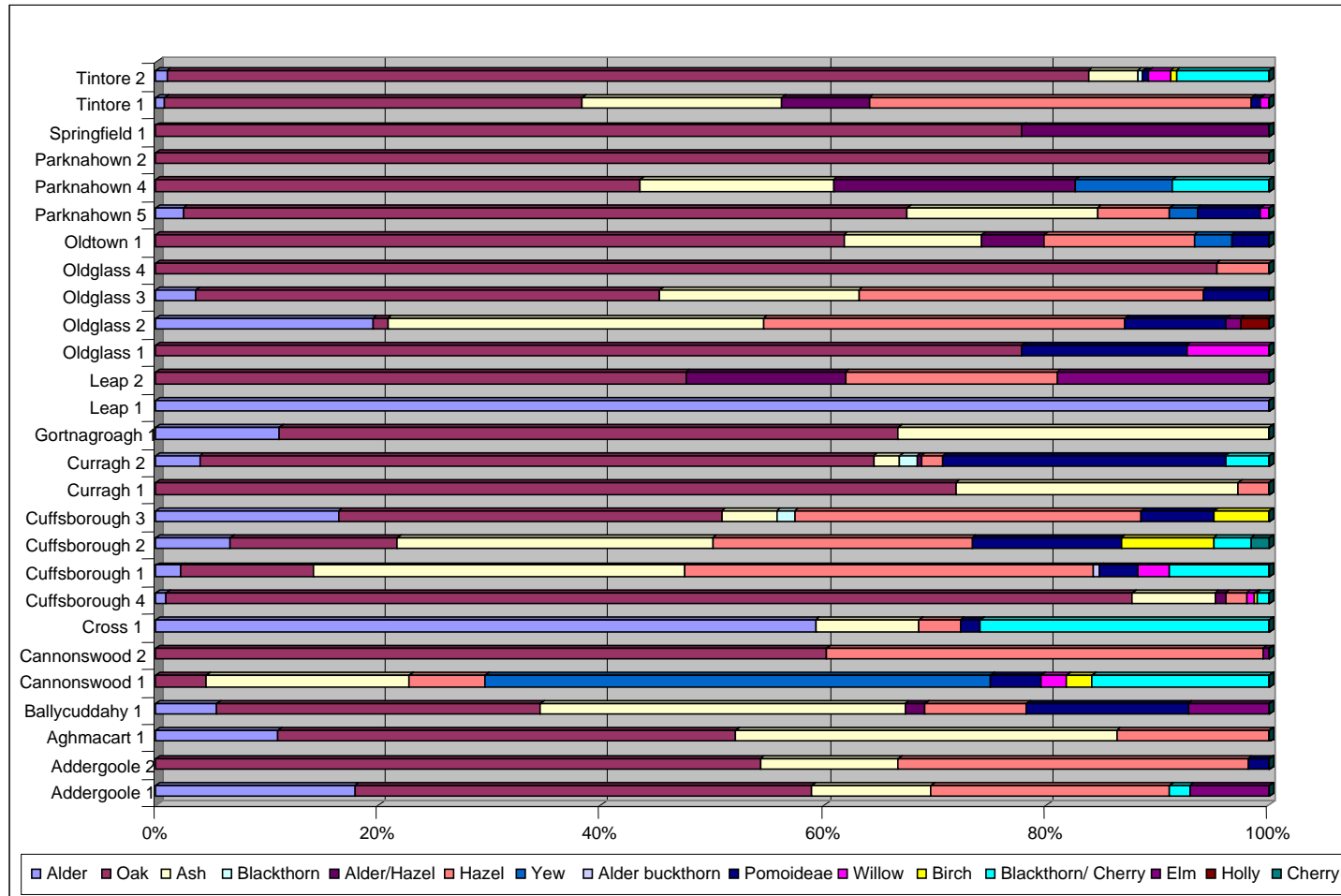
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**Wood assemblage**

Overall the wood assemblage was limited in numbers and poor in relation to information obtainable with regard to wood types selected and wood working evidence. Wood timbers were identified from Addergoole 2, Cuffsborough 1, Cuffsborough 3, Cuffsborough 4 and Parknahown 5. The wood from Addergoole 2 is most likely associated with a natural oak tree trunk as is the oak and yew wood identified from Parknahown 5. The oak, alder and hazel wood uncovered from a well feature at Cuffsborough 3 may have served as a lining to the well as the alder wood was split. A carved 'S' shaped type artifact was also identified from the wood collection at Cuffsborough 3. Pine wood identified from Cuffsborough 4 was very hard and is probably modern in origin.

## 6. Discussion of Charcoal and wood assemblage

Table 3: Wood taxa identified from each site excavated along Contract 1, M7/M8



### Principal 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 Early, Middle and Late Bronze Age as well as the Medieval periods.
3. To analyse the wood for woodworking evidence and examine and describe any wooden artefacts recognised in the assemblage.

### Wood types identified from charcoal and wood assemblages

Table 4: Taxa types identified from the charcoal and wood assemblage along Contract 1

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
<i>Pomoideae</i>	Apple type
<i>Quercus</i> spp	Oak
<i>Alnus glutinosa</i>	Alder
<i>Salix</i> sp	Willow
<i>Fraxinus excelsior</i>	Ash
<i>Frangula alnus</i>	Alder buckthorn
<i>Betula</i> sp	Birch
<i>Taxus Baccata</i>	Yew
<i>Pinus sylvestris</i>	Pine
<i>Ilex acquifolium</i>	Holly

Two thousand seven hundred and ten charcoal fragments from sixty three contexts related to twenty seven archaeological sites were analysed from excavations along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill, Contract 1. Thirteen wood samples from five sites were also identified from Contract 1. Contract 1 covers a length of approx 31 km and includes numerous *fulacht fiadh* sites, iron working sites, enclosures, house and palisade structures, barrows, pits, postholes and kilns.

Charcoal was identified from the fill of various troughs, the fill of pits, from burnt mound spreads and postholes/stakeholes associated with excavated *fulachta*

*fiadh*. These were from Addergoole 1, Addergoole 2, Aghmacart 1, Ballycuddahy 1, Cannonswood 2, Cuffsborough 1, Cuffsborough 2, Cuffsborough 3, Curragh 1, Curragh 2, Oldglass 1, 2 & 3, Oldtown 1, Parknahown 5 and Tintore 1. Charcoal analysed from charcoal pits which are most likely associated with metalworking activities were from Cuffsborough 4, Parknahown 4, Tintore 4, Leap 2 and Parknahown 5. Charcoal was also analysed from a kiln at Parknahown 5 dating to the Early medieval period. Charcoal from pits excavated at Cuffsborough 2, Cannonswood 1, Cross 1, Parknahown 4 and Tintore 2 were also identified to determine possible function and fuel type used at the pits. Possible structural wood used at the site were analysed from charcoal associated with postholes from a C shaped structure and slot trenches at Cuffsborough 4. Charcoal from postholes were analysed from Curragh 2, Parknahown 5 and Tintore 2. Ditch and enclosure fills examined were sampled from Parknahown 2, Tintore 2 and Curragh 2. The fill of a slump possibly associated with a cow horning site was analysed from Gortnagroagh 1 and charcoal from Barrow fills were identified from Oldglass 1 and 4. Charcoal from an early Medieval hearth was examined from Cannonswood 1 and charcoal from waste pits at Leap 1 dating to the Iron Age were also identified.

Wood timbers were identified from Addergoole 2, Cuffsborough 1, Cuffsborough 3, Cuffsborough 4 and Parknahown 5. The wood from Addergoole 2 is most likely associated with a natural oak tree trunk as is the oak and yew wood identified from Parknahown 5. The oak, alder and hazel wood uncovered from a well feature at Cuffsborough 3 and may have served as a lining to the well as the alder wood was split and the hazel brushwood was pointed. A carved 'S' shaped type artefact was also identified from the wood collection at Cuffsborough 3. Pine wood identified from Cuffsborough 1 was very hard and is probably modern in origin.

There were fourteen taxa present in the charcoal and wood remains. Pine was present in the wood assemblage and not in the charcoal identifications while pomoideae, ash, blackthorn/cherry, yew, alder buckthorn, holly, elm, willow and birch were present in the charcoal assemblage and not in the wood samples.

Taxa identified from the assemblage were oak (*Quercus* sp), hazel (*Corylus avellana*), ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), Pomoideae (apple type), blackthorn/cherry (*Prunus* spp), yew (*Taxus baccata*), willow (*Salix* spp), birch (*Betula* sp), holly (*Ilex aquilofium*), elm (*Ulmus* sp), alder buckthorn (*Frangula alnus*) and pine (*Pinus sylvestris*) in order of representation. The pine identified from the wood samples at Cuffsborough 1 is likely to be modern in date as it was hard and similar in nature and form to modern wood. The range of taxa identified from the features analysed includes large trees (elm, ash, yew, pine and oak), medium sized trees (alder and birch) and smaller scrub or hedgerow trees like blackthorn, blackthorn/cherry, willow, hazel, holly, pomoideae and alder buckthorn.

The charcoal is mainly representative of fuel collection policies at the site although charcoal from structural features was identified from pre-historic features at Cuffsborough 4, high medieval postholes at Curragh 2, a late Bronze Age stakehole at Oldtown 1, Early medieval postholes at Parknahown 5 and pre-historic postholes at Tintore 2 (see tables 10, 12, 21, 23 & 27). The charcoal identified from the pre-historic slot trenches at Cuffsborough 4 was dominated by oak while the posthole **F177** was ash. The charcoal from the charcoal production pit at Cuffsborough 4 was also dominated by oak. This suggests that oak was specifically collected for use for slot trenches and charcoal production in the Bronze Age and Iron Age and ash may have been used as post material in relation to habitation sites. Ash wood was nearly exclusively used as post material at a Late Bronze Age habitation site at Clonfinlough in Co. Offaly (Moloney *et al*, 1993).

Oak was also more prevalent at the medieval-dated structural features identified from Curragh 2 and Parknahown 5 as well as the charcoal identified from the Bronze Age stakeholes and postholes at Oldtown 1 and the Tintore 2. Oak was also identified in high quantities from the ditch and enclosure features at the Bronze Age sites at Tintore 2 and Springfield 1 and the Iron Age-dated site at Parknahown 2 and the medieval site of Curragh 2. Oak may have been used as structural posts or other such features within these ditches.

In summary oak was present at most sites analysed but was identified in greater amounts at the aforementioned sites and was noticeably lacking from a Late Bronze Age dated pit at Cross 1. The frequent occurrence of oak within the structural features excavated is not surprising as the use of oak for structural wood is well attested to in both the Pre-historic and Medieval periods. It is only when oak is not used at these features that we can infer that it may not have been available in the surrounding landscape or that the charcoal associated with that particular feature may not be related to its structural function.

The oak identified from the charcoal production pit at Cuffsborough 4 (Table 10) and at the slag pits at Parknahown 5 (Figure 3) is repeated elsewhere across the country where oak was exclusively collected for charcoal production. Oak is a dense wood and is very suitable for charcoal production and associated metalworking activities. It also makes good firewood when dried and will grow in wetland areas when conditions are dry. The oak identified suggests that there was a supply of oak in the surrounding environment. The oak was possibly selected from a coppiced wood. A coppice tree is where the tree is cut down at its base and as a consequence several new shoots or straight growing trees will grow out of this one stump. The use



of quickly renewable oak coppiced trees would have been the most efficient method of sustaining a continuous supply of fuel for use in these charcoal production pits.

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

A hearth dated to the early medieval periods from Cannonswood 2 which produced over 380 grams of oak charcoal may have been a charcoal production pit based on the exclusivity of oak in the sample and the date. Similar unassociated pits along several road schemes which when analysed have produced large fragments of oak and are re-classified as charcoal production pits (Charlestown by-pass, unpublished post excavation report, 2007). These charcoal production pits are generally lost in the archaeological record until the charcoal is examined and assessed.

Other industrial sites examined from the route were a kiln from the medieval period at Parknahown 5 (Figure 8). The range of taxa identified from these kilns mirrors results from other road schemes where a range of taxa are identified. Charcoal identified from kilns along the N8 produced a similar array of taxa. Ash is the only taxa that is more prevalent within this sites as opposed to the N8, Cashel to Mitchelstown (O'Donnell, 2008, unpublished post excavation report).

Barrows similar to the sites excavated at Oldglass 1 and 4 are generally regarded as funerary monuments therefore the charcoal present in the ditch is possibly associated with the rituals of the dead and with cremation processes (Figure 9). It is not surprising then that oak is the dominant species identified from these ditches as oak is nearly always used for the purpose of cremating bodies. This may be due to the excellent properties of oak as a fuel or the body may have lain on an oak plank which was later burnt with the body. Charcoal analyses at other cremation sites Bettystown, Co. Dublin (98E072), Ballybrowney Lower 1 (03E1058), Ballynapark, Co. Wicklow (A022-33) and Hermitage, Limerick (01E0319) revealed that oak is the dominant species identified from within these features. Charcoal from a ring ditch analysed from site D, Morett (03E0461) produced mainly oak fragments from the fill of its ditch.

Charcoal present in the pits, troughs and burnt mounds were all quite similar with dryland taxa dominating rather than wetland taxa. This is contrast 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 land around Co. Laois and the siting of these *fulachts* may have occurred in less marshy

or wetland areas and as such the inhabitants of the sites excavated along the M7/M8 had access to more dryland taxa such as ash, hazel and oak. The presence of similar taxa within the pits and the trough suggest that similar functions were being carried out at these sites. The *fulacht* site at Addergoole 2 had a noticeable absence of wetland taxa which indicates that this area may have been particularly dry during the period of use of the site.

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 from the south of Ireland and here along the M7/M8 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). O' Donnell also notes that the values for ash are lower in the Late Bronze Age and attributes the decrease in ash charcoal from the Middle Bronze Age onwards to a period of land clearance prior to the Early Bronze Age which allowed ash to grow well in these clearings (O' Donnell 2007, 37). This is probably the same phenomenon that occurred here along the M7/M8 where the values for ash are lower, although not by a huge margin in the Later Bronze Age. The noticeable decrease in hazel along the M7/M8 may have been a product of deforestation. Can we then suggest an increase in population throughout the Bronze Age and widespread land clearance which is noticeable in the drop off of hazel and oak? The amount of *fulachts* excavated from the Late Bronze Age also points strongly to an increase in population in the Late Bronze Age in the study area.

Other patterns emerging from the analysis is that elm appears to occur more frequently in the Early Bronze Age sites as seen at Ballycuddahy and Oldglass 2. Elm is thought to have extensively died out with the occurrence of an elm disease epidemic in the Neolithic period. Yew, a much venerated and valued tree type, was identified from two undiagnostic Late Bronze Age pits at Cannonswood 1 and Parknahown 4. The presence of yew at these pits does not occur at other sites along the scheme and may point to some ritual or unusual type of activity being undertaken at these pits.

When the charcoal is plotted against time periods we see a slight reduction in the presence of oak charcoal in the Middle Bronze Age and an increase in hazel wood. Does this suggest a clearance of oak trees in the early Bronze Age whereby they are not so prolific in the Middle Bronze Age? Hazel decreases notably in the Late Bronze Age which also may indicate a clearance of scrub for the inhabitants of the Late Bronze population expansion in the area. There are certainly more Late Bronze Age-dated sites excavated from the area than any other period of activity along the road scheme.

Oak dominates the charcoal assemblage from the Iron Age and Medieval periods. Certainly oak was present in the area during these periods but is difficult to make any further assumptions on woodland cover during these periods due to the small sample set and the nature of the archaeological features examined which were in the main structural.

## **7. Woodworking evidence**

Analysis of wood was carried out from 3 *fulacht fiadh* which included Addergoole 2, Cuffsborough 1 and 3. Other sites where wood was analysed from were houses and palisade structures from Cuffsborough 4 from F23 at Parknahown 5.

The wood from Addergoole 2 is most likely associated with a natural oak tree trunk as is the oak and yew wood identified from Parknahown 5. The oak, alder and hazel wood uncovered from a well feature at Cuffsborough 3 may have served as a lining to the well as the alder wood was split. A carved 'S' shaped type artefact was also identified from the wood collection at Cuffsborough 3 (see section 8). Pine wood identified from Cuffsborough 1 was very hard and is probably modern in origin.

Woodworking evidence was only present on the wood from Cuffsborough 3, the late Bronze Age *fulacht* site. The wood was identified as alder split wood, unworked hazel brushwoods and oak charred unworked wood (see table 28). The split type of the alder wood was not recognisable due to the degraded state of the wood. The function of this wood is indeterminate but it may have functioned as a lining for the well/trough. Alder and oak planks as well as hazel stakes are commonly identified from trough linings.

## **8. Conclusions on Wood and charcoal Assemblage**

Two thousand seven hundred and ten charcoal fragments from sixty two contexts related to twenty seven archaeological sites were analysed from excavations along the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill, contract 1. Thirteen wood samples including a hazel wooden artifact was also analysed from the assemblage. Fourteen taxa were identified from the charcoal and wood assemblage retrieved from the sites and features excavated along the routeway. These were oak

(*Quercus* sp), hazel (*Corylus avellana*), ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), Pomoideae (apple type), blackthorn/cherry (*Prunus* spp), yew (*Taxus baccata*), willow (*Salix* spp), birch (*Betula* sp), holly (*Ilex aquilifolium*), elm (*Ulmus* sp) and alder buckthorn (*Frangula alnus*) and pine (*Pinus sylvestris*) in order of representation. The charcoal is mainly representative of fuel collection policies at the Bronze Age *fulacht* sites although charcoal from structural features were identified from Cuffsborough 4 and posthole fills were analysed from Curragh 2, Parknahown 5 and Tintore 2 dating to the Middle & Late Bronze Age and Medieval periods. The fills of the ditches (Curragh 2 & Tintore), enclosures (Parknahown 2 & Springfield 1) and barrow sites (Oldglass 1 & 4) are more difficult to attribute a function to. They are most likely related to various burning episodes on site and deposition through various formation processes on the site. Charcoal identified from waste pits at Leap 1, slag pits at Parknahown 5 and possible charcoal production pits at Cannonswood 2 and Cuffsborough 4 are associated with fuel used for metalworking. The charcoal identified from the kilns are also more difficult to attribute a function to as the wood could have been used as firewood or structural features within the kiln site which later burnt down.

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

Oak is seen to dominate the charcoal assemblages in all periods of use. Oak was specifically selected for most structural uses such as posts and planks in slot trenches and was the preferred taxon for use at metalworking activities including charcoal production pits. Oak was also very prevalent in the ditches and enclosure fills which may indicate that these features contained oak posts or planks. Oak was also the dominant taxon identified from the Barrow sites at Oldglass 1 and 4. Oak is generally the preferred taxon used for cremation deposits due to the high temperatures it can reach and its high calorific value. Ash posts may have been used at one site at Cuffsborough 4 in the Bronze Age.

A variety of taxa were also identified from the kiln although dryland taxa were more frequently identified such as hazel, oak and ash.

Oak, hazel and ash are the dominant taxa identified from the *fulacht* sites. These are all dryland type taxa. These results are in contrast to wood analysis carried out at Charlesland and the N11 in Co. Wicklow, the gas pipeline to the west the N6 KEK in the midlands and Charlestown in Co. Mayo where alder and oak appear to be more dominant. However recent results from the N8 Cashel to Mitchelstown have produced a similar array of taxa where oak, hazel and ash are more common than wetland taxa such as alder. With regard to other functions for the charcoal we can conclude that the activities carried out within the troughs were

similar to that which was being carried out at the pits as the taxon identified from the *fulacht* pits mirrors those present in the troughs.

Yew was identified in frequent amounts from two late Bronze Age pits at Cannonswood 1 and Parknahown 4. The yew wood which is generally associated with special type artifacts and holy places, may point to a ritual use for these enigmatic pits.

Wood timbers were identified from Addergoole 2, Cuffsborough 1, Cuffsborough 3, Cuffsborough 4 and Parknahown 5. The wood from Addergoole 2 is most likely associated with a natural oak tree trunk as is the oak and yew wood identified from Parknahown 5. The oak, alder and hazel wood uncovered from a well feature at Cuffsborough 3 may have served as a lining to the well as the alder wood was split. A carved 'S' shaped type artifact was also identified from the wood collection at Cuffsborough 3. Pine wood identified from Cuffsborough 4 was very hard and is probably modern in origin.

The archaeological evidence points to an increase in inhabitants in the Late Bronze Age as the quantity of *fulachts* in this period is greater than any other period in the area. The environmental evidence from the wood and charcoal may also point to an increase in population and an increase in wetness along this particular route of the M7/M8 where there is less hazel and oak than earlier periods and more wetland type taxon. Oak is more frequently identified from the sites dating to the Iron Age and Medieval periods. Oak was sourced for use in the metalworking activities and the charcoal production pits at these sites. Oak was again the more dominant taxon identified from the Medieval periods but this may be a reflection of wood usage related to structural timbers rather than the trees in the surrounding environment.

All of the wood taxa identified from the excavations were of native origin. The wood and charcoal assemblage analysed here is indicative of a more dryland environment. Wetland species identified in lower quantities were alder, birch and willow which are symptomatic of local wet condition along river banks or peat bogs.

It would be of great benefit to the project if the results were compared and contrasted with a pollen core specifically taken from the areas that underwent excavation along the M7/M8.

## 8. Wooden Artefacts

One wooden artefact was uncovered from the fill of a well **F64** at Cuffsborough 3 (plate 1 & 2).

It was rounded at one end and had a small curving shaft. The shaft appeared to be broken. It was manufactured from hazel (*Corylus avellana*) wood. There were tiny facets measuring 1 cm in width present at the top of the circular section.



Plate 1: The wooden artifact from Cuffsborough 3



Plate 2: The wooden artifact from Cuffsborough 3

### Assessment of Wooden Artefacts

It is unclear what the artefact was used for or what it represents. It may have been part of a composite artefact. The taxa it was manufactured from (hazel) is not normally related to domestic artifacts so its use as handle or part of a wooden implement is probably not practical.

### Catalogue of Wooden Artefacts

**Worked and shaped hazel wood piece:** F64:2: From well area associated with fulacht fiadh. Incomplete and broken. Hazel. Sub-circular in shape at one end with a short slightly curving shaft. L 816 mm. Wth 300 mm (max). T 230 mm (max)

## **Recommendations**

- The artefact from Cuffsborough 3 listed in Section 8 should be drawn and then conserved.

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## 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.

*Frangula alnus* (Alder buckthorn) is a small deciduous shrub up to 4-5 m in height, with wide-spreading branches. It is found on moist acid soils along riversides and on peat.

#### *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. 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).

*Pinus sylvestris* (Scots Pine),

It was generally thought that although Scots pine became common throughout Ireland after the last glaciation, it had declined and was absent by the medieval period and not reintroduced until the late 17th century. Contrary to this, pollen evidence of former tree growth on Clonsast bog, Co. Offaly suggests that Scots pine may have survived in Ireland as a true native. Dr Neil Murray found a continuous record of pine pollen from the early post-glacial period right up to the modern era (Nelson 1994, 148).

The quality and texture of Scots pine depends on the rate of growth of each tree. Scots pine wood is not naturally durable and is no longer widely planted as a commercial forest species in Ireland.

*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.

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*Prunus spinosa* (Blackthorn)

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

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

*Prunus padus/Prunus avium* (Bird /Wild cherry)

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

*Quercus* spp (Oak)

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

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

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

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

*Salix* sp (Willow),

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

*Taxus Baccata* (Yew)

The yew (*Taxus baccata* 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. It is much less common in recent times because of overharvesting (its hard, springy wood was the source of English longbows). The evergreen needles are very broad, and the seeds are produced in red, berry-like cones. Yews are toxic; one of the toxic compounds, taxol, is an effective treatment for some cancers. Yew is used for the manufacture of wooden bows, spears and many staves were constructed from yew in the Early Medieval periods.

*Ulmus* spp (Elm)

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

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

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## 9 References

- Beckett, J.K., 1979, *Planting Native Trees and Shrubs*. Jarrold and Sons Ltd; Norwich.
- Eogan, G., 1983, *Hoards of the Irish Later Bronze Age*. University College Dublin
- Edlin, HL, 1956. *Trees, wood and man*. Collins, London
- Grogan, E, O Donnell, L, Johnston, P. 2007. *The Bronze Age Landscapes of the pipeline to the west*. Wordwell, Wicklow
- Grogan, E., O'Donnell, L. & Johnston, P. (2007) *The Bronze Age landscapes of the Pipeline to the West: an integrated archaeological and environmental assessment*. Wordwell Ltd., Dublin.
- Grogan, E. (2005) *The North Munster Project*. 2 Volumes. Wordwell Ltd., Dublin.
- Heery, A. (1998) *The vegetation history of the Irish midlands: Palaeoecological reconstructions of two lake sites adjacent to eskers* PhD thesis, University of Dublin (Trinity College).
- The Heritage Council (2007) *A review of research needs in Irish archaeology*. The Heritage Council of Ireland Series, Kilkenny.
- Hall, V., 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 artifacts from the excavation of the medieval City of Cork" in S. McGrail, *Woodworking Techniques before A.D 1500*, B A R **129**, 301-311.
- Hurley, M.F., 1986, *A study of Skeletal and Wooden Artefacts from Medieval Cork*. Unpublished M.A. Thesis, University College Cork.
- Hurley, M. & Scully, O., 1997, *Late Viking Age and Medieval Waterford Excavations 1986-1992*. Waterford Corporation.
- Kelly, F., 1988, *A Guide to Early Irish Law*. Institute for Advanced Studies, Dublin.
- Keepax, C. A. (1988) *Charcoal analysis with particular reference to archaeological sites in Britain*. Ph.D. Dissertation, University of London.
- McCracken, E., 1971, *The Irish Woods Since Tudor Times*. Institute of Irish Studies, Belfast.
- Morgan, R., 1975, "The Selection and Sampling of Timber from Archaeological Sites for Identification and Tree-ring analysis", *Journal of Archaeological Science*, 2, 221-230.
- Nelson E.C., 1993, *Trees of Ireland*. The Lilliput Press, Dublin.
- Moloney et al, 1994) *Excavations at Clonfinlough, Co. Offaly*, Crannog Publications.
- Mac Coitir, N., 2003, *Irish Trees, Myths, legends and Folklore*. The Collins Press

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- 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 Donnell, L. 2005, *Wood and charcoal identifications from Charlesland, Co. Wicklow*, Unpublished specialist report for Margaret Gowen and Co.
- O Donnell, L. 2005, *Wood and charcoal identifications from Ballynagran, Co. Wicklow*, Unpublished specialist report for Margaret Gowen and Co.
- O Donnell, 2008, *Wood and charcoal identified from the N8 Cashel to Mitchesltown*, unpublished post excavation report for NRA/Margaret Gowen & Company
- O' Sullivan, A., 1987, "Wood in Archaeology", *Archaeology Ireland* 4, 69-73.
- O' Sullivan, A., 1994, "The use of Trees and Woodland in early medieval Ireland", *Irish Forestry* 51, 80-94.
- Rackham, O., 1976, *Trees and Woodlands in the British Landscape*. Weidenfeld & Nicholson, London.
- Rackham, O., 1980, *Ancient Woodland: its history, vegetation and uses in England*. Edward Arnold, London.
- Schweingruber, F.H., 1990, (3rd edition) *Microscopic Wood Anatomy*. Birmensdorf: Swiss Federal Institute for Forest, Snow and Landscape Research.
- Sands, R. 1997, *Pre-historic woodworking. The Analysis and Interpretation of Bronze and Iron Age toolmarks*. Institute of Archaeology, University of London
- Webb, D.A., 1977, *An Irish Flora*. Dundalgan Press Ltd., Dundalk.
- Western, C. A., 1970, "Wood and Charcoal in Archaeology", *Science in Archaeology*, 178-187.

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**Appendix 6**



Archaeological Services  
University of Durham

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# **Parknahown 5, M7/M8 Motorway Project, Co Laois, Ireland**

## **environmental analysis**

*on behalf of*

**Archaeological Consultancy Services Ltd**

**Report 1879**

April 2008

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# **Parknahown 5, M7/M8 Motorway Project, Co Laois, Ireland**

## **environmental analysis**

### ***Report 1879***

April 2008

***Archaeological Services Durham University***

on behalf of

***Archaeological Consultancy Services Ltd***

*Unit 21 Boyne Business Park, Greenhills, Drogheda, Co. Louth, Ireland*

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## 1. Summary

### *The project*

- 1.1 An excavation was undertaken by Archaeological Consultancy Services Ltd at Parknahown 5, Co Laois, Ireland. The remains of an early medieval enclosed, secular cemetery was uncovered which consisted of a double-ditched circular enclosure measuring c.60m in diameter. This report presents the results of environmental analysis of the fills of the enclosure ditches, grave cuts, a pit and a slot trench.

### *Results*

#### *Plant macrofossil analysis*

- 1.2 The few cereal remains recorded on the site included oats, hulled barley and wheat. The only charred remains in the grave fills were a few hazel nutshell fragments and two oat grains. The cereals and nuts may reflect food waste resulting from feasting association with the burials.

#### *Cremated bone analysis*

- 1.3 The majority of the contexts contained small amounts of cremated bone weighing <10g each, with the most cremated bone (226.1g) seen in context (386). This context contained several fragments of definite animal bone. None of the remaining contexts contained bone fragments that could be identified, and whether the bone is from humans or animals is unknown. The colour of the bone in most contexts ranged from brown and black (exposure to cooler temperatures, c. 300°C), through dark and mid greys (partial oxidation, 300-600°C), to pale greys and whites (complete oxidation, c.600°C+).

#### *Mollusc analysis*

- 1.4 Small assemblages of snails shell were recovered from two deposits and submitted for analysis. The identifiable land snail remains were predominantly of catholic taxa and of little interpretative value. There were also some aquatic snails present in one of the deposits which could indicate that ditch (29) held freshwater at the time of the formation of the primary fill. However, these were rather few in number and it is quite possible that they arrived with waste water discarded into the ditch.



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## 2. Project background

### *Location and background*

- 2.1 An excavation was undertaken by Archaeological Consultancy Services Ltd at Parknahown 5, Co Laois, Ireland. The remains of an early medieval enclosed, secular cemetery was uncovered which consisted of a double-ditched circular enclosure measuring c.60m in diameter. Approximately c.600 individuals were excavated from the section which occurred within the excavation limits. Finds from the burial ground include bronze ring-pins, bone needles and glass beads (mainly occurring with infants), while finds from the enclosure ditches include an Anglo-Saxon bronze penannular brooch dating to the late 7th century, a decorated bone comb, quern stone fragments and corroded iron knife blades. The site exhibited little evidence for domestic settlement and no significant evidence for any ecclesiastical association. This report presents the results of environmental analysis of the fills of the enclosure ditches, grave cuts, a pit and a slot trench.

### *Objective*

- 2.2 The objective was to further our understanding of the nature of secular cemeteries and early medieval burial practices in Co Laois.

### *Dates*

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

### *Personnel*

- 2.4 Sample processing was undertaken by Archaeological Consultancy Services Ltd. Report preparation and plant macrofossil analysis was carried out by Dr Charlotte O'Brien and Mr Lorne Elliott. Cremated bone analysis was by Dr Anwen Caffell, with faunal identifications by Ms Louisa Gidney. Mollusc analysis was by Mr John Carrott.

### *Archive*

- 2.5 The licence number is A015/060 (E2170). The samples are currently at the Environmental Laboratory at Archaeological Services Durham University awaiting collection or return.

## 3. Plant macrofossil analysis

### *Method*

- 3.1 Plant macrofossil analysis was undertaken on 16 flots. These were scanned at up to x60 magnification using a Leica MZ6 stereomicroscope and plant remains were identified by comparison with modern reference material held in the Environmental Laboratory at Archaeological Services Durham University. Plant taxonomic nomenclature follows Stace (1997).

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**Results**

- 3.2 Low numbers of charred cereal grains occurred in 4 of the contexts. The largest number of them was in pit fill (258), which consisted of a few barley and wheat grains and several indeterminate grains. One of the barley grains was hulled, but the others were too badly degraded to differentiate them between the hulled or naked varieties. A hulled barley grain also occurred in ditch fill (105). An oat grain was recorded in the fill of the enclosure ditch (102), and two were in grave fill (837). The only other charred remains in the grave fills were hazel nutshell fragments in the two samples from context (1053). A few charred weed seeds were present in ditch fill (102) and pit fill (258). A pig tooth was also present in the flot of (258).
- 3.3 A few uncharred seeds, insect egg cases and roots were present in some of the flots, but the non-waterlogged nature of the deposits suggests that these are later intrusive material. Crinoids (pre-Quaternary fossils), were noted in context (105), which will have derived from the Carboniferous limestone bedrock of the area. The results are presented in Table 3.1.

**Discussion**

- 3.4 The few cereal remains recorded on the site included oats, hulled barley and wheat. Archaeobotanical studies from other sites suggest that hulled barley and oats were the main crops cultivated in Ireland during the early medieval period, while bread wheat became increasingly important in the post-Norman period (Monk 1986; Monk & Sheehan 1998).
- 3.5 The few charred seeds of ribwort plantain, grass and vetch are likely to reflect weeds which had been growing with the cereal crops. The absence of chaff and low numbers of weeds indicates that the crops had been cleaned prior to their incorporation into the deposits.
- 3.6 The largest number of charred cereals was recorded in pit fill (258), in which a pig tooth also occurred. As there is little evidence of settlement at the site, these may be the remains of ritual feasting in association with burial activity. The occurrence of pig may reflect a continuation of the traditional association of this animal with burial practices; pig joints were often buried with the body in the Iron Age, for example at Wetwang Slack, East Yorkshire (Jay & Richards 2006). Remains of cattle and sheep-size bones were also recorded on the site (section 4 below). The only charred plant remains in the grave fills were a few hazel nutshell fragments and two oat grains. These may again be the remains of food-waste resulting from feasting.

**Table 3.1:** Plant macrofossils from Parknahown 5

Context	102	105	258	270	474	837	923	SK967	1037	1053	1053	1210	1393	1393	1403	1442
Sample	67	93	259	843	114	379	424	678	509	493	495	693	558	644	646	687
Fill type	Ditch	Ditch	Pit	Slot	Grave cuts											
Material available for C14 dating	✓	✓	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-
Volume of flot (ml)	25	5	12	2	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Flot matrix (relative abundance)																
Bone (unburnt)	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal	2	2	-	2	-	2	-	-	-	-	-	-	-	-	-	-
Fossils (pre-Quaternary) (crinoids)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Insect (egg cases)	2	1	-	-	1	1	1	1	2	-	-	1	1	1	1	1
Molluscs (terrestrial)	1	1	-	1	-	2	-	-	-	-	-	-	-	-	-	-
Roots (modern)	2	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Tooth (pig)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Twig (charred)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charred remains (total number)																
(c) <i>Avena</i> spp (oat species) grain	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
(c) <i>Hordeum</i> spp (Hulled barley species) grain	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
(c) <i>Hordeum</i> spp (Undiff. barley species) grain	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
(c) <i>Triticum</i> spp (Wheat species) grain	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
(c) <i>Cerealia</i> indeterminate grain	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-
(r) <i>Plantago lanceolata</i> (Ribwort plantain) seed	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(t) <i>Corylus avellana</i> (Hazel) nutshell frag.	-	-	-	-	-	-	-	-	-	4	1	-	-	-	-	-
(x) Poaceae undifferentiated >2mm (Grass family) caryopsis	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
(x) <i>Vicia</i> spp (vetch) seed	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Uncharred remains (total number)																
(a) <i>Chenopodium album</i> (Fat-hen) seed	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(a) <i>Fallopia convolvulus</i> (Black Bindweed) nutlet	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
(a) <i>Fumaria</i> sp (Fumitory) seed	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(r) <i>Persicaria maculosa</i> (Redshank) nutlet	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(t) <i>Rubus fruticosus</i> agg. (Bramble) fruitstone	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(t) <i>Sambucus nigra</i> (Elder) fruitstone	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(w) <i>Carex</i> spp (Sedges) trigonous nutlet	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(x) <i>Ranunculus</i> subgenus <i>Ranunculus</i> (Buttercup) achene	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(x) <i>Viola</i> sp (violet) seed	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-

(a: arable; c: cultivated; r: ruderal; t: woodland; w: wetland; x: wide niche). Relative abundance is based on a scale from 1 (lowest) to 5 (highest)

## 4. Cremated bone analysis

### *Method*

- 4.1 Cremated bone was recovered from a variety of contexts at this site, including enclosure ditches, postholes and pits (Table 4.1). Some of the latter were located within the area of the cemetery. Most of these features probably dated to the early medieval period, with the exception of contexts (230), (287) and (1364) which probably dated to the Bronze Age, and (362) which was prehistoric and associated with burnt mount activity. Overall, 32 samples from 24 contexts were presented for analysis, with a total weight of 454.7g. Each sample of cremated remains was divided into fragments above 10mm, between 5-10mm, and between 2-5mm in size (McKinley 2004). Each fraction was weighed and the largest fragment of bone was measured.

### *Results and interpretation*

- 4.2 Summary data for each context is presented in Table 4.1, the fraction weights and fragment size data for each individual sample are given in Appendix 1, with the combined weights per context given in Table 4.2.

**Table 4.1:** Summary of cremated remains

Context	Context Detail	Bone Colour	Species	Weight (g)
1	Topsoil	Black/dark-grey to pale grey, some white	Animal	35.1
34	Fill of enclosure F29	Light brown to blue-grey, small amount of white	Animal	2.3
37	Fill of enclosure ditch F37	White, with black/grey lens in centre of cortex	Unknown	9.3
97	Fill of enclosure cut F29	Grey/black to white	Unknown	1.8
110	Fill of enclosure F106	Mid blue-grey to white	Animal?	31.9
124	Fill of enclosure F106	Black/dark grey, some white	Unknown	9.6
127	Fill of enclosure F106	Brown/black to dark grey, some pale grey/white	Unknown	6.1
146	Non-archaeological root bole	White, some pale grey or black	Animal	3.6
165	Fill of enclosure F106	Brown/black to pale grey/white	Animal?	42.4
171	Fill of enclosure F106	Pale grey/white	Unknown	1.7
194	Fill of ditch F134	Black/dark grey to pale grey/white	Unknown	18.5
222	Fill of pit 223	Mid grey to white	Unknown	2.4
225	Fill of stakeholes associated with pits	Pale blue-grey/white, some brown/black	Unknown	8.7
230	Deposit	Brown, black, grey, white	Animal?	12.3
287§	Cut for posthole	White	Unknown	2.9
331	Fill of ditch F29	White	Unknown	0.4
339	Fill of enclosure F106	Brown/black, small amount of blue/white	Animal?	2.6
362	Trough associated with burnt mount activity	Buff/white	Animal?	1.2
386	Fill of pit F384	Black/dark grey, some pale grey	Animal	226.1
421	Fill of pit F1062, in cemetery area	Light brown, some black, some white	Unknown	15.4
904	Fill of pit F1062, in cemetery area	White	Animal	3.8
1318	Fill of pit F1317, in cemetery area	Grey to pale grey	Animal	15
1364	Pit	White	Unknown	0.6
1373	Fill of posthole F1317	White	Unknown	1

§ - largely soil containing very small fragments of bone; actual weight of bone probably c. 0.1-0.2g

**Table 4.2:** Fraction weights and fragment size

Context	Sample	Total Weight g	Fraction Weights						Max. Frag Size mm
			>10mm		5-10mm		2-5mm		
			g	%	g	%	g	%	
1	all	35.1	35.0	99.7	0.0	0.0	0.1	0.3	42.9
34	1	2.3	1.0	43.5	0.8	34.8	0.5	21.7	0.0
37	all	9.3	3.4	36.6	4.7	50.5	1.2	12.9	21.8
97	1	1.8	0.6	33.3	0.4	22.2	0.8	44.4	0.0
110	1	31.9	23.1	72.4	8.0	25.1	0.8	2.5	33.1
124	1	9.6	4.1	42.7	4.3	44.8	1.2	12.5	30.4
127	1	6.1	2.7	44.3	1.6	26.2	1.8	29.5	25.1
146	all	3.6	0.9	25.0	1.6	44.4	1.1	30.6	18.0
165	all	42.4	21.2	50.0	19.5	46.0	1.7	4.0	42.8
171	1	1.7	0.7	41.2	0.5	29.4	0.5	29.4	15.1
194	1	18.5	16.0	86.5	2.5	13.5	0.0	0.0	45.5
222	1	2.4	0.0	0.0	1.8	75.0	0.6	25.0	17.6
225	1	8.7	4.7	54.0	3.0	34.5	1.0	11.5	22.4
230	1	12.3	4.2	34.1	5.1	41.5	3.0	24.4	22.2
287 <sup>§</sup>	1	2.9	0.0	0.0	1.8	62.1	1.1	37.9	4.5
331	1	0.4	0.0	0.0	0.3	75.0	0.1	25.0	9.9
339	1	2.6	0.8	30.8	1.4	53.8	0.4	15.4	23.9
362	1	1.2	0.0	0.0	1.1	91.7	0.1	8.3	23.2
386	1	226.1	176.8	78.2	47.3	20.9	2.0	0.9	82.8
421	all	15.4	6.1	39.6	5.3	34.4	4.0	26.0	29.8
904	1	3.8	3.2	84.2	0.6	15.8	0.0	0.0	42.2
1318	1	15.0	9.9	66.0	4.8	32.0	0.3	2.0	43.1
1364	1	0.6	0.0	0.0	0.0	0.0	0.6	100.0	6.0
1373	1	1.0	1.0	100.0	0.0	0.0	0.0	0.0	18.1

§ - largely soil containing very small fragments of bone; actual weight of bone probably c. 0.1-0.2g

- 4.3 The amount of cremated bone recovered from the majority of contexts was small: 16 of the 24 contexts weighed <10g (66.7%), with 12 of these weighing <5g (Table 4.1). Seven of the remaining contexts weighed between 10 and 50g, and only one context (386) weighed over 100g, at 226.1g. Fragment size ranged from 4.5mm to 82.8mm, the latter in the heaviest context (386). The bulk of most of the contexts was either in the 10mm+ or the 5-10mm sieved fractions (Table 4.2).
- 4.4 The bone from seven of the contexts (Table 4.1) was white to pale grey in colour, suggesting that these bones had been exposed to temperatures in excess of c. 600°C and had achieved full oxidation (McKinley 2004). The remaining contexts demonstrated a spectrum of colours, from brown and black (indicating burning at low temperatures of c. 300°C), through dark and mid greys (suggesting partial oxidation at temperatures between 300-600°C or lack of sufficient oxygen), to pale greys and whites.
- 4.5 All fragments were examined with a view to identification. Six contexts contained definite fragments of animal bone (Table 4.3). These included sheep-size, pig and cattle bones. A further 6 contexts contained possible fragments of animal bone, but identification in these cases was less certain (contexts 34, 165, 230, 339, 362 and 1318). Unfortunately, the bone in the remaining contexts was too small and lacking

in distinctive features for identification of fragments to be possible, and it could not be ascertained whether the bone was human or animal.

**Table 4.3:** Identified fragments of animal bone

Context	Description
1	Sheep tooth (maxillary premolar from the upper jaw; not worn) Cow-size indeterminate fragment
110	Sheep-size mandible; calcined Cattle-size tibia fragment; calcined Cattle-size calcaneum with proximal end fused; calcined Cattle-size humerus; calcined (The cattle-size fragments could be deer)
146	Pig toe; third phalanx; calcined Pig toe; second phalanx; calcined Fragment of animal jaw
258	Pig tooth (identified from plant macrofossil flot)
386	Cattle-size fragments; calcined Cattle humerus; calcined Cattle mandible fragment; calcined Cattle carpal bone x 2; calcined Cattle metatarsal Cattle incisor tooth enamel; unburnt Cattle-size rib
904	Cattle tooth; mandibular molar from the lower jaw

## 5. Mollusc analysis

### *Method*

- 5.1 Small assemblages of snails shell were recovered from two deposits and submitted for analysis. The sediment samples from the site were processed to 500 microns by the excavator. The material was examined for mollusc remains and these were identified as closely as possible with reference to published works (main sources Cameron 2003, Cameron & Redfern 1976, Ellis 1969, Kerney 1999, Kerney & Cameron 1979, Macan 1977). The assemblages were small so that minimum numbers of individuals could be readily determined and counts were recorded (based on numbers of shell apices). Nomenclature follows Kerney (1999).

### *Results*

- 5.2 The results are presented in context order, with archaeological information presented in square brackets. The quantity of sediment processed and a brief summary of the processing is given in round brackets following the sample numbers.

#### **Context F28** [primary fill of ditch F29]

- 5.3 Sample 8 (2.9 kg sieved to 500 microns)

Most of the remains were of *Cepaea* sp. (probably all *Cepaea nemoralis* (L.)) representing 21 individuals, some of which were fairly complete shells but there were also numerous smaller fragments. There were seven other land snail remains. Two of these (from two individuals) could be identified as *Ena obscura* (Müller) but the remainder were unidentified (although at least two further species were represented). Twelve freshwater snails were also recorded, all bar one of which were planorbids, represented by apex fragments. One of these was *Bathyomphalus*

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*contortus* (L.) and the remainder were either *Anisus leucostoma* (Millet) or *Anisus vortex* (L.). A single *Valvata cristata* Müller was also present.

**Context F165** [fill of enclosure ditch F106]

- 5.4 The remains comprised eight small fragments (to 15 mm) of very poorly preserved (soft and flaking) unidentified snail shell, with one apex fragment of *Discus rotundatus* (Müller).

**Discussion**

- 5.5 The traces of snail shell from context (165) were of no interpretative value; the only identifiable fragment was of *Discus rotundatus*, which is more or less ubiquitous in all moderately moist and sheltered places throughout the British Isles.
- 5.6 The small assemblage of snails from context (28) was only of very limited value for the reconstruction of the past environment of the site being predominantly of *Cepaea* sp. (probably *Cepaea nemoralis*); catholic taxa showing no strong ecological preferences. The only other identified land snail remains were of *Ena obscura* which lives in a wide range of relatively undisturbed, shady places (e.g. hedgerow, deciduous woods, scrubland), usually on base-rich soils. There were also some aquatic snails present which could indicate that ditch F29 held freshwater at the time of the formation of this primary fill. However, these were rather few in number and it is quite possible that they arrived with waste water discarded into the ditch.

## 6. Sources

Cameron, R, 2003 *Keys for the identification of Land snails in the British Isles*, Field Studies Council Occasional Publication **79**, Shrewsbury

Cameron, RAD, & Redfern, M, 1976 *British Land Snails, Synopses of the British Fauna (New Series)* **6**, London

Ellis, AE, 1969 *British Snails: A guide to the non-marine gastropoda of Great Britain and Ireland – Pleistocene to recent*, Oxford

Jay, M, & Richards, MP, 2006 Diet in the Iron Age cemetery population at Wetwang Slack, East Yorkshire, UK: carbon and nitrogen stable isotope evidence, *Journal of Archaeological Science*, **33**, 653-662

Kerney, M, 1999 *Atlas of the land and freshwater molluscs of Britain and Ireland*, Colchester

Kerney, MP, & Cameron, RAD, 1979 *A field guide to the land snails of Britain and North-West Europe*, Glasgow

Macan, TT, 1977 A key to the British Fresh- and Brackish-water Gastropods with notes on their ecology: fourth edition, *Freshwater Biological Association Scientific Publication* **13**, Ambleside

McKinley, J I, 2004 Compiling a Skeletal Inventory: Cremated Human Bone, in M Brickley & J I McKinley (eds) *Guidelines to the Standards for Recording Human Remains*, 9-13, Southampton and Reading

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

Monk, MA, & Sheehan, J 1998 *Early Medieval Munster, Archaeology, History and Society*, Cork

Stace, C, 1997 *New Flora of the British Isles*, 2<sup>nd</sup> Edition, Cambridge



**Appendix 1: Cremated bone – fraction weights and maximum fragment size per sample**

Context	Sample	Total Weight	Fraction Weights						Max. Frag Size
			>10mm		5-10mm		2-5mm		
		g	%	g	%	g	%	mm	
1*	1	2.5	2.4	96.0	0.0	0.0	0.1	4.0	30.9
1*	1	<0.1	0.0	0.0	0.0	0.0	<0.1	100.0	10.3
1*	1	32.6	32.6	99.5	0.0	0.0	<0.1	0.3	42.9
34	1	2.3	1.0	43.5	0.8	34.8	0.5	21.7	36.0
37	1	6.6	2.9	43.9	3.0	45.5	0.7	10.6	21.8
37	2	2.7	0.5	18.5	1.7	63.0	0.5	18.5	16.2
97	1	1.8	0.6	33.3	0.4	22.2	0.8	44.4	18.3
110*	1	31.9	23.1	72.4	8.0	25.1	0.8	2.5	33.1
124	1	9.6	4.1	42.7	4.3	44.8	1.2	12.5	30.4
127	1	6.1	2.7	44.3	1.6	26.2	1.8	29.5	25.1
146	1	2.7	0.9	33.3	0.8	29.6	1.0	37.0	16.9
146	2	0.9	0.0	0.0	0.8	88.9	0.1	11.1	18.0
165	1	9.6	4.1	42.7	4.5	46.9	1.0	10.4	42.8
165*	1	17.1	9.8	57.3	6.8	39.8	0.5	2.9	28.9
165*	2	15.7	7.3	46.5	8.2	52.2	0.2	1.3	42.3
171*	1	1.7	0.7	41.2	0.5	29.4	0.5	29.4	15.1
194*	1	18.5	16.0	86.5	2.5	13.5	0.0	0.0	45.5
222*	1	2.4	0.0	0.0	1.8	75.0	0.6	25.0	17.6
225	1	8.7	4.7	54.0	3.0	34.5	1.0	11.5	22.4
230	1	12.3	4.2	34.1	5.1	41.5	3.0	24.4	22.2
287*§	1	2.9	0.0	0.0	1.8	62.1	1.1	37.9	4.5
331	1	0.4	0.0	0.0	0.3	75.0	0.1	25.0	9.9
339	1	2.6	0.8	30.8	1.4	53.8	0.4	15.4	23.9
362	1	1.2	0.0	0.0	1.1	91.7	0.1	8.3	23.2
386	1	226.1	176.8	78.2	47.3	20.9	2.0	0.9	82.8
421	1	4.4	0.0	0.0	1.6	36.4	2.8	63.6	11.2
421*	1	1.0	0.0	0.0	0.7	70.0	0.3	30.0	20.0
421*	2	10.0	6.1	61.0	3.0	30.0	0.9	9.0	29.8
904	1	3.8	3.2	84.2	0.6	15.8	0.0	0.0	42.2
1318	1	15.0	9.9	66.0	4.8	32.0	0.3	2.0	43.1
1364*	1	0.6	0.0	0.0	0.0	0.0	0.6	100.0	6.0
1373*	1	1.0	1.0	100.0	0.0	0.0	0.0	0.0	18.1

\* - samples found on the 27th of August and sent separately

§ - largely soil containing very small fragments of bone; actual weight of bone probably c. 0.1-0.2g

## Appendix 7 Prehistoric Pottery Analysis

### The prehistoric pottery from Parknahown 5, Co. Laois

(E2170)

Eoin Grogan and Helen Roche

#### Summary

*The site at Parknahown produced 86 sherds of prehistoric pottery (plus 23 fragments) representing a probable late Neolithic Grooved Ware vessel and an exceptionally large fine Beaker. Both of these are important discoveries as these ceramic forms have only very occasionally been recovered from the south midlands.*

#### Discussion: the late Neolithic

A small quantity of Grooved Ware pottery consisting of five sherds and 10 fragments and crumbs came from the fills [1356, 1352, 297] of postholes [1357, 1353, 286] (total weight: 49g). This represents one or possibly more vessels. Vessel 1 is represented by a rimsherd [1356.3] but two bodysherds [297.108–09] are from this or a very similar pot. The fine, well-made, vessel has a flat-topped upright rim with two shallow, horizontal, internal grooves immediately beneath the rim: these are partly obscured by a blackened accretion that indicates the pot was used in a domestic context. It is probable that another vessel is represented by bodysherds 1352.[1–2].

The very small quantity of Parknahown material can tentatively be paralleled by material from the north Leinster – east Ulster area. Very similar vessels, in both form and decoration, came from the timber circles at Knowth (Eogan and Roche 1997, 101–222, figs 20–48; 1999) and Ballynahatty, Co. Down (Hartwell 1998), as well as from Newgrange, Co. Meath (Cleary 1983; Sweetman 1985) and the ‘Dundrum Sandhills’ (Collins 1952; 1959)(Roche 1995: ‘Knowth Style 1’; Brindley 1999: ‘sub style Dundrum-Longstone’). The Parknahown sherds are similar to the material from Fourknocks, Co. Meath (King 1999). Current evidence suggests a date range in the late Neolithic (c. 2900–2600 BC).

Only a small number of Grooved Ware sites have been identified in the Irish midlands. Small assemblages came from Greatheath, Co. Laois (Keeley 1993; Roche 1995), 33km to the northeast of Parknahown, and Whitewell, Co. Westmeath (Grogan *et al.* 2007, 137–39, 349–50). More recently a large assemblage came from sites at Scart, Co. Kilkenny, that produced evidence for four-post settings possibly associated with a timber circle (Grogan and Roche 2007; 2008). The only other Grooved Ware site from the south of the country is at Longstone Cullen, Co. Tipperary (Roche 1995).

#### The final Neolithic/early Bronze Age

A substantial part of a single fine Beaker is represented by 81 sherds and 12 fragments (total weight: 1,507g). The pottery is in good condition although there is evidence for wear to both the inner and outer surfaces from towards the base of the vessel. Marl, from the layer [231] in which the pottery was contained, adheres to most of the edge breaks and many of the surfaces. The edges are generally very well-preserved and there is a large percentage of refitting sherds. This evidence suggests that the assemblage suffered very little post-depositional disturbance. The evidence of sooting, and a thick burnt accretion over part of the upper external surface, shows that the vessel had been used for cooking and represents domestic debris.

The Parknahown Beaker is an unusually large vessel with a rim diameter of c. 30cm and a height of c. 29cm (Fig. 1). It has a strongly defined S-shape profile typical of Bell Beakers with a deep concave neck and a slightly angular belly. The vessel is very well-made but has a larger percentage of inclusions than normal for fine Beakers: this is probably due to the vessel size. The best preserved sherds (*e.g.* 231.[14, 46], 38, 55) have a smooth, inclusion-free, finish and appear to have been burnished – a feature noted at Newgrange, Co. Meath (Cleary 1983), but rarely identified elsewhere<sup>1</sup>.

<sup>1</sup> Rare exceptions occur at Newtownbalregan 2 and 6, and Mell, Co. Louth (Bayley 2004; Grogan and Roche 2005a; 2005b; McQuade 2005).

This pot is considerably larger than average for so-called ‘fine’ Beaker in Ireland, such as a similarly decorated pot from Lough Gur Site C, Co. Limerick (Ó Ríordáin 1954, 277–8, pl. 36), and it also dwarfs most of the ‘domestic’<sup>2</sup> examples including a large pot from Kilgobbin, Co. Dublin (Fig. 2; Hagen 2006; Grogan 2004), of a type referred to as ‘Rockbarton’ by Case (1961, 198–99). A very similar profile occurs at Newtownbalregan 2, Co. Louth (Bayley 2004; Grogan and Roche 2005a), albeit on a smaller plain vessel (Fig. 2).

The decoration on Vessel 2, consisting of bands of horizontal comb-impressed lines alternating with blank panels, forms one of the most common designs on Irish Beaker. Examples include Knowth concentrations B, C, and D (Eogan 1984, 266–8, fig. 94.1565–95, fig. 95.1596–1618, 277–80, figs 100–1, 294, fig. 110), Dalkey Island Site 5 (Liversage 1968, 72, fig. 8.p51–2), Lough Gur Sites C, D (including a reconstructed example; Ó Ríordáin 1954, 277–8, pls 36–7, and 394, fig. 36.1–12), L (Grogan and Eogan 1987, 407, fig. 46) and 10 (Grogan and Eogan 1987, 451, fig. 68.V.5 and V.6). This decorative treatment dominates the assemblage at Kilgobbin, Co. Dublin, and is also represented at Newtownbalregan 2 and 6, Co. Louth (Bayley 2004; Grogan and Roche 2005; 2005b).

The panels towards the base filled with closely spaced oblique comb lines are also a common part of the Irish Beaker repertoire although their restriction to this part of the vessel is unusual. They occur, for example, on a vessel from Dalkey Island, Co. Dublin, where, however, they occur throughout the design (Fig. 2; Liversage 1958, fig. 9.p61).

The Parknahown is particularly important as this appears to be the first reported discovery of this type of pottery from county Laois. The nearest sites are those, such as Monadreela, Boscabell, Windmill and Farranamanagh, in the vicinity of Cashel, Co. Tipperary (Grogan and Roche 2006), c. 40km to the southwest. The style of Beaker at Parknahown has generally been assigned to Clarke’s European Bell Beaker, or his Wessex/Middle Rhine types (1970). More recently, following reviews by, for example, Lanting and van der Waals (1972), there has been a greater recognition of the regional development of Beaker. Case’s (1993) simpler threefold scheme, and its specific application to the Irish material, provides a straightforward medium for insular comparison (Case 1995). The Parknahown vessel, with its classic Bell Beaker profile and simple horizontally arranged zonal ornament, conforms to his style 2 and is dated to c. 2450–2200 BC.



Fig. 1. Conjectural reconstruction of Beaker Vessel 2, Parknahown 5 (sherd nos from context **231**).

<sup>2</sup> Other terms, such as ‘coarse’ Beaker or ‘rusticated’ ware have also been used to refer to this material. Often these vessels, while larger and heavier, are not appreciably ‘coarser’ than the so-called ‘fine’ wares. Rustication refers specifically to decoration with fingernail, or sometimes bird bone, impressions frequently arranged haphazardly over the entire vessel.

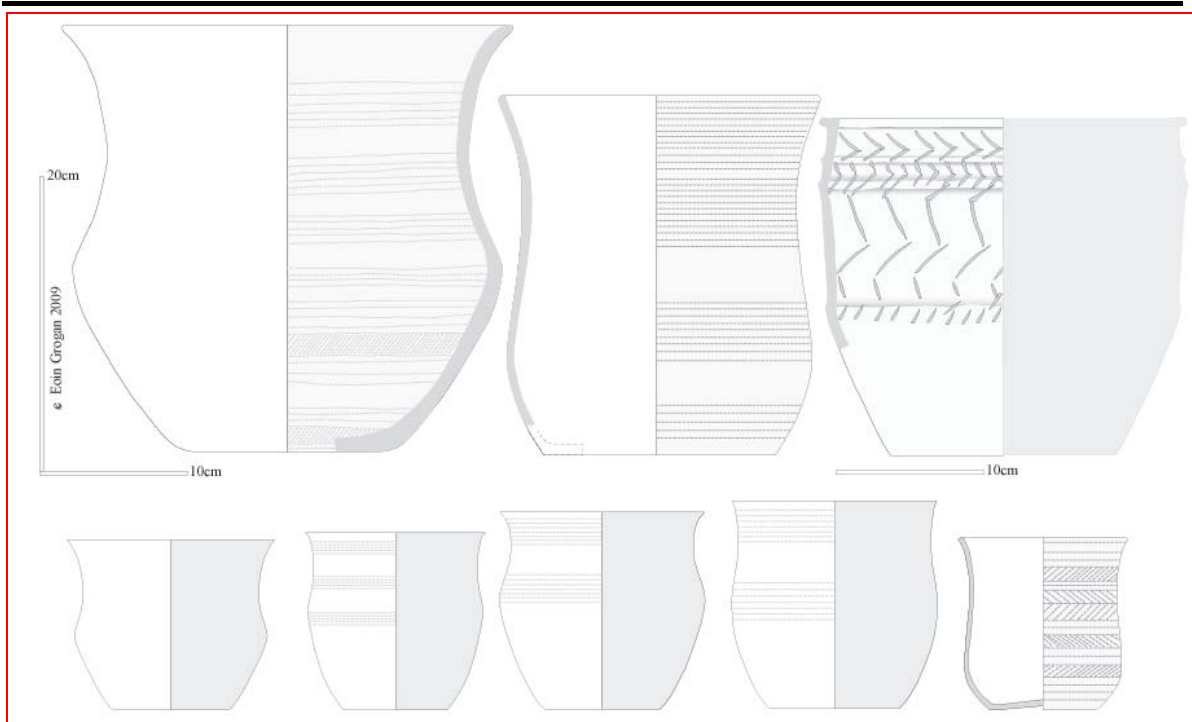


Fig. 1. Comparative vessels for Parknahown Beaker Vessel 2: top, left, Parknahown 5, vessel 2; centre, large 'fine' Beaker from Lough Gur, Site C (Ó Riordáin 1954, pl. 36), right, large 'domestic' Beaker from Kilgobbin, Co. Dublin (Grogan 2004); bottom from left, plain Beaker and three comb decorated vessels from Newtownbalregan 2, Co. Louth (Grogan and Roche 2005a), right, comb decorated vessel from Dalkey Island, Co. Dublin (Liversage 1958, fig. 9, p61).

**Bibliography**

- Bayley, D. 2004 M1 Dundalk Western Bypass. Newtownbalregan Excavations: Sites 111, 112 and 113: Post-excavation Assessment and Project Design. Unpublished Report for Irish Archaeological Consultancy Ltd.
- Brindley, A. 1999 Irish Grooved Ware. In R. Cleal and A. MacSween (eds), *Grooved Ware in Britain and Ireland*, 23–35.
- Neolithic Studies Group Seminar Papers 3, Oxbow Books, Oxford.
- Case, H. 1961 Irish Neolithic Pottery: Distribution and Sequence, *Proceedings of the Prehistoric Society* **9**, 174–233.
- Case, H. 1993 Beakers: Deconstruction and After, *Proceedings of the Prehistoric Society* **59**, 241–68.
- Case, H. 1995 Irish Beakers in their European Context. In J. Waddell and E. Shee Twohig (eds), *Ireland in the Bronze Age*, 14–29. Stationery Office, Dublin.
- Clarke, D.L. 1970 *Beaker Pottery of Great Britain and Ireland*. Gulbenkian Archaeological Series, Cambridge University Press, Cambridge.
- Cleary, R.M. 1983 The Ceramic Assemblage. In O'Kelly, M.J., Cleary, R.M. and Lehane, D. *Newgrange, Co. Meath, Ireland: The Late Neolithic/Beaker Period Settlement*, C. O'Kelly (ed.), 58–117. British Archaeological Reports International Series **190**, Oxford.
- Collins, A.E.P. 1952 Excavations in the Sandhills at Dundrum, Co. Down, 1950–51, *Ulster Journal of Archaeology* **15**, 2–26.
- Collins, A.E.P. 1959 Further Investigations in the Dundrum Sandhills, *Ulster Journal of Archaeology* **22**, 5–20.
- Eogan, G. 1984 *Excavations at Knowth 1*. Royal Irish Academy Monographs in Archaeology, Dublin.
- Eogan, G. and Roche, H. 1997 *Excavations at Knowth 2*. Royal Irish Academy Monographs in Archaeology, Dublin.
- Eogan, G. and Roche, H. 1999 Grooved Ware from Brugh na Bóinne and its wider context. In R. Cleal and A. MacSween (eds), *Grooved Ware in Britain and Ireland*, 98–111. Neolithic Studies Group Seminar Papers 3. Oxbow Books, Oxford.
- Grogan, E. 2004 The prehistoric pottery assemblage from Kilgobbin, Co. Dublin. Unpublished Report for Margaret Gowen and Co. Ltd.
- Grogan, E., O'Donnell, L. and Johnson, P. 2007 *The Bronze Age landscapes of the Pipeline to the West*. Wordwell, Dublin.
- Grogan, E. and Eogan, G. 1987 Lough Gur excavations by Seán P. Ó Riordáin: further Neolithic and Beaker habitations on Knockadoon, *Proceedings of the Royal Irish Academy* **87C**, 299–506.
- Grogan, E. and Roche, H. 2005a The prehistoric pottery from Newtownbalregan 2, Co. Louth. Unpublished Report, Irish Archaeological Consultancy Ltd.
- Grogan, E. and Roche, H. 2005b The prehistoric pottery from Newtownbalregan 6, Co. Louth. Unpublished Report, Irish Archaeological Consultancy Ltd.
- Grogan, E. and Roche, H. 2006 The prehistoric pottery assemblages from the N8 Cashel Bypass, Co. Tipperary. Unpublished Report for The National Roads Authority.
- Grogan, E. and Roche, H. 2007 The prehistoric pottery assemblages from Scart 1, Co. Kilkenny. Unpublished Report for V.J. Keeley Ltd.
- Grogan, E. and Roche, H. 2008 The prehistoric pottery assemblages from Scart North, Co. Kilkenny. Unpublished Report for V.J. Keeley Ltd.
- Hagen, I. 2006 Kilgobbin, Co. Dublin. Neolithic and Beaker habitation. In I. Bennett (ed.), *Excavations 2003*, 163–65. Wordwell, Bray.
- Hartwell, B. 1998 The Ballynahatty Complex. In A. Gibson and D. Simpson (eds), *Prehistoric Ritual and Religion*, 32–44. Sutton Publishing Ltd., Gloucestershire.
- Keeley, V.J. 1994 The Heath, Heath. Area of archaeological potential. In I. Bennett (ed.), *Excavations 1993*, 50. Wordwell, Dublin.
- King, H.A. 1999 Excavations on the Fourknocks Ridge, Co. Meath, *Proceedings of the Royal Irish Academy* **99C**, 157–198.
- Lanting, J. and van der Waals, D. 1972 British Beakers as seen from the Continent, *Helenium* **12**, 20–46.
- Liversage, G.D. 1968 Excavations at Dalkey Island, Co. Dublin, 1956–1959, *Proceedings of the Royal Irish Academy* **66C**, 53–233.
- McQuade, M. 2005 Archaeological Excavation of a Multi-Period Prehistoric Settlement at Waterunder, Mell, Co. Louth, *County Louth Archaeological and Historical Journal* **26**, 31–66.
- Ó Riordáin, S.P. 1954 Lough Gur Excavations: Neolithic and Bronze Age Houses on Knockadoon, *Proceedings of the Royal Irish Academy* **56C**, 297–459.
- Roche, H. 1995 *Style and Context for Grooved Ware in Ireland with special reference to the assemblage at Knowth*, Unpublished MA Thesis, National University of Ireland.
- Sweetman, P.D. 1985 A Late Neolithic/Early Bronze Age pit circle at Newgrange, Co Meath, *Proceedings of the Royal Irish Academy* **85**, 195–221.

## CATALOGUE

The excavation number E2170 is omitted throughout; only the context number followed by the find number is included.

Where the pottery is listed in the catalogue the context numbers are in bold: *e.g.*: **231**.73. Numbers in square brackets (*e.g.* **231**.[41, 60]) indicate that the sherds are conjoined. The thickness refers to an average dimension; where relevant a thickness range is indicated. Vessel numbers have been allocated to pottery where some estimation of the form of the pot is possible, or where the detailed evidence of featured sherds (*e.g.* rims, shoulders), decoration or fabric indicates separate vessels.

R = rimsherd      N = necksherd

### Late Neolithic Grooved Ware

The site produced a very small assemblage of 5 sherds (1 rim- and 4 bodysherds; 11 fragments and crumbs, total weight: 49g). This came from the fills [**1356**, **1352**, **297**] of postholes [**1357**, **1353**, **286**].

*Vessel 1.* This is represented by a single rimsherd (**1356.3**) from a vessel with a flat-topped rim and an upright bucket-shaped overall profile. Worn, red-buff fabric with a dark grey core: the inner surface is obscured by a thick black accretion which is the result of use in a domestic context. There is a medium content of crushed dolerite inclusions ( $\leq 2 \times 2\text{mm}$ , up to  $5.7 \times 2.4\text{mm}$ ). Neck thickness: 7–7.6mm. Total weight: 9g.

Decoration There are two fine, possibly fingernail applied, horizontal lines 6mm and 11.6mm beneath the rim on the inner surface: these are partly obscured by the accretion.

#### Other sherds

**1356.2** is a fragment of pale buff fabric with a medium content of crushed quartzite inclusions ( $\leq 1.5 \times 1\text{mm}$ , up to  $2.7 \times 2\text{mm}$ ). Total weight: 1g.

**1352**.[1–2] are much worn bodysherds of light buff fabric with a grey-buff core. There is a medium content of dolerite inclusions ( $\leq 4 \times 3\text{mm}$ , up to  $7.6 \times 7.3\text{mm}$ ). Body thickness: *c.* 12.8mm. Total weight: 9g.

**297**.108–09 (plus 19 fragments and crumbs) are bodysherds from Vessel 1 or one very similar to it. Red buff fabric throughout with a medium content of crushed dolerite inclusions. Where well-preserved the fabric has a smooth fine finish. Body thickness: 9.8–10.3mm. Total weight: 27g.

### Final Neolithic / early Bronze Age Beaker

The Beaker all came from a layer of marl [**231**].

*Vessel 2* (Figs 1 and 2). A substantial portion of an unusually large Beaker is represented by 81 sherds (8 rimsherds: **231**.[R.2, 9, N.39, 74–75], [7, 10], 8, 11–13; 42 necksherds: **231**.[14, 46], 16, 18–19, 20–23, [27, 52], 29–34, [37, 77], 38, 44–45, 48, 54–56, 63–65, [73, 80, 83], 78, 86, 87–91, 93–95; 14 bellysherds: **231**.17, 25–26, 28, 35, [36, 81], 51, 57, 72, 79, 83, 85, 92; 9 lower bodysherds: **231**.24, [41, 60], [43, 69], [48, 50], 58, 70; 8 base/base-anglesherds: **231**.[3, 6, 53, 66], [4–5, 67, 71]; 12 fragments: **231**.40, 42, 47, 49, 59, 62, 96–101). The vessel has a rounded everted rim, a deep concave neck and rounded belly that narrows gently to an unfooted base. The hard, compact, fabric is well-fired, light brown-buff externally and grey internally with a grey-buff to dark grey core: much of the exterior is obscured by grey to dark grey sooting and, close to part of the rim, by a thick blackened accretion. The accretion is concentrated on one side of the pot suggesting a single episode of spillage. There is a medium content of mainly uncrushed shale and quartzite inclusions (generally  $\leq 1.5 \times 1.5\text{mm}$ , up to  $9.8 \times 6.6 \times 4.9\text{mm}$ ). This was a very large handsome vessel and the best preserved sherds (*e.g.* **231**.[14, 46], 38, 55) have a smooth, inclusion-free, finish with evidence for burnishing. Although the pot is very well-made the wall thickness varies considerably (8.5mm – 11.2mm) even on the same section of the vessel: this is probably due to difficulties in producing a vessel of this size.

Decoration This is generally well-applied with regular and evenly applied comb-impressed lines. However, the denticulated implement used to impress the decoration, a very slightly curved tool with tapering ends (32.5mm x 2.13mm x 1mm), was not particularly suitable for the execution of even straight lines: this is especially evident and the lower portions of the pot (*e.g.* sherds **231**.[36–81]) where there is considerable overlapping of the individual impressions.

The decoration consists of bands of horizontal comb-impressed lines with intervening blank zones. Towards the base of the vessel two of these zones have a fill of closely spaced horizontal lines.

External rim diameter: *c.* 29cm

External base diameter: *c.* 14cm

Vessel height: *c.* 29cm

Total weight of sherds: 1,507g

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## Appendix 8 Lithics Analysis

**Analysis of the lithic collection from  
Parknahown 5, Co. Laois  
Archaeological Licence No: (E 2170) Scheme AO15/60  
Contract 1: M7/M8 Portlaoise to Castletown/Cullahill**

by  
Dr. MARIA B. O'HARE

*Statement of Significance*

*The archaeological lithic collection consists of 229 pieces, which are almost exclusively of flint. The collection was recovered as a result of excavations undertaken as part of the construction of the M7/M8 motorway scheme, contract 1 at Parknahown 5, Co. Laois. This lithic collection appears to represent at least two distinctive prehistoric traditions; one indicative of general Neolithic activity with a later phase preferred and the other relating to an entirely different tradition - the Beaker/earlier Bronze Age period. Almost half the assemblage was mixed and randomly distributed within the historic horizon (mainly Early Medieval features), where characteristically Neolithic technology was predominant.*

*More than half of the assemblage derived from within prehistoric features, and the majority of these were from a single posthole. This lithic material was predominantly burnt and fragmentary and is suggestive of ritual activity. The cultural affinities of the collection from within the prehistoric strata appear to relate to the Beaker/earlier Bronze Age period. This is based upon characteristic lithic type-fossils, other datable material finds and feature diagnostics of this prehistoric period. Overall, the entire lithic collection from Parknahown 5 is significant in representing a diverse range of archaeological activity spanning more than a millennium and being an archaeological marker for potentially fruitful excavations in the future.*

### Lithic collection from Parknahown 5

#### *Introduction*

A total of 229 lithic pieces were recovered as part of an archaeological excavation under licence number (E 2170) scheme AO15/60 at Parknahown 5, Co. Laois. These have individual entries within a database (Microsoft Excel) for Contract 1, report number one and is accompanied by a glossary of terms corresponding to this database. Almost half of the total lithic assemblage was derived from within Early Medieval burials, ditch features and from F1 – corresponding to the topsoil above the historic burials. This lithic industry within this historic stratum appears to indicate a broadly later Neolithic chipped stone tradition with components of Beaker/earlier Bronze Age lithic technology, although the composition and condition of this assemblage does strongly suggest a random lithic scatter rather than an in-situ collection that has subsequently been disturbed, presumably as a result of the various activities such as the digging of ditches and graves within the historic period.

The remaining lithic collection from Parknahown 5 represents more than half of the total assemblage. This was recovered from within its original prehistoric context and the vast majority of these were from a single posthole. The overall condition of this collection is fragmentary and extensively burnt suggesting ritual activity. The lithic-rich feature appears to date to the Bronze Age which is based upon ceramic finds; a date that is reiterated by the presence of several recognisable lithic type-fossils from within this posthole. There were other postholes containing small quantities of lithic material, some which is of a diagnostic type, along with occasional Bronze Age pottery sherds.

Other features from within the prehistoric strata are most certainly Bronze Age in date such as a fulacht fiadh (burnt mound) of which only a small portion lay within the boundary of this present investigation. This partially excavated feature produced only a single lithic, although this is a relatively diagnostic Beaker/earlier Bronze Age type. There was also a dense spread of Beaker sherds recovered from within the Parknahown 5 site. This deposit may have been transported by flood action. Therefore, the unexpected paucity of lithic material associated with this Beaker sherd deposit may be accounted for by the dislocated nature of this material. In other words, the lithic material would not be transported via water as easily as ceramic material.

This feature would therefore appear to be broadly contemporaneous with the main concentration of possible ritual activity within the postholes from Parknahown 5 and is an important archaeological marker for the potential recovery of extensive lithic material in the future. The entire lithic collection from Parknahown 5 appears to indicate prehistoric activity possibly spanning more than a millennium and although the lithic material from the historic horizon would appear to be randomly distributed and much disturbed collection, it is also an archaeological indicator of potential in-situ features and contextually meaningful lithic material as yet undiscovered.

### The composition and context of the collection

The Parknahown 5 lithic collection is made up of a total of 229 pieces which are almost exclusively of flint. A significant proportion of these are patinated and derived in the main from the historic horizon. There is a high incidence of fragmentary and burnt pieces within the prehistoric horizon which has obscured the comprehensive assessment of the full range and frequency of lithic components. For example, out of the total collection from Parknahown 5, forty one per cent could not be assigned to a particular lithic category; however *c.* 60% could be identified. These include 33 modified tools (secondary technology) accounting for 24% and the remaining primary technology (reduction material) accounts for 76% (101 pieces) of the identifiable pieces from Parknahown 5. Table 1 shows the relative frequency of lithic types from Parknahown 5. Tables 2-3 show the lithic types within the main contexts from within the historic and prehistoric features respectively.

**Table 1: Composition of lithic types from Parknahown 5, Co. Laois (E2170)**

Type	NO.	%
*GP scraper	8	3.5
Sub-circular scrapers	17	7.4
End scrapers	2	0.9
Retouched flakes	4	1.7
Utilised pieces	2	0.9
Platform flakes	10	4.4
Broken platform flakes	38	16.6
Debitage flakes	22	9.6
Blades	7	3.0
Broken blades	5	2.2
Scalar flakes	12	5.2
Bipolar cores	6	2.6
Micro-debitage	2	0.9
Fragments	92	40.2
Miscellaneous	2	0.9
<b>Total</b>	<b>229</b>	<b>100%</b>

**Table 1:** *The lithic types from Parknahown 5, Co. Laois. GP= general purpose*



**Table 2: The contextual distribution of lithic types within the historic horizon (mainly Early Medieval burial features) from Parknahown 5. Co. Laois (E2170)**

<b>Feature No.</b>	<b>Lithic types</b>	<b>N.</b>	<b>%</b>
<b>F1</b> <b>(Topsoil above</b> <b>Early Medieval</b> <b>burials)</b>	<i>x 2 bipolar cores</i> <i>x 5 scalar flakes</i> <i>x 5 complete platform flakes</i> <i>x 11 broken platform flakes</i> <i>x 2 broken blades</i> <i>x 2 complete blades</i> <i>x 5 sub-circular scrapers</i> <i>x 1 general purpose scraper</i> <i>x 1 end scraper</i> <i>x 3 debitage flakes</i> <i>x 12 fragments</i> <i>x 1 retouched flake</i> <i>x 2 miscellaneous</i>	52	22.7
<b>F800</b> <b>(Cemetery soil</b> <b>spread)</b>	<i>x 1 bipolar core</i> <i>x 2 scalar flakes</i> <i>x 2 broken platform flakes</i> <i>x 2 complete blades</i> <i>x 2 broken blades</i> <i>x 1 general purpose scraper</i> <i>x 3 debitage flakes</i> <i>x 2 fragments</i> <i>x 1 utilised platform flake</i> <i>x 1 retouched platform flake</i>	17	7.4
<b>All other contexts</b> <b>from historic</b> <b>horizon containing</b> <b>&lt; 10 pieces</b> <b>mainly from</b> <b>single E/Med burials</b>	<i>x 1 bipolar core</i> <i>x 4 complete platform flakes</i> <i>x 13 broken platform flakes</i> <i>x 1 complete blade</i> <i>x 1 broken blade</i> <i>x 2 general purpose scrapers</i> <i>+ another poss,</i> <i>x 1 end scraper</i> <i>x 1 sub-circular scraper</i> <i>x 1 retouched flake</i> <i>x 4 debitage flakes</i> <i>x 1 micro-debitage piece</i> <i>x 3 fragments</i>	34	14.8
<b>Total lithics</b>		103	45%

**Table 2: The lithic types from within the main historic contexts from Parknahown 5, Co. Laois.**

**Table 3: The contextual distribution of lithic types within the prehistoric horizon  
(mainly posthole structures) from Parknahown 5. Co. Laois (E2170)**

Feature N. type + association	lithics	N	%
<b>F297</b> Posthole F286. Secondary fill frequent charcoal inclusions + heat shattered sandstone.  2 sherds of Bronze Age pottery (E2170:297:108-109)	<i>Most burnt + fragmentary (E2170:297:1-104 + E2170:297:110-111) (106 pieces</i> <i>x 2 bipolar cores</i> <i>x 2 scalar flakes</i> <i>x 10 platform flakes (most broken)</i> <i>x 1 blade</i> <i>x 1 utilised flake</i> <i>x 1 retouched flake</i> <i>x 10 sub-circular scrapers</i> <i>x 1 general purpose scraper</i> <i>x 10 debitage flakes</i> <i>x 68 burnt fragments</i>	106	46.3
<b>F296</b> Posthole F295. Charcoal inclusions + sandstone.	<i>Most burnt + fragmentary (E2170:296:1-14).</i> <i>x 2 scalar flakes</i> <i>x 2 broken platform flakes</i> <i>x 1 scraper</i> <i>x 2 debitage flakes</i> <i>x 1 micro-debitage piece</i> <i>x 6 fragments</i>	14	6.1
<b>F1356</b> Posthole F1357 2 sherds of Bronze Age pots :E2170:1356:2-3	<i>1. complete blade: E2170:1356:1 (37x15.5x2.8mm)</i> <i>1. fragment: E2170:1356:4</i>	2	0.87
<b>F1358</b> Posthole F1359 secondary fill with charcoal inclusions + 1 sherd of Bronze Age pot : E2170:1358:2	<i>1. broken scraper: E2170:1358:1 (23x19x5mm) could be a sub-circular type</i>	1	0.44
<b>F1373</b> Posthole F1371 primary fill	<i>1. scalar flake: E2170:1373:1 (&lt;40mm)</i>	1	0.44
<b>F5</b> Fulacht fiadh with heat cracked sandstone	<i>1. burnt sub-circular scraper: E2170:005:1 (28.3x23x4mm)</i>	1	0.44
<b>F231</b> Poss. re-deposited flood water material 100 sherds of Beaker pots (E2170:231:2-10)	<i>1. broken platform flake: E2170:231:1</i>	1	0.44
<b>Total lithics</b>		126	55%

**Table 3: The lithic types from within the prehistoric features from Parknahown 5, Co. Laois.****Discussion and comparanda of the type-fossils from the Parknahown 5**

There appears to be a distinction between the condition and lithic types from the historic and prehistoric horizons; although the former is significantly displaced within essentially historic features and the latter was obscured by the predominance of burnt and fragmentary material, a number of observations can be made. One lithic tradition dominated the historic horizon. This appears to represent a broadly Neolithic tradition indicated by the predominance and nature of platform technology. Furthermore, the latter part of the Neolithic is indicated by the diversity of blades and flakes along with a few end type scrapers. In addition to this, the absence of lithic type-fossils from the Early or Middle Neolithic and the lack of Mesolithic type material would tend to support this postulated date range for the bulk of material from within the historic stratum.

Although there was a fairly strong indication of Beaker/earlier Bronze Age component within the historic horizon, this was fairly marginal. This later prehistoric tradition is indicated by the presence of several type-fossils such as bipolar technology and diagnostic scrapers of this period (O' Hare 2005 and O' Hare forthcoming). The general displacement of the collection within the historic horizon is obviously as a result of significantly later activities as seen in the random distribution of types from the various concentrations of lithic material within the topsoil, burial spreads, within the burials and ditch-type features mainly relating to the Early Medieval period (Table 2). Therefore, as logic would dictate, these prehistoric lithic pieces have become randomly and unintentionally incorporated within this Medieval context via activities such as the regular cutting of graves and digging of ditches.

There is also a high frequency of patination on the lithic material from Parknahown 5 accounting for almost 40% of the total lithic collection. The vast majority of these patinated lithic pieces were derived from the historic horizon, accounting for 86% of all the lithic material from this stratum. Therefore, the high incidence of patination on the lithic material from within the historic horizon and the absence of many components that would be expected within a cohesive prehistoric assemblage are indicative of a lithic scatter that has subsequently become incorporated within a significantly later stratum.

A direct parallel for the nature of prehistoric lithic material deposited within a significantly later horizon can be made with a lithic assemblage from Kiltasheen, Co. Roscommon, licence number (05/EO/531) (O' Hare 2007). Here, Beaker/Early Bronze Age lithic technology were found mixed with Neolithic types and deposited with later Medieval contexts distributed in particular within mass-grave burials of this period. Therefore, the presence of essentially prehistoric lithic material within an otherwise historic context of this nature is not unique to Parknahown 5.

The prehistoric features would appear to relate to the Beaker/earlier Bronze Age period. Almost half of the entire collection from Parknahown 5 derived from within a single posthole (Table 3) accounting for over 84% of the total lithics from the prehistoric horizon. The vast majority of these lithic pieces are fragmentary (83%) and no less than 93% are burnt suggesting ritual activity. These were found associated with pottery sherds of a Bronze Age date and several of the identifiable lithics have strong affinities with this period. For example, sub-circular scrapers are fairly diagnostic of the Irish Beaker/earlier Bronze Age periods when they are the predominant type and end scrapers are very rare within this époque (O' Hare 2005 and O' Hare forthcoming).

Within the lithic rich posthole, no less than 10 of the total 17 sub-circular scrapers were found together within this context (Table 3). The remaining sub-circular scrapers were distributed between the topsoil (Table 2), another possible scraper of this type was from within one of the other postholes (Table 3) and a definite scraper of this type, which is burnt and derived from the Bronze Age fulacht fiadh (burnt mound) (Table 3). Furthermore, there was no end scrapers found within the in-situ features from the prehistoric stratum.

It is very difficult to draw a direct parallel with the nature of the main deposits within the prehistoric postholes from Parknahown 5 and contemporaneous excavated examples, as although during the Irish Beaker period and again within the latter part of the Irish Bronze Age, ritual lithic-rich deposits are fairly common (O' Hare 2005 and O' Hare forthcoming); these are invariably within pits and spreads/depressions rather than postholes. On the other hand, it is a more common practice for the ritual deposition of lithic material within postholes during

the Final Neolithic, Grooved Ware tradition in Ireland. Examples being: Knowth, Co. Meath (Dillon 1997), a neighbouring Grooved Ware ritual site at Fourknocks Ridge, Co. Meath (Cross 1999), Ballynahatty, Co. Down (Hartwell pers. comms.) and Liscolman Co. Antrim (O' Hare 2004).

However, the predominant lithic types within these Final Neolithic contexts are typically formally deposited end scrapers, whereas within the prehistoric posthole within Parknahown 5, these are sub-circular type scrapers. Therefore, given their quantity and condition and based upon the weight of evidence of these fairly time-sensitive lithics, which is strongly supported by the ceramic sherds identified as Bronze Age, it would seem reasonable to interpret these as a ritual deposit of the Beaker/earlier Bronze Age period; and these are simply within a fairly unusual context for this period.

### *Summary*

In conclusion then, the excavations carried out under licence number (E 2170), Contract 1, M7/M8 Portlaoise to Castletown/Cullahill scheme AO/15/60, have been very productive in terms of revealing in-situ features that appear to belong to the Beaker/earlier Bronze Age period from the prehistoric horizon and a fairly diverse though essentially Neolithic type assemblage with some Beaker/earlier Bronze Age components from within a significantly later horizon – mainly relating to the Early Medieval period.

Inferences of a specific date are limited by the disturbed nature of material revealed in the historic horizon. However, a general later Neolithic tradition is assigned to the bulk of the collection based upon characteristic range of platform produced pieces of this period and perhaps this is reiterated by the lack of more obvious type-fossils of a Mesolithic, Early or Middle Neolithic date. Given the fairly random distribution of this lithic material, the absence of expected components within a platform produced collection and the overall high frequency of patination on the bulk of material from the historic horizon is highly indicative of a lithic scatter which ultimately became incorporated into the Early Medieval strata via various agencies. Thus, this portion of the Parknahown 5 collection appears to be an archaeological marker for potential later Neolithic features and in-situ lithic material as yet undiscovered within this site.

Although there were definite Beaker/earlier Bronze Age components within the historic horizon, these are fairly marginal. Whereas, within the in-situ features from the prehistoric horizon this appears to be the main prehistoric period represented. Although the high frequency of burnt and fragmentary lithic material from the lithic-rich posthole has obscured the full assessment of the bulk of this material, the characteristic type-fossils of later prehistoric period are well represented within this context. This lithic deposit appears to indicate ritual activity and although the deposition of ritual material is quite a widespread phenomenon of the Irish Bronze Age; this type of material is not typically found within postholes but within spreads and pits. This lithic-rich posthole from Parknahown 5 could therefore simply be an unusual type of feature within a ritual context for this period.

There is certainly potential Beaker/earlier Bronze Age lithic material from within the prehistoric stratum that is as yet undiscovered judging by the density of Beaker sherds found dislocated from its original position. Therefore any future excavations or investigations of this site have the potential for recovering more meaningfully contextual and perhaps more informative lithic pieces and collections dating from the latter prehistoric period within the Parknahown 5 area of County Laois.

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**Bibliography**

Cross, S. 1999. Analysis of the Lithic Collection, Appendix II, in H. King (ed.), *Excavation on Fourknocks Ridge, Co. Meath, Proceedings of the Royal Irish Academy* 99C, 183-187.

Dillon, F. 1997. Lithic Assemblages from Knowth 2, in G. Eogan and H. Roche *Excavations at Knowth 2: Settlement and Ritual Sites of the Fourth and Third Millennia BC*. Royal Irish Academy, Dublin.

O' Hare, M. 2004. *Liscolman, Co. Antrim (AE/03/10) lithic assemblage*, Unpublished lithics report for Northern Archaeological Consultancy, Ltd.

O' Hare, M. 2005. *The Bronze Age Lithics of Ireland*, Unpublished PhD, Queen's University, Belfast.

O' Hare, M. 2007. Kiltasheen, Co. Roscommon (05/EO/531) lithic assemblage, Unpublished lithics report for the archaeology dept, Sligo Institute, Sligo.

O' Hare, M. (Forthcoming) Publication for BAR. British Archaeological Reports. *The Bronze Age Lithics of Ireland*.

**Catalogue of Lithics**

Find Number	Description
E2170:001:004	distal portion (broken) of poss. platform flake with slight patination
E2170:001:007	v/neat sub-circular scraper made on split pebble
E2170:001:008	sub-circular scraper dorsal face is fully cortical place of retouch/ hard impact
E2170:001:009	proximally broken platform blade /fully patinated
E2170:001:010	elongated scalar flake/ fully patinated
E2170:001:019	distally broken poss. platform blade
E2170:001:020	proximally broken poss. platform flake /fully patinated + fully cortical dorsal
E2170:001:021	sub-circular scraper with uni-facial flaking
E2170:001:022	distal portion of platform flake /fully patinated
E2170:001:023	poorly struck platform flake with scalar attributes
E2170:001:024	fragment
E2170:001:025	flake fragment
E2170:001:031	poorly struck platform flake with scalar attributes
E2170:001:030	irregular scraper with uni-facial flaking
E2170:001:032	proximal portion of platform flake
E2170:001:034	medial portion of platform flake
E2170:001:035	poorly struck platform flake
E2170:001:036	heavily burnt scalar flake
E2170:001:037	bipolar fragment
E2170:001:042	sub-circular thin flake scraper fully patinated
E2170:001:043	fragment
E2170:001:065	fragment
E2170:001:068	poorly struck platform blade with bipolar attributes
E2170:001:069	distally broken platform flake
E2170:001:070	slightly broken flake
E2170:001:071	fragment
E2170:001:072	burnt fragment
E2170:001:073	large nodule/fully patinated obscuring possible cortex + burning
E2170:001:077	broken proximal portion of flake/fresh flint
E2170:001:084	large nodule/fully patinated/burnt obscuring possible cortex
E2170:001:085	fragment
E2170:001:090	scalar flake
E2170:001:091	poss. utilised thick broken flake
E2170:001:096	scalar fragment
E2170:001:097	heavily burnt sub-circular scraper/slightly invasive retouch
E2170:001:098	good quality chert flake/pointed may be composite awl + scraper
E2170:001:104	platform flake

E2170:001:107	fragment
E2170:001:108	bipolar fragment
E2170:001:113	fragment
E2170:001:112	fragment/poss. distal tip
E2170:001:115	scalar flake splayed dorsal
E2170:001:118	well made blade with slight distal damage
E2170:001:121	fragment
E2170:001:123	debitage flake <20mm
E2170:001:124	burnt scalar flake
E2170:001:125	burnt platform flake/ poss. distal or proximal end
E2170:001:127	distally broken platform flake
E2170:001:147	debitage flake <20mm
E2170:001:153	burnt platform flake with scalar attributes
E2170:001:156	proximal portion of platform flake
E2170:001:158	debitage flake <20mm
E2170:001:159	end scraper with broken distal end
E2170:005:001	burnt sub-circular scraper
E2170:017:001	poss. heat exposed cortical flake scraper/soil colouration
E2170:036:002	very poorly struck flake with scalar attributes
E2170:037:005	very smooth poss. cortical scraper/ soil colouration
E2170:100:003	distally broken platform flake
E2170:102:002	very poorly struck flake with scalar attributes
E2170:102:005	distally broken platform flake
E2170:102:006	debitage flake <30mm
E2170:104:003	debitage flake <20mm
E2170:104:004	proximal portion of platform flake
E2170:104:006	distally broken platform flake
E2170:132:002	proximal broken platform flake
E2170:132:003	debitage cortical flake <20mm
E2170:161:002	distally broken platform flake
E2170:166:001	distally broken platform flake
E2170:183:128	fragment
E2170:183:129	laterally broken chert flake (scalar type) poss. a convex scaper
E2170:194:001	platform flake with evidence of heavy impact
E2170:194:002	fragment
E2170:231:001	platform flake with proximal damage
E2170:296:001	burnt fragment
E2170:296:002	burnt debitage flake <20mm
E2170:296:003	burnt distally broken scraper
E2170:296:004	burnt flake fragment

E2170:296:005	burnt splinter fragment
E2170:296:006	burnt distally broken platform flake
E2170:296:007	burnt + flawed scalar flake
E2170:296:008	burnt distally broken platform flake
E2170:296:009	burnt fragment
E2170:296:010	burnt (bipolar) fragment
E2170:296:011	burnt fragment
E2170:296:012	burnt micro-debitage
E2170:296:013	burnt scalar flake
E2170:296:014	burntdebitage flake <20mm
E2170:297:001	burnt sub-circular scraper
E2170:297:002	burnt flake
E2170:297:003	burnt sub-circular scraper
E2170:297:004	burnt sub-circular scraper with ventral damage
E2170:297:005	burnt sub-circular scraper with ventral damage
E2170:297:006	burnt sub-circular scraper made on bipolar core
E2170:297:007	burnt sub-circular scraper with ventral damage
E2170:297:008	burnt poss. utilised flake
E2170:297:009	burntdebitage flake <20mm
E2170:297:010	burnt and broken poorly struck platform flake
E2170:297:011	debitage flake <20mm
E2170:297:012	heavily burnt retouched flake
E2170:297:013	heavily burnt flake fragment
E2170:297:014	burnt scalar flake
E2170:297:015	burnt + broken platform flake
E2170:297:016	debitage flake <20mm
E2170:297:017	heavily burn distal portion of flake
E2170:297:018	burnt sub-circular scraper with steep invasive retouch
E2170:297:019	heavily burnt fragment
E2170:297:020	heavily burnt distal portion of flake
E2170:297:021	burnt blade
E2170:297:022	fully patinated + burnt bipolar core
E2170:297:023	fully patinated + burntdebitage flake <30mm
E2170:297:024	fully patinated butt portion ofdebitage flake
E2170:297:025	heavily burnt platform flake
E2170:297:026	burnt fragment
E2170:297:027	burnt + fully patinated fragment
E2170:297:028	burnt fragment
E2170:297:029	burnt fragment
E2170:297:030	burnt + fully patinated scalar flake



E2170:297:031	heavily burnt fragment
E2170:297:032	fully patinated distally broken platform flake
E2170:297:033	burnt + broken sub-circular scraper
E2170:297:034	heavily burnt debitage fragment <20mm?
E2170:297:035	fully patinated + laterally broken platform flake
E2170:297:036	heavily burnt fragment
E2170:297:037	burnt distal portion of platform flake
E2170:297:038	heavily burnt sub-circular scraper
E2170:297:039	heavily burnt fragment
E2170:297:040	fully patinated + burnt debitage <20mm
E2170:297:041	burnt fragment
E2170:297:042	burnt ad-hoc scraper with evidence of utilisation
E2170:297:043	fully patinated + burnt bipolar core
E2170:297:044	burnt fragment splinter
E2170:297:045	burnt fragment
E2170:297:046	burnt fragment
E2170:297:047	heavily burnt fragment
E2170:297:048	heavily burnt proximal portion of platform flake
E2170:297:049	burnt fragment
E2170:297:050	burnt fragment
E2170:297:051	burnt fragment
E2170:297:052	burnt fragment
E2170:297:053	burnt fragment
E2170:297:054	burnt fragment
E2170:297:055	burnt fragment
E2170:297:056	burnt fragment
E2170:297:057	burnt fragment
E2170:297:058	burnt fragment
E2170:297:059	burnt fragment
E2170:297:060	burnt fragment
E2170:297:061	burnt fragment
E2170:297:062	burnt fragment
E2170:297:063	burnt fragment
E2170:297:064	burnt fragment
E2170:297:065	burnt fragment
E2170:297:066	burnt fragment
E2170:297:067	burnt fragment
E2170:297:068	burnt fragment
E2170:297:069	burnt fragment
E2170:297:070	burnt fragment

E2170:297:071	burnt fragment
E2170:297:072	burnt fragment
E2170:297:073	burnt fragment
E2170:297:074	burnt fragment
E2170:297:075	burnt fragment
E2170:297:076	burntdebitage flake <20mm
E2170:297:077	burntdebitage flake <20mm
E2170:297:078	burntdebitage flake <20mm
E2170:297:079	burnt flake fragment
E2170:297:080	burnt scalar flake fragment
E2170:297:081	burnt fragment
E2170:297:082	burnt fragment
E2170:297:083	burnt fragment
E2170:297:084	burnt fragment
E2170:297:085	burnt fragment
E2170:297:086	burnt flake fragment
E2170:297:087	burnt fragment
E2170:297:088	burnt fragment
E2170:297:089	burnt flake fragment
E2170:297:090	burnt fragment
E2170:297:091	burnt fragment
E2170:297:092	burnt flake fragment
E2170:297:093	burnt flake fragment
E2170:297:094	burnt flake fragment
E2170:297:095	burnt flake fragment
E2170:297:096	burnt flake fragment
E2170:297:097	burnt fragment
E2170:297:098	burnt flake fragment
E2170:297:099	burnt fragment
E2170:297:100	burnt fragment
E2170:297:101	burnt flake fragment
E2170:297:102	burnt flake fragment
E2170:297:103	burnt flake fragment
E2170:297:104	burnt flake fragment
E2170:297:110	well made sub-circular platform scraper
E2170:297:111	flake fragment
E2170:326:001	superficially like arrow point/retouched flake poss. burnt
E2170:431:001	fully patinateddebitage flake <20mm
E2170:431:002	blade-like segment
E2170:546:001	poss. blade medial segment

E2170:558:001	broken platform flake with proximal + lateral damage
E2170:730:001	micro-debitage
E2170:730:002	fully patinated flake fragment
E2170:730:003	fully patinated distal portion of platform flake
E2170:735:001	fully patinated badly damaged cortical flake
E2170:745:001	fully patinated + burnt proximal segment of badly damaged cortical flake
E2170:800:005	blade-like segment
E2170:800:012	massive distally broken platform blade with evidence of use on concave butt /fresh flint?
E2170:800:013	translucentdebitage flake <20mm
E2170:800:014	fully patinated proximally broken blade fragment
E2170:800:015	patinateddebitage flake <20mm
E2170:800:017	patinateddebitage flake <30mm
E2170:800:016	distal portion of platform flake
E2170:800:018	massive slightly damaged poorly produced platform flake/abraded fresh flint?
E2170:800:019	scalar flake
E2170:800:020	burnt proximal portion of platform flake
E2170:800:021	scraper type flake with evidence of utilisation
E2170:800:022	very roughly flaked scraper made on scalar type piece
E2170:800:023	burnt bipolar core
E2170:800:024	patinated blade
E2170:800:025	fragment
E2170:800:026	scalar flake
E2170:800:027	butt fragment of platform flake
E2170:839:001	blade-like bipolar core
E1270:999:001	very rough sub-circular scraper
E2170:1119:001	platform flake with scalar attributes
E2170:1356:001	blade
E2170:1358:001	distally broken scraper
E2170:1356:004	fragment
E2170:1373:001	scalar flake
E2170:1389:001	very rough scraper made on scalar flake chunk
E2170:1393:001	broken + burnt flake

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**Appendix 9 Petrographical Analysis**

# **PETROGRAPHICAL REPORT**

**on**

**Stone Objects**

**from**

**Archaeological Excavations**

**in advance of the**

**M7/M8 Portlaoise to Castletown/Culahill  
Contract 1**

**License Number E2170**

## **Parknahown 5**

**on behalf of  
ACS Ltd.**

**by  
EurGeol Dr Stephen Mandal MIAI PGeo**

**May 08  
CRDS Ltd Ref: 1020P1**

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## 1. Introduction

This report is based on the macroscopic (hand specimen) examination of 38 stone objects found as a result of archaeological excavations carried out at Parknahown 5 in advance of the construction of the M7/M8 Portlaoise to Castletown/Culahill (Licence No. E2170). The objects consist of: six Quernstones; six Whetstones; one Hammer-stone; one disc; one stone ball; one plough pebble; one worked stone; and 21 natural unworked pebbles/ cobbles/ blocks.

The purpose of the study was to identify the rock types from which the stone objects were made, to highlight potential sources for them, and to comment on their possible function. It is important to note that macroscopic petrographical studies have been considered of limited value in comparison to microscopic (thin section and geochemical analysis) studies. On the other hand, macroscopic studies provide an excellent preliminary assessment tool and have proven to be of considerable value in petrographical studies (e.g. see Mandal 1997; Cooney and Mandal 1998).

## 2. Solid Geology and Soils of the Site

*(see Figure 1 for a site location and geology (after 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 consist 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 Killeslin 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 Durrow Formation (DW) of shaly fossiliferous and oolitic limestone.

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.

The area is part of a physical geographical region known as the Southern Hill and Vale Area (part of the Central Lowlands). The soil types are predominantly grey brown podzolics (see Aalen *et al.* 1997, ch. 1).

### **3. Results**

The results of the macroscopic identification of the finds are given in Table 1 and are discussed below. Based on a preliminary assessment of the material, the assemblage includes 17 artefacts, all of which are sedimentary (eight sandstone, seven quartzite and two vein quartz).

#### ***Quernstones***

The assemblage includes six quernstones, five of which are made from coarse grained quartzite and one from coarse grained yellow quartz conglomerate sandstone. All except E2170:350:1 exhibit clear evidence of working, in the form of dressing / pecking of the faces and or circumference.

#### ***Whetstones***

The assemblage includes six whetstones, all made from sandstone. Four are made from greywacke sandstone (fine to medium grained), one (E2170:347:1) from parallel bedded quartz rich sandstone and one (E2170:1318:1) from fine grained parallel laminated dark grey sandstone. All are modified from water rolled cobbles and cleaved blocks, with evidence of one or more faces having been ground smooth due to use a fine grinding / rubbing stone.

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***Hammerstone***

E2170:606:1 is probably a hammerstone. It is made from a coarse grained yellow quartzite water rolled cobble. Its circumference has been modified particularly at the end to give broad facets. This may actually be some sort of unfinished tool as opposed to a hammerstone.

***Stone disc***

E2170:179:2 is a stone disc made from fine grained red quartzite. It is a naturally flat bedded water rolled pebble. It has a smooth circumference which appears to have been deliberately modified to a disc shape.

***Stone ball***

E2170:111:2 is a stone ball made from a coarse grained greywacke sandstone water rolled cobble. The cobble is naturally spherically shaped and has minimal working and the function of the ball is unclear.

***Plough pebble***

E2170:1:76 is a plough pebble derived from a red vein quartz water rolled pebble which has been burnt.

***Worked stone (undefined)***

E2170:386:3 is made from a water rolled cobble of vein quartz. It has been broken in half. The upper face shows subtle reworking flakes at break, which may be deliberate. However, the intended function is unclear.

***Other Stones***

The 21 remaining stones in the assemblage are all natural and unworked. These include water rolled cobbles and pebbles, and cleaved blocks. In terms of rock types, all are sedimentary (12 vein quartz; three sandstone; three limestone; two fossils; and one chert). E2170:356:11 (sandstone) has been burnt. The two fossils (E2170:258:2 and E2170:723:1) are of coral, and appear to be of Carboniferous age (derived from limestone).

**4. Potential Sources**

It is likely that the sources for all of these objects are local. There are abundant sources for rocks of these types in the area (see Figure 1). It is, however, important to note that these objects did not arrive on site from bedrock, but from secondary sources, such as a water-rolled river cobbles / pebbles, or in the till.

## 5. Conclusions

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

## 6. Bibliography

- Aalen, F.H.A., Whelan, K. and Stout, M., 1997. *Atlas of the Irish Rural Landscape*. Cork University Press: Cork.
- 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.
- Cooney, G. and Mandal, S., 1998. *The Irish Stone Axe Project: Monograph I*. Wordwell: Wicklow.
- 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.
- Mandal, S., 1997. Striking the balance: the roles of petrography and geochemistry in stone axe studies in Ireland. *Archaeometry* **39(2)**, 289-308.



Table 1 – Results of petrographical assessment

Scheme#	Find #	Rock type	Description	Function	Description
AO15/60	E2170 : 0001:0012	Quartz	vein, white	Natural	water rolled pebble; broken
AO15/60	E2170 : 0001:0014	Sandstone	red greywacke	Whetstone	from cleaved block; one face ground / polished smooth and flat
AO15/60	E2170 : 0001:0016	Sandstone	greywacke	Natural	water rolled cobble
AO15/60	E2170 : 0001:0076	Quartz	vein, red	Plough pebble	water rolled pebble; burnt and worn
AO15/60	E2170 : 0001:0110	Sandstone	greywacke; decayed	Whetstone	naturally cleaved block; one flat surface ground more so than others but unevenly; possible whetstone
AO15/60	E2170 : 0001:0119	Sandstone	fine grained parallel laminated dark grey fossiliferous	Natural	water rolled cobble
AO15/60	E2170 : 0001:0132	Chert	block	Natural	unworked
AO15/60	E2170 : 0001:0148	Sandstone	dark greywacke	Whetstone	fragment from water rolled cobble; sides, faces and butt ground / polished to smooth facets
AO15/60	E2170 : 0001:0155	Quartz	vein, clear	Natural	from vein; unworked
AO15/60	E2170 : 0006:0160	Sandstone	coarse grained yellow quartz conglomerate with vein quartz pebble inclusions	Quernstone	
AO15/60	E2170 : 0111:0002	Sandstone	coarse grained greywacke	Stone ball	from water rolled cobble
AO15/60	E2170 : 0149:0007	Sandstone	greywacke	Whetstone	naturally cleaved block; faces and sides ground smooth; ends show evidence of deliberate breakage
AO15/60	E2170 : 0171:0001	Quartz	vein, grey	Natural	water rolled pebble
AO15/60	E2170 : 0171:0002	Quartz	vein, white	Natural	water rolled pebble; broken
AO15/60	E2170 : 0179:0002	Quartzite	fine grained red	Disc	naturally flat bedded water rolled pebble; smooth circumference may be modified
AO15/60	E2170 : 0258:0002	Fossil	fossil coral; Carboniferous	Natural	fossil
AO15/60	E2170 : 0342:0002	Quartzite	very coarse grained quartzite conglomerate	Quernstone	fragment of very large quernstone
AO15/60	E2170 : 0342:0003	Limestone		Natural	water rolled cobble; scratched but unmodified
AO15/60	E2170 : 0342:0010	Quartzite	coarse grained yellow	Quernstone	made from very large boulder; upper and lower faces appear to be bedding planes; dressed
AO15/60	E2170 : 0342:0011	Quartzite	very coarse grained yellow conglomerate	Quernstone	
AO15/60	E2170 : 0347:0001	Sandstone	parallel bedded quartz rich	Whetstone	naturally cleaved block; one side ground smoother than others; burnt
AO15/60	E2170 : 0350:0001	Quartzite	very coarse grained yellow conglomerate	Quernstone	faces are bedding planes; no obvious evidence of working
AO15/60	E2170 : 0353:0001	Quartzite	very coarse grained quartzite conglomerate	Quernstone	fragment of very large rotary quernstone; upper face and rim dressed
AO15/60	E2170 : 0356:0011	Sandstone	fine grained parallel bedded quartz rich	Natural	water rolled cobble; faces smooth but natural; burnt red
AO15/60	E2170 : 0386:0002	Limestone		Natural	water rolled pebble; broken
AO15/60	E2170 : 0386:0003	Quartz	vein	Worked stone	water rolled pebble; broken in half; upper face shows subtle reworking flakes at break, which may be deliberate; function unclear

**Table 1 – Results of petrographical assessment (continued)**

<b>Scheme#</b>	<b>Find #</b>	<b>Rock type</b>	<b>Description</b>	<b>Function</b>	<b>Description</b>
AO15/60	E2170 : 0606:0001	Quartzite	coarse grained yellow	Hammerstone	water rolled cobble; circumference has been modified particularly at the end to give broad facets; unfinished tool, possibly a hammerstone
AO15/60	E2170 : 0723:0001	Fossil	fossil coral; Carboniferous	Natural	fossil
AO15/60	E2170 : 0730:0005	Quartz	vein, orange	Natural	water rolled pebble; broken
AO15/60	E2170 : 0730:0006	Quartz	vein, white	Natural	water rolled pebble; broken
AO15/60	E2170 : 0730:0007	Quartz	vein, white	Natural	water rolled pebble
AO15/60	E2170 : 0800:0003	Limestone	grey, fossiliferous	Natural	water rolled cobble; broken
AO15/60	E2170 : 0963:0003	Quartz	vein, white	Natural	water rolled pebble; broken
AO15/60	E2170 : 0982:0002	Quartz	vein, white	Natural	water rolled pebble
AO15/60	E2170 : 1027:0001	Quartz	vein, white	Natural	water rolled pebble
AO15/60	E2170 : 1027:0002	Quartz	vein, pink	Natural	water rolled pebble
AO15/60	E2170 : 1318:0001	Sandstone	fine grained parallel laminated dark grey	Whetstone	naturally cleaved block; upper face ground / polished smooth; fresh break to ends and lower face
AO15/60	E2170 : 1326:0003	Quartz	vein, white	Natural	water rolled pebble

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**Appendix 10 Bone and Antler Finds Report****05 – 09 Parknahown 5  
Objects and Waste of Antler and Bone**

Publication Text  
Ian Riddler and Nicola Trzaska-Nartowski  
February 2008

**Settlement Finds****Combs**

An antler comb (35.1) from a settlement context is almost complete, although it lacks most of its teeth and parts of its connecting plates. It can be placed in Dunlevy's class B, a broad class that conceals a variety of comb forms of different dates (Dunlevy 1988, 353-6 and fig 3). The comb has lightly curved outer edges to the end segments with perforations at their centres and flat, rectangular connecting plates with elaborate decoration on both sides. The teeth of the end segments are not graduated in length. These are significant characteristics that can also be seen on four combs from Lagore, as well as further examples from Cloghermore Cave, County Kerry and Rathtinaun crannóg, County Sligo (Hencken 1950, figs 97.1563 and 1626; 98.148 and 242; Dunlevy 1988, fig 3.1; Connolly and Coyne 2005, fig 37 and pl 37; O'Sullivan 1998, pl 36). The combs of this group share similar characteristics and they are defined here as a distinctive Class B sub type (Table One). Combs of this sub-type were recovered from the earlier levels at Rathtinaun, dated to the 7th to mid 8th century, and from Period II levels at Lagore, of a similar date (O'Sullivan 1998, 119; Dunlevy 1988, 354-5). There is no direct equivalent in comb design from Scotland, with the exception of a single, undated comb from Foshigarra (Hallén 1994, 222 and fig 14.2); but within Anglo-Saxon contexts double-sided composite combs with lightly curved outer edges are of 7th century date, providing some substantiation for the overall dating of the sub-type. The curved ends, lack of tooth graduation and general proportions of the combs are, however, much more redolent of early Roman simple combs of wood, as noted by Dunlevy (1988, 354). Their technology is of interest because, with one exception, all of the rivets are made of iron; just one is made of bone or antler. The use of bone or antler rivets is more widespread on combs of class D, most of which are likely to be later in date, and their use may not have been widespread before the later part of the 7th century (Dunlevy 1988, 358). Most of the combs of the sub-type have small perforations, placed at either end of the comb, at the centre, just beyond the connecting plates and close to the outer edges. They help to define this sub-type and are seldom seen on double-sided composite combs of other classes. They are smaller than the suspension holes that appear on single-sided simple combs of class A and composite combs of class C and they are borrowed once again from late Roman prototypes, as seen with combs from London and Winchester (Riddler 1988, fig 1; Clarke 1979, fig 31.471). The extensive copying of late Roman prototypes might suggest that this sub type is relatively early in date, and could possibly go back to the 6th century.

Site	Comb	No of Rivets	Rivet Material	Suspension Holes	Decorated End Segment
Cloghermore Cave	136	3	Iron	0	No
Lagore Crannóg	148	3	Iron	0	No
Lagore Crannóg	242	3	Iron	0	Yes
Lagore Crannóg	1563	3	Iron	2	No
Lagore Crannóg	1626	3	Iron	2	No
Parknahown	325.1	3	Iron	2	No
Rathtinaun Crannóg	A	3	Iron and Bone	2	Yes
Rathtinaun Crannóg	B	3	Iron	2	Yes

**Table One****Class B Sub-Type A; Comb Characteristics**

A small part of an antler connecting plate survives from a second comb (325.1), also from a settlement context. It is trapezoidal in section and decorated with paired diagonal and vertical lines, possibly separating the design into panels. Similar designs can be seen on combs from Ardnahue, Ballinderry I, Carraig Aile and Raheennamadra (Hencken 1936, fig 6e; O’Riordain 1949, fig 13.94.I; Stenberger 1966, fig 3.29). All of these combs belong to Dunlevy’s class D1 (Dunlevy 1988, 358-9). They are not closely dated but may belong to the 8th to 9th centuries, or even later; the Ballinderry comb may have come from a 10th century deposit (Hencken 1936, 213-4 and fig 6E; Johnson 1999, 44 and 47).

**35:001**

Comb fragment consisting of two tooth segments, two end segments and parts of two connecting plates, all made of antler. The connecting plates are thin and rectangular in section, and are decorated with an intricate design on both sides consisting of four double ring-and-dot motifs with three small single ring-and-dot motifs in the interstices at either end, linked by sinuous lines filled by knife point decoration to four single ring-and-dot motifs at the centre. There are three rivet holes; all the rivets are made of iron. Five teeth per centimetre on both sides of the comb. Most of the teeth are now missing; surviving examples show some traces of wear. The two end segments are lightly curved on their outer edges, with perforations at their centres.

Length: 84mm  
Width: 57mm (estimated)  
Thickness: 4mm

**325:001**

Fragment of an antler connecting plate from a double-sided composite comb. Trapezoidal in section with single framing lines along the bevelled edges. Decorated with paired crossing diagonal lines set within panels defined by paired vertical lines. Fractured across a rivet hole at one end.

Length: 30.1mm  
Width: 18.1mm  
Thickness: 5.2mm

**Pin**

A small bone or antler pin (37.2 and 6) has a short, cylindrical shaft with a lateral moulding above and two fractured stubs at the apex. The upper part may originally

have formed a small loop. A similar if larger pin, again fractured at the apex, came from Cahercommaun, whilst a moulding of the same type, lacking any loop, can be seen on a pin from the Broch of Burrian (Hencken 1938, fig 23.20; Stevenson 1955, fig A.12; MacGregor 1974, fig 5.22). The pin shaft is cylindrical and relatively short, which aligns it well with Foster's LIA dating for Scottish pins, of c AD 600 – 800 (Foster 1990, 150; Hallén 1994, 210). Short bone or antler pins with cylindrical or lightly hipped shafts also occur in Anglo-Saxon England during the period from c AD 630 – 750 (Riddler, Trzaska-Nartowski and Hatton forthcoming).

### 37:002 and 37:006

Near complete bone or antler pin with straight shaft of circular section leading to rounded point. Two lateral mouldings form the head, with stubs probably from an upper loop above them.

Length: 54.4mm  
Width: 6.9mm

## Needle

An incomplete needle (342.13) has been neatly produced from a pig fibula, with a knife-cut oval perforation at the head. Bone needles of this type, with narrow heads and oval or circular perforations, are a common object type that changes little over time. Hencken's statement concerning bone pins, that they 'are common in Ireland during the Christian period and material from sites of this time in the National Museum nearly always includes them' could equally well be applied to pig fibula needles. Sites with such needles include Ballinderry I, Cahercommaun, Feltrim Hill, Knowth and Lough Faughan (Hencken 1936, fig 17d; 1938, fig 39.629; Hartnett and Eogan 1964, fig 13.514; Eogan 1974, fig 43.239; Collins 1955, fig 9.33-4).

### 342:013

Incomplete needle, produced from a pig fibula, with head cut from the distal end. Shaft of circular section, flattened and slightly widened at the head, tapering to the apex. Lower part of shaft missing. Knife cut oval perforation.

Length: 62.7mm  
Width: 4.9mm  
Thickness: 3.1mm  
Perforation: 3.2 x 1.8mm

## Pin-beater

A bone object (34.4), produced from a pig fibula, has been rounded at one end and roughly faceted at the other. It can be tentatively identified as a single pointed pin-beater, albeit of an unusual type. Single pointed pin-beaters have a blunt end, often rounded and sometimes indented with a thumb groove, and taper evenly to a point at the other end. They were often made of bone, but rarely from a bone as small as a pig fibula, and usually they were finished to a smooth and polished surface (Brown 1990). Nonetheless, this could be an unfinished example. They do not occur in English contexts before c AD 850, and possibly not before AD 900; and they continue in use into the 13th to 14th century. They have been associated with the vertical two-beam loom, which supplanted the earlier warp-weighted loom (Walton Rogers 1997, 1755-7; 2001). The date of the introduction of the vertical two-beam loom into Ireland has

yet to be precisely determined. The warp-weighted loom utilised a series of loomweights to apply tension to the warp threads, but these were not used on the vertical two-beam loom, and its presence has been attested indirectly from the distribution of single pointed pin-beaters. Hodkinson noted the paucity of loomweights from early Christian sites and suggested that this reflected textile production in a small number of specialised centres, and that the vertical two-beam loom had been adopted in these centres (Hodkinson 1987). Numerous single pointed pin-beaters have been found in Dublin, as might be expected. Outside of Cork, Dublin and Waterford, however, they are known only from a few rural sites, including Carraig Aile, Cloghermore Cave and Knowth (Hurley 1997a, fig 104.14-5; 1997b, fig 17.5.8; O’Riordain 1949, fig 14.11; Coyne and Connolly 2005, 109, fig 31 and pl 35; Eogan 1974, fig 43.240).

34:004

Complete implement, produced from a pig fibula, with an oval section. Roughly faceted to a point at one end, with a rounded terminal cut from the lower part of the proximal end.

Length:	71.8mm
Width:	6.6mm
Thickness:	4.0mm

### **Spearhead and Scoop**

A fragment of a pointed bone implement (40.1), produced from an ovicaprid tibia, survives in poor condition. A lateral hole has been cut towards the proximal end and part of the diagonal trimming of the midshaft can also be seen. Similar objects have been found on a number of sites, including Carraig Aile, Feltrim, Lagore and Raheennamadra (O’Riordain 1949, fig 14.156, 32H and fig 22.49 and 56; Hartnett and Eogan 1964, fig 13.462; Hencken 1950, fig 106.673; Stenberger 1966, 47 and fig 3.9, 10, 41 and 42; Olsen 2003, 102). Where the midshaft has been sliced diagonally to form a sharp point, as is the case here, the object can be identified as a spearhead, following recent interpretations of Iron Age implements from England, which effectively confirm Hencken’s earlier suggestion (Olsen 2003, 107-9; Hencken 1938, 62). The bone pointed implement would originally have been attached to a wooden shaft and used in hunting and fishing. The object type has also been found in contexts contemporary with the early Christian period, notably at Elisenhof, and a summary of a series of Anglo-Saxon bone spearheads has been published recently (Westphalen 1999, 7-8 and taf 2; Riddler 2007, 315-6). A second, fragmentary object (347.8) includes a scoop-like terminal. The bevelled and slightly indented but almost flat front edge distinguishes this object type from the larger form of gouge. Later prehistoric examples of large, cattle-sized gouges are known from several sites in south-west England, including Cadbury Castle, Gwithian and Stanton Harcourt, and they have also been found at Cahercommaun and Carraig Aile (Britnell 2000, 255 and fig 127.3; Boyle and Wait 2004, 289-90; O’Riordain 1949, fig 14.2111; Hencken 1938, fig 38.108). Scoops are less common, although this example can be compared with an unpublished scoop of Iron Age date from Fen Ditton in Cambridgeshire, and a cattle radius implement from Middle Farm, Dorset (Stacey and Walker 1997, 127 and fig 75.4). They were made from large mammal bones, usually of cattle and, as

Hencken observed, they were too large to serve as spearheads and may have been used in in craft or household tasks (Hencken 1938, 62).

40:001

Fragmentary bone spearhead, surviving in poor condition, heavily abraded and fractured at both ends. Produced from an ovicaprid tibia with a lateral perforation on one side towards the proximal end.

Length:	75.9mm
Width:	16.0mm
Thickness:	10.9mm

347:008

Fragment of bone, possibly from the posterior surface of a cattle metatarsus, with a scored line on one side and a smoothed outer surface. Fractured at both ends.

Length:	47.0mm
Width:	30.4mm

## Antler Waste

Two fragments of antler waste came from settlement contexts. A tine end (234.4) has been sawn laterally from several directions and includes a noticeably broad saw mark on one side, 3.5 mm in width. The antler would therefore have been sawn with a very broad blade, broader than almost all of those used in Viking and medieval Dublin. The greater width of the blade would not have helped in the sawing process and perhaps explains why the tine was sawn in several stages. A segment of a tine (165.1) is a more accomplished piece of work and appears to be an unfinished handle. It has been extensively worked by drawknife to a smooth surface, and trimmed by knife at either end. Similar undecorated handles can be seen on several of the knives from Lagore (Hencken 1950, 110-2). A number of unfinished handles of antler came from Armagh (Gaskell Brown and Harper 1984, 125-8 and fig 8.20-7).

234:004

Antler tine end, sawn from remainder of tine in several directions with broad saw trace 3.5mm in width on one side. Small perforation mark at centre of sawn surface.

Length:	61.0mm
Width:	17.7mm

165:001

Section of antler tine, cut by knife at both ends and smoothed with the aid of a draw-knife, forming an unfinished handle.

Length:	112.7mm
Width:	20.3mm
Thickness:	16.5mm

## Grave Goods

### Beads

The two complete beads were both associated with burials. An antler bead (963.1) of annular form, decorated with two incised lateral lines, came from the fill of burial

585, alongside a perforated horse tooth and a quartz pebble. A smaller, undecorated bone or antler bead of biconical section with a narrow, axial perforation (*1417.1*) was found in the fill of burial 870. Bone or antler beads are comparatively rare finds from the early Christian period and, when published examples are examined in detail, their numbers decrease still further. Some of them can now be identified as gaming pieces, including six examples from Lagore and two cylindrical objects from Cahercommaun (Hencken 1938, fig 24.39 and 743; 1950, 196; Connolly and Coyne 2005, 110). Three bone or antler beads of biconical section were recovered from Feltrim Hill, however, and they form a close parallel for the smaller of the Parknahown beads (Hartnett and Eogan 1964, 27). Several bone or antler beads came from an early medieval context at Lough Gara (Fredengren 2002, fig 63). All of these bone and antler examples are likely to have served as paternoster beads, rather than dress accessories, and the small stone discoidal beads, commonly found on early Christian sites, may have fulfilled a similar purpose.

#### 963:001

Complete antler bead of annular shape with a prominent axial perforation. Curved sides, indented at either end.

Length:	5.8mm
Width:	11.7mm
Perforation Diameter:	5.7mm
Burial 585	

#### 1417:001

Complete bone or antler bead of biconical section with a pronounced carination at the midpoint. The two ends are flat or slightly convex and the central perforation is oval rather than circular.

Height:	4.7mm
Width:	9.3mm
Perforation Diameter:	2.5 x 2.2mm
Burial 870	

### Gaming Piece and Pegs

An incomplete gaming piece (*1419.1*) was found close to the left hand of the skeleton in burial 873. It has been made from a section of antler and is decorated with three bands of paired lines incised with the aid of a knife. The central peg stem is now missing. Gaming pieces of the same shape and decoration have been found at several sites, including Carraig Aile and Cloghermore Cave (O'Riordain 1949, fig 14.58.1, 339 and 349; Connolly and Coyne 2005, fig 32.151). Dating evidence for them is sparse, but the occurrence of similar, cylindrical gaming pieces from Periods I and II at Lagore is indicative of a 7th to 10th century date (Hencken 1950, 196 and fig 106.1116). The closest parallel is provided, however, by a gaming piece from a grave at Solar, County Antrim dated broadly to the 9th to 13th century (Hurl 2002, 59 and fig 23.321). The cylindrical form of gaming piece seen here subsequently develops into a more bulbous character, whilst retaining the same decoration, and can be seen at Waterford, for example (Hurley 1997b, fig 17.4.24). The antler cylinder would originally have included a central peg but at both Parknahown and Solar this



component is missing and it is likely that these objects were buried not as gaming pieces, but as beads or pendants.

A complete bone or antler peg (800.29) was also found in the cemetery area, whilst a small fragment of a second peg (382.1) came from a settlement context. The complete peg has a rounded apex and is roughly faceted to a point. It was originally used as the central part of a composite gaming piece, set into a pegged board of the type seen at Ballinderry (Hencken 1936, 175-90). Both pegs are relatively short and thin, suggesting that they were originally part of gaming pieces of the type seen at Knowth, a typologically early form (Eogan 1974, 76-8 and fig 31; Raftery 1997, 94-5). They occur occasionally as settlement finds, as at Armagh, for example (Hurl 2003, 105 and fig 10.1).

1419.001

Complete antler gaming piece, barrel shaped with three sets of lateral paired lines around the outer surface. The decoration is knife-cut and fades out on one side, where the surface appears to be heavily worn.

Length:	21.3mm
Width:	22.0mm
Perforation Diameter:	9.0mm
Burial 873	

800:029

Complete bone or antler peg, roughly faceted to a sub-circular section and tapering to a point. Cut by knife across its apex.

Length:	25.8mm
Width:	4.9mm
Thickness:	4.3mm

382:001

Lower part of a bone or antler peg of sub-circular section, roughly faceted by knife to a rounded point.

Length:	12.9mm
Width:	3.0mm
Thickness:	2.8mm

### **Amulet**

A horse tooth (963.2) from the fill of burial 585 is little modified beyond the addition of an oval perforation through the lower end. It is a very rare object type to be found in an Irish early Christian context. Perforated mammal teeth have a long ancestry, stretching back to the Neolithic period where, however, sequences of teeth were used as dress accessories (Kahlke 1955; Lemkuhl 1987; Choyke 2001). The single teeth of dogs were often placed in the graves of young children during the later prehistoric period, whilst perforated teeth from Romano-British contexts are largely from pigs (MacDonald, Manning and Riddler forthcoming). Perforated horses teeth are less common, although Meaney has drawn attention to a text by Pliny, where it is noted that 'the first teeth of horses to fall out were reputed to make the cutting of teeth easy for babies who wore them' (Meaney 1981, 131). The horse was also familiar as the means of transport between this world and the next. Amulets in general are seldom

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seen in early Christian contexts, although an antler pendant came from Cahercommaun (Hencken 1938, fig 24.342).

963:002

A perforated horse tooth, lightly curved in profile with the upper surface triangular in section. Knife cut oval perforation set laterally close to the lower edge, which has been trimmed.

Length:	57.5mm
Width:	13.0mm
Thickness:	10.9mm
Burial 585	

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**Bibliography**

Britnell, W., 2000

Worked Bone, in J. C. Barrett, P. W. M. Freeman and A. Woodward, *Cadbury Castle, Somerset. The later prehistoric and early historic archaeology*, English Heritage Archaeological Report 20, London, 253-5

Brown, D., 1990

Weaving Tools, in M. Biddle, *Object and Economy in Medieval Winchester*, Winchester Studies 7ii, Oxford, 225-32

Choyke, A. M., 2001

Late Neolithic Red Deer Canine Beads and their Imitations, in A. M. Choyke and L. Bartosiewicz, *Crafting Bone: Skeletal Technologies through Time and Space*, British Archaeological Reports, International Series 937, Oxford, 251-66

Clarke, G., 1979

*The Roman Cemetery at Lankhills*, Pre-Roman and Roman Winchester II, Oxford

Collins, A. E. P., 1955

Excavations in Lough Faughan Crannog, County Down, *Ulster Journal of Archaeology* **18**, 45-80

Connolly, M. and Coyne, F., 2005

*Underworld. Death and Burial in Cloghermore Cave, Co. Kerry*, Bray

Dunlevy, M., 1988

A Classification of Early Irish Combs, *Proceedings of the Royal Irish Academy* **88C**, 341-422

Eogan, G., 1974

Report on the Excavations of some Passage Graves, Unprotected Inhumation Burials and a Settlement Site at Knowth, Co. Meath, *Proceedings of the Royal Irish Academy* **74**, 11-112

Foster, S. M., 1990

Pins, combs and the chronology of later Atlantic settlement, in Armit, I., editor, *Beyond the Brochs*, Edinburgh, 143-74

Fredengén, C., 2002

*Crannogs. A study of peoples' interaction with lakes, with particular reference to Lough Gara in the north-west of Ireland*, Bray

Gaskell Brown, C. and Harper, A. E. T., 1984

Excavations on Cathedral Hill, Armagh, 1968, *Ulster Journal of Archaeology* **47**, 109-61

Hallén, Y., 1994

---

The Use of Bone and Antler at Foshigarry and Bac Mhic Connain, two Iron Age Sites on North Uist, Western Isles, *Proceedings of the Society of Antiquaries of Scotland* **124**, 189-232

Hartnett, P. J. and Eogan, G., 1964  
Feltrim Hill, Co. Dublin; a Neolithic and early Christian Site, *Journal of the Royal Society of Antiquaries of Ireland* **94**, 1-37

Hencken, H., 1936  
Ballinderry Crannog N° 1, *Proceedings of the Royal Irish Academy* **43C**, 103-239

Hencken, H., 1938  
*Cahercommaun: a Stone Fort in County Clare*, Dublin

Hencken, H., 1950  
Lagore Crannog: an Irish Royal Residence of the 7<sup>th</sup> to 10<sup>th</sup> Centuries AD, *Proceedings of the Royal Irish Academy* **53C**, 1-247

Hodkinson, B., 1987  
A Reappraisal of the Archaeological Evidence for Weaving in Ireland in the early Christian Period, *Ulster Journal of Archaeology* **50**, 47-53

Hurl, D. P., 2002  
The excavation of an early Christian cemetery at Solar, County Antrim, 1993, *Ulster Journal of Archaeology* **61**, 37-82

Hurl, D. P., 2003  
Excavations in Abbey Street, Armagh, *Ulster Journal of Archaeology* **62**, 97-109

Hurley, M. F., 1997  
Artefacts of Skeletal Material, in R. M. Cleary, M. F. Hurley and E. Shee Twohig, *Skiddy's Castle and Christ Church Cork. Excavations 1974-77 by D. C. Twohig*, Cork, 239-73

Hurley, M. F., 1997  
Artefacts of Skeletal Material, in M. H. Hurley, O. M. B. Scully and S. W. J. McCutcheon, *Late Viking Age and Medieval Waterford: Excavations 1986-1992*, Waterford, 650-99

Johnson, R., 1999  
Ballinderry Crannóg N° 1: a Reinterpretation, *Proceedings of the Royal Irish Academy* **99C**, 23-71

Kahlke, H. -D., 1955  
Schnurkeramische 'Kettenhocker' aus Thüringen, *Alt-Thüringen* **1**, 153-81

Lemkuhl, U., 1987  
Archäozoologische und typologische Untersuchungen an Metapodia-Anhängern des Neolithikums und der Bronze- bis frühen Eisenzeit in der DDR, *Jahrbuch für Bodendenkmalpflege Mecklenburg* **34**, 19-38 and 332-8

MacDonald, P., Manning, W. and Riddler, I. D., forthcoming  
The Roman Small Finds, in J. Rady, A. Hicks, S. Pratt and P. Bennett, *Monkton-Mount Pleasant, Thanet: Prehistoric, Roman and medieval discoveries on the Isle of Thanet 1994-95*, Canterbury Archaeological Trust Occasional Papers, Canterbury

MacGregor, A., 1974  
The Broch of Burrian, North Ronaldsay, Orkney, *Proceedings of the Society of Antiquaries of Scotland* **105**, 63-118

Meaney, A. L., 1981  
*Anglo-Saxon Amulets and Curing Stones*, British Archaeological Reports, British Series 96, Oxford

Müller, H. -H., 1989  
Tierzahn amulette aus dem Mittelalter im Salle-Unstrut-Gebiet, *Jahresschrift. für mitteldeutsche Vorgeschichte* **72**, 295-7

O'Riordain, S. P., 1949  
Lough Gur Excavations: Carraig Aille and the 'Spectacles', *Proceedings of the Royal Irish Academy* **52**, 39-111

O'Sullivan, A., 1998  
*The Archaeology of Lake Settlement in Ireland*, Discovery Programme Monograph 4, Dublin

Olsen, S. L., 2003  
The Bone and Antler Artefacts: their Manufacture and Use, in N. Field and M. Parker Pearson, *Fiskerton. An Iron Age Timber Causeway with Iron Age and Roman Votive Offerings: the 1981 Excavations*, Oxford, 92-110

Raftery, B., 1997  
Part 2: Discussion of Diagnostic Finds, in D. M. Waterman, *Excavations at Navan Fort 1961-71*, Northern Ireland Archaeological Monographs 3, Belfast, 90-5

Riddler, I. D., 1988  
Late Saxon or Late Roman ? A comb from Pudding Lane, *London Archaeologist* **5**, 372-4

Riddler, I. D., 2007  
Objects of Antler and Bone, in S. Mays, C. Harding and C. Heighway, *The Churchyard, Wharram. A Study of Settlement on the Yorkshire Wolds*, XI, York University Archaeological Publications 13, York, 313-7

Riddler, I. D., Trzaska-Nartowski, N. I. A. and Hatton, S., forthcoming  
*An Early Medieval Craft. Objects and Waste from Ipswich Excavations 1974 – 1994*, East Anglian Archaeology, Gressenhall

Stacey, L. and Walker, K. E., 1997

---

Objects of Worked Bone, in R. J. C. Smith, F. Healey, M. J. Allen, E. L. Morris, I. Barnes and P. J. Woodward, *Excavations Along the Route of the Dorchester By-Pass, Dorset, 1986-8*, Wessex Archaeology Report 11, Salisbury, 125-7

Stenberger, M., 1966

A ring-fort at Raheennamadra, Knocklong, Co. Limerick, *Proceedings of the Royal Irish Academy* **65C**, 37-54

Stevenson, R. B. K., 1955

Pins and the Chronology of the Brochs, *Proceedings of the Prehistoric Society* **21**, 282-7

Walton Rogers, P., 1997

*Textile Production at 16-22 Coppergate*, The Archaeology of York. The Small Finds 17/11, London

Walton Rogers, P., 2001

The Re-appearance of an Old Roman Loom in Medieval England, in P. Walton Rogers, L. Bender Jørgensen and A. Rast-Eicher, *The Roman Textile Industry and its Influence*, Oxford, 158-71

Westphalen, P., 1999

Die Kleinfunde aus der frugeschichtlichen Wurt Elisenhof, *Offa-Bücher* **80**, 1-232

White Marshall, J. and Walsh, C., 2005

*Illaunloughan Island. An early medieval Monastery in County Kerry*, Bray

Waterman, D. M., 1971

A marshland habitation site near Larne, Co. Antrim, *Ulster Journal of Archaeology* **34**, 65-76

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## Appendix 11 Glass Beads Report

### The Beads from Parknahown 5 by Cecily Cropper

The assemblage comprises 9 glass beads and one of amber. Three beads were recovered from redeposited cemetery soil but the remaining 7 were associated with 4 individual burials. Although classified as beads, 4 appear to have had uses other than that of conventionally strung fashions. Of these, 3 are directly associated with copper alloy rivets that point to their use within composite objects, and the fourth is a large bead still looped onto a copper alloy wire.

#### Classification

Both monochrome and polychrome beads are represented. The categories of monochrome types include annular, globular, melon/gadrooned and segmented beads. The polychrome beads range from a simple globular to two more complex and distinctly-shaped examples with *reticella* decoration, both coming under the general classification of 'roped' beads. This report has drawn upon classifications proposed by Beck (1927), Callmer (1977) and Guido (1978; 1999).

#### Manufacture

This report does not go into detail on individual bead manufacture, as much is already written on methods of manufacture on beads from archaeological contexts, such as Callmer (1977), Henderson (1986) and Küçükerman (1988). Further invaluable reference can also be taken from modern bead makers such as Adams (2005). All the glass beads from Parknahown have been wound onto a metal rod or mandrel and then smoothed or worked before annealing and final removal from the rod once cooled.

#### Catalogue

The catalogue is based upon the system outlined by Hirst (2000, 125) where beads are listed under their respective grave and burial numbers. The low representation of beads here does not allow for individual grave series to be built up (except a suggestion of one from Burial 293). However, a very basic colour type series and type series can be presented for the entire site. Globular defines a bead where the height is more than half its diameter; annular is where the height is less than half the diameter.

#### *Redeposited cemetery soil (context 800)*

- a) Translucent yellow globular bead (2170:800:12). Remains of pontil mark on perforation exit. Alloy wire loop. D: 20mm. PD: 4.5mm. H: 13.5mm.
- b) Opaque mid-blue globular bead (2170:1:111). D: 6mm. PD: 1mm. H: 4 mm.
- c) Near complete but fragmented sub-circular amber bead (2170:800:28). D: 16-19.5mm. PD: 9mm. H: 7mm.

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**Burial 149 (infant)**

- a) Opaque dark blue annular bead (2170:459:1). D: 8mm. PD: 5mm. H: 3-4mm.

**Burial 293 (adult female)***Monochrome glass - 2 beads*

- a) Translucent cobalt blue melon/gadrooned and collared bead (2170:614:1). Associated with a copper alloy rivet. D: 12mm. PD: 3.5-4mm. L: 17mm.
- b) Translucent cobalt blue segmented bead (2170:614:4). D: 8mm. PD: 4mm. L: 10mm
- c) Complete copper alloy rivet, round copper cap with caulked shank, possibly associated with a bead (2170:614:3). D: 10mm, L: 16mm.

*Polychrome glass - 1 bead*

- d) Opaque dark blue globular bead (2170:614:2) with *reticella* threads of translucent blue and opaque white glass applied as collars around each end of the perforation. White opaque glass applied in a double swag with a third wave pattern around bead body. Copper alloy rivet within one opening of perforation. D: 8mm. PD: 4mm. H: 10mm

**Burial 508 (infant)**

- a) Opaque near black annular bead (2170:872:1). D: 11mm. PD: 4mm. H: 5.5-7.5mm.

**Burial 1007 (juvenile)***Polychrome glass - 2 beads*

- a) Opaque white globular bead with marbled translucent cobalt blue glass in irregular wave around the circumference (2170:1254:1). D: 10mm. PD: 5mm. H: 6mm
- b) Semi-translucent dark blue barrel-shaped bead with *reticella* threads of opaque white and translucent blue applied as collars around each end of the perforation. Three dark blue 'eyes' equidistant around bead body, each with an applied spiral of opaque white glass (2170:1254:2). D: 10-11.5mm. PD: 5-5.5mm. L: 21mm

**Analysis, context and use**

The colour range represented includes one yellow, 6 blues, one white and one near black. There were slightly more opaque beads than translucent.

Both infants were buried with a single dark opaque bead, one of which was recovered from underneath the mandible and the other from the area of the left pelvis. The juvenile and adult female graves however contained the more complex and sophisticated polychrome and shaped beads.



The adult female was buried with three of the 7 beads, the 2 shaped beads and one polychrome and all found at the region of her upper left thorax. Two beads, the *reticella* and melon, were directly associated with rivets. The juvenile was associated with two polychrome beads, both recovered from the right and front side of the cranium. One of these beads was the most ornate polychrome example from the assemblage, associated with a copper alloy rivet.

The presence of copper alloy rivets indicates the use of these beads within composite objects, possibly associated with clothing or textiles. Of note is a bronze pin from Drummiller Rocks, Dromore, with a knobbed glass terminus (Armstrong, 1922, Fig.2, No.8, 74). The base of the terminus has an applied *reticella* blue and white collar, and overall is very similar to the two Parknahown roped beads apart from not having a full perforation and thus being classified by Armstrong as a half-bead (1921, 80).

### Dating and Origin

The two polychrome *reticella* beads (2170:1254:2; 2170:614:2) yield the most definite evidence for both dating and provenance, through the results of the analysis of beads from Scandinavian contexts (Callmer, 1977). Both fit confidently within his exclusive Bj type, described as “dark blue translucent beads with *reticella* decoration” and where that decoration is of “blue and white *reticella*, opaque white lines and circles.” (ibid, 1977, 86). This group has a chronological range of c. 820-950AD.

Comparative examples from Irish contexts come from the Norse cemetery at Island Bridge, Kilmainham, Co. Dublin (Armstrong, 1921, 71-3). Although Armstrong compared the roped example (ibid, 72, Fig.1, b) to a Scandinavian bead from a Viking burial site at Veka, Voss in Norway, he goes on to say, “Such roped beads have been considered characteristic of Ireland.” (ibid, 72). This assemblage was re-analysed by Guido (1985, 101-103), who supports the argument that these distinctive roped beads “...are almost certainly of Irish origin”. Guido postulated a date for the Islandbridge beads as being c.830-900.

Roped and *reticella* beads were recovered from the royal crannog site of Lagore, Co. Meath (Hencken, 1950, 1-197), and with a probable occupation date range from the mid-6<sup>th</sup> century to the end of the 10<sup>th</sup> century AD. Parknahown 2170:614:2 fits within Hencken’s category of ‘Beads with cables not covering the whole surface’ (ibid, 140), with the earliest from Lagore dating to Phase 1b, c.650-850AD and a second example coming from phase II, c.850-934AD. Unfortunately all roped examples from the crannog were unstratified. Yet another comparable bead is horned bead with an applied *reticella* collar from Carraig Aille I, Lough Gur, with an occupation date range from the 8<sup>th</sup> to the late 10<sup>th</sup> centuries (Ó Ríordáin, 1949, Fig. 19, No. 19.I, 90).

The remaining beads are more difficult to date with any precision, the majority being common types, some of which have precursors dated back to

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the Iron Age and all of which continue in popularity through the Viking period.

The cobalt blue melon bead (2170:614:1) and the segmented bead (2170:614:4) are popular long-lived forms. Guido writes that melon beads are first known from Roman contexts but are evidenced at Viking sites such as Birka and that "...a few come from Ireland, some certainly of post fifth-century date..." (Guido, 1978, 100). Post-Roman beads however tend to be less well made, as the example from Parknahown shows. Melon beads were found also at Lagores (Hencken, 1950, 134, Fig.65), again all unstratified. The Parknahown example differs from typical melon beads in that it is also collared, both shaped from the main bead rather than applied. The remains of a rivet shank and caulking are present within the perforation. Blue segmented beads were also recovered from Lagore, but whilst long-lived forms, are not necessarily numerous (Hencken, 1950, 141).

The small globular bead (2170:872:1) and the small annular bead (2170:459:1) are also of types with recognized longevity and commonality from a variety of sites. Hencken describes the plain blue beads from Lagore crannog as "such commonplace things... that they have no special significance." (1950, 134). Guido refines this statement somewhat, saying that whilst simple blue globular and annular beads are not closely datable, the majority of the examples from Ireland date from the 7<sup>th</sup> - 10<sup>th</sup> centuries AD." (2000, 175).

The small mid-blue bead (2170:1:111) is of a colour that appears best described by Callmer's 'forget-me-not blue'. This colour appears in his Ao bead group of a mainly early Viking date, c.790-820 AD (1977, 80). It also appears for example in his patterned Bb group with an emphasis on the same early Viking date though extending into the last quarter of the 9<sup>th</sup> century AD (ibid, 82). Interestingly both bead groups appear to be Scandinavian in origin.

The large globular yellow bead (2170:800:12) is not out of place within a Viking assemblage. A comparably large yellow bead (No.331) was recovered from Site C of the ring fort at Garranes, Co. Cork (Ó Ríordáin, 1942). Beck noted this bead as generally being of an Early Iron Age type but continuing into the Saxon period (ibid, 1942, 118). It is thought to be of a 6<sup>th</sup> century date, fitting within a 5<sup>th</sup> and early 6<sup>th</sup> century occupation period (ibid, 1942, 141). What singles this Parknahown bead out is that it is still attached to a copper alloy wire looped through the perforation. It is reminiscent of beads found attached to silver-wire festoons, popular during the 6<sup>th</sup> and 7<sup>th</sup> centuries. Good examples were recovered from a late 7<sup>th</sup> century burial ground at Harford Farm in Norfolk, England (Penn, 2000). However, such large beads can also be worn singly and "...centrally on a string or as part of a chatelaine with other objects. In this role they may be amuletic..." (ibid, 2000, 52). However, whilst large, the bead is neither particularly carefully made nor is it decorated in the fashion that Guido attributes to amuletic beads (1989, 51).

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The opaque white bead with irregular blue, marvered trail (2170:1254:1) is more reminiscent of Anglo-Saxon English beads, for example those from Morning Thorpe, Norfolk, that Brugmann refers to as Norfolk BlueWhite (2004, Fig.148) or Koch 34 Blue (ibid, Fig.162). Brugmann classifies these as 6<sup>th</sup>-8<sup>th</sup> century continental imports, particularly Frankish (ibid, 37).

The presence of the amber bead (2170:800:28) is certainly not out of place alongside glass beads, and amber beads or rings have been recovered from all Irish sites mentioned in this report above. Amber objects are common on Irish sites from the Bronze Age to the medieval period and there is evidence of native amber deposits in Ireland and not just the Baltic or the east coast of England (Briggs 1985, 103-4).

To sum up, the *reticella* beads indicate an early/mid-9<sup>th</sup> century to mid-10<sup>th</sup> century for most of the assemblage. Although some beads suggest and may well be of an earlier date, it must however be recognized also that, given their status as trade or treasure, they may have been kept as heirlooms (Guido, 1985, 102).

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## Appendix 12 Lignite Finds Report

### Bangles of lignite and related materials from Parknahown 5

Fraser Hunter

(with scientific analysis by Lore Troalen)

Excavation recovered two bangle fragments from the fill of a secondary recut of enclosure ditch F156, and a notably small intact bangle from burial 514. Bangles of lignite and related materials are common finds in Early Christian Ireland; although their occurrence has never been synthesised, parallels may be noted *inter alia* from Clonmacnoise, Co Offaly, Lough Gur, Co Limerick and Cahercommaun, Co Clare (Ó Floinn & King 1998, 125, ill 7-3, no 17; Ó Riordáin 1950, 87-9, fig 17; Hencken 1938, 42; more generally, Edwards 1990, 96). It is particularly valuable to have close dating for the current examples. Such bangles were a common form of jewellery in the period; there is no firm evidence whether both sexes wore them, but the small size of the bangle from the burial strongly indicates it was that of a child. Its presence in an adult burial is interesting; it was in the fill rather than a grave good with the corpse, and while it could be an accidental inclusion, it is more likely to be a deliberate token left in the grave by a mourning child.

Such bangles are invariably described as lignite in the literature, but this is rarely tested. The opportunity was taken to analyse these examples non-destructively, using standard techniques of X-ray fluorescence and visual inspection (for the methodology see Hunter et al 1993; Davis 1993). This showed they were not lignite but oil shale and cannel coal. The detailed geological work necessary to suggest likely surface exposures has not been done in Ireland, but suitable geology exists in the region, with coal mines known around Rossmore and Ballingarry; surface exposures of Coal Measures deposits would be likely to contain cannel coals and oil shales. A wider study of this material in Ireland would be of considerable value in understanding systems of production and distribution. In the meantime, the finds under study here illustrate the need for more research into these unloved but informative artefacts, and the dangers of labelling the material without scientific investigation.

### Catalogue

E2170:325:004

Fragment from a well-rounded D-sectioned bangle, gently rounded on the inner face with a fairly flat top; split horizontally around the section's midpoint. Well-made, with no toolmarks and a high polish; worn and smoothed from post-depositional wear. One fracture edge has knife-cut facets, indicating an abandoned attempt to reuse it. Material: very dark, with laminar splitting and a poor conchoidal fracture; analysis indicates this is more organic than the other materials, but not as organic as typical lignites. Its various characteristics suggest it is cannel coal or canneloid shale. L 14.5 mm, W 8 mm, T 5 mm; too small to estimate diameter. F.325, fill of first recut in enclosure ditch F156 (dated AD 430-650).

E2170:325:005

Bangle fragment, split horizontally around the midpoint of a thick D-sectioned bangle, the surface spalled. The ends are rather worn from post-depositional wear. Well-finished, with no visible toolmarks; polished to a medium lustre. The lamination is typical of oil shale, and this is supported by the high scatter peak ratio from XRF, indicating it is more inorganic than lignite or cannel coal; its dark colour indicates it comes from a different source than the bangle from burial 514. Surviving L 57 mm, W 8.5 mm, T 4 mm; internal D 55 mm (37% surviving). F.325, fill of first recut in enclosure ditch F156 (dated AD 430-650).

E2170:876:001-009

Ring or small bangle, intact when buried but unfortunately broken during excavation. Slightly oval with a D-shaped section, slightly rounded on the interior; this suggests it is a bangle rather than a ring-pendant, as these tend to have circular or oval sections. Its size would only fit a child. The interior shows fine circumferential knife-trimming facets; the exterior is well-finished, with no visible toolmarks, but only a low polish. However, areas on the edges of the perforation and the outer curve have a higher polish from wear. Material: grey, with laminar cracking, and a high scatter peak ratio and iron level from XRF analysis, all indicating this is an oil shale. Internal D 30.4 x 29.7 mm, external D 41.7 x 39.8 mm, W 5-5.5 mm, H 8.3 mm. F876, fill of burial 514.

## References

- Davis, M 1993 'The identification of various jet and jet-like materials used in the Early Bronze Age in Scotland', *The Conservator* 17, 11-18
- Edwards, N 1990 *The Archaeology of Early Medieval Ireland*. London: Batsford
- Hencken, H O'N 1938 *Cahercommaun: a stone fort in County Clare*. Dublin: Royal Society of Antiquaries of Ireland
- Hunter, F J, McDonnell, J G, Pollard, A M, Morris, C R, and Rowlands, C C 1993 'The scientific identification of archaeological jet-like artefacts', *Archaeometry* 35, 69-89
- Ó Floinn, R & King, H A 1998 'Archaeological investigations at St Ciarán's National School', in H A King (ed) *Clonmacnoise Studies Vol. 1: Seminar papers 1994*, 119-132. Dublin: Dúchas
- Ó Ríordáin, S P 1950 'Lough Gur excavations: Carraig Aille and the "Spectacles"', *Proc Royal Irish Academy* 52C (1948-50), 39-111

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## **Appendix 13 Medieval Pottery Report**

### **Pottery and Small Finds Report**

**Parknahown 2, 3 & 5  
and  
Cuffsborough 1  
M7/8 Portlaoise to Castletown Culahill**

Registration Nos: E2196, E2186, E2170 & E2185

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For  
Archaeological Consultancy Services Ltd

28<sup>th</sup> January 2008

## Introduction

- 1.1 This report details the pottery and a small number of other finds recovered from the excavation of four sites along the M7/M8 Portlaoise to Castletown/Cullahill scheme, Parknahown 2, 3 and 5 and Cuffsborough 1. Fourteen sherds of medieval pottery, one ceramic crucible, one fragment of possibly worked stone and one small fragment of burnt clay were recorded (see Table 1 below).

**Table 1 - Finds retrieved by site and material**

Licence number	Site	Pottery	Ceramic Crucible	Worked Stone	Burnt Clay
E2196	Parknahown 2	1	0	0	0
E2186	Parknahown 3	1	0	0	0
E2170	Parknahown 5	2	1	1	1
E2185	Cuffsborough 1	10	0	0	0
<i>Totals</i>		14	1	1	1

## 2 Methodology

- 2.1 These artefacts were identified visually utilising existing published typologies and artefact reports. A brief description of each pottery or artefact type is given. The complete catalogue is presented at the end of the report.

## 3 Dating

- 3.1 Date ranges for the pottery are based on dated material from previously published excavated sites in Ireland and England.

## 4 Medieval Pottery

- 4.1 The assemblage from these four sites contains fourteen sherds of medieval pottery. Only one sherd is from pottery imported into Ireland from Bristol during the 13<sup>th</sup> or 14<sup>th</sup> century. The remaining sherds are from pottery manufactured in Ireland. Twelve sherds are of Leinster Cooking ware dating to the late 12<sup>th</sup> to mid-14<sup>th</sup> century and one sherd was possibly produced locally.

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#### 4.2 ***Leinster Cooking Ware***

Twelve of the fourteen sherds of medieval pottery recovered from the four sites were of Leinster Cooking ware. One base sherd came from Parknahown 1 (E2196:31:1), one body sherd from Parknahown 5 (E2170:109:2) and the remaining ten sherds were from Cuffsborough 1.

Leinster Cooking Ware is the most widespread type of medieval pottery found in Leinster (Ó Floinn 1988, 340). It is found on most medieval sites in Leinster (*ibid.*, 327). The fabric is hand-built and coarse, containing large plates of mica, quartz grits and sometimes decomposed feldspar. It has an orange, oxidised fabric, often with a grey reduced internal surface or core (*ibid.*, 327-8). The range of vessels produced with this type of ware are limited but they are not just confined to cooking pots but also include jugs, platters, shallow dishes and occasionally curfews (*ibid.*, 328).

The Leinster Cooking ware sherds from Parknahown 2 and 5 and Cuffsborough 1 all have an orange oxidised fabric and some have a grey reduced core (E2196:31:1; E2170:109:2; E2185:7:3-4). The fabric has inclusions of mica and quartz, some having large plates (E2196:31:1; E2170:109:2) and some sherds also have inclusions of decomposed feldspar (E2185:7:2-4, 6, 9-10). The two base sherds are sand-gritted. This feature is not found on any other type of medieval pottery in the country (Ó Floinn 1988, 327). The remaining ten sherds are body sherds. None of the Leinster Cooking ware from is decorated. Six of the sherds have sooting on the exterior, suggesting that they are from cooking pots.

#### 4.3 ***Bristol Redcliffe***

There is one body sherd (E2186:9:1) from Parknahown 3 of Redcliffe ware imported from Bristol. These wares are wheel-thrown and have a buff-coloured fabric with a dark grey core and have glazes which range from yellow to green. They replaced the earlier Ham Green wares from the mid-thirteenth century and they continued to be made into the fifteenth century but their main period of production was the fourteenth century (Gahan, McCutcheon & Twohig 1997, 120; McCutcheon 2003, 206; Gahan & McCutcheon 1997, 301-3).



The sherd of Redcliffe ware from Parknahown 3 is a body sherd in two pieces which has a buff-coloured fabric with a dark grey core. The exterior is glazed with a patchy yellow-green glaze and it is decorated with horizontal grooving.

#### 4.4 *Laois-type ware*

One sherd of pottery from Parknahown 5 is possibly a body sherd of a locally produced ware. It is a buff-coloured fabric with inclusions of mica and quartz grits. It is possibly wheel-thrown and is unglazed. Where a ware is found in a particular area but there is no kiln or production site known, the ware is given the suffix '-type' (McCutcheon 2006, 58; Blake & Davey 1983, 39-40)

#### 4.5 *Ceramic Crucible*

A wall fragment of a ceramic crucible (E2170:36:4) was retrieved from Parknahown 5. It is a rim fragment from a straight-sided vessel. The fabric has a grey core and has inclusions of mica and quartz grits. The internal and external surfaces of the vessel have been distorted, probably due to repeated firings. The internal surface has yellow staining...The exterior has fine cracks in the fabric and has signs of vitrification at the bottom end of the sherd which was caused by the migration of the silicates in the fabric when the crucible was heated (Craddock 1989, 186). The original shape of the crucible is unknown, making it difficult to date, but the fabric appears to be medieval.

#### 4.6 **Worked Stone**

A possible fragment of worked stone (E2170:1:141), which is broken in two pieces, was found at Parknahown 5. It is of fine-grained, buff- to light-orange coloured sandstone. It is smooth on the exterior and rough on the interior where it was fractured. The smooth surface appears to be part of a rim and the fragment was possibly part of a stone vessel.

#### 4.7 **Burnt Clay**

One small fragment of burnt clay (E2170:258:1) was recovered from Parknahown 5.

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**Bibliography**

Blake, H. & Davey, P. (eds.) 1983 *Guidelines for the Processing and Publication of Pottery from Excavations*. Department of the Environment, London.

Craddock, P.T. 1989 'Metalworking Techniques' in S. Youngs, *The Work of Angels': Masterpieces of Celtic Metalwork, 6<sup>th</sup>-9<sup>th</sup> Centuries AD*, 170-213. British Museum, London.

Gahan, A. & McCutcheon, C. 1997 'Medieval Pottery' in M.F. Hurley, O.M.B. Scully & S.W.J. McCutcheon, *Late Viking and Age and Medieval Waterford: Excavations 1986-1992*, 285-336. Waterford Corporation, Waterford.

Gahan, A. McCutcheon, C. & Twohig, D.C. 1997 'Medieval Pottery' in R.M. Cleary, M.F. Hurley & E. Shee Twohig *Skiddy's Castle and Christ Church Cork: Excavations 1974-77 by D.C. Twohig*, 108-129. Cork Corporation, Cork.

Ó'Floinn, R. 1988 'Handmade Medieval Pottery in SE Ireland – "Leinster Cooking Ware"' in G. MacNiocaill & P.F. Wallace (eds), *Keimelia: Studies in Medieval Archaeology and History in Memory of Tom Delaney*, 325-348. Galway University Press, Galway.

McCutcheon, C. 2003 'Pottery' in R.M. Cleary & M.F. Hurley (eds), *Cork City Excavations 1984-2000*, 197-235. Cork City Council, Cork.

McCutcheon, C. 2006 *Medieval Pottery from Wood Quay, Dublin: The 1974-6 Waterfront Excavations*. Royal Irish Academy, Dublin.

**Catalogue of Pottery and Small Finds****Parknahown 2**

Licence No.	Feature No.	Find No.	Category	Type	Part	Date	Origin	Notes
E2196	31	1	Pottery	Leinster Cooking Ware	Basf	L12-Mid14thC	Ireland	Base sand-gritted

**Parknahown 3**

Licence No.	Feature No.	Find No.	Category	Type	Part	Date	Origin	Notes
E2186	9	1	Pottery	Bristol Redcliffe ware	Bf	mid 13th-15thC	England	In two pieces

**Parknahown 5**

Licence No.	Feature No.	Find No.	Category	Type	Part	Date	Origin	Notes
E2170	1	141	Stone	Possible worked stone	Rf?			In two pieces
E2170	1	152	Pottery	Laois-type ware	Bf	Medieval	Ireland	
E2170	36	4	Ceramic	Crucible	Rf	Medieval?		
E2170	109	2	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	4 small fragments
E2170	258	1	Burnt Clay	Small fragment of burnt clay				

**Cuffsborough 1**

Licence No.	Feature No.	Find No.	Category	Type	Part	Date	Origin	Notes
E2185	7	1	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	In two pieces. Sooting on exterior
E2185	7	2	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	Some sooting on exterior
E2185	7	3	Pottery	Leinster Cooking Ware	Basf	L12-Mid14thC	Ireland	In two pieces. Sand-gritted base.
E2185	7	4	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	
E2185	77	5	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	Sooting on exterior
E2185	7	6	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	
E2185	7	7	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	
E2185	7	8	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	Some sooting on exterior
E2185	7	9	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	Sooting on exterior
E2185	7	10	Pottery	Leinster Cooking Ware	Bf	L12-Mid14thC	Ireland	Sooting on exterior

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**Appendix 14 Conservation Report - Adrian Kennedy**

# Conservation Report

Site # 05-09 / AE015/060

Parknahown

Metals

Sylvia Desmond, NRA archaeologist

Archaeological Consultancy Services Limited  
Boyne Business Park, Greenhills, Drogheda, Co. Louth

These archaeological objects were conserved by Adrian Kennedy in 2008.  
They were conserved under licence issued through the National Museum of Ireland in accordance with the  
National Monuments Acts.  
All objects listed in this report have been treated to a standard approved for the storage conditions within the  
National Museum archaeological storage facility.

Adrian Kennedy 1 Sycamore Close, Dublin 24

## Details of intervention

<b>FEATURE#:</b> 348	<b>FIND#:</b> 002	<b>OBJECT:</b> Loop-shaped attachment
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**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:**

The surface has a hatched pattern and one loop terminal is incomplete.

**NATURE OF DECAY:**

The find was covered with dense accretions – stained with ferric acid.

**AIM OF INTERVENTION:**

Clean the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 0.50g.

**TREATED WEIGHT:** 0.52g including added coatings.

**PRIOR DIMENSIONS:** T: 2.93mm. Diam: 11.16mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

<b>FEATURE#:</b> 348	<b>FIND#:</b> 012	<b>OBJECT:</b> Ring Pin
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**COMPOSITION:** Metal – Iron.

**INCOMING OBSERVATIONS:** None.

**NATURE OF DECAY:**

The find was covered with dense accretions – stained with weeping ferric acid.

**AIM OF INTERVENTION:**

Clean the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 11.40g.

**TREATED WEIGHT:** No change.

**PRIOR DIMENSIONS:** L: 10.35mm. T: 10.52mm. Diam: 26.12mm.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully inspected and were found to be in a stable condition. In addition, all the iron is now converted to a stable oxide state – requiring no conservation measures.

A Protective coating of microcrystalline wax – Renaissance was applied to the surface to prevent the ingress of moisture and polluting materials.

**COMMENTS:**

I recommend an x-ray to determine structural shape and possible surface decoration.

**FEATURE#: 102****FIND#: 001****OBJECT: Ring pin****COMPOSITION:** Metal – Copper alloy.**INCOMING OBSERVATIONS:****NATURE OF DECAY:** This find suffered with severe Azurite particularly to the ring.**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 5.30g.**TREATED WEIGHT:** 5.28g.**PRIOR DIMENSIONS:** L: 8.10mm. W: 3.12mm. Diam: 7.18mm.**TREATED DIMENSIONS:** No obvious change.**OTHER RECORDINGS:** Colour photograph.

Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes to remove the Azurite crusts.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

**FEATURE#: 1****FIND#: 103****OBJECT: Ring Pin****COMPOSITION:** Metal – Copper alloy.**INCOMING OBSERVATIONS:** Overlap ring.**NATURE OF DECAY:**

This find suffered with severe Azurite causing much pitting loss to the surface.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 4.25g.**TREATED WEIGHT:** 4.30g.**PRIOR DIMENSIONS:** L: 8.10mm. W: 3.08mm. Diam: 12mm.**TREATED DIMENSIONS:** No obvious change.**OTHER RECORDINGS:** Colour photograph.

Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The surface was carefully cleaned with a burnishing brush to reveal any surface tool marks and/or decoration. A fine patina was in place and it was important to retain this even though many spots of Azurite marred the surface. This work was carried out using white light under X50 magnification.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.



<b>FEATURE#:</b> 104	<b>FIND#:</b> 001	<b>OBJECT:</b> Pin – incomplete shank
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**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:**

**NATURE OF DECAY:**

This find suffered with severe Azurite causing much pitting loss to the surface.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 0.70g

**TREATED WEIGHT:** 0.68g.

**PRIOR DIMENSIONS:** L: 25.30mm. W: 2.90mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

<b>FEATURE#: 104</b>	<b>FIND#: 002</b>	<b>OBJECT: Tack or Pin</b>
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**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:**

**NATURE OF DECAY:** This find suffered with Paratacamite.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 0.88g.

**TREATED WEIGHT:** 0.56g.

**PRIOR DIMENSIONS:** L: 23.45mm. Diam: 3.90mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

**FEATURE#:**122**FIND#:** 001**OBJECT:** Stick Pin

**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:**

Incomplete and bent slightly at the neck and (broken) tip area.

**NATURE OF DECAY:** This find suffered with traces of Paratacamite.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 3.55g.

**TREATED WEIGHT:** 3.43g.

**PRIOR DIMENSIONS:** L: 45.48mm. Diam: 7mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes revealing serious corrosion along the centre of the shaft.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

**FEATURE#:** 179

**FIND#:** 001

**OBJECT:** Brooch

**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:** Pennanular type.

**NATURE OF DECAY:**

This find suffered with severe Paratacamite causing much pitting loss to the surface particularly along the shank.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 12g.

**TREATED WEIGHT:** 11.98g.

**PRIOR DIMENSIONS:** L: 8.30mm - extended. T: 4.5mm at eye. Diam: 42.28mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The accretions were carefully removed to expose all underlying corrosion and to reveal the surface tool marks and decoration. This work was carried out using white light under X50 magnification. Scalpels, dental pick and conservation brushes were employed and great care was taken because of the severe nature of the underlying corrosion products. The entire remaining original surface was preserved but this entailed leaving underlying chlorides in place. Neutralising the underlying chlorides would, hopefully, make the metal in this brooch stable. However, please respect the recommendations regarding the environmental storage conditions.

Chlorides were removed by immersing the brooch in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**FEATURE#: 237****FIND#: 001****OBJECT: Brooch****COMPOSITION:** Metal – Copper alloy.**INCOMING OBSERVATIONS:**

Pennanular type. There is a loss of settings in sockets.

**NATURE OF DECAY:**

This find was covered with dense accretions, exhibiting traces of Paratacamite chloride particularly on the face of the ring.

**AIM OF INTERVENTION:**

As this brooch is decorated, removal of accretion was strongly advised to reveal surface detail. Conserve to retard further decay.

**PRIOR WEIGHT:** 10.10g**TREATED WEIGHT:** 9.32g.**PRIOR DIMENSIONS:** L: 5.70mm - folded. T: 7.40mm. Diam: 31.88mm.**TREATED DIMENSIONS:** No obvious change.**OTHER RECORDINGS:** Colour photograph.

Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose underlying corrosion and to reveal any surface tool marks and/or decoration. Care was taken on part of the ring where accretions contained the remains of tool work in the form of lines. These accretions were allowed to remain as they held the only evidence of decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

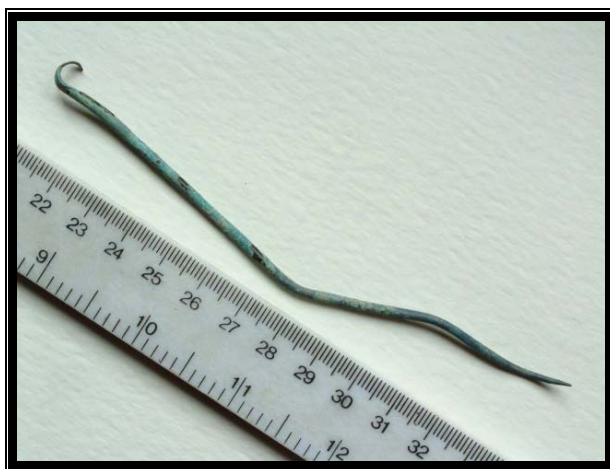
Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**FEATURE#: 324****FIND#: 019****OBJECT: Pin****COMPOSITION:** Metal – Copper alloy.**INCOMING OBSERVATIONS:** The shank is badly bent in zigzag manner.**NATURE OF DECAY:**

This find suffered with severe Azurite causing complete loss of original surface.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 4.80g.**TREATED WEIGHT:** 4.78g.**PRIOR DIMENSIONS:** L: 134.55mm. W: 3.78mm. Diam: 7.72mm.**TREATED DIMENSIONS:** No obvious change.**OTHER RECORDINGS:** Colour photograph.

Prior to conservation



**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

Few of the dense accretions could be removed, as they supported some of the original surface. Instead minor amounts were removed where safe to do so. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

**FEATURE#:** 376**FIND#:** 001**OBJECT:** Pin

**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:** The top of the shank is missing.

**NATURE OF DECAY:**

This find suffered with severe Paratacamite causing much loss to the surface of the metal.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 3.28g

**TREATED WEIGHT:** 3.28g.

**PRIOR DIMENSIONS:** L: 97mm. Diam: 3.03mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The light surface accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes revealing a rich patinated surface.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None

**FEATURE#:** 572

**FIND#:** 001

**OBJECT:** Tack

**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:** None.

**NATURE OF DECAY:**

This find suffered with traces of Paratacamite activity causing much loss to the surface along the centre of the shaft.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

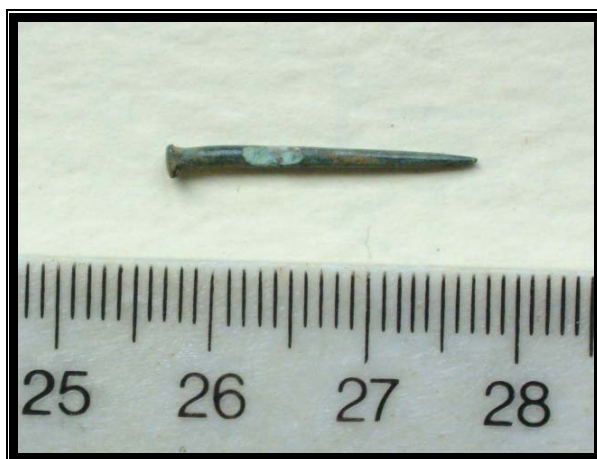
**PRIOR WEIGHT:** 0.22g.

**TREATED WEIGHT:** 0.22g.

**PRIOR DIMENSIONS:** L: 21mm. Diam: 2.48mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation



**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The fine accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This revealed a rich patina which was preserved. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

<b>FEATURE#:</b> 800	<b>FIND#:</b> 030	<b>OBJECT:</b> Ring – from ring pin
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**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:** It is likely that this ring is from ring pin

**NATURE OF DECAY:** This find suffered with severe Paratacamite.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 1g.

**TREATED WEIGHT:** 1g.

**PRIOR DIMENSIONS:** T: 2.5mm. Diam: 4.57mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The dense accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This revealed a rich patina which was preserved. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

<b>FEATURE#:</b> 800 Loose find	<b>FIND#:</b> 031	<b>OBJECT:</b> Pin shank
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**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:** This pin shank is incomplete with loss to the tip area.

**NATURE OF DECAY:** This find suffered with severe Paratacamite.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 4.75g.

**TREATED WEIGHT:** 4.69g.

**PRIOR DIMENSIONS:** L: 54.60mm. W: 5.72mm X 4.30mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels, dental pick and conservation brushes revealing a rich patina and many decorative dots to one face of the pin.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

**FEATURE#:** 800**FIND #:** 032**OBJECT:** Cylindrical bar**COMPOSITION:** Metal – Copper alloy.**INCOMING OBSERVATIONS:** None.**NATURE OF DECAY:** This find suffered with severe Paratacamite.**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 0.45g.**TREATED WEIGHT:** 0.48g.**PRIOR DIMENSIONS:** L: 18.58mm. Diam: 2.30mm.**TREATED DIMENSIONS:** No obvious change.**OTHER RECORDINGS:** Colour photograph.

Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

**FEATURE#: 1300****FIND#: 001****OBJECT: Ring fragment**

**COMPOSITION:** Metal – Copper alloy.

**INCOMING OBSERVATIONS:** None.

**NATURE OF DECAY:** This find suffered with severe Paratacamite.

**AIM OF INTERVENTION:**

Clean the surface of the find to reveal surface detail and conserve to retard further decay.

**PRIOR WEIGHT:** 0.30g.

**TREATED WEIGHT:** 0.25g.

**PRIOR DIMENSIONS:** T: 1.5mm. Diam: 9.37mm.

**TREATED DIMENSIONS:** No obvious change.

**OTHER RECORDINGS:** Colour photograph.



Prior to conservation

**ENVIRONMENTAL / HANDLING CONDITIONS:**

Store this find in a controlled and monitored environment between 20% and 35% relative humidity. Always avoid extreme fluctuations of humidity. Always wear inspection gloves when handling.

**TREATMENT PROCESS:**

The accretions were carefully removed to expose all underlying corrosion and to reveal any surface tool marks and/or decoration. This work was carried out using white light under X50 magnification. Various tools were employed which included scalpels and conservation brushes.

Chlorides were removed by immersing the find in a solution of Benzotriazole @ 5% in Ethanol for a period of 10 hours

Protective coatings were applied to the surface to prevent the ingress of moisture and polluting materials. These coatings were Incralac to form a hard durable surface followed by microcrystalline wax – Renaissance.

**COMMENTS:** None.

All measurements are recorded as maximum sizes.

FIND #	OBJECT DESCRIPTION	PRIOR CONDITION
A015:060:348:012	Iron Ring pin	Dense accretions with weeping chlorides
A015:060:800:30	Cu. Alloy coffer wire ring	Severe Paratacamite activity
A015:060:800:32	Cu. Alloy pin fragment	Paratacamite activity
A015:060:800:31	Cu. Alloy ring pin fragment	Severe Paratacamite activity
A015:060:376:001	Cu. Alloy pin	Paratacamite activity
A015:060:572:001	Shroud pin	Trace of Paratacamite activity
A015:060:1300:001	Small Cu. Alloy ring	Paratacamite activity
A015:060:348:002	Copper alloy loop-shaped attachment	Chloride decay
A015:060:237:001	Cu. Alloy Pennanular Brooch	Covered with dense accretions, exhibited traces of Azurite chloride. As this brooch is decorated, removal of accretion was strongly advised.
A015:060:324:019	Cu. Alloy pin	Severe Azurite activity
A015:060:179:001	Cu. Alloy Brooch	Severe Paratacamite activity
A015:060:122:001	Cu. Alloy stick pin	Incomplete and with trace of Paratacamite activity
A015:060:104:002	Cu. Alloy nail or pin	Paratacamite activity
A015:060:104:001	Cu. Alloy pin	Severe Azurite activity
A015:060:102:001	Cu. Alloy ring pin	Severe Azurite activity
A015:060:1:103	Cu. Alloy ring pin	Severe Azurite activity

A015:060:179:001	Cu. Alloy Brooch	Severe Paratacamite activity
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Sent to Raghnaill O'Floinn, National Museum of Ireland in late July 2006 and returned for conservation.

**\*All other metal finds were conserved by Suzanna Kelly who does not provide a report\***

## **Appendix 15 Metal Finds Report**

# **Report on the Metal Artefacts from the M7 Portlaoise to Castletown/M8**

## **Portlaoise to Cullahill Motorway Scheme, Contract 1**

### **For Archaeological Consultancy Services**

**By**

**Órla Scully, MA MIAI**



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**Report on the Metal Artefacts from the M7 Portlaoise to Castletown/M8****Portlaoise to Cullahill Motorway Scheme, Contract 1****For Archaeological Consultancy Services****By****Órla Scully, MA MIAI****Introduction**

There are metal finds from twelve excavation sites in contract one. These are; Addergoole 2 (E2213), Cannonswood 1 (E2200), Cannonswood 2 (E2201), Cuffsborough 1 (E2185), Cuffsborough 3 (E2198), Cuffsborough 4 (E2184), Cuffsborough 5 (E2199), Curragh 2 (E2249), Gortnagroagh 1 (E2189, ) Parknahown 3, (E2186), Parknahown 5 (E2170), and Springfield 3 (E2192). In total there were 290 metal artefacts from contract one, (here fragments of a single are counted as one, if multiple numbers were issued it is indicated in the catalogue). Most were iron, 32 were copper alloy, one silver bank token and one unidentified- modern- alloy.

The results of the examination are given in the accompanying catalogue. The finds are listed according to their National Museum of Ireland registration no. The next listing is the site name, followed the feature from which the artefact was recovered; the finds no; what the object is, what metal type it is; its description; the dimensions and under what category it functioned as.

The measurements are all given as millimetres. The format of measurement is length by breadth by width. In the case of circular objects, the letter 'd' preceding a measurement indicates a diameter. When giving measurements of nails, the first measurement gives length, followed by the max width of the head, followed by the max width of the shaft. If an object is fragmented, the dimensions of the largest piece are given, with the prefix 'max'.

The objects are assigned a function to facilitate discussion. The details of each artefact are given in the catalogue which follows the discussion. The finds from contract one are many and varied. They fall under several functional categories; coinage, domestic, dress, horse equipment, keys and locks, knives, miscellaneous, personal, structural, tools and weaponry. Where possible, a type and date range for an artefact is given.

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Where comparative material from other site can be found it is also given, with full bibliographical references.

### **Coinage**

There is only one item in this section and it came from Parknahown 5. This is a bank token (E2170:102:3), silver, with the obverse having the head of 'Georgius 111 Dei Gratia'. The reverse states that it is a 'Bank token 10 pence Irish 1803'. 'The first copper issue of George 111 was similar in style to that of the old-head coinage of his predecessor [George 11], but owing to a shortage of copper and its resulting high price, none was issued until 1770...From 1775 until 1797 there was no further minting of copper, and once again the lack of official small change prompted merchants, manufacturers, cities, and counties to issue their own tokens, occasionally in denominations as high as the half crown...It was not until 1806 that the Soho mint produced an Irish farthing [in the reign if George 111], one year after it had issued pennies and halfpennies'<sup>3</sup>.

### **Domestic**

Several fragments of sheet metal may derive from vessels. One of these is a rim of copper alloy from Curragh 2, (E2249:130:1) possibly from a plate or bowl or even the base of a candlestick. 'By the 1650's candlesticks of silver, pewter, or sheet brass were made with broad trumpet-like feet sweeping up into straight stems encircled by a drip tray at the midsection almost as broad as the foot'.<sup>4</sup> All other possible vessel fragments were iron. As their survival is fragmentary it must remain a tentative identification. What may be a part of an iron cauldron came from Cuffsborough 4, (E2184: 168:5). Two such pieces were also recovered from Parknahown, (E2170: 325:6 & 347:5). The latter has 4 iron studs. Repair of vessels is well attested to in the archaeological record. An iron pan from Anglo-Saxon levels in York has been repaired in a number of places, with patching plates riveted to the pan, and even used rivets to plug small holes.<sup>5</sup> Iron vessels of mid 9<sup>th</sup>- 11<sup>th</sup> century date are well known in Scandinavia, and continue right through to early modern times. 'The essential continuity of form and function is strikingly demonstrated by a series of Irish cooking pots from the round-bottomed Neolithic bole with its suspension holes to the present-

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<sup>3</sup> Noël-Hume, 1991, 162-6

<sup>4</sup> Noël-Hume, (1991) 93

<sup>5</sup> Ottaway, (1992) 604



day globular iron pot with its twin lugs and its three stubby legs, a concession to a hard uneven floor. The three-legged pot is the countrywife's maid-of-all-work and it is only slowly giving way to flat-bottomed pans and kettles.<sup>6</sup> From the topsoil at Parknahown 5 an iron fragment of what may be a pot or pan handle was recovered (E2170:1:1). The object has tapered rectangular bar sloping to a fan shaped broken edge. It could equally represent part of the bowl and handle of an iron ladle. A handle of a different type from the same site (D2170:231:103) is a simple iron rod, bent somewhat in the centre, gently tapered on either side. It may have acted as a handle to a canister or bucket. From Gortnagroagh 1 a large hook most probably came from a domestic situation, large enough to have hung from a rafter, though the expanded terminal is not spiked. It could also have functioned as part of the suspension of a pot crane. A tack (E2170:104:2) is included as domestic, as it is made of copper alloy and would not have functioned in structural work. It has a small round head and sturdy almost straight shaft. These long shafted tacks 'would have been suitable for fine carpentry and may be seen on extant medieval objects attaching fabric, leather, and other decorative elements to caskets'<sup>7</sup>, including coffins.

### **Dress**

The most spectacular find from contract 1 came from Parknahown 5. This is the copper alloy penannular brooch (2170:179:1). This was recovered from a lens between the primary and secondary fill of the ditch inner enclosure. The brooch is likely to date from the seventh century. 'Irish metal work in the later Iron Age was characterised by a range of personal ornaments and horse fittings in plain cast bronze with engraved and cast curvilinear decoration. Through contact with late and post-Roman Britain in the fourth and fifth centuries, new techniques and forms were introduced. These included a range of new dress ornaments, in particular the penannular brooch - a ring brooch with a gap in the ring to enable a movable pin to be passed through it. The brooches were developed in the third and fourth centuries by British metalworkers ...spirals, stylised animal heads and other curvilinear motifs were derived from the repertoire of the late Iron Age metalworker. Archaeological finds indicated that this fusion [between Roman and British styles] took place first in south-western Britain and was later introduced to the east of Ireland- the area most

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<sup>6</sup> Evans (1957) 76

<sup>7</sup> Groves, 1990, 1102

prone to external influences and contacts.<sup>8</sup> A brooch from Lagore Crannog ‘has terminals in the form of birds’ heads, which originally had settings, perhaps of glass or amber to form the eyes. Hencken attributed the motif to Germanic brooches of the Migration Period, believing the technique of ‘bird head as ornament for a brooch probably reached Ireland along with the Germanic animals of the Book of Durrow’<sup>9</sup> using a brooch from Antrim -very similar to the zoomorphic example from Parknahown 5 to illustrate the point.

A second copper alloy penannular brooch from Parknahown (E2170:237:1) is smaller without the zoomorphic terminals. It is an open sided brooch, with flattened, straight-edged terminals. It is decorated on one side only with vertical lines. The terminals are raised around circular sockets which may have contained enamel or glass beads. The pin is rolled over the frame of the brooch.

These bronze penannular brooches could have been worn by a man or a woman. They had a long span in Irish ornamental jewellery, the later examples of which became more stylised with lavish decoration, such as the Tara and Loughmoe-or ‘Tipperary’-Brooches, quintessentially Irish in global iconography. In Britain the design lived on primarily in escutcheons on hanging bowls, often associated with Anglo-Saxon graves of the sixth and seventh centuries.

Four ring pins came from the same site. Three of these were copper alloy, and one made of iron. Similar iron examples were found in Feltrim Hill near Dublin.<sup>10</sup> From there came twenty three ring-headed iron examples. Among these several round-sectioned pins with a blunt point with the opposite end of the pin hammered flat and looped over to hold the ring were found. This compares with a find from Parknahown 5, (E2170:1:103). The finds from Feltrim Hill are from an Early Christian enclosure, a habitation site dated by associated finds to within the 8<sup>th</sup> and 10<sup>th</sup> century period.

The pin of one unstratified ring pin from Parknahown, with perforated head, had no ring attached, but was decorated with dot motif over most of its surface.

A cylindrical highly decorated bead (E2170:216:2) found in the primary fill of the inner ditch cut is beautifully preserved. The object is decorated with a variety of incised lines; perforated longitudinally, the central panel has a blackberry or raised crosshatch motif. This panel is confined on both sides by 3 concentric lines. The

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<sup>8</sup> Ó Flóinn, (2001) 172

<sup>9</sup> Hencken, (1950) 64

<sup>10</sup> Hartnett & Eogan, (1964) 33

terminals also have panels of 3 concentric lines and the interval between the centre and terminals is decorated with a herring bone design. The decoration is symmetrical from the central axis. This decoration compares extremely well with an object from Ballinderry crannóg. The object from the crannóg is ‘a C-sectioned half cylinder of bronze decorated with alternating bands of cross-hatching, herringbone and parallel lines’. This is uncannily like the bead from Parknahown 5. In his re-interpretation of the evidence from the site, Newman notes the comparisons with the pattern on the hoop of the large zoomorphic brooch found in Ballinderry and also compares the design with the Sutton Hoo hanging-bowl escutcheon frames, claiming ‘an emphatic endorsement of a later 6<sup>th</sup> century date’.<sup>11</sup>

A round-headed collared stick pin (E2170:122:1) from Parknahown is unusual. Stick pins follow on from ring pins in the archaeological record, atrophied versions of the ringed pin. This is most closely paralleled with round headed class of pin in O Rahilly’s classification of the Dublin stick pins, a sub division of stud headed pins found from the 1100’s onwards in Dublin City. Coarse loose weave woollen clothes of early medieval period were replaced with finer weaves, and this may have been a reason for the changes in the pin dress fasteners. Fragments of shafts of copper alloy pins could belong to either ring or stick pins, and are catalogued simply as pins.

Several parts of buckles were found in sites from contract 1. Some small flattened bars may represent buckle pins. The large cast copper alloy buckle (E2199:46:1) from Cuffsborough 5 is a late example, having perforations to accommodate a separate central bar. The same can be said of the buckle from Cuffsborough 4, (E2184; 303:1), also copper alloy and decorated with a grooved lines which mimic the outline of the frame. A B-shaped iron buckle (E2170:1003:1) from Parknahown is not a common type. In general, double frames become commoner from the mid 13<sup>th</sup> century.

A dress, or household pin (E2170:572:1), in this instance from a grave, would in the context from which it was recovered have held a shroud together. These pins were produced from the 13<sup>th</sup> century. ‘Although often called ‘sewing pins’, they were also used for fixing women’s head-dress and in general instead of buttons for fastening clothes’.<sup>12</sup> It is not possible to discern what type of head the pin from Parknahown 5 has, solid or wire bound, as it is now conserved and that detail is obscured. It appears to be solid.

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<sup>11</sup> Newman, (2002) 112

<sup>12</sup> Biddle & Barclay, (1990) 560

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## Horse Equipment

The most frequent item from this category was horseshoe nails or fragments thereof. These have flattened rectangular heads and by and large come from the topsoil as would be expected in rural green field sites. Only one of the nails may be an early type. A fiddle- key shaped object (E2170:365:7) is probably a horseshoe nail. These were associated with countersunk holes in a shoe type formally called Norman, now Type 2 of Clarks typology of medieval horseshoes.<sup>13</sup>

The four shoes were fragmentary but did not display any early characteristics, such as a wavy outline. In the case of a small donkey or pony shoe from Parknahown 5 (E2170:800:2) the shoe had a fuller, (a groove running along the centre of the shoe in which the nail-head sits), a post-medieval innovation.<sup>14</sup>

## Keys and Locks

A much corroded cylindrical object (E2170:348:6) from Parknahown 5 may represent the remains of a barrel padlock. Where the outer shell has fallen away in antiquity, some central striations are visible which may represent the internal spines and springs. 'Box padlocks with internal mechanisms incorporating leaf springs were in use until the eleventh century and barrel padlocks with similar mechanisms were in use at the same time and continued in use throughout and beyond the medieval period'.<sup>15</sup> A possible barrel padlock key (E2170:234:1) was recovered from a different context on the same site. The top of the shank is looped over, a common terminal for barrel padlock keys, but here the bit is obscured by corrosion so classification is ruled out.

## Knives

There were a total of twenty knives in the Contract 1 assemblage. All but two came from Parknahown 5. Nearly all of the knives were whittle-tanged. These have a simple extended tapering terminal to the blade to facilitate hafting by the insertion into the handle. Whittle-tanged knives pre-dated the scale-tanged variety (a flattened broad tang which is riveted to plated handles). The tang did not always survive, but only one scale-tang knife (E2170:348:41) was identified from the contract 1 knives.

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<sup>13</sup> Clark (1995) 86

<sup>14</sup> Clark (1986) 1

<sup>15</sup> Goodall, (1990) a, 1001

Whittle-tanged knives are basically a derivative of the Saxon Scramasax knife, which had a characteristic angle halfway down the back of the blade. This form of knife is classed as Type A by Goodall.<sup>16</sup> It is known from tenth to thirteenth-century contexts in Britain. There are no examples from contract 1. Type B is characterised by a flat blade-back, which angles down to the tip, with a straight or curved cutting edge. This type is dated by Goodall from the ninth century to not later than the fourteenth century. There are two Type B knives from contract 1, (E2170:356:9 & 145:2). There are four Type C knives from the assemblage (E2170:324:6 & 33:2; E2184:2:3; E2198:64:3). This type is recorded prior to the tenth century and is found in limited numbers in late medieval contexts. Type D are knives in which the blade-back and cutting-edge both taper from the junction of the tang to the tip. There is only one from contract 1, (E2170:356:12). The final type in Goodall's typology is Type E, the most popular type in the collection from contract 1, totalling eight. This has a curved blade-back, with variously shaped cutting-edge. Its date range is also broad, from the tenth to the fifteenth century. Whilst such a typology is devised from a well stratified urban excavation, the caveat must be applied to more rural self sufficient sites, where smiths were reproducing tried and tested forms, which would have a long lifespan. Trends of guilds did not apply to the smithy of a rural enclosure. An example of a possible folding knife comes from Parknahown 5 (E2170:356:4). The blade tip is incomplete but a pronounced arch at the junction between the tang and the blade is suggestive of the type. At a point near the tang, before the object arches upwards is a small indentation which may be the location of the pivotal rivet. The tang is flatter than normal whittle tangs.

### **Miscellaneous**

This category contains the various bars, strips, slag and unidentified material which do not fit under any other functional category. Included here are some decorative mounts which may have been attached to coffins, (e.g. E2170:324:60). Some finds in this category may be modern, such as the copper alloy bottle rim (E2199:46:2) from Cuffsborough 5. A thin cone of iron (E2170:342:7), though flattened, may have functioned as a chape or ferrule. An unusual item is the clasp (?) from Parknahown 5, (E2170:348:2). This small band of copper alloy is decorated with incised lines and the

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<sup>16</sup> Goodall, (1990) b, 838

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ring terminates in two small perforated right angled projections. Perhaps a rivet passed through the apertures tightening the band around some cloth or ribbon.

### **Personal**

Included here are some mounts and what may have functioned as a clasp, (E2170:1:314). The small rectangular copper alloy piece is doubled over and secured by a tiny rivet. It may also have functioned as a belt chape but more likely was used to fasten a small purse, or binding strap of a prayer book may have used such a terminal to assist closing.

A copper alloy mount or binding strip (E2170:348:1) may have been mounted on a book. The flat shaped strip has three small apertures for rivets. Another small mount is iron, tapered with an expanded bi-lobed head. Each lobe has a perforation, both decorative and presumably functional for attachment.

Finally, a beautiful 3-sided copper alloy mount from Parknahown 5 (E2170:800:11) completes this category. The face of the enamelled mount has a cross as its central motif. The outline of the cross is done in a darker material, possibly niello. 'Niello is a mixture of sulphides, usually of copper, lead and silver. It has been used as a black 'ground' since the Roman period and probably shows up best in Anglo-Saxon metalwork where it is used extensively as a black matrix to contrast with silver and copper-base metals'.<sup>17</sup> The background to the cross is infilled with light green coloured enamel. There are two projecting sides, with small perforations in each, and the front top and bottom are expanded in semi circular panels, also filled with enamel. It may have functioned as a 'slider', a medieval strap attachment. A similar type of object from Ballynahone Beg, Co Armagh is dated from the 8<sup>th</sup> to the 10<sup>th</sup> century.<sup>18</sup>

### **Structural**

The majority of the finds from contract 1 fall under this category. Of the 290 objects examined, 105 of them were nails; 5 were rivets- one with the rove still attached and 2 roves alone. The distinction between nails and rivets when the rove is absent is often a matter of thickness and size, rivets being more sturdy and robust. Spikes are very large nails, of which there were two examples, (E2199:83:1 & E2249:16:1). Rivets were used to fit heavy timbers together. They are often referred to as clench bolts and are very often found in association with boats in Viking and medieval contexts. A rivet consists of a 'nail which, once passed through the timbers to be joined, had a

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<sup>17</sup> Tylecote, (1990) 132

<sup>18</sup> Bourke, (2003)92

small pierced plated, the rove, set over its tip. The tip was then burred or hammered over [clenched] to hold the bolt in position'.<sup>19</sup> Two examples of large timber connecting spikes were identified. These are rarely pristine and- corrosion aside, are usually twisted, bent or otherwise incomplete. Nearly all nails are rectangular-sectioned, round headed and tapered to a point. There is very little difference in nail shape from the Iron Age to the early modern period. Nails from the Iron Age site at Freestone Hill in Co. Kilkenny, or the Early Christian levels at Garryduff Ringfort, Ballinderry Crannog or throughout medieval levels in Irish cities are remarkably similar. As such they are fairly ubiquitous, but not a good aid for dating due to the continuity of type when hand manufactured. It was not until the late 18<sup>th</sup> century that nails were manufactured by machine, but they continued to be hand wrought, especially in rural areas.

## Tools

The long tapered bar (E2189:1:4) with angled point from Cuffsborough 5 is likely to have been used as a stone punch. It resembles a medieval example found in Kings Lynn, Norfolk.<sup>20</sup> As builders' tools, they have a long span of use, but are normally found in later medieval or post medieval contexts, as early houses were mostly constructed of wood. Two other punches from Parknahown are from the same context, (215). They are long and possibly used by a mason. Other tools include what may have functioned as a chisel; (E2170:342:4). It is similar in form to a slightly smaller find from late fourth or early fifth century at Shakenoak in England<sup>21</sup>. Another partly socketed object (E2170:348:4) with a flat rounded head may be a socketed gouge, known from Roman carpenters' tools.<sup>22</sup> A tanged spoon bit auger (E2170:224:5) from Parknahown 5 would have also been used in woodwork. These iron bits would have been 'set in transverse wooden handles [and] were used to drill holes in wood'.<sup>23</sup> A large iron needle (E2170:341:1) is large enough for a sacking needle. The object is broken where the bifurcation for the eye begins. It is rounded near the eye, and becomes rectangular as it tapers down the shank. Towards the point, the axis of the rectangular section is turned, forming a triangular sectioned point. At the point of

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<sup>19</sup> Ottaway, (1992)615

<sup>20</sup> Goodall, 1981 53

<sup>21</sup> Brodrib et al (1968) 102

<sup>22</sup> Aldred, (1956) 231

<sup>23</sup> Goodall, op cit

the change of axis, the object is gently curved. Large curved needles were used for sewing leather and course fabrics. Iron needles were found in Iron Age habitation levels at Freestone Hill,<sup>24</sup> and on several medieval urban sites in Ireland. The length of the artefact from Parknahown is comparable to one from Winchester<sup>25</sup> which is 18<sup>th</sup> century in date. Three awls all came from Parknahown. Two (E2170:325:3 & 224:4) are classic examples, double-pointed tapered from the centre such as those found in the early medieval levels at Castle Acre Castle in England.<sup>26</sup> The third (E2170:388:1) is a socketed spike, which may have been used as an awl or small punch. Three small wedges from Parknahown (E2170: 1: 13; 341: 3 & 342:12) would have been used in wood chopping. This type of object is unchanged in type almost to modern times. A possible fish hook from Cuffsborough 4, (E2184: 303:3), is similar to the smaller examples from Waterford City<sup>27</sup>, though without a barb, the Cuffsborough example is a tentative identification. The long bar with blade on one side (E2199:6:1) though slender, is most likely to be part of a shears.

### **Weaponry**

The artefacts categorised as weapons are tentatively classified as such. Three of the objects are small links, which it is suggested only, may have been part of mail. This would have been worn to deter arrow heads or even sword wounds and was widespread before the fourteenth century. The links (E2170:192:6, 743:1 & 1300:1) are 9mm long, and are similar in appearance and size to the links of a piece of mail found in medieval levels of a graveyard in Waterford.<sup>28</sup> Mail armour was basically of a form that had remained in use since it had been adapted in the Later Roman Empire. During the fourteenth century the overall trend was for a transition from mail to plate armour.

The other possible weapon is a blunt-ended possible hunting arrow (E2170:324:12). This is a rectangular sectioned leaf shaped object, but it must be stressed it is not flat and as such is suggested as a type of weapon used to stun or kill feathered or furred animals without penetrating the skin in the latter or in the former, when the bird was to be kept alive. Wooden and antler artefacts identified as such were found in Novgorod,

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<sup>24</sup> Raftery, (1968) 73

<sup>25</sup> Biddle & Elmhirst (1990) 813

<sup>26</sup> Goodall, (1982) 229

<sup>27</sup> Scully, (1997) 463

<sup>28</sup> Scully (1997) b 449



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and Waterford. <sup>29</sup>A metal type, with blunt point, found in Hiberno-Norse levels in Waterford was suggested as such a weapon.<sup>30</sup>

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<sup>29</sup> Hurley, (1997) 667

<sup>30</sup> Halpin (1997) 541

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## **Bibliography**

Aldred, C. (1956) 'Furniture to the end of the Roman Empire' in 'A History of Technology' edited by C. Singer et al.

Biddle M and L. Elmhirst, (1990) 'Sewing Equipment' in M. Biddle 'Object and Economy in Medieval Winchester', vol 7 ii ii

Biddle M and K. Barclay (1990) 'Sewing pins and wire' in M. Biddle 'Object and Economy in Medieval Winchester', vol 7 ii ii

Bourke, C. (2003) 'Three Early Medieval Mounts from Co. Armagh' in *Ulster Journal of Archaeology*, Vol 62.

Brodribb, A, A. Hands & D. Walker, (1968) 'Excavations at Shakenoak Farm, Near Wilcote, Oxfordshire, Part 1: sites A & D

Clark, J. (1986) 'Medieval Horseshoes, datasheet 4, Finds Research Group 700-1700',- consolidated reprint of datasheets issued by the Finds Research Group between 1985 and 1998'

Clark, J. (1995) 'The Medieval Horse and its Equipment', *Medieval Finds From Excavations In London*'.

Evans, E. E. (1957) 'Irish Folk Ways'

Goodall, I. H. (1981) 'The medieval blacksmith and his products' in D. W. Crossley, *Medieval Industry*, CBA no. 40

Goodall, I. H. (1982) The Iron Objects in J. Coad & A. Streeten 'Excavations at Castle Acre Castle, Norfolk. *Archaeological Journal*, 139

Goodall, I. H. (1990) a 'Locks and Keys' M. Biddle, *Object and Economy in Medieval Winchester*, vol 7 ii ii

Goodall, I.H. (1990) b 'Knives and Spoons' in M. Biddle, *Object and Economy in Medieval Winchester*, vol 7 ii ii

Groves, M, (1990) 'Silver and Copper Tacks' in M. Biddle 'Object and Economy in Medieval Winchester', vol 7 ii ii

Halpin, A. (1997) 'Archery Material' in M. Hurley & Ó. Scully, Late Viking Age and Medieval Waterford, Excavations 1986 – 1992

Hartnett, P.J & G. Eogan, (1964) 'Feltrim Hill, Co. Dublin; a Neolithic and Early Christian Site' in Journal of the Royal Society of Antiquities of Ireland, 94.

Hencken, H. O'N, (1950) Lagore Crannóg: an Irish Royal residence of the 7<sup>th</sup> to the 10<sup>th</sup> century A.D.' in Proceedings of the Royal Irish Academy 53C.

Hurley, M. F. (1997) 'Artefacts of Skeletal Material' in M. Hurley & Ó. Scully, Late Viking Age and Medieval Waterford, Excavations 1986 – 1992

Newman, C., (2002), 'Ballinderry Crannóg No. 2, Co Offaly: Pre- Crannóg Early Medieval Horizon' in Journal of Irish Archaeology, x1

Noël-Hume, I (1991) 'A Guide to Artifacts of Colonial America'

Ó Flóinn, (2001), 'Treasures of the National Museum of Ireland'

Ottaway, P. (1992) 'The Anglo-Saxon metalwork from Coppergate, York.

Raftery, B. 'Freestone Hill, Co. Kilkenny: An Iron Age Hillfort and Bronze Age Cairn' in Proceedings of the Royal Irish academy, Vol 68, C.

Scully, Ó (1997) 'Metal Artefacts' in M. Hurley & Ó. Scully, Late Viking Age and Medieval Waterford, Excavations 1986 – 1992

Tylecote, R. F. (1990) 'Scientific Examination and Analysis of Objects of Copper-Base Alloy' in M. Biddle, Object and Economy in Medieval Winchester, vol 7 ii i

**Catalogue of Metal Artefacts**  
**From the M7 Portlaoise to Castletown/M8 Portlaoise to Cullahill Motorway Scheme, for A.C.S. Ltd**

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0001	001	iron	nail	round head, shaft sheared diagonally and only partial remains	27 x 16 x 10mm	structural
E2170	Parknahown 5	0001	013	iron	wedge	thick short tapered bar	66 x 13 x 11mm	tools
E2170	Parknahown 5	0001	018	iron	nail	fragment of rectangular tapered shaft only	19 x 4 x 3mm	structural
E2170	Parknahown 5	0001	026	iron	horseshoe e nail	rectangular head and expansion of the tapered flattened rectangular shaft, point missing	23 x 8 x 6mm	horse equipment
E2170	Parknahown 5	0001	028	iron	nail	rectangular tapered shaft only	40 x 7 x 5mm	structural
E2170	Parknahown 5	0001	038	iron	nail	round head, rectangular shaft, adhesions	68 x 19 x 10mm	structural
E2170	Parknahown 5	0001	039	iron	nail	vestige of head only, rectangular tapered shaft	48 x 9 x 8mm	structural
E2170	Parknahown 5	0001	040	iron	buckle	part of D-shaped frame, rectangular section, incomplete, curved side slightly wider than straight side	27 x 23 x 5mm	dress
E2170	Parknahown 5	0001	045	iron	horseshoe e nail	rectangular head, short tapered shaft	22 x 9 x 7mm	horse equipment
E2170	Parknahown 5	0001	046	iron	nail	head incomplete, at present rectangular, rectangular shaft	27 x 17 x 7mm	structural
E2170	Parknahown 5	0001	047	iron	nail	rectangular tapered shaft, round head, complete	65 x 19 x 8mm	structural
E2170	Parknahown 5	0001	048	iron	nail	large round head, tapered rectangular shaft which is missing end of shaft	37 x 21 x 6mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0001	052	iron	strap hinge	triangular-shaped flat sheet, though no rivet holes apparent, most likely to have functioned as strap hinge	93 x 43 x 6mm	structural
E2170	Parknahown 5	0001	055	iron	nail	rectangular sectioned fragment of shaft	23 x 9 x 8mm	structural
E2170	Parknahown 5	0001	056	iron	horseshoe nail	point of nail, section is a flattened rectangle	26 x 7 x 5mm	horse equipment
E2170	Parknahown 5	0001	057	iron	nail	oval head, rectangular sectioned shaft, incomplete	28 x 15 x 7mm	structural
E2170	Parknahown 5	0001	058	iron	horseshoe nail	flattened rectangular head is an expansion of shaft	43 x 13 x 6mm	horse equipment
E2170	Parknahown 5	0001	059	iron	nail	oval head, rectangular shaft, tip of point missing	48 x 14 x 10mm	structural
E2170	Parknahown 5	0001	060	iron	nail	fragment of rectangular shaft	36 x 7 x 6mm	structural
E2170	Parknahown 5	0001	063	iron	nail	small round head, rectangular shaft, flaking	40 x 5 x 4mm	structural
E2170	Parknahown 5	0001	064	iron	nail	fragment of rectangular shaft	18 x 4 x 4mm	structural
E2170	Parknahown 5	0001	066	iron	nail	rectangular shaft, no head	52 x 8 x 7mm	structural
E2170	Parknahown 5	0001	074	iron	nail	rectangular shaft, no head	43 x 6 x 4mm	structural
E2170	Parknahown 5	0001	075	iron	bar	tapered rectangular sectioned bar, broken at wider end, poss tang for tool?	49 x 10 x 9mm	tools?

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0001	078	iron	horseshoe nail	flattened rectangular head is an expansion of shaft, shaft bent	24 x 11 x 5mm	horse equipment
E2170	Parknahown 5	0001	079	iron	nail	fragment of rectangular shaft	20 x 8 x 6mm	structural
E2170	Parknahown 5	0001	087	iron	nail	rectangular shaft, no head	26 x 6 x 5mm	structural
E2170	Parknahown 5	0001	088	iron	nail	rectangular shaft, no head	49 x 8 x 7mm	structural
E2170	Parknahown 5	0001	089	iron	nail	head sub round, damaged, rectangular shaft,	39 x 11 x 8mm	structural
E2170	Parknahown 5	0001	092	iron	nail	head sub round, damaged, rectangular shaft, bent	32 x 7 x 3mm	structural
E2170	Parknahown 5	0001	093	iron	nail	head sub round, damaged, rectangular shaft, flaking	21 x 8 x 6mm	structural
E2170	Parknahown 5	0001	094	iron	nail	rectangular shaft, fragment, no head	23 x 6 x 6mm	structural
E2170	Parknahown 5	0001	095	iron	tang?	tapered rectangular bar, slightly flattened at one end into blunt rounded point, poss tang of knife or tool	56 x 8 x 6mm	tools?
E2170	Parknahown 5	0001	102	iron	nail	circular sectioned short pointed shaft, modern nail	19 x d 3mm	structural
E2170	Parknahown 5	0001	105	iron	nail	square head, slender tapered rectangular shaft, complete	28 x 10 x 4mm	structural
E2170	Parknahown 5	0001	106	iron	unident	piece of stone with corrosion products adhering or high haematite content	n/a	misc

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0001	109	iron	nail	head incomplete, at present rectangular, rectangular shaft	32 x 14 x 6mm	structural
E2170	Parknahown 5	0001	114	iron	nail	sub round large head, rectangular shaft	52 x 21 x 8mm	structural
E2170	Parknahown 5	0001	117	iron	nail	vestige only of head, tapered partial remains of rectangular shaft	19 x 10 x 7mm	structural
E2170	Parknahown 5	0001	120	iron	nail	rectangular tapered shaft only	60 x 7 x 6mm	structural
E2170	Parknahown 5	0001	122	iron	nail	sub round head, rectangular shaft point missing	26 x 16 x 9mm	structural
E2170	Parknahown 5	0001	126	iron	buckle pin?	rectangular sectioned short bar with flattened tip, and opposite end slightly bent, poss. for attachment to buckle frame	25 x 6 x 4mm	dress?
E2170	Parknahown 5	0001	136	iron	nail	head incomplete, at present rectangular, rectangular shaft	31 x 14 x 6mm	structural
E2170	Parknahown 5	0001	137	iron	unident	section of rolled over sheet metal, poss. rim of box or flattened tube	53 x 12 x 8mm	misc
E2170	Parknahown 5	0001	138	iron	unident	flattish scrap of metal, un-diagnostic	24 x 14 x 6mm	misc
E2170	Parknahown 5	0001	139	iron	nail	rectangular tapered shaft only	67 x 9 x 8mm	structural
E2170	Parknahown 5	0001	140	iron	nail	sub round head, rectangular shaft	76 x 15 x 8mm	structural
E2170	Parknahown 5	0001	142	iron	chain link	oval shaped link, small opening, sub-rectangular in section	56 x 28 x 7mm	misc

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0001	143	iron	nail	small, corroded, round head and rectangular shaft	29 x 10 x 6mm	structural
E2170	Parknahown 5	0001	144	iron	nail	rectangular tapered shaft only	76 x 9 x 8mm	structural
E2170	Parknahown 5	0001	157	iron	nail	round head, tapered rectangular shaft	65 x 10 x 8mm	structural
E2170	Parknahown 5	0001	229	iron	knife	tip of blade triangular section, rounded tip	28 x 15 x 4mm	knives
E2170	Parknahown 5	0001	314	cu alloy	clasp	rectangular flat strip doubled over and secured by tiny rivet. Like a belt chape, but may be part of purse clasp	15 x 10 x 2mm	personal
E2170	Parknahown 5	0026	001	iron	eyed hinge	tapered rectangle which has an open, eyed head, which is a flattened band.	49 x 21 x 18.5mm	structural
E2170	Parknahown 5	0029	001	iron	nail	fragment of rectangular shaft	26 x 9 x 7mm	structural
E2170	Parknahown 5	0029	002	iron	nail	fragment of rectangular shaft	30 x 9.5 x 8mm	structural
E2170	Parknahown 5	0029	003	iron	nail	shaft only, corroded, rectangular, tapered	34 x 11 x 10mm	structural
E2170	Parknahown 5	0029	004	iron	nail	round head, detached, rectangular shaft, section only	a: 18 x 12 x 8mm, b: 21 x 9 x 7mm	structural
E2170	Parknahown 5	0029	005	iron	nail	shaft only, corroded, rectangular, tapered	35 x 11 x 9mm	structural
E2170	Parknahown 5	0029	006	iron	nail	corroded rectangular sectioned piece of shaft	39 x 13.5 x 13mm	structural



museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0032	001	iron	knife	fragment of triangular-sectioned blade, non diagnostic	37 x 11 x 3mm	knives
E2170	Parknahown 5	0034	003	iron	unident	two straight-sided flat bars, rectangular in section, originally one object? One narrow, like tang. Not a knife as section not triangular, possibly a file? Some smaller fragments do not aid identification	a: 60 x 11 x 4mm b: 65 x 13 x 3mm	misc
E2170	Parknahown 5	0036	003	iron	knife	blade back and edge curved, blade may be worn in this way, tip of blade edge straight, type E	62 x 13 x 4mm	knives
E2170	Parknahown 5	0037	001	cu alloy	binding strip/mou	broken into 3 parts, flat strap with rounded terminals, 2 rivets survive near each end. 2 small holes or eyelets at one end, and short bifurcation at opposite end	53 x 8.5 x 3.5mm	misc
E2170	Parknahown 5	0100	004	iron	staple	rectangular sectioned bar, slightly expanded in the centre, turned down at right angles to two short arms which are tapered to points	51.5 x 9 x 8mm	structural
E2170	Parknahown 5	0102	003	silver	coin token	obverse; 'Georgious III Dei Gratia', reverse; 'Bank Token 10 pence Irish 1803'	d 23 x 1.3mm	coinage
E2170	Parknahown 5	0102	004	iron	tang?	rectangular tapered bar, which thickens at the wider end, where it is broken, poss tang for tool, bend upwards at wider end	85 x 15 x 11mm	tools?
E2170	Parknahown 5	0104	001	cu alloy	pin	tip of tapered pin, circular in section, of stick or ring pin?	25 x d 2.5mm	dress
E2170	Parknahown 5	0104	002	cu alloy	tack?	short rectangular sectioned bar, pointed, with small barely differentiated round head	23 x 3 x 2.5mm	domestic?
E2170	Parknahown 5	0105	001	iron	unident	small corroded lump	15 x 10 x 9mm	misc
E2170	Parknahown 5	0109	001	iron	tang?	sturdy rectangular bar, tapered to a flat blunt point, tentative i.d. (not a nail, as not pointed) tentative i.d.	75 x 10 x 9mm	structural
E2170	Parknahown 5	0122	002	iron	nail	no head, long tapered rectangular shaft	87 x 7 x 6mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0122	007	iron	nail	partial remains of shaft, no head	25 x 9 x 7mm	structural
E2170	Parknahown 5	0122	008	iron	tang	tapered rectangular sectioned bar, whittle tang	32 x 8 x 4mm	knives
E2170	Parknahown 5	0122	010	iron	nail	corroded rectangular sectioned tapered shaft	86 x 11 x 9mm	structural
E2170	Parknahown 5	0132	004	iron	scrap	irregularly shaped piece of sheet metal, possibly part of vessel, but no clean edges	54 x 40 x 8	misc
E2170	Parknahown 5	0142	001	iron	buckle pin?	circular-sectioned tapered bar, ends in neat point. The 'head' is corroded, and flattened into roughly circular flat disc, with break at top, possibly the point of attachment to frame. Large, ergo poss used in	66 x 12 x 8mm	horse equipment
E2170	Parknahown 5	0145	002	iron	knife	straight blade edge, blade back straight and drops to point, tang missing, type B	74 x 14 x 3mm	knives
E2170	Parknahown 5	0149	002	iron	strap	rectangular strip with 3 rivet holes along its length, the central rivet still in place, wider at one end, rounded terminals	112 x 19 x 11mm	misc
E2170	Parknahown 5	0149	003	iron	hinge	tapered point perforates shaped object, rectangular where pierced, then narrows, before expanding again to oval shape, which is also pierced, though only part of second point survives, window furniture	45 x 37 x 15.5mm	structural
E2170	Parknahown 5	0149	010	iron	tethering ring	large circular closed ring, rectangular in section	d88, (int 73) x 8mm	tools
E2170	Parknahown 5	0154	001	iron	knife	gently curved blade back, blade edge straight, whittle tang set low, complete, type E	86 x 16 x 5mm	knives
E2170	Parknahown 5	0161	003	iron	nail	damaged, originally round head, short tapered rectangular shaft	21 x 9 x 8mm	structural
E2170	Parknahown 5	0161	004	iron	nail	rectangular shaft tapered to a point, head missing, corroded	73 x 13 x 10mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0192	006	cu alloy	link frag	circular-sectioned semi-circular piece, possibly part of mail	9 x 3 x d 2mm	weaponry?
E2170	Parknahown 5	0194	003	iron	slag	shiny bubbled elongated lump	41 x 18 x 7mm	misc
E2170	Parknahown 5	0194	007	iron	nail	small rectangular sectioned shaft adhering to stone. Measurement nail only	26 x 8x5mm	structural
E2170	Parknahown 5	0216	001	iron	rove	head incomplete, at present rectangular, rectangular shaft	47 x 17 x 4mm	structural
E2170	Parknahown 5	0216	003	iron	nail	round head, rectangular tapered long shaft	64 x 15 x 9mm	structural
E2170	Parknahown 5	0216	004	iron	nail	rectangular shaft, some mortar adhering	37 x 9 x 8mm	structural
E2170	Parknahown 5	0216	005	iron	buckle pin?	neat short tapered bar with point intact. Opposite end penetrates a small oval piece. Possible buckle pin.	34 x 8 x 3mm	dress?
E2170	Parknahown 5	0216	006	iron	knife	blade back gently curved, blade edge is straight, point missing. Tang is long and straight and set centrally. Type E	92 x 12 x 3mm	knives
E2170	Parknahown 5	0216	007	iron	slag	small globular piece with some bubbling on surface	16 x 8 x 7mm	misc
E2170	Parknahown 5	0224	006	iron	strap	irregularly shaped flat piece of sheet metal	31 x 27 x 3mm	misc
E2170	Parknahown 5	0224	007	iron	unident	corroded with adhesions, semi-circular in shape, some stones in corrosions products, possible hook	56 x 43 x 24mm	misc
E2170	Parknahown 5	0231	103	iron	handle?	circular-sectioned bar, bent c 45 degrees near centre, tapered at both ends to blunt points, poss bucket or canister handle	218 x d 11mm	domestic

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0234	001	iron	b.p. key?	rectangular sectioned bar, in 3 pieces, possible barrel padlock key, one end is folded over on itself, the opposite end is thickened with corrosion products, not classifiable, tentative i.d. Measurements of	75 x 7 x 6mm	keys and locks?
E2170	Parknahown 5	0246	001	iron	nail	round head, long rectangular tapered shaft	97 x 16 x 9mm	structural
E2170	Parknahown 5	0314	002	iron	knife	socketed implement, hollow tube, flattened at one end, blunt ends, flattened end is triangular in section, incomplete.	91 x 19 x 15mm	knives
E2170	Parknahown 5	0317	002	iron	horseshoe nail	tapered short flattened rectangular bar	40 x 8 x 6mm	horse equipment
E2170	Parknahown 5	0317	003	iron	horseshoe nail	tapered short flattened rectangular bar	29 x 11 x 8mm	horse equipment
E2170	Parknahown 5	0324	001	iron	horseshoe	tapered rectangular bar, slightly curved, along its length, poss. Heel of a small horse or pony shoe	54 x 15 x 11mm	horse equipment
E2170	Parknahown 5	0324	006	iron	knife	blade back and edge parallel, tip missing, whittle tang incomplete, curved projection between tang and blade edge Type C	67 x 15 x 4mm	knives
E2170	Parknahown 5	0324	008	iron	nail	in two pieces, very corroded rectangular shaft	a: 44 x 11 x 10mm b: 28 x 9 x 7mm	structural
E2170	Parknahown 5	0324	009	iron	unident	small rectangular piece, un-diagnostic	26 x 11 x 4mm	misc
E2170	Parknahown 5	0324	010	iron	horseshoe nail	flattened rectangular sectioned tapered shaft	38 x 10 x 4mm	horse equipment
E2170	Parknahown 5	0324	011	iron	nail	rectangular sectioned shaft, no head	62 x 10 x 8mm	structural
E2170	Parknahown 5	0324	012	iron	arrowhead?	rectangular tang which narrows before expanding to leaf-shaped rectangular-sectioned head, which is tapered to fairly blunt point, hunting arrow?	53 x 10 x 8mm	weaponry?

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0324	013	iron	nail	head damaged, tapered rectangular shaft is complete	83 x 15 x 9mm	structural
E2170	Parknahown 5	0324	016	iron	knife	blade back gently curved, blade edge is parallel until near point where it slopes upwards. Tang is short and straight and set centrally. Type E	70 x 12 x 3mm	knives
E2170	Parknahown 5	0324	017	iron	rivet	large circular head with stout tapered shaft	65 x 33 x 20mm	structural
E2170	Parknahown 5	0324	018	iron	off cut	elongated lozenge-shaped flat piece of sheet.	42 x 10 x 4mm	misc
E2170	Parknahown 5	0324	019	cu alloy	pin/b.p. key?	long circular-sectioned pin, tapered to sharp point, the wider end is flattened and starting to loop over, and tapers slightly before break, gently bent near centre	135 x 7 x 3mm	dress/keys and
E2170	Parknahown 5	0324	021	iron	strap hinge	flat rectangular, slightly tapered strip, now in 2 pieces, rivet intact at narrower end. Indent at wider end suggest broke at rivet hole. Measurements of combined pieces	71 x 25 x 11mm	structural
E2170	Parknahown 5	0324	021	iron	nail	round head, only part of rectangular shaft survives	54 x 19 x 10mm	structural
E2170	Parknahown 5	0324	022	iron	staple	or timber dog, rectangular bar with one end tapered to a sharp point, splayed at a obtuse angle, scar where return should be on other end	95 x 12 x 11mm	structural
E2170	Parknahown 5	0324	022	iron	strap	rectangular flat bar, in two pieces, non diagnostic. Measurements combined	74 x 12 x 8mm	misc
E2170	Parknahown 5	0324	023	iron	unident	folded piece of sheet, formerly wrapped around something, which is now gone,	18 x 17 x 7mm	misc
E2170	Parknahown 5	0324	024	iron	unident	amorphous lump of corrosion products, original object possibly removed altogether, small stones adhering, lumpy, possibly slag or soil associated with furnace	53 x 26 x 20mm	misc
E2170	Parknahown 5	0324	060	iron	escutcheon	Coffin mount, swag shaped mount with apertures at both sides for attachment.	86 x 21 x 6mm	misc

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0325	002	iron	bar	short robust corroded bar, undiagnostic	54 x 21 x 17mm	misc
E2170	Parknahown 5	0325	003	iron	awl	short squared sectioned bar which is tapered at both ends to blunt points, possible awl	57 x 9 x 8mm	tools
E2170	Parknahown 5	0325	006	iron	vessel frag?	one straight side, the other edges are irregular. Slightly curved. Suggestion of a rivet near smooth edge. Poss. fragment of iron pot	46 x 26 x 8mm	domestic
E2170	Parknahown 5	0325	007	iron	nail	round head, long tapered rectangular shaft	75 x 15 x 11mm	structural
E2170	Parknahown 5	0326	002	iron	tang	possible tang of knife or tool. Tapered flat rectangle	60 x 10 x 6mm	knives?
E2170	Parknahown 5	0341	001	iron	needle	long narrow flattened pointed rectangular strip, toward point the axis of the rectangle is opposed, or pinched. At this point the object curves gently. The wider end ends abruptly (broken), though a hint of	134 x 5 x 3	tools
E2170	Parknahown 5	0341	003	iron	wedge	short tapered wedge-shaped bar	50 x 20 x 14mm	tools
E2170	Parknahown 5	0341	004	iron	nail	thin corroded shaft	60 x 6 x 5mm	structural
E2170	Parknahown 5	0342	001	iron	nail	round headed with tapered shaft which is rectangular	35 x 20 x 10mm	structural
E2170	Parknahown 5	0342	005	iron	nail	tapered shaft, head obscured by corrosion	73 x 10 x 8mm	structural
E2170	Parknahown 5	0342	006	iron	nail	damaged, head, long tapered rectangular shaft. Wood appears to survive in corrosion products	91 x 14 x 12mm	structural
E2170	Parknahown 5	0342	007	iron	unident	cone-shaped hollow object, closed at wider end and point of cone truncated, appears slightly grooved along its length	40 x d 13mm	misc

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0342	008	iron	nail	part of shaft, rectangular sectioned, tapered, point and head missing, stone adhering	41 x 10 x 8mm	structural
E2170	Parknahown 5	0342	009	iron	nail	fragment, rectangular outline discernible	11 x 10 x 7mm	structural
E2170	Parknahown 5	0342	012	iron	wedge	short tapered wedge-shaped bar	42 x 16 x 10mm	tools
E2170	Parknahown 5	0342	060	iron	rivet	large round head with tapered rectangular sectioned shaft	86 x 23 x 11mm	structural
E2170	Parknahown 5	0343	002	iron	strap hinge	central section of rectangular strap, rivet holes at both ends	79 x 45 x 5mm	structural
E2170	Parknahown 5	0347	002	iron	staple	rectangular sectioned bar, bent in two right angles, with side arms tapered	64 x 25 x 13mm	structural
E2170	Parknahown 5	0347	003	iron	nail	sub-circular domed head of nail	21 x 17 x 13mm	structural
E2170	Parknahown 5	0347	004	iron	nail	rectangular shaft tapered to a point, head missing	35 x 5 x 4mm	structural
E2170	Parknahown 5	0347	005	iron	vessel frag?	roughly rectangular piece of sheet metal with 4 studs, possible part of vessel, tentative i.d.	45 x 17 x 7mm	domestic?
E2170	Parknahown 5	0347	006	iron	buckle frag?	thin oval sectioned bar, which is turned at both ends. Vague indent in centre, possible part of buckle frame	33 x 9 x 3.5mm	dress
E2170	Parknahown 5	0347	007	iron	horseshoe nail	flattened rectangular sectioned tapered bar, head missing	22 x 7 x 5mm	horse equipment
E2170	Parknahown 5	0348	001	cu alloy	mount	possible book binding, flat strip has three apertures, one at either end, though one is incomplete. The object is flat at one end, narrows, expands and tapers to rounded end which is damaged, where it once	39 x 8 x 3mm	personal

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0348	002	cu alloy	clasp	small looped band with short pieces at both ends turned out. The terminals are perforated, one bifurcated and broken, was originally perforated so both holes lined up to be fastened onto or around	11 x 8 x 3mm, int d 5mm	misc
E2170	Parknahown 5	0348	004	iron	gouge	semi-socketed object, flat body with straight end has raised sides along part of its length, expands to rounded terminal	55 x 17 x 10mm	tools
E2170	Parknahown 5	0348	005	iron	eyed hinge	tapered rectangle which has an open, eyed head, which is a flattened band.	84 x 18 x 13mm	structural
E2170	Parknahown 5	0348	006	iron	lock barrel	round ended cylindrical object, poss.barrel padlock. Much corrosion with stones accreted. Where object has flaked in antiquity there can be seen vertical striations which may represent the lock	62 x 37 x 25mm	keys and locks
E2170	Parknahown 5	0348	007	iron	nail	round head, tapered rectangular shaft	45 x 13 x 7mm	structural
E2170	Parknahown 5	0348	008	iron	nail	only a vestige of the head remains, rectangular tapered shaft	62 x 7 x 5mm	structural
E2170	Parknahown 5	0348	009	iron	staple	thin and narrow strip which is turned in at both ends, in two parts	max 23 x 5 x 4mm	misc
E2170	Parknahown 5	0348	010	iron	buckle?	5 pieces of one object, one of which is bent in a right angle, another is flat rectangular and other pieces rectangular, with one wider, possibly where pin rested. Tentative l.d..	max 33 x 10 x 7mm	dress?
E2170	Parknahown 5	0348	013	iron	nail	round head, twisted tapered rectangular shaft	29 x 12 x 5mm	structural
E2170	Parknahown 5	0348	015	iron	buckle pin?	flat rectangular sectioned bar, with short piece turned over on itself at one end, opposite end pointed, large pin, possibly for girdle of horse	68 x 6 x 3mm	horse equipment
E2170	Parknahown 5	0348	016	iron	mount	possible coffin fixture? Flat bar with one curved end, central expansion, and opposite end incomplete, decorative	62 x 14 x 4mm	misc
E2170	Parknahown 5	0348	017	iron	hinge pivot?	tapered flattened rectangular sectioned bar with evidence for a return at wider end	55 x 23 x 14mm	structural



museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0348	018	iron	nail	round head, most of rectangular sectioned shaft missing	19 x 18 x 10mm	structural
E2170	Parknahown 5	0348	019	iron	nail	round headed with only partial remains of shaft which is rectangular	20 x 15 x 10mm	structural
E2170	Parknahown 5	0348	020	iron	buckle frag?	rectangular-sectioned bar, which is curved at one end. Possible part of buckle frame	insert this	dress?
E2170	Parknahown 5	0348	021	iron	buckle pin?	corroded flat rectangular tapered shaft, possibly a pin of buckle, thickens a little at one end, the opposite end pointed	39 x 6 x 5mm	dress
E2170	Parknahown 5	0348	022	iron	buckle?	flat thin rectangular-sectioned bar, turned at one end in right angle, incomplete, tentative id	22 x 7 x 8mm	dress?
E2170	Parknahown 5	0348	023	iron	nail	rectangular corroded shaft	31 x 11 x 9mm	structural
E2170	Parknahown 5	0348	024-027	iron	unident	4 fragments, corroded non diagnostic	max 28 x 19 x 9mm	misc
E2170	Parknahown 5	0348	028-038	iron	unident	11 fragments of metal, one of which is like the tip of a knife, others are short bars, tapered	max 24 x 13 x 5mm	misc
E2170	Parknahown 5	0348	041	iron	knife	scale tanged knife, blade incomplete, flat rectangular tang with one rivet remaining, there is a curved projection at point where blade edge meets tang. Short shoulder between blade back and tang.	79 x 13 x 3mm	knives
E2170	Parknahown 5	0353	002	iron	horseshoe nail	thin rectangular shaft with rectangular small head	32 x 6 x 5mm	horse equipment
E2170	Parknahown 5	0356	001	iron	latch?	rectangular bar which has 2 rivets along its length, one end is curved into a loop. Terminal of loop is pointed, opposite terminal is expanded at point of break and beginning to turn in opposite direction of	49 x 21 x 9mm	structural
E2170	Parknahown 5	0356	003	iron	strap hinge?	flattened tapered elongated triangle which appears to have wood in corrosion products	114 x 22 x 19mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0356	004	iron	knife	flat rectangular tang rises to arch , blade dips down from this point. Poss. blade of folding knife	77 x 11 x 4mm	knives
E2170	Parknahown 5	0356	005	iron	rivet	circular head of rivet, scar of rectangular shaft visible	d 25 x 8mm	structural
E2170	Parknahown 5	0356	006	iron	unident	small rectangular piece, un-diagnostic	14 x 10 x 5mm	misc
E2170	Parknahown 5	0356	008	iron	buckle pin?	square short bar which is flattened along half its length. flat side ends in rounded point, no means of attachment remains, therefore tentative i.d.slightly bend at centre	37 x 7 x 6mm	dress
E2170	Parknahown 5	0356	012	iron	knife	blade back and edge slope gradually towards point, whittle tang set centrally, sloped shoulders Type D	102 x 17 x 4mm	knives
E2170	Parknahown 5	0365	002	iron	unident	triangular corroded bar, non diagnostic	37 x 13 x 11mm	misc
E2170	Parknahown 5	0376	001	cu alloy	pin	slender long pin tapered to a shaft point. Thicker end has no head, but is flattened and turned before point of break. Most likely to belong to ring pin	97 x 4 x 3mm	dress
E2170	Parknahown 5	0386	001	iron	mount	decorative mount, rectangular sectioned bar incomplete, one terminal expanded into double loop which has two apertures, possibly for attachment	37 x 13 x 3mm	personal
E2170	Parknahown 5	0421	002	iron	nail	head incomplete, at present rectangular, rectangular shaft	29 x 17 x 8mm	structural
E2170	Parknahown 5	0421	003	iron	nail	rectangular shaft	37 x 5 x 4mm	structural
E2170	Parknahown 5	0447	001	iron	rove	lozenge shaped, flat, with point of rivet protruding from one side	34 x 25 x 14mm	structural
E2170	Parknahown 5	0494	002	iron	strap	narrow strap wound into open loop	47 x 45 x 8mm	misc

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0572	001	cu alloy	dress pin	short pin tapered to a point , complete(from shroud), circular sectioned shank, detail of head obscured, (conserved), appears solid	21 x 2.2 x 1.2mm	dress
E2170	Parknahown 5	0602	001	iron	nail	damaged, barely surviving head, long tapered rectangular shaft	72 x 11 x 10mm	structural
E2170	Parknahown 5	0602	002	iron	tang?	flattened rectangular tapered bar, tentative i.d.	52 x 8 x 5mm	structural
E2170	Parknahown 5	0604	001	iron	nail	round head, rectangular tapered long shaft, point missing	75 x 20 x 7mm	structural
E2170	Parknahown 5	0614	003	cu alloy &	tack	slightly domed, circular-headed copper alloy tack, or stud. The square shaft appears to be iron (post conservation). It is straight and comes to an abrupt end. Associated with burial, possibly with glass	18 x d9.5 x 4mm	dress
E2170	Parknahown 5	0717	002	iron	nail	small round head, tapered rectangular shaft, accreted	65 x 14 x 9mm	structural
E2170	Parknahown 5	0730	004	iron	nail	damaged, originally round head, short tapered rectangular shaft	35 x 11 x 7mm	structural
E2170	Parknahown 5	0743	001	cu alloy	link frag	circular-sectioned semi-circular piece, possibly part of mail	9 x 6.5 x d 2mm	weaponry?
E2170	Parknahown 5	0800	?	cu alloy	wire ring	circular-sectioned wire bent into circle, not completely closed	d 14 x 2	misc
E2170	Parknahown 5	0800	001	iron	nail	damaged, originally round head, short tapered rectangular shaft	26 x 11 x 8mm	structural
E2170	Parknahown 5	0800	002	iron	pony shoe	arched part of shoe with 2 rectangular holes, fullered, post medieval	65 x 11 x 4mm	horse equipment
E2170	Parknahown 5	0800	005	iron	nail	round head, long tapered rectangular shaft	74 x 15 x 7mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	0800	006	iron	nail	incomplete round head, short tapered rectangular shaft	31 x 17 x 10mm	structural
E2170	Parknahown 5	0800	007	iron	nail	round head, tapered rectangular shaft	40 x 17 x 9mm	structural
E2170	Parknahown 5	0800	008	iron	nail	round head, tapered incomplete rectangular shaft	34 x 14 x 7mm	structural
E2170	Parknahown 5	0800	009	iron	nail	rectangular shaft tapered to a point, head missing	51 x 8 x 7mm	structural
E2170	Parknahown 5	0800	010	alloy?	strip	grey, light object, like lead came, but too light to be lead, not malleable. Modern? Slag?	51 x 19 x 21mm	misc
E2170	Parknahown 5	0800	032	cu alloy	pin	piece of shaft of stick or pin, almost imperceptibly tapered, probably from near point	18.3 x 2mm	dress
E2170	Parknahown 5	0800	033	iron	nail	round head, tapered short tapered rectangular shaft	38 x 16 x 7mm	structural
E2170	Parknahown 5	0800	034	cu alloy	fragments	very fragmented piece of sheet metal	max 10 x 8 x 1mm	misc
E2170	Parknahown 5	0800	037	iron	nail	damaged, originally round head, long tapered rectangular shaft	78 x 21 x 8mm	structural
E2170	Parknahown 5	0982	001	iron	nail	incomplete round head, tapered rectangular shaft	57 x 12 x 8mm	structural
E2170	Parknahown 5	1127	001	cu alloy	unident	flat chunk of corroded metal, roughly triangular outline, un-diagnostic	27 x 23 x 8mm	misc
E2170	Parknahown 5	1181	001	iron	nail	nail head, corroded, incomplete, sub round with little of shaft attached	13nxn12n x n11mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170	Parknahown 5	1252	001	iron	nail	round head, tapered rectangular shaft	50 x 14 x 8mm	structural
E2170	Parknahown 5	1288	001	iron	nail	tapered rectangular shaft	52 x 8 x 7mm	structural
E2170	Parknahown 5	1300	001	cu alloy	link	small circular sectioned piece of chain link, not fully closed, poss from mail	9 x 7 x 1.5mm	weaponry?
E2170	Parknahown 5	1364	001	iron	unident	curved oval/sub rectangular= sectioned bar, gently tapered pinched at one end	43 x 11 x 8mm	misc
E2170	Parknahown 5	1430	001	iron	nail	incomplete round head, tapered rectangular shaft	40 x 12 x 7mm	structural
E2170*	Parknahown 5	0001	027	iron	socket	part of a socket, open-sided, a flat rectangular bar with raised curved sides at one end forming the socket, and opposite end a flattened rectangle. A small projection at one side of flat end, and	58 x 20 x 11mm	tools?
E2170*	Parknahown 5	0001	100	iron	handle?	gently tapered short rectangular bar, expands into sloped fan shape, spoon-like. Possible handle of cast iron pan	72 x 43 x 12mm	domestic
E2170*	Parknahown 5	0001	103	cu alloy	ring pin	complete ring pin, small and fully intact. The ring is plain, as is the head of the pin which is rolled over ring to form attachment. No decoration	81 x 17 x 4.5mm pin 69 x 3mm	dress
E2170*	Parknahown 5	0001	116	iron	horseshoe heel	elongated triangular fragment of horseshoe	56 x 16 x 5mm	horse equipment
E2170*	Parknahown 5	0032	001	iron	knife	small blade with blade back curved to meet point. Blade edge straight, short coil, sloped shoulder from back to tang, which is tapered and centrally placed. Type E	62 x 15 x 4mm	knives
E2170*	Parknahown 5	0033	002	iron	knife	straight blade back, damaged edge of blade, slight uplift at shoulder, (coil), whittle tang set low in line with blade edge, Type C	96 x 12 x 6mm	knives
E2170*	Parknahown 5	0034	002	cu alloy	unident	small thin rectangular flat scrap which is not diagnostic	10 x 8 x 1mm	misc

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170*	Parknahown 5	0100	001	iron	knife	curved blade back, blade edge almost parallel, tang set centrally, short shoulder Type E	101 x 15 x 4mm	knives
E2170*	Parknahown 5	0102	001	cu alloy	ring pin	delicate pin, with ring looped through aperture in pin head, and overlapped on itself. The pin head is plain and wrapped around to form the aperture, though well executed.	80 x 12 x 4mm d int ring d 8mm	dress
E2170*	Parknahown 5	0122	001	cu alloy	stick pin	stud-headed pin with domed head with has a collar, shank incomplete,	47 x d 7 x d3mm	dress
E2170*	Parknahown 5	0145	001	iron	knife	blade back curves to point, blade is straight, dips to curved projection between blade edge and tang which is whittle and placed low, in line with blade edge. Projection at back of blade back is possibly an	97 x 19 x 5mm	knives
E2170*	Parknahown 5	0179	001	cu alloy	penannular brooch	Open-sided sub circular brooch. Terminals are zoomorphic, bird-like heads facing each other. Pin rolled over, decorated by raised ridges infilled with diagonal raised ridges. Circular bosses form the eyes of	42 x 34 x 4mm pin 56 x 9 x 3.5mm,	dress
E2170*	Parknahown 5	0216	002	cu alloy	bead	Decorated cylinder, perforated longitudinally, Centre has raised crosshatch motif, outer edges and edges of central panel have 3 concentric lines. Interval of v-shaped lines between bands of raised lines	20.5 x d 9mm, int d 4.5mm	dress
E2170*	Parknahown 5	0224	004	iron	awl	short narrow bar, square in section, tapered at both ends	47 x 4.5 x 4.5mm	tools
E2170*	Parknahown 5	0224	005	iron	auger	tapered tang? with semi-circular open sided socket or spoon but at wider end. Straight edge to bit	79 x 8 x 5mm	tools
E2170*	Parknahown 5	0237	001	cu alloy	penannular brooch	open sided brooch, with flattened straight-edged terminals. Decorated on one side only with vertical lines. Terminals are raised around circular sockets which would have contained enamel or glass beads	33 x 30.5 x 7mm pin 49 x 7 x 6mm	dress
E2170*	Parknahown 5	0324	015	iron	punch	rectangular tapered bar, with wider end flattened	114 x 13 x 10mm	tools
E2170*	Parknahown 5	0324	015	iron	punch	rectangular bar with flattened head and point at opposite end, similar to #015 from same context	121 x 14 x 11mm	tools
E2170*	Parknahown 5	0342	004	iron	chisel	rectangular-sectioned bar with flattened roughly circular head, tapers to rectangular terminal with straight edge	224 x 24 x 13mm	tools

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2170*	Parknahown 5	0348	003	iron	spatula?	spoon-like object, circular slightly dished bowl with short tapered projection. Small V-shaped piece missing from one side	51 x 27 x 7mm	domestic?
E2170*	Parknahown 5	0348	012	iron	ring pin	circular shaft which seems to be looped over the ring. Detail is obscured by corrosion, ring is circular sectioned, and plain	103 x 26 x 11mm	dress
E2170*	Parknahown 5	0348	014	cu alloy	buckle pin?	short pointed bar, looped into circular opening which is closed by the shorter side of the bar. Possible functioned with buckle	27 x 8 x 4mm	dress
E2170*	Parknahown 5	0356	009	iron	knife	small complete blade which has straight edge and blade back is parallel but curves to tip. Tang is set high on ling with the blade back Type B	58 x 15 x 4mm	knives
E2170*	Parknahown 5	0365	007	iron	horseshoe nail	fiddle-key shaped object, sub-round flattened head and tapered rectangular shaft, bar slightly convex near expanded head	48 x 18 x 5mm	horse equipment
E2170*	Parknahown 5	0388	001	iron	awl?	socketed spike, round by socket, tapers to a rectangular shaft ending in a point	118 x d 16mm	tools
E2170*	Parknahown 5	0800	011	cu alloy	mount	3-sided mount, face of which has a raised cross motif with the background infilled in green enamel. Cross is central to the front panel, which has semi-circular projections above and below, also with	19 x 11 x 9.5mm	personal
E2170*	Parknahown 5	0800	035	cu alloy	ferrule	possible lace point, fragmented pieces of a hollow cylinder	max 14 x 4 x 3mm	dress
E2170*	Parknahown 5	1003	001	iron	buckle	double buckle, one straight side, to which the buckle pin is attached, the other side is B-shaped, with the pin resting at the intersection of the curves.	47 x 27 x 8mm	dress
E2170*	Parknahown 5	1232	001	iron	unident	rectangular sectioned bar slightly curved longitudinally and pointed at both ends though not evenly	73 x 6 x 3mm	misc
E2170*	Parknahown 5	1386	001	iron	knife	blade back arched, blade edge curved from shoulder to tip. Whittle tang is tapered, set centrally. Complete, excellent condition. Type E	133.5 x 32 x 7mm	knives
E2170*	Parknahown 5	unstratified	031	cu alloy	ring pin shank	upper portion of shank, with perforated baluster head, slight collar, all facets of head decorated with simple dots. One side of shank is decorated with a line of dots.	54.5 x 5 x 4mm aperture 3mm	dress

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2184	Cuffsboroug h 4	0002	002	iron	washer	circular disc, corroded and flaking, central aperture apparent in corrosion products, modern	d27 x 9mm	misc
E2184	Cuffsboroug h 4	0002	003	iron	knife	whittle tang, blade back straight, continues in line with top tang, blade edge slopes from tang and continues parallel to back. Point missing. Type C	81 x 15 x 4mm	knives
E2184	Cuffsboroug h 4	0002	004	iron	unident	unfortunately too corroded for definite i.d. this has a rectangular section at one end. The main part of the bar is somewhat expanded but this may be as a result of corrosion. The opposite end is sloped	117 x 12 x 11mm	misc
E2184	Cuffsboroug h 4	0002	033	iron	trap	part of animal trap, single bar moulded into 3 sides of a rectangle. The termini are turned outwards for a short distance to articulate with the rest of the apparatus. The central section is serrated on one side	112 x 50 x 14mm	tools
E2184	Cuffsboroug h 4	0002	034	iron	nail	rectangular tapered shaft, no head	36 x 8 x 7mm	structural
E2184	Cuffsboroug h 4	0002	089	iron	rivet and rove	tapered shaft which has lozenge-shaped rove still in place, head missing. The tip of the rivet protrudes through the rove and is clenched off to one side.	38 x 23 x 7mm	structural
E2184	Cuffsboroug h 4	0002	090	iron	nail	rectangular tapered shaft, no head	45 x 10 x 8mm	structural
E2184	Cuffsboroug h 4	0148	001	iron	nail?	long tapered shaft coming to a sharp point. The section is a flattened rectangle, poss. horseshoe nail, or floor brad, no head	77 x 7 x 4mm	structural
E2184	Cuffsboroug h 4	0168	002	iron	nail	rectangular tapered shaft, no head, bent	58 x 27 x 6mm	structural
E2184	Cuffsboroug h 4	0168	003	iron	nail	corroded, round head, rectangular tapered shaft	39 x 9 x 4mm	structural
E2184	Cuffsboroug h 4	0168	004	iron	horsesho e nail	flattened rectangular section, shaft fragment only	25 x 8 x 7mm	horse equipment
E2184	Cuffsboroug h 4	0168	005	iron	vessel fragment?	one even-surfaced edge, the rest irregular, very slightly curved cast iron sheet from cauldron, tentative i.d. Corroded	54 x 40 x 16mm	domestic?



museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2184	Cuffsboroug h 4	0237	008	iron	nail	corroded rectangular tapered shaft	25 x 10 x 9mm	structural
E2184	Cuffsboroug h 4	0237	009	iron	nail	corroded rectangularshaft fragment	27 x 15 x 10mm	structural
E2184	Cuffsboroug h 4	0237	011	iron	horsesho e nail	fragmentary and flaking, flattened rectangular shaft, expanded, corroded head	21 x 19 x 3	horse equipment
E2184	Cuffsboroug h 4	0237	012	iron	nail	corroded rectangularshaft fragment, bent	27 x 17 x 13mm	structural
E2184	Cuffsboroug h 4	0303	001	cu alloy	buckle	3 sides of rectangular buckle, one side is simply decorated with grooved lines which follow the outline of the frame. The centre of the longest surviving side has an aperture (2mm) to accommodate the	42 x 33 x 4mm	dress
E2184	Cuffsboroug h 4	0303	002	iron	nail	rectangular tapered shaft, no head	42 x 9 x 8mm	structural
E2184	Cuffsboroug h 4	0303	003	iron	fish hook	circular-sectioned bar, pointed at one end and bent into U shape at the other end, no barb	48 x 14 x 4.5mm	tools
E2185	Cuffsboroug h 1	0001	001	iron	vessel fragment	rim of iron vessel, such as a cauldron or large pot, one part of original edge survives, other ends rough	73 x 35 x 18mm	domestic
E2186	Parknahown 3	0001	001	iron	horsesho e nail	flattened rectangular shaft which is curled back on itself, wider end of shaft forms flat rectangular head	16 x 8 x 3mm	horse equipment
E2186	Parknahown 3	0001	002	iron	rivet	large rectangular head, tapered robust shaft, point missing	54 x 25 x 10mm	structural
E2189	Gortnagroa gh 1	0001	004	iron	stone punch	large gently tapered, sturdy bar withbluntly angled point end, opposite end obscured by corrosion products.,	236 x 24 x 18mm	tools
E2189	Gortnagroa gh 1	0002	001	iron	hook	large hook, such as would have hung meat from rafters. Tapered rectangular bar bent into a U-shaped curve, closing in towards point. Head expanded, sub round	112 x 53 x 33mm	domestic

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2189	Gortnagroa gh 1	0006	003	iron	unident	hollow section of tubing, with bits of flat rectangular bar adhering, possibly modern. jubilee clip?	36 x 30 x 24mm	misc
E2189	Gortnagroa gh 1	0006	004	iron	bicycle part?	semi-circular sectioned bar, which curves at one end, where it is broken. The opposite end has suggestion of serrated edge. Shape reminiscent of old bicycle brake mechanism, Tentative i.d.	78 x 43 x 14mm	misc
E2192	Springfield 3	0011	001	iron	vessel fragment	one evenly finished edge, the others edges broken, cast iron pot rim? Even thickness where corrosion products not adhering	47 x 29 x 7mm	domestic?
E2198	Cuffsboroug h 3	0064	001	iron	strap	possibly part of a strap hinge, flat rectangular thick sheet, incomplete	58 x 36 x 10mm	misc
E2198	Cuffsboroug h 3	0064	003	iron	knife	blade back and edge are parallel, tang set low in line with edge, sloped shoulder from back to top of tang. Tip missing. Type C	110 x 16 x 4mm	knives
E2199	Cuffsboroug h 5	0006	001	iron	shears blade	rectangular bar narrows somewhat before expanding on one side only to an elongated triangular shape, Rectangular in section, tapers to a point. Alternate suggestion a harpoon or fish spear	82.5 x 7 x 4.5mm	tools
E2199	Cuffsboroug h 5	0046	002	cu alloy	ferrule	circular rim/ ferrule, or binding with the one edge slightly folded in, very thin sheet, possible rim of bottle?	d 25 x 11 x 1mm	misc
E2199	Cuffsboroug h 5	0083	001	iron	spike	robust rectangular sectioned bar, expanded at one end, very corroded, flaking. Corrosion products adhering	105 x 25 x 22mm	structural
E2199	Cuffsboroug h 5	0085	001	iron	bracket	flattened rectangular-sectioned strap, which is gently tapered. It is curved into broad U-shape, terminal thicker but obscured by corrosion	90 x 31 x 23mm	structural
E2199	Cuffsboroug h 5	0091	001	iron	nail	rectangular tapered shaft, head obscured, coal and mortar in corrosion products	52 x 20 x 16mm	structural
E2199	Cuffsboroug h 5	0091	002	iron	nail	rectangular tapered shaft, head obscured by corrosion products	43 x 23 x 12mm	structural
E2199	Cuffsboroug h 5	0091	003	iron	nail	rectangular tapered shaft, head obscured by corrosion products	41 x 20 x 13mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2199	Cuffsboroug h 5	0091	004	iron	nail	partial shaft, rectangular, head obscured by corrosion	30 x 20 x 17mm	structural
E2199	Cuffsboroug h 5	0093	001	iron	horsesho e nail	narrow rectangular tapered shaft, rectangular head	52 x 10 x 6mm	horse equipment
E2199*	Cuffsboroug h 5	0046	001	cu alloy	buckle	large rectangular buckle, raised at the centre of the frame, where it is expanded and pierced, (aperture 2mm) on both sides to accommodate the central bar, which is missing. One side wider where	61 x 48 x 8mm	dress
E2200	Cannonswo od 1	0005	001	iron	nail	tip of tapered oval shaft	24 x 9 x 6mm	structural
E2200	Cannonswo od 1	0005	002	charco - al?	-	-	-	N/A
E2200	Cannonswo od 1	0005	003	iron	unident	4 small fragments largest is rectangular, curved, un-diagnostic	max 12 x 7 x 3mm	misc
E2200	Cannonswo od 1	0005	004	iron	unident	shattered fragments	n/a	misc
E2201	Cannonswo od 2	0025	001	iron	nail	rectangular tapered shaft, head missing, bent into curve	43 x 11 x 9mm	structural
E2201	Cannonswo od 2	0025	002	iron	nail	rectangular tapered shaft, head missing	75 x 10 x 8mm	structural
E2201	Cannonswo od 2	0093	001	iron	horsesho e	one half of shoe, arched profile, smooth outline, one nail in place, heel flat and rounded outline, front hoof	123 x 91 x 9mm	horse equipment
E2213	Addergoole 2	0001	001	iron	horsesho e	one half of shoe, arched profile, smooth outline, one nail in place, heel flat and straight edged, edge of arm damaged, terminal of heel may also be damaged.	93 x 66 x 21mm	horse equipment
E2249	Curragh 2	0016	001	iron	spike	robust tapered rectangular sectioned bar, with corrosion products adhering, measurements of bar where corrosion absent	141 x 7 x 6mm	structural

museum reg	site	feature	finds no	metal	object	description	dimensions	function
E2249	Curragh 2	0052	001	iron	hinge	flattened rectangular bar, bent, which expands into triangular shape, suggesting of bifurcation at broad end	58 x 22 x 9mm	structural
E2249	Curragh 2	0052	003	iron	horseshoe nail	thin, rectangular-sectioned ,tapered shaft, heavy square head	48 x 10 x 5	horse equipment
E2249	Curragh 2	0130	001	cu alloy	vessel fragment	flat strip, original edge on one long side, slightly curved, possibly rim of plate or platter	77 x 16 x 2mm	domestic



# GeoArch

Report 2009/21

**Evaluation of Archaeometallurgical  
residues from the M7/M8 Contract 1:  
Parknahown 5 (E2170)**

Dr Tim Young  
16<sup>th</sup> July 2009

## Evaluation of Archaeometallurgical residues from the M7/M8 Contract 1: Parknahown 5 (E2170)

Dr T.P. Young

### Abstract

*The assemblage from Parknahown 5 comprises 100kg of archaeometallurgical residues, principally from iron working (smithing), but with a minor component from iron smelting. There were no metallurgical features recorded within the enclosure; the residues derive from accumulations within the enclosure ditches and from the dump of material down slope at the north of the site. Both the ditch of the early univallate enclosure and the inner of later ditches of the bivallate enclosure contained slags. The outer ditch of the bivallate phase contained almost no residues, suggesting that activity was focused on the interior of the enclosure. Disposal of residues was concentrated to the north of the site, with over two thirds of residues recovered from this area.*

*Smithing residues are dominantly smithing hearth cakes of a fairly small size. There is a marked upper cut-off at 490g, with 70% of SHCs being below this weight. Larger SHCs range up to around 2.9kg, but are rare. In addition to more normal textures of SHC, the site yielded evidence for the use of hearth with a large stone in its base. Development of the SHC took place with a burr-like feature on the base of the SHC which appears to have eaten into the basal stone. Distally the SHCs from this hearth pass in material which has flowed across the surface of the stone, giving an internally flow-lobed sheet with a shiny, non-wetted basal surface.*

*Iron smelting slags were difficult to discriminate from smithing slags on this site, for both processes may produce slags which are agglomerations of small prills. Some material of this type contains moulds of large pieces of wood or charcoal associated with amalgamated flow slags; these are more confidently ascribed to iron smelting and resemble smelting slag cakes from slagpit furnaces on other sites. No large pieces of these smelting slag cakes were recovered, but small pieces suggest that the cakes may have had a shallow, plano-convex form with gently sloping sides, at least towards the blowing side, suggesting a rather shallow slagpit.*

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### Methods

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

## Results

### 1. Materials associated with iron-working

#### 1a. Smithing Hearth Cakes (SHCs)

The SHCs from Parknahown are mainly fairly small, but are very variable in terms of morphology and structure. The size-frequency distribution is given in Table 2 and illustrated in Figure 1, with the summary of the statistics given in Table 3.

Textures vary from dense, compact forms, through to rather open-structured prilly cakes with abundant included charcoal. Most of the larger examples are of forms with a dense, coarsely crystalline thick crust.

One curious form of SHC noted in the assemblage has a well-fluxed bulbous zone (somewhat similar to the burr on a conventional SHC) apparently within the lower crust. This form is explained by a specimen from F20 which shows development of an SHC immediately above a flat sandstone slab. The base of the SHC has impinged on the sandstone and resulted in the corrosion of a hole into the sandstone. The reaction of the iron-rich slag with silica of the sandstone has generated a very fluid fayalitic slag that has flowed away from the reaction zone (presumably away from the tuyère). This slag adheres tightly to the sandstone close to the hollow, but rapidly changes to show a no-wetting, lobate, surface similar to the textures commonly seen on the sides of the slag mass from a slagpit smelting furnace. Such lobate slags with a shiny, planar contact were recovered from various contexts and presumably came from this, or a similar, hearth.

#### 1b Other smithing slags

Very few slags, besides the SHCs, could be attributed to smithing. The exceptions were rounded balls of slag, similar to those in the SHCs, that could be interpreted as hearth slags. The generation of detached slags in the smithing hearth outside the SHC is less common in charcoal hearths than in coal hearths, and it is possible that hearth slags such as these may either be incipient SHCs or fragments of SHCs that have been moved and deformed when hot.

#### 1c Technical ceramics

Small fragments of vitrified and/or slagged clay occurred in many contexts. A proportion of these could be identified positively as sherds from ceramic tuyères. All of the material was compatible with such an origin and it is unlikely that any of the sherds are not from tuyères.

The small size of the pieces from Parknahown meant that it was difficult to estimate the external diameters of the tuyères with any confidence. Some sherds suggested a rather low degree of curvature of the outer face, indicating either the use of large tuyères or of tuyères with non-circular cross sections.

#### 1d Iron

Various concretions around pieces of iron were recorded, but none was indicative of the form of the contained iron.

### 2. Material from Iron smelting

Certain iron smelting slags formed only a small proportion of the Parknahown assemblage. The two most easily recognisable features of iron smelting slags from slagpit furnaces in Ireland are the characteristic dense flow slags (formed from the flow of slag trickles through the fuel within the slag pit) and the moulds formed by the flow of the flow slags around the very large pieces of wood (or charcoal) with which the basal pit was packed. At Parknahown these features are recognisable, but not in their classic forms. Many of the flow slags are of rather low density slags (and may also be rather badly altered). No really large wood moulds were found, although there are flow textures delimiting medium sized moulds, particularly of round-wood. Some of the specimens showing these features (e.g. from sample 990) appear to show them occurring near the margins of slag cakes with gently sloping sides, meeting the upper surface at a very acute angle.

This suggests that the identified smelting slags may be from with the main slag cake, rather than the situation at most sites where it is the dense isolated slags from lower in the pit that are more easily recognisable than the agglomerated prills of the main slag mass.

Not enough of the slag cakes survives at Parknahown to be able to determine much about their morphology, but the lack of isolated slags might suggest either different patterns of disposal of the pit fines and the main slag mass (a feature suggested by other sites where only the pit slags survive), or that, in this instance the smelting furnaces were very small and the main slag mass actually impinged on the pit base.

### 3. Indeterminate slags

This category includes all the slags not specifically identifiable to the other categories. This includes material that is simply too fragmented to identify, as well as pieces that are of non-diagnostic textures.

The problematic textures at Parknahown are particularly the rather friable slags, formed of amalgamations of small prills. Both the smelting slags and some of the SHCs show such textures, so for fragments without any indication of external form, discrimination was usually impossible.

### 4. Distribution of the residues

A summary of the distribution of the residue classes is given in Table 5. Despite the simplifications inherent in this division of the stratigraphic record, it seems ironworking activities continued through the early medieval history of the site.

Residues are associated with the enclosure ditches and in the bivallate phase it is the inner ditch which received the residues, not the outer, suggesting activities were within the enclosure. Two thirds of the residues derive from the northern end of the site – suggesting either metalworking occurred in this area, or that downhill disposal of the residues was preferred.

It is noteworthy that almost no metallurgical residue was recovered from the cemetery. This indicates exclusion of such activities, in contrast to the situation at Ballykilmore (Young 2009b), for instance, where the graveyard appears to have spread within the enclosure over areas previously involved with iron production.



## Interpretation

The residues from Parknahown 5 are indicative of both iron smelting and smithing. Given the large area of the enclosure that was excavated, the total quantities of residues are not very great. Quantification of blacksmithing activity is always difficult, for assessing the degree of completeness of the record is impossible. Thus, only a minimum level of activity can be calculated – in this instance there is sufficient slag to be equivalent to perhaps just one smelt and 150 smithing sessions – but the real level of activity will have been much higher. None-the-less, despite the substantial assemblage of 100kg of residues, the metalworking activity need have been no more than intermittent.

The evidence from the SHC assemblage would suggest that end use blacksmithing was a more significant activity at Parknahown than the refining of raw blooms, which may have happened only rather rarely. Smelting also occurred, but the level of residues is very small.

In detail the SHC assemblage shows similar characteristics to the small assemblages from Carrigoran (Young 2006b; another site showing some evidence for occasional smelting alongside smithing), Navan (Young 2007; which had no evidence for smelting) and Moneygall (Young 200b; also with no evidence for smelting). Sites with mean SHC weights above 1kg are all believed to have been involved with bloom refining.

The lack of any identified hearths within the enclosure may mean they were outside the excavated area, or perhaps were raised hearths, or that they have been removed, either by general agricultural truncation or because they were situated on the enclosures bank. The location of the discovery of the stone-floor of a smithing hearth (F20, sample 922), which was unlikely to have been transported far, may help with locating a hearth of at least one period.

## Evaluation of potential

The Parknahown assemblage does have useful potential to further understanding of small-scale early medieval iron smelting. Further analysis of both the probable smelting slags and some of the other flow-lobed residues would be useful.

Detailed analysis of the smithing residues would be rather less useful since they are both not particularly well-preserved and relatively straightforward to interpret.

## References

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

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

YOUNG, T.P. 2006b. Evaluation of archaeometallurgical residues from Carrigoran, Co. Clare (98E0338). *GeoArch Report 2005/18*. 12pp.

YOUNG, T.P. 2007. Evaluation of metallurgical residues from the Navan Inner Relief Road project, Site 1 (06E274), Co. Meath. *GeoArch Report 2007/09*. 10pp.

YOUNG, T.P. 2008a. Archaeometallurgical residues from Coolamurry 7, 04E0323. *GeoArch Report 2006/10*. 46pp.

YOUNG, T.P. 2008b. Evaluation of archaeometallurgical residues from Moneygall, Co. Offaly, 06E0321. *GeoArch Report 2008/10*. 15pp.

YOUNG, T.P. 2008c. Evaluation of Archaeometallurgical residues from the M7/M8 Contract 2: Lismore-Bushfield 1 (E2220). *GeoArch Report 2008/27*.

YOUNG, T.P. 2008d. Evaluation of Archaeometallurgical residues from the M7/M8 Contract 3: Trumra 4 (E2281). *GeoArch Report 2008/33*.

YOUNG, T.P. 2009a. Archaeometallurgical residues from Clonfad 3, Co. Westmeath (A001: 036 E2723). *GeoArch Report 2008/17*. 173pp.

YOUNG, T.P. 2009b. Archaeometallurgical residues from Ballykilmore, Co. Westmeath, E2798, *GeoArch Report 2009/16*, 81 pp.

context sample weight notes				SHC details	
				% of orig.	Orig. Wt.
box 1					
1	892	22	dense slag		
1	893	36 19	weathered irregular slag sheet clinkery slag		
1	894	11 2	rounded lump of fired clay tuyère sherd		
1	895	355 481 355 84 202	90x80x50mm of which bowl 30mm, neat dense SHC rather rusted 110x110x50mm (bowl 25mm) discoidal SHC, rather irregular slag on top of bowl, neat base rather amorphous lump of slag which, might be a twisted and folded SHC, - if so unclear whether it is complete SHC crust fragment 4 pieces of iron slag	100 100	355 481
1	896	21	iron slag indet		
1	897	1280	large irregular block of slightly granular slag - probably from SHC		
1	898	118	SHC crust fragment		
1	899	6	dense slag indet		
1	900	8	vitrified clay		
1	901	124	probable SHC crust - might even be almost entire small SHC		
1	902	9	highly blebby dimpled prill		
1	903	10 167	2 pieces of dark possible flow slag 7 fragments of vesicular probably hearth slag		
1	904	31 15 81	small scraps of fresh dark slag low density lining slag bleb curious very dark well flowed lobate slag attached to crust - probably an SHC fragment but could be flow slag - very fresh		

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
1	905	11	granular slag fragment		
1	906	159	part of small SHC - not enough to give dimensions but well-formed and dense		
1	907	7	slag indet		
1	908	106	dense slag with rounded blebs, dark - possibly coal-fuelled smithing slag?		
1	909	1	tiny slag bleb		
1	910	12	corroding nail head		
1	911	15	slightly flowed dense slag with flat non-wetted base		
1	913	11	iron slag, dense, indet		
1	914	1	coal		
1	915	21	dense slag bleb with attached iron		
1	916	31	dense microporillly slag fragment		
1	917	349 30	19 pieces of indet slag 3 pieces of vitrified clay - probably tuyère sherds		
1	918	320	SHC fragment		
1	919	97	2 rounded, possibly hollow, certainly very vesicular slags, dark with rounded blebs, just possibly coal fuelled slags		
17	920	59	3 indet slag fragments		
17	921	281 257 297	4 rounded lumps of slightly granular hearth slags 90x90x45mm small SHC with central void, slightly biconvex but would have been more so before collapse of central void base of granular cake - presumably SHC	100	257

context	sample	weight	notes	% of orig.	SHC details	Orig. Wt.
20	922	3730	stone slab broken in two forming the base of a hearth. This piece ties in various other types of residue seen in these contexts. It has a dense burr type of area in a deep rounded hollow in the stone, probably around 150x180mm or so, distally of this the slag is initially attached to the planar face of the sandstone, then lifts off with a non-wetted surface, then rises off the stone with a brownish somewhat flowed slag layer/sheet. No good directional flow so presumably this is a flat hearth base, rather than a vertical side. The slag shows a cavernous/coralline/cloited texture in many areas suggesting some draining from main slag area - perhaps associated with flow outwards, there is fired clay associated with the proximal edge and left side of the main stone - the slag also appears at lower level to the left of the main stone - suggests hearth was complex- perhaps with a just a stone centrally in a clay hearth even?			
22	924	91	slag indet			
28	925	594	130x90x40mm double layer SHC - upper dimpled irregularly-shaped slab, rusty, lower dense layer is sheet like - and may have extended further, microprilly	100		594
26	926	215 158 8 28 33 142	probably SHC fragment - in 3 pieces internally prilly slag block charcoal-rich slag fragment possible flow slag slagged margin of small (c100mm) tuyère tip small cavernous, slightly gravelly, lining slag mass - possibly small SHC			
32	927	323 38 143 434 186 403 1668	16 sherds of fired ceramic - 3 of which are positively identifiable as coming from a large diameter tuyère slagged tuyère sherd 7 pieces of flowed slag - all could be flow slags or just dribbles in the smithing hearth curved slab with a planar slightly flowed face and a convex microprilly face. 130x80x50mm, probably an SHC - but inverted could be a furnace floor - same problem as 222g piece from c34 80x50x45mm, probable small SHC - has slightly flowed dense planar surface and microprilly strongly convex base block of microprilly - granular slightly friable slag - no clear external surface 42 pieces of iron slag indet - some probably SHC fragments	100		142
32	928	358 148 154 503	30 sherds of tuyère plus a substantial slag beard on a tip. Curvature of several pieces suggests 180-200mm diameter irregular lump of microprilly/granular low density slag granular slag passing down into thin crust, dense 30 pieces of iron slag indet	100		434
32	929	75	90mm long slag rod - possible a poker cast?	100		186
32	930	381	dense burr broken in 3 - must have been from a large cake			
32	931	96 127	7 sherds of tuyère tiny low density SHC - prilly with inclusions of lining lag	100		127

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
33	932	271	2 pieces of dense vesicular slag with planar base - another stone based SHC?		
		256	15 pieces of slags indet		
34	933	203	18 sherds of tuyère		
		732	folded and snapped slag sheet, microprilly on lower, glass on upper- suggests this is a very flat SHC	100	732
		222	90x70x40mm small SHC with lobate margins, somewhat soft and brown (alternatively possibly a low slag piece)		
		260	80x70x60mm small irregular SHC	100	260
		170	slab of basal crust with some low slag like material adhering to inside of bowl, brownish		
		74	possible flow slag bleb		
		52	probable flow slag		
		82	probable flow slag		
		101	crust like 170g piece above		
		96	possible flow slag		
		117	brown weathered cavernous slag indet		
34	934	46	brown weathered slag indet		
		330	block of irregular charcoal-rich slag, one side smoothish with wood impression and red rust, body is prilly with up to 70mm charcoal/wood moulds		
36	935	372	90x75x55mm of which bowl 25mm, small dense SHC with one end raised or twisted up, micro-dimpled base, rusty top	100	372
		402	rounded prilly vaguely triangular piece with smooth top, probably a very odd SHC, with most present, 100x80x60mm	100	402
36	936	383	small SHC with deeply dimpled top, 90x75x45mm	100	383
		250	block of friable internally prilly material with smooth top, could be from a thin crust SHC or even from a smelting cake		
		386	100x80x55mm curiously shaped piece- possibly a SHC with glassy top and slightly prilly base with an earlier inclined disc-like SHC stuck to distal end	100	386
		26	friable slag fragment - possibly from 250g piece above		
		62	SHC fragment		
		120	another friable piece, curved, this has some poorly developed crust, but is contorted, making interpretation difficult		
36	937	92	2 pieces of good dense low slag		
		84	flow slag attached to more charcoal-rich material		
		148	3 fragments of charcoal-rich material of varying density		
		1166	massive concretionary lump enclosing some somewhat flowed slag of uncertain nature and size		
		2308	another concretionary lump - protruding curved crust suggests it contains an SHC		
37	938	1843	20 fragments of a friable slag cake with internal flows and moulds of very large fuel fragments, shows mould to curve of base of pit in one piece - this must be "furnace bottom"		
		217	80x80x35mm, small rather blebby looking SHC	100	217

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
	203		irregular slightly lobate sheet - could be an odd SHC?	100	203
	400		70x90x45mm dense slightly dimpled plano-convex SHC	100	400
	92		55x40x25mm tiny plano-convex slag lump - possibly an SHC	100	92
37	939	144	broken piece of low density flow slag		
box 2	106		low density slag probably associated with above pieces		
47	940	403	prilly mass - possibly an SHC equivalent - but wide and deep, 50x130x70mm. Top very rusty but smooth, full of charcoal and white chalky ash	100	403
	352		wide shallow coralline SHC, central part of dish top glassy, raised coralline texture all round (except proximally) 110x125x35mm. Glassy drop has flown as drip down straight fracture on bowing side	100	352
74	941	3	small chert piece - silicified burrow? Not slag		
100	942	81	curiously superficially prilly curved sheet of slag - possible part of a small SHC or a beard from a tuyère tip		
104	943	371	13 pieces of indet slag, variable but possibly all SHC fragments		
104	944	253	3 pieces of grey very dense slag - probably SHC fragments		
110	945	103	probably most of a small SHC broken into 3 pieces		
111	946	113	2 pieces of probably weathered small SHC		
	30		blebby piece that may be a flow slag		
122	947	83	contorted dark, almost purple, slag sheet - probably a folded tiny SHC or part of an SHC		
122	948	880	dense SHC with really neat dished dense upper layer, sitting on much more irregular lower part, 120x110x60mm	100	880
	251		5 SHC fragments		
122	949	1159	double layered very thick crust SHC, about 40% probably, c170mm diameter, bowl to 60mm deep	40	2898
	587		18 pieces of irregular hearth slags		
	374		130x100x30mm, either gently curved crust from a large SHC - or a flat entire SHC		
	113		SHC fragment		
	133		SHC fragment		
	70		charcoal-rich slag indet		
1	950	93	rounded slag lump with smoothly lobate top, indet, but just possibly a tiny SHC?		

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
122	951	5	indet slag		
		105	SHC fragment		
		110	dense slag lump		
		421	110x100x30mm crust or SHC with eroded top?		
		130	SHC fragment		
		103	SHC fragment		
		1006	140x130x35mm medium sized very dense SHC, smooth planar top, fairly smooth but finely porous base	100	1006
		444	130x95x35mm SHC. Prilly base but absolutely smooth puddle top - must have been a very fluid lag. Prills large and locally pale	100	444
		665	mass of finely charcoal-rich soft material similar to 960g block below		
		330	60x110x60mm microprilly mass with knife-sharp planar surface to rear - possibly formed against stone - SHC equivalent	100	330
		151	thin crust with smoothly lobate upper surface		
		220	part of small dense SHC - maybe about half	50	440
122	952	777	150x130x70mm very irregular ashy block, possibly a SHC	100	777
		960	large block, possibly deformed of friable soft brown charcoal-rich slag		
		54	2 piece of probable dense low slag		
123	953	178	lobed slag set in ashy matrix - a bit like some smelting floor material, but could be a prilly SHC fragment		
		134	2 pieces of charcoal-rich ashy slag		
		45	dense flow slag		
		21	2 pieces of slagged ceramic surface		
132	954	4	rusty concretion		
135	955	96	very fresh fragment of microprilly/granular slag with microprilly base		
142	956	74	prob SHC fragment		
145	957	487	100x100x50mm (30mm bowl) almost plano-convex SHC, very neat shape, slight central cavity	100	487
		662	100x110x70mm quarter circle shape SHC, very deep central part of top is iron rich disc	100	662
149	958	52	SHC crust fragment		
		16	slag indet		
149	959	932	large irregular block from the centre of an extremely large double layer cake, probably double layer because there are two superimposed cakes rather than an intrinsically two layer structure		
		372	probably complete small SHC, very iron rich lower lumpy part and more slaggy, smaller upper layer, 80x80x55mm of which iron rich layer 25mm	100	372
		103	part of small SHC		



context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
		124	iron slag indet		
149	960	550	115x140x55mm neat dense transverse SHC	100	550
		443	80x110x40mm probably an SHC, but has area of crust or burr rather low down giving an odd appearance	100	443
		938	110x90x50mm slight irregular but very dense SHC	100	938
149	961	118 37	lobate slag sheet, rough base, smooth top, probably vestigial SHC, 75x75x25mm indet slag	100	118
149	962	163	dense small burr or base of SHC, grey slightly vesicular shaped - curved but overall form not known		
149	963	15	rusty slag fragment		
		31	charcoal-rich slag fragment		
		97	SHC burr/lip with very smooth top		
		321	ferricrete on much of small SHC		
		933	90x125x65mm dense deep SHC probably 90%, parts of lower crust seem missing	90	1037
		924	120x155x50mm dense neat SHC with fairly smooth top	100	924
		572	60% of dense plano-convex SHC, 130x(80)x45 of which bowl 30mm, crust 15mm	60	953
149	964	1224	160x135x40 very flat SHC	100	1224
149	965	398	4 blocks of grey dense slag with small vesicles. At least two pieces appear to be from a burr		
149	966	300	110x80x50mm of which bowl 35mm, rather irregular SHC	100	300
		265	dense double layer mass- possibly a small deep intact SHC	100	265
		52	indet slag in 2 pieces		
		162	probably entire small SHC - odd shape 60x50x40mm, rounded quarter circular top, angular base	100	162
149	967	1462	140x120x80mm dense neat almost plano-convex SHC - just very slightly dishd top, very dense, deepest proximally	100	1462
		444	100x100x45mm plano-convex SHC dense, neat	100	444
		36	indet slag fragment		
		114	slag broken from tuyère tip, tuyère is of very low curvature		
		113	70x50x30mm tiny dense plano-convex SHC	100	113
		79	indet vesicular slag fragment		
		248	small SHC with thin crust and charcoal-rich interior, badly fractured on extraction - originally 100x90x40mm	100	248
1	968	9	dense indet slag with lobate flows above flat base - just a small fragment though		
167	969	27	dense blebby dimpled slag with purple surface in rounded lump rusty concretion		



context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
		47	nub of charcoal rich slag		
161	970	380	curious prilly slag mass with various smooth surfaces, probably a low density SHC, 90x100x60mm	100	380
		29	dense slag rich in tiny charcoal		
		18	dimpled slag fragment		
		481	110x100x50mm probably a very irregular dense SHC	100	481
<b>Box 3</b>					
427	343	7	dimpled slag bleb with one large charcoal mould		
165	971	9	corroded iron artefact		
165	972	109	dense slag fragment with dimpled base and smooth top. Strange grey-purple colour, very coarsely crystalline, possible chert fragments included - almost entirely fayalite		
167	973	13	dimpled small slag bleb		
180	974	20	sherd from margin of tuyère face - only small area of edge but suggests 100mm diameter, oxidised fired internally		
184	975	518	large slab of curved crust with 3 tool marks on base (cf Frocester). crust to 20mm no bowl contents, no true edges		
		367	charcoal rich friable slag with planar basal contact		
		20	small lobate fragment		
		158	charcoal-rich crust with bend - deformed?		
		63	SHC fragment		
165	976	4	small fragment of ashy possible flow slag		
194	977	45	4 pieces of rusty blebby slags, one with possible planar floor contact		
213	978	4	bog iron ore fragment?		
		15	charcoal-rich microprilly slag - curves around a larger void - so might just be a flow slag		
		16	ferricrete on slag or iron?		
224	979	465	block from the centre of a large SHC with crust 30mm thick, microprilly base irregular (charcoal?) top is not the top of the cake		
		1101	11 pieces of a prilly friable cake, a bit weathered, one piece has a possible burr but little overall sign of shape - but presumably large		
		568	9 lumps of dense slag, some probably with included iron		
224	980	538	6 pieces of dense slag apparently containing iron		

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
231	42		lumps of iron		
	508		plano-convex prilly cake - not clear if it is an SHC or part of something larger? 120x120x50mm		
	536		ferricrete block - probably mainly prilly slag, but obscured		
	677		5 pieces of large thinish crust SHC with crust to 20mm, with tubular vesicles, below deep porous bowl fill to 60mm? Proportion of cake unknown		
				100	453
234	453		130x100x40mm elongate triangular SHC or tongue, top glassy, base iron rich and prilly		
	27		dense slag with smooth charcoal dimples		
	58		lower density iron slag with enclosed charcoal lumps		
	1224		180x115x65mm SHC, of which bowl 40mm, plano-convex, slab of lining rich material resting on proximal end, elongate, dense, smoothish base, top has slight concentric lineations	100	1224
234	47		dense rather blebby or prilly slag lump		
	49		dense rather blebby or prilly slag lump		
	1128		large accreted block of slag with one perfectly smooth face - looks like an accumulation on, or flow over, stone, but no real detail		
	452		irregular dense slag lump		
	159		clean piece of flow with a smooth, but non-wetted lobate base. Upper part broken - not good lobes like true flow slag		
234	442		axe head shaped fragment from a SHC, has moderately thick crust with brittle fractures. Must have been a large SHC		
	106		ferricrete on slag		
	309		biconvex SHC with central void, similar to material above, this is probably 80% of a cake - very dense slag lower crust to 10mm, 100x60x45mm	100	309
	470		SHC broken off then folded double with tongs on extraction, dense, size not determinable	100	470
	373		neat small SHC, plano-convex bowl with spherical lump of slag stuck on top at one end, 110x80x60mm of which bowl 25mm, base dimpled	100	373
234	200		part of small SHC crust		
	178		part of crust of an SHC		
	209		dense slag with flow lobes onto planar surface		
	319		very dense rather granular appearing slag lump		
	451		probable SHC fragment		
234	332		probable SHC fragment		
	832		large block representing the burr region of an extremely thin crust cake with microprilly/granular crust, curvature suggests cake of c250mm across		
	150		prilly/lobate slag with sediment contact on one side and medium-large voids, probably charcoal voids		
	188		lobate slag around medium charcoal moulds, rusty		
	394		large block of porous slag with several denser crust-like horizons, has one possible basal surface at low angle to these and a possible blown surface at a high angle - could be side of large bowl with inclined layers		
234	103		low density charcoal rich slag lump		
	1058		curious almost plano-convex presumably SHC formed of lobes, rusty top with hollow, lobate base, 150x110x50mm	100	1058
	810		130x130x50mm triangular SHC with dished blown top and strongly lobate base, extending distally well-beyond top	100	810

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
1058			margin with burr of large cake with neatly inclined base, but orientation hard to establish; it could be a relatively flat SHC with a disturbed proximal area, perhaps folded up, or it could be a steep sided piece - perhaps even from smelting, very difficult, but SHC probably best interpretation		
276			very weathered piece which is probably most or all of deeply dished low density SHC, rusting hints there might have been loss of metallic iron from this though	100	276
303			rounded lump of charcoal-rich slag, with a rounded blown surface, might be deformed SHC but hard to be certain		
252			porous rusty weathered slag - possibly from lip of large bowl		
314			prilly SHC, now low-density, cut through centre at angle so either 50% of a cake - or one which formed as a semicircle against an inclined wall	100	314
908			part of a large flat dense SHC, possibly 60% but very tentative, 130x150x50mm, bowl 30mm deep, but horizontal dimensions not known because broken	60	1513
863	234	984	120x110x45mm, very dense neat SHC, plano-convex, smoothish base	100	863
1213			150x140x65mm, prilly SHC, with slightly double-layered form, lower bowl 25mm deep some lateral lobing, upper part prilly with blown hollow	100	1213
127			piece of basal crust with large lobes above between moderate charcoal moulds		
131			rusty, prilly slag lump		
101			broken slag ball, dense with central void, probable lower crust has somewhat tubular vesicles		
41			rusty low density slag lump		
26			dimpled slag fragment		
162			dense crust from cake with lobate form, non-wetted sides show lobes, massive internally, cake base has a distinct angle suggesting possible base of wall?		
214			SHC fragment from small dense SHC, possibly around one third	33	642
208			lobate to granular slag with smooth blown face, base is very smooth as if in contact with stone - so may be from vertical wall - difficult to orient		
280			c90% of small irregular SHC with hint of multiple layers	90	311
82			iron-rich prilly slag lump - possibly contorted		
117			probably most of small SHC with well flowed smooth top, very thin 80x60x20mm	100	117
141			fragment from lip of large dense SHC with open deep bowl, interior smooth, top of lip has charcoal dimples, tubular vesicles in crust, base microprilly		
428			110x70x50mm, transverse biconvex rather microprilly SHC		
273			80x100x30mm, probably most of small transverse SHC, 90%?, rough, very rusty	100	428
98			roughly lobate slag piece	90	303
208			fragment from medium-sized two layer cake, oddly the upper layer has tubular vesicles		
83	235	985	lump of decomposed charcoal-rich slag		
21	1181	986	horn shaped brown slag bleb - probably originally hollow but now one end has collapsed		

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
236	987	150	complicated block of fired (reduced) and vitrified ceramic. Presumably tuyère related, but very hard to orient, backing of reduced fired material with possible "brick" edge - and slag in front has large (now missing) oxidised fired piece of clay		
		28	second piece of vitrified clay - note oxidised fired clay in front could just be matrix		
244	988	98	prilly slag with what appears to be a lower contact surface at right angles to blown surface, could be top of side of smelting cake, but there are other possibilities		
		109	plano-convex prilly piece 110x70x40mm. Top smoothish and blown,		
		83	prilly/dimpled slabby low density slag	100	452
		452	double layer cake - upper layer very iron-rich. Not clear if this could be a standalone cake or part of something larger. 70x80x90mm	100	453
		453	medium dense SHC, probably transverse, 80x100x50mm, possibly gravel base but could be accretion		
270	989	113	probable SHC fragment, dense slag, would be from small SHC		
<b>box 4</b>					
122?	990	1617	obsured by accretion - but appears to be dense SHC, 160x140x60mm	100	1617
(Given		178	rounded lobate lump - probably an odd prilly SHC, 65x50x50mm	100	178
as		251	110x100x35mm, probably an SHC - thin triangular sheet-like crust overlain by lobate materials	100	251
F291		270	obsured but probably SHC 80x80x30mm	100	270
on					
label,		1350	140x120x80mm of which 40mm bowl, charcoal-rich upper but dense SHC, micro-dimpled base	100	1350
but		1407	140x120x70mm SHC with another crust attached low down to one side overall 170x100x100mm	100	1407
that is		1371	130x160x80mm very dense thick crust SHC, probably 75% preserved	75	1828
p/hole		63	dense flow slag		
cut,		823	8 blocks of brown flow slag with large moulds, impression is of cake with gently sloping sides		
p-trace		1756	17 pieces of similar cavernous thin crust cake without flow or large charcoal moulds		
label		295	sub-blowhole piece with straight oxidised wall attachment, curving crust internally, prilly below, hint of glass on top. This is brown like the slags above, but the whole looks as if it may be an SHC attachment to tuyère front		
gives					
F122)		306	80x70x45mm slag ball with corroding iron - probably a small SHC	100	306
		233	70x80x40mm most of small microprilly SHC	100	233
		1486	9 fragments of SHC crust		
		93	flow slag with moulds		
		239	3 pieces of indet iron slag		
317	991	278	lower part of clinkery-looking charcoal-rich SHC with dimpled base		
		130	dense sheet from distal edge of well flowed SHC - could be another of the ones from stone base		
		92	3 SHC fragments probably		
317	992	846	120x100x55mm neat slightly two layer very prilly SHC	100	846
318	993	473	100x120x50 brown weathered prilly SHC	100	473

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
319	994	100	SHC crust with attached lump of iron	100	388
	388		decomposing small poorly-compacted biconvex SHC, exploding, 110x80x55mm of which bowl 30mm		
324	995	44	2 pieces of dark dense prilly slag flown between small charcoal		
324	996	454	80x130x60mm, probable SHC but very irregular	100	454
	268		very dense SHC starting to explode, probably 70%	70	383
	267		3 pieces of indet dense slag		
	249		90x70x40mm exploded plano-convex rough slag block - very irregular but probably a piece of flow slag - has 15mm diameter moulds - flow or SHC - difficult to tell		
324	997	76	concretion around iron - has exploded		
	82		concretion around iron		
	33		concretion around iron		
324	998	10	3 tiny slag fragments		
	7		accretion on small piece of iron		
324	999	173	disintegrated lump of rusted iron		
	102		3 indet slag fragments		
339	1000	496	rounded large slightly dimpled block - probably a large burr		
341	1001	81	slightly granular rounded nub of hearth slag		
342	1002	42	4 pieces of blebby prill		
	50		dense slag with flat base - cf other stone based materials		
	44		slag indet.		
343	1003	46	4 pieces of brown friable porous slightly prilly slag		
347	1004	402	80x130x35mm, rather fluid appearing SHC, thin puddle on top of more charcoal rich material, some marginal lobation	100	402
347	1005	56	corroding iron		
	323		5 slag lumps all probably SHC fragments	100	86
	86		60x65x25mm tiny SHC?	100	127
	127		60x50x35mm tiny SHC?	100	153
	153		70x60x30mm tiny SHC - v dense		

context	sample	weight	notes	SHC details	
				% of orig.	Orig. Wt.
348	1006	4	thin slag sheet from large vesicle in flow over flat base		
348	1007	279	80x85x55mm of which bowl 35mm, small dense SHC	100	279
348	1008	7 244 250 366	possible poker mould iron in accretion - worth X-Ray 23 fine scale flow slag pieces 11 slag fragments - all probably SHC debris		
353	1008	307	small biconvex SHC, exploded into 3 from corrosion of central iron fragment, 80x95x50mm of which bowl 35mm	100	307
356	1009	1683	160x190x75mm, 80% of original cake, folded/lobate smooth top - non -directional, internally seems to have lots of flow lobes, very dense cake. This is interesting, has moderate charcoal moulds - long stick like pieces of low diameter max 17mm	80	2104
		827	very dense slag flow with thick burr areas at one end extending out into very irregular sheet form with lots of holes and charcoal moulds. Burr area to 55mm thick - reminiscent of SHC attached to stone block from c20		
		199 114	75x80x45mm, small neat low density SHC, slightly biconvex SHC crust?	100	199
		357 159 129	granular to microprillily slag block, irregular, has a long stick charcoal mould margin of very dense SHC probably entire small granular/microprillily SHC, 70x70x30mm	100	129

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

[illegible]

Table 2. Distribution of smithing hearth cakes by weight (g) for cakes from Parknahown 5. Each class interval runs from the lower limit up to, but not including the upper figure. †000g class intervals are shown for entire assemblage, with additional detail for the smaller SHCs.

<i>n</i>	89
<i>min</i>	86g
<i>max</i>	2898g
<i>average</i>	567g

	<i>number</i>	<i>%</i>
<500	62	70%
<1000	75	84%
>1000	14	16%
>3000	0	0%

Table 3. Summary statistics for the smithing hearth cakes from Parknahown 5, for which the total weight could either be measured or estimated.



	Coolamurphy	Navan	Moneygall	Carrigoran	Parknahown 5	Trumra 4	Clonmacnoise (NG)	Ballykilmore	Woodstown 6	Clonmacnoise (WWS)	Clontarf	Lismore/ Bushfield 1
date	C10-12	E. Med.	E. Med- Med.	C10?	C5-C10?	C5/6	C7-10	C10-15?	C9-10	C10?	C7-9	E. Med?
SHC count	41	17	22	18	89	57	117	30	140	38	381	23
SHC min. wt		60	114		86	92	100	94	68		60	426
SHC max. wt	2588	2990	1800	3866	2898	3163	7815	4033	6310	5540	11000	4390
SHC mean wt	386	507	527	553	567	727	843	1022	1060	1087	1302	1737
% <500g	83%	82%	55%	72%	70%	47%	50%	47%	40%	39%	30%	4%
% <1000g	95%	88%	95%	89%	84%	75%	78%	73%	71%	68%	61%	39%
% >1000g	5%	12%	5%	11%	16%	25%	22%	27%	29%	32%	39%	61%
% >3000g	0%	0%	0%	6%	0%	2%	3%	10%	7%	8%	9%	13%
Modal 100g interval	100-200	100-200	200-300	100-200	400-500	100-300	400-500	200-300	200-300	300-400	300-400	500-600

Table 4. Comparison of the Parknahown 5 SHC assemblage with other Irish smithing assemblages.

Assemblages ordered by mean SHC weight.

Coolamurphy from Young, 2008a; Navan Site 1 from Young 2007; Moneygall from Young 2008b; Carrigoran from Young 2006b; Parknahown, this study; Trumra 4 from Young 2008d; Clonmacnoise New Graveyard site from the author's work in progress; Ballykilmore from Young 2009b; Woodstown from Young, 2006a; Clonmacnoise Waste Water Scheme from Young 2005; Clontarf from Young 2009a; Lismore/Bushfield 1 from Young 2008c.

The assemblages from Coolamurphy, Navan, Moneygall, and Carrigoran are interpreted as being dominantly blacksmithing residues. The assemblages from Trumra, Clonmacnoise, Ballykilmore, Woodstown, Clontarf, and Lismore/Bushfield are interpreted as including bloomsmithing residues.

	SHC	other smithing	smelting	Indeterminate slag	tuyère	iron	other	total
<b>Period 2 phase 1</b>								
F106 enclosure	5905	0	2068	2829	21	9	4	10836
F156 same as F106 on north?	7222	0	0	1386	0	671	0	9279
F134 internal ditch	0	0	0	45	0	0	0	45
slot 282	113	0	0	0	0	0	0	113
pit 183	581	0	0	545	0	0	0	1126
pit 186	0	0	0	0	20	0	0	20
<b>Period 2 Phase 2</b>								
F29 inner ditch	7386	281	634	5218	1051	0	0	14570
F391 same as F29 on the north?	0	0	0	217	0	0	0	217
F24 outer ditch	0	0	0	81	0	0	0	81
<b>Period 2 General</b>								
F257 bank	41843	862	2789	13056	292	42	0	58904
Grave-fills	0	0	0	28	0	0	0	28
<b>total</b>								
topsoil	3369	0	0	1282	51	12	1	4715
non-archaeological contexts	1223	0	0	87	0	0	3	1313
<b>total</b>								
	67642	1163	5491	24774	1435	734	8	101247

Table 5. distribution of residue classes at Parknahown 5 by feature and phase

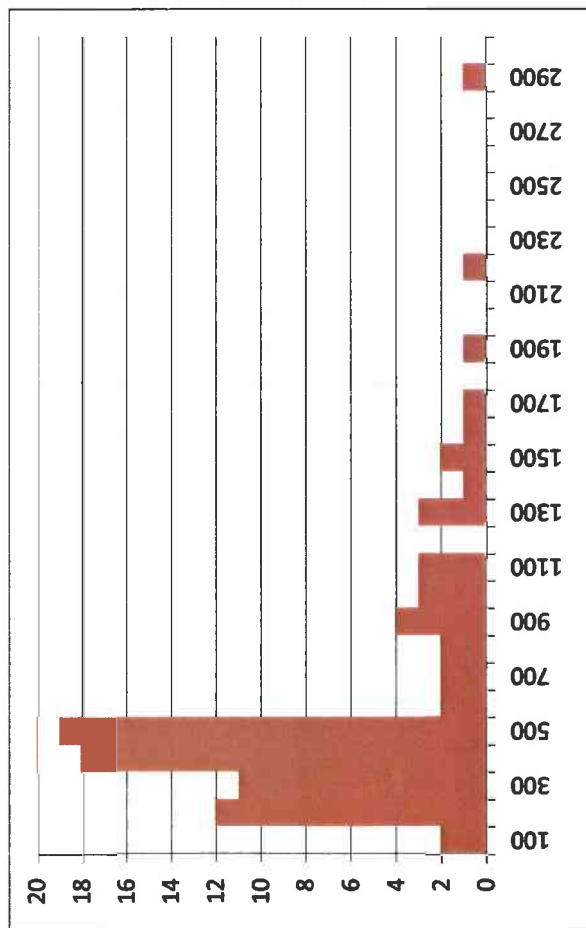


Figure 1. Size-frequency distribution for the weight of SHCs from Parknahown 5. Weight classes are 100g intervals up to the labelled value.

# GeoArch



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**Parknahown 5,  
M7 Portlaoise-Castletown /  
M8 Portlaoise-Cullahill, Contract 1,  
Gortnaclea To Oldtown**

**Archaeological Geophysical Survey**

**Direction No. A015  
Registration No. R35  
(Adjacent to Testing Area 12 A015/153)**

**Survey undertaken on behalf of  
*Archaeological Consultancy Services Limited***

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**EAG 100  
08 March 2007**

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## Summary of Results

*On the 21<sup>st</sup> November 2006 and 5<sup>th</sup> February 2007, a series of geophysical surveys funded by Archaeological Consultancy Services Limited were conducted within the common purchase order boundary of the proposed M7 Portlaoise to Castletown / M8 Portlaoise to Cullahill Road Scheme, County Laois. The areas were investigated using a fluxgate gradiometer at a sampling resolution of 1 x 0.125 m. An area defined by the client, inside this survey, was highlighted as possibly containing burials and therefore was resurveyed using a higher sampling interval. Fluxgate gradiometer surveys at a sampling resolution of 0.5 x 0.125 m and an earth resistance meter at a 0.5 x 0.5 m sampling resolution were used.*

*The survey was conducted upon a bedrock geology of Durrow Formation consisting of shaly fossiliferous & oolitic limestone. The survey areas were covered in short grass which was amenable for geophysical surveys.*

*The magnetic gradiometer survey conducted over the entire survey area revealed the presence of a substantial ditched enclosure with a possible entranceway. This enclosure appears to have a double ditch defensive system on its south and west sides, while no evidence of this second ditch was detected on the eastern side. From the geophysical results it is possible to suggest that the enclosure once occupied the area now defined by the field boundaries associated with the watersystem and a pipeline present on site.*

*A number of internal features were also detected suggesting a series of sub-divisions once existed inside the enclosure. A central sub-circular ditch was detected which suggests a possible smaller enclosure or subdivision. The remains of a possible habitation structure and a right-angled ditch were also detected suggesting continued use of the site. High-resolution surveys were undertaken in the centre of the enclosure over an area thought to contain burials. A number of possible graves were identified as well as possible boundary features.*

*On the outside of the enclosure further possible archaeological remains were identified in the form of a rectangular pit system, relict field boundaries and cultivation activity as well as a linear pit trend.*

## Statement of Indemnity

*A geophysical survey is a scientific procedure that produces observations of results which are influenced by specific variables. The results and subsequent interpretation of the geophysical survey presented here should not be treated as an absolute representation of the underlying archaeological features, but as a hypothesis that must be proved or disproved. It is normally only possible to provide verification via intrusive means, such as Test Trench excavations.*



## 1. Introduction

*Earthsound Archaeological Geophysics* were commissioned by Ms. D. Murphy of *Archaeological Consultancy Services Limited*, to execute a geophysical survey adjacent to an archaeological site within the proposed M7 Portlaoise to Castletown / M8 Portlaoise to Cullahill Road Scheme, County Laois. The geophysical survey area was located beyond C.P.O. boundary of the road scheme.

The geophysical survey was requested to determine the presence/absence of unknown archaeological features associated with the results of archaeological excavations, which revealed the presence of a large enclosure, known as Parknahown 5, which contained a number of burials. The site was assessed via high resolution magnetic gradiometer and earth resistance surveys.

Permissions to undertake the survey were obtained from the *Department of the Environment, Heritage and Local Government* (Licence Number A015/153-R35).

### 1.1 Geography, Topography, Geology & Climate

Located within the townland of Parknahown, the northwest corner of the site (Figure 1) lies at *Ordnance Survey of Ireland* Irish National Grid (ING) Reference E234265 N174256.

Parknahown is located in County Laois, 1 km northwest of Cullahill, approximately 7 km southeast of Rathdowney, and 8 km southwest of Durrow. The survey area is located west of the Cullahill junction off the N8 National Road. A number of Third Class Local Roads also provide access to and from the site.

The survey area is located in two fields between a Third Class Road leading from Cullahill village to the south, and the River Goul to the north. The geophysical survey area is located adjacent to the C.P.O. boundary and the archaeological excavation area of Parknahown 5. The geophysical grid baseline was established along the eastern side of the C.P.O. boundary.

The topography of the site is comprised of a central raised area of ground which falls off sharply to the east and north and more gently to the south. The fields were covered in short grass, which proved amenable for each of the survey techniques

The survey was conducted upon a bedrock geology of Durrow Formation consisting of shaly fossiliferous & oolitic limestone. The geology provided a good contrast for the magnetic gradiometer geophysical survey.

Local and recent climate can severely affect earth resistance data. In the week preceding the geophysical survey, the climatic conditions were wet with dry periods, which continued during fieldwork. Surveys conducted in this climate will have a lower mean resistance than those conducted during the drier periods.

## 1.2 Archaeological Background

The land located within the C.P.O. boundary was excavated by *Archaeological Consultancy Services Ltd.* during 2006 and a large number of archaeological features were encountered, including four enclosure ditches, a burial ground containing approximately 600 individuals and settlement evidence in the form of a circular slot trench and associated postholes and pits. The enclosures were circular and the outermost enclosed an area of 70 m in diameter. Approximately half of the enclosure and a smaller burial enclosure, lies within the C.P.O. boundary. A large number of finds were retrieved from the site including glass beads, fragments of decorated bone combs, a collection of bronze pins including two penannular pins with elaborate decoration, bone pins, iron knife blades and Bronze Age Beaker pottery among others. All of the finds with the exception of the pottery were Early Christian in date. Parknahown is a complex site, which spans hundreds of years. The earliest phase of use relates to settlement in the Early Christian period, probably sometime around the sixth or seventh century. The settlement is then superseded by the burial phase of activity, which appears to continue into the late Medieval period.

## 1.3 Aims & Objectives

The aim of the geophysical survey was to determine the nature of the archaeological resource in advance of the proposed development scheme. Specific objectives were to:

- Determine the eastern extent of the enclosure (beyond the C.P.O. boundary)
- Determine the eastern extent of burials (beyond the C.P.O. boundary)
- Assessment of the spatial extent and presence/absence of any further archaeological features

A methodology was developed to allow multiple techniques to systematically investigate the site. Highly detailed magnetic gradiometer and earth resistance surveys were carried out within the survey area. The survey was adapted to identify potential burials if possible. Burials are extremely difficult to identify in geophysical data due to the short and narrow size of the grave cut.

These geophysical techniques have been used in commercial and research archaeological projects for many years and are considered the most appropriate techniques for a detailed investigation of the underlying archaeology (Clarke 1996, Scollar *et al.* 1990).

Where possible, the use of multiple geophysical techniques allows a greater confidence to be placed in the interpretation of detected anomalies, which is especially useful on small sites such as this. Their combined application can be used to determine the geometry, compositional material and the extent of an archaeological target.

## 2. Methodology

J. Bonsall and I. Murin of *Earthsound Archaeological Geophysics* carried out the fieldwork on the 21<sup>st</sup> November 2006 and 5<sup>th</sup> February 2007. The geophysical survey was carried out in a number of Phases (see Table 1, below). Two *Geoscan Research* FM256 fluxgate gradiometers were used for Phases 1-3. A *Geoscan Research* RM15 earth resistance meter was used for Phases 4 & 5.

Phase	Technique	Sampling Resolution	Direction of Survey	Reason for Survey
1	Magnetic gradiometer	1 x 0.125 m	NNW-SSE	Determine the extent of the Parknahown 5 main enclosure, over a 110 x 90 m area
2	Magnetic gradiometer	0.5 x 0.125 m	NNW-SSE	Focused on a 30 x 30 m area where burials are suspected to continue. The high-resolution survey may pick up magnetic anomalies that could be indicative of graves. A 0.5 m traverse separation could record more data points for a potential 1.8 m long grave cut (6 ft).
3	Magnetic gradiometer	0.5 x 0.125 m	ENE-WSW	Focused on the same 30 x 30 m area as Phase 2. The survey direction has turned 90° in order to sample along the length of potential 1.8 m long grave cuts (6 ft).
4	Earth resistance	0.5 x 0.5 m	NNW-SSE	Focused on the same 30 x 30 m area as Phases 2 & 3. The high-resolution survey may pick up low resistance anomalies that could be indicative of graves. A 0.5 m traverse separation could record more data points for a potential 1.8 m long grave cut (6 ft).
5	Earth resistance	0.5 x 0.5 m	ENE-WSW	Focused on the same 30 x 30 m area as Phases 2-4. The survey direction has turned 90° in order to sample along the length of potential 1.8 m long grave cuts (6 ft).

Table 1. Geophysical Survey Phases

For each detailed assessment over the potential burial area (Phases 2-5), the survey was repeated and the direction of the survey was altered by 90°. Burials are generally east-west aligned and by altering the survey direction a greater amount of information can be gained over small features such as grave cuts.

Graves are poorly defined within geophysical data:

Magnetic gradiometer data:

Graves are rarely magnetically enhanced. The grave cut is generally dug and backfilled with the same material within a day. This reduces the chance for soil fermentation and magnetic enhancement, which occurs over a long period of time.

A grave cut is usually very small, even for adults. A typical grave cut may be expected as 1.8 x 1 m in size for an adult. A small feature is very difficult to identify and requires a high-resolution sample interval.

Coffin nails or grave goods may create dipolar anomalies or anomalies of localised magnetic enhancement, but a magnetic gradiometer is very unlikely to identify a single grave cut as an individual feature.

Earth resistance data:

A low resistance anomaly may be identified as a discrete feature, providing enough contrast exists between the background response and the grave cut.

The density of burials excavated at Parknahown 5 suggests that rather than identify individual grave cuts, a large area of low resistance may be found, which would represent a number of overlapping and inert-cutting graves.

A rectangular grid was laid out using a *Trimble* Pro-XRS Differential Global Positioning System (see Technical Appendix 2), and divided in to 40 x 40 m sub-grids for the gradiometer survey and 20 x 20 m for the earth resistance survey.

## 2.1 Magnetic Gradiometer Survey

The survey was undertaken along lines parallel to the sub-grid edges (the traverse direction is given for each phase of work in Table 1, above). Subsequent lines were surveyed in alternate directions ('zigzag').

Data were recorded using an FM256 at a variable spatial resolution (the sampling density is given for each phase of work in Table 1, above). The instrument was positioned facing north, parallel to the Earth's magnetic field, to allow increased geo-magnetic resolution.

The instrument was set to a recording sensitivity of 0.1 nT. Prior to the beginning of the survey and after the completion of every two sub-grids, the electronic and mechanical set-up of the instrument were examined and calibrated as necessary over a common reference point. The magnetic drift from zero was not logged.

Data were collected automatically using an internal sample trigger while the operator walked at a constant pace along the traverse. The data were stored in an internal data logger and downloaded to a field computer using the *Geoscan Research* Geoplot v.3.00a software.

## **2.1.1 Data Processing**

### **2.1.1.1 Preliminary Data Treatment**

The data were pre-processed in Geoplot 3.00.

Spurious high intensity anomalies, commonly statistical outliers, are referred to as geophysical 'spikes'. In magnetic data, an 'iron spike' is a response to a buried ferrous object, often in the topsoil. Iron spikes are generally not removed in geophysical data; although often modern in origin, they can be indicative of archaeological material.

The raw data contained some poorly matched sub-grids, caused by the internal drift of the fluxgate gradiometer and the gradual misalignment of the fluxgate sensors between calibration episodes. To compensate for this, a zero mean traverse (ZMT) function was employed. The use of ZMT alters data to adjust the mean of each traverse to zero by increasing or decreasing data as necessary. This alters the statistical properties of the data to give a uniformly bipolar background, centred around zero. Post-ZMT plots were compared with raw data to analyse the potential removal of geophysical anomalies along the line of a traverse.

### **2.1.1.2 Further Processing**

No further processing functions were applied due to the high quality of the data collection.

A low pass Gaussian filter was applied, reducing the variability of the data whilst improving the visibility of weak archaeological features. This also had a smoothing effect on the data.

A sine wave interpolation function was applied to provide a smooth, aesthetically pleasing image for presentation. For a given point  $x$ , the contribution of adjacent readings to the interpolated point is given by the function  $\text{sinc}(x) = \sin \pi x / \pi x$  (Scollar 1990). This function is used as a sliding window along each transect, resulting in an interpolated image, doubling the resolution of the data (e.g. for Phase 1, from 1 m x 0.125 m to 0.5 m x 0.06125 m). This function was chosen as giving a clearer interpolated image than linear interpolation (which assumes a direct linear change between each point) or bicubic interpolation (taking the surrounding sixteen values into account).

### **2.1.2 Graphical Display**

Pre-processed data are displayed in XY traceplot format in Figures 2 and 5. An XY traceplot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a stacked plot. The data have been clipped at  $-3$  and  $+3$  nT. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the 'shape' of individual anomalies can be discerned and potentially archaeological anomalies differentiated from iron 'spikes'.



Processed data are shown in Greyscale format in Figures 3 and 6. The greyscale plot presents data as pixels on a linear grey shaded scale, increasing or decreasing dependent on the values of the maximum and minimum clip. The geophysical data in Figures 3 and 6 have been clipped at  $-2$  (white) and  $+2$  nT (black). Data values beyond the clip limits are shown as 'pure' black or white. The main advantage of this display option is that the data can be viewed as a base map.

Interpretation plots are presented in Figures 4 and 7.

## **2.2 Earth Resistance Survey**

The survey was undertaken along lines parallel to the sub-grid edges (the traverse direction is given for each phase of work in Table 1, above). Subsequent lines were surveyed in alternate directions ('zigzag').

Data were recorded using an RM15 PA5 Twin-probe array with a multiplexer, at a spatial resolution of  $0.5 \times 0.5$  m. The instrument was rotated between traverses and set to a recording sensitivity of  $1 \Omega$  (Gain at  $\times 1$ ). The mobile probes were spaced  $0.5$  m apart. The remote probes were located  $15$  m away from the mobile probes ( $0.5 \text{ m} \times 30$ ) and were spaced  $1.5$  m apart. The remote probes were relocated eight times during the survey and calibrated as necessary to ensure consistency.

The data were stored in an automatic data logger and downloaded to a field computer, using Geoplot 3.00.

### **2.2.1 Data Processing**

#### **2.2.1.1 Preliminary Data Treatment**

The data were pre-processed in Geoplot 3.00.

The raw data contained some poorly matched sub-grids, caused by the relocation of the remote probes. To compensate for this, an edge matching function was employed.

Spurious high intensity anomalies, commonly statistical outliers, are referred to as geophysical 'spikes'. In earth resistance data, spikes are caused by poor contact resistance, often with loose lying stones within the survey area. To compensate for this, the data were 'de-spiked' with an image processing algorithm threshold of 2, to remove the spurious data.

#### **2.2.1.2 Further Processing**

No further processing functions were applied due to the high quality of the data collection.

A sine wave interpolation function was applied to provide a smooth, aesthetically pleasing image for presentation. For a given point  $x$ , the contribution of adjacent readings to the interpolated point is given by the function  $\text{sinc}(x) = \sin \pi x / \pi x$  (Scollar 1990). This function is used as a sliding window along each transect, resulting in an interpolated image, expanding the resolution of the data from  $0.5 \text{ m} \times 0.5 \text{ m}$  to  $0.25 \text{ m} \times 0.25 \text{ m}$ . This function was chosen as giving a clearer interpolated image than linear interpolation (which assumes a direct linear change between each point) or bicubic interpolation (taking the surrounding sixteen values into account).

### **2.2.2 Graphical Display**

Pre-processed data are displayed in XY traceplot format in Figure 8. This display method has been chosen for the reasons stated above. The data have not been clipped. The main advantage of this display option is that the full range of data can be viewed, so that the 'shape' of individual anomalies can be discerned.

Processed data are displayed in greyscale plot format in Figure 9. The greyscale data have been clipped at 30  $\Omega$  (white) and 150  $\Omega$  (black).

An interpretation plot of the earth resistance data is presented in Figure 10.

## **2.3 Reporting, Mapping and Archiving**

The geophysical survey and report follow the recommendations outlined in the *English Heritage Guidelines* (David 1995) and *IFA Paper No. 6* (Gaffney *et al.* 2002) as a minimum standard.

Geophysical data, figures and text are archived following the recommendations of the *Archaeology Data Service* (Schmidt 2001).

Field boundaries were mapped and drawn based upon data gathered by the DGPS. All figures reproduced from *Ordnance Survey Ireland* mapping are done so with permission from *OSI* copyright (Licence No. AR 0047306).

Technical information on the equipment used, data processing and methodology are given in Appendix 1. Appendix 2 details the survey geo-referencing information and Appendix 3 describes the composition and location of the archive.

### 3. Results & Discussion

*The interpretation figures should not be looked at in isolation but in conjunction with the relevant discussion section and with the information contained in the Appendices. Features are numbered in Figures 4, 7 & 10 and are described and interpreted within the text.*

#### 3.1 Phase 1 Magnetic Gradiometer Survey

Figure 3 – Magnetic Gradiometer Data

Figure 4 – Magnetic Gradiometer Interpretation

##### Site Summary

By combining the excavation data and geophysical results a comprehensive series of enclosure ditches can be appreciated, including the original site enclosure and a double ditch. The inner component of the double ditch (anomaly 1) is roughly oval in shape, measuring 82 m in diameter (northwest-southeast), enclosing an area of approximately 0.6 hectares. The majority of the enclosure lies within the C.P.O. boundary. The northern portion of the enclosure ditch may have been located on or adjacent to the present day water system at the northern end of the field. A modern pipe or dumped material (anomaly 2) seems to follow the likely trajectory of the enclosure, and occupies an area in which the ditch itself should be expected. It is possible that the pipeline or dumped material was placed in the remains of the enclosure ditch and backfilled. The combined excavation and geophysical data suggest that the outer enclosure ditch is at least 147 m in length (discounting the potential continuation of the ditch associated with the dumped material).

The outer component of the double ditch (anomaly 3) has also been identified in the geophysical data. The remains of pipe sections within the field prevented a full assessment of the site, however the data suggests that the outer enclosure ditch does not completely surround the main ditch. The combined excavation and geophysical data suggest that the outer enclosure ditch is at least 110 m in length.

In magnetic data, a dipolar anomaly or 'iron spike' is a response to buried ferrous objects, often in the topsoil. Iron spikes generally are not removed in geophysical data, although often modern in origin, they can be indicative of archaeological material.

Anomaly [1] is a sub-circular ditch and is the continuation of the inner double ditch identified within *Archaeological Consultancy Services Limited's* excavations. The enclosure ditch is approximately 4 m wide and was detected for a length of 42 m. The anomaly appears to contain an entranceway to the southeast. The ditch probably continues to the northeast however a modern concrete structure and associated debris has disturbed the magnetic signature in this area.

Anomaly [2] is a highly magnetic modern pipeline or dump of material and runs adjacent to the field boundary from the concrete structure. It was noted at the time of survey that pipe work was present on the site leading from the structure. The associated geophysical anomaly suggests that the pipeline or dump of material continues to the nearby water system. The pipeline or dumped material is likely to have been placed within the enclosure ditch.



Anomaly [3] is a sub-circular ditch, which represents the outer double ditch of the enclosure (anomaly 1). The location and orientation of this ditch matches an external enclosure ditch identified within the C.P.O. boundary. Anomaly 3 represents a continuation of this outer double ditch. Measuring 28 m in length this second ditch appears narrower than anomaly 1. The outer enclosure ditch (anomaly 3) appears to only enclose the south and western part of the site, although the eastern edge of the survey area could not be completely surveyed due to the presence of concrete pipe sections on the field. The outer enclosure ditch also appears to join another ditch (anomaly 12).

Anomaly [4] comprises a ditch that runs between two sections of the main enclosure ditch (anomaly 1). There appears to be a 2 m gap (a possible entrance?) within the ditch, which is broadly aligned with the possible entranceway in the main enclosure ditch. The anomaly 4 ditch may represent another access or boundary feature on the edge of the enclosure.

Anomalies [5] and [6] are two curvilinear ditches measuring 10 m and 6 m respectively. These could represent the extent of the original site enclosure, and may continue as anomaly 10.

Anomaly [7] represents three curvilinear possible ditches located at the northern end of the enclosure. They have no discernable formation associated with them and could be archaeological or geological in nature.

Anomaly [8] is a sub-circular possible ditch located to the west of anomaly 7 ditch group. Measuring 3 m in radius this anomaly has been magnetically disturbed in places by the C.P.O. boundary. It could represent a drip gully, however it occurs within the area of burials and may be a bounding feature related to that.

Anomaly [9] is a right-angled possible ditch, which is truncated by the original site enclosure (anomaly 10). Measuring 19 m by 10 m the right-angled nature of this anomaly suggests that it is archaeological in nature. It may be another enclosing element of the burials.

Anomaly [10] is a sub-circular ditch, which probably represents the original site enclosure. Anomaly 10 was detected for a length of 38 m and appears to contain a right-angled linear ditch at its southern end.

Anomaly [11] is a large area of magnetic interference located on a north facing slope and leading down to the water system. The presence of this anomaly may well have obscured any weaker archaeological remains, such as graves. It is likely that this anomaly represents a dump of material containing ferrous items and burnt remains, meaning that it could be archaeological or relatively modern in nature.

Anomaly [12] is a linear possible ditch, which runs from the southern edge of the survey area for 27 m and terminates at the outer enclosure ditch (anomaly 3).

Anomaly [13] is a collection of ten possible pits, which appear to form a rectangular feature measuring 12 m by 10 m. Located 5 m to the south of the enclosure ditches (anomalies 1 & 3) this collection of pits is likely to represent archaeological activity, such as post-holes *etc.*, suggestive of possible structural remains.

Anomaly [14] is a collection of three isolated circular response, which appear to form a linear trend measuring 4 m in length. These could represent possible pits, or may be associated with agricultural activity on the site.

Anomaly [15] is a possible ditch, which was detected on the edge of the survey area. This possible ditch has a detected length of only 5 m and is difficult to classify.

Anomaly [16] is a possible ditch, which may be roughly aligned to another possible ditch (anomaly 15). Detected for a length of 47 m this anomaly appears to terminate against the present day field boundary and may be a relict field boundary or drainage ditch.

Anomaly [17] is a linear trend of six possible pits that appear to terminate near a possible ditch (anomaly 16). The trend of possible pits is 27 m in length. These may represent tree bowls rather than archaeological remains.

### 3.2 Phases 2 & 3 Magnetic Gradiometer Survey – High Resolution Survey

Figure 6 – Magnetic Gradiometer Data

Figure 7 – Magnetic Gradiometer Interpretation

#### Site Summary

Due to the likely presence of graves, two magnetic gradiometer surveys were undertaken over the same area. These surveys were undertaken perpendicular to each other ensuring that the most effective methodology for finding graves was deployed. A number of potential grave indicators (ferrous responses, possibly representing coffin nails or grave goods) and isolated pits or graves were detected within the high-resolution magnetic gradiometer survey area.

#### Phase 2 (survey undertaken in an east-north-east direction)

Anomaly [18] is an extensive area of magnetic interference that (already discussed as an area of possible dumping, anomaly 11). Associated with a wide spread of burnt or magnetic material, any underlying archaeological signatures, such as graves, may be masked by the anomaly.

Anomaly [19] is a linear possible ditch measuring 26 m in length that appears to cut through a dump of magnetic material (anomaly 18). This anomaly runs parallel to the existing water system and may represent a relict field boundary.

Anomaly [20] comprises four-isolated dipolar (ferrous) responses located within the area of possible graves. Isolated ferrous responses can often be the only indication of underlying graves gained within a geophysical survey and may be caused by metallic items placed within the grave or by coffin nails. The group of responses represented by anomaly 20 should be regarded as potential grave indicators.

Anomaly [21] comprises nine possible pits or graves detected within the survey area. A number of these appear to be aligned on a broadly east-west orientation.

#### Phase 3 (survey undertaken in an north-north-west direction)

Anomaly [22] is the same as anomaly 19 (Phase 2), a curvilinear possible ditch. Due to the change in survey direction, the ditch in Phase 3 appears to have a more circular composition and may act as a bounding feature for the majority of the wide spread of burnt or magnetic material.

Anomaly [23] is a curvilinear possible ditch that appears to traverse the survey area. Measuring 30 m in length the anomaly has been partly obscured by the magnetic interference. A series of plough furrows were also detected along the same alignment as the ditch suggesting it may represent a boundary. It could be an enclosing element around the burials.

Anomaly [24] comprises five-isolated ferrous responses. These match the location of the responses detected as anomaly 20 (in Phase 2), which should be regarded as potential grave indicators.

Anomaly [25] comprises eleven possible pits located within an area known to contain graves. These possible pits may represent the grave cuts and a number of them coincide with the location of the responses detected as anomaly 21 (Phase 2). The area has however been cultivated and a number of these responses may be associated with this activity, especially as five of the pit signatures are located on or around a possible boundary (anomaly 23).

### **3.3 Phases 4 & 5 Earth Resistance Survey – High Resolution Survey**

Figure 9 – Earth Resistance Data

Figure 10 – Earth Resistance Interpretation

#### **Site Summary**

Due to the likely presence of graves, two earth resistance surveys were undertaken over the same area. These surveys were undertaken perpendicular to each other ensuring that the most effective methodology for finding graves was deployed. A number of isolated pits or graves were detected within the high-resolution earth resistance survey area.

#### **Phase 4 (survey undertaken in an east-north-east direction)**

Anomaly [26] is a large area of high resistance centred on a tree growing in the middle of the survey area. Measuring 11 m by 8 m this anomaly is suggestive of an underlying hard or compacted surface. The location of the anomaly places it on the edge of the high ground over looking a low-lying water logged area to the north. It is possible that shallow geology in this area has caused this anomaly however an archaeological explanation cannot be ruled out.

Anomaly [27] is a collection of three bank features that form a right-angled feature (11 m in length) with a central bank (10 m in length). This is suggestive of an internal bank division, which is located in the centre of the enclosure. To the south of these features is an area of low resistance; no individual features can be identified within this area it is probable that it represents the continuation of the burial enclosing ditch and possibly some associated graves.

Anomaly [28] is a linear possible bank, measuring 16 m in length that runs from the edge of the survey area in a northern direction into anomaly 26. In the centre of this anomaly an area of high resistance has been identified, suggesting an extension or possibly an area of shallow geology.

Anomaly [29] is located to the east of a possible bank (anomaly 28) and runs parallel to it. Anomaly 29 may represent a possible ditch that runs in a northern direction for a length of 30 m. The anomaly runs along the topographically high ridge and down into the low-lying waterlogged area, where it apparently terminates at the water system.

Anomaly [30] is a linear bank that appears to define the eastern side of a ditch (anomaly 29). The bank terminates at the edge of the topographic depression and appears to contain a subdivision at its northern end that links into anomaly 31.

Anomaly [31] is a discrete area of high resistance located on the edge of the topographical rise. Possibly associated with shallow geology, this feature appears to be truncated by a ditch (anomaly 29) and is links with a bank (anomaly 30), forming a possible sub-division. It is possible that this represents a subdivision or enclosure located inside the enclosure identified within the magnetic gradiometer data.

Phase 5 (survey undertaken in an north-north-west direction)

Anomaly [32] is the same feature as anomaly 26 (Phase 4). The feature within this dataset appears to be more elongated continuing to the edge of the survey area. It is likely that this is geological in nature.

Anomaly [33] is an area of diffuse low resistance located on the edge of the survey. This area was also highlighted within the Phase 4 data. The low resistance nature of the anomaly may represent an area of disturbed earth and probably a continuation of the burial enclosure ditch.

Anomaly [34] is the same anomaly as the high resistance associated with anomaly 28 (Phase 4).

Anomaly [35] is a linear possible bank that matches the location of the sub-division bank associated with anomaly 30 (Phase 4). However within the Phase 5 data the anomaly was detected from the area of high resistance (anomaly 32) for a length of 29 m. This suggests that the anomaly truncates the ditch (anomaly 29) detected within the Phase 4 survey area. The stratigraphy of these anomalies can only be determined by archaeological testing.

Anomaly [36] is an area of diffuse high resistance that matches anomaly 31 (Phase 4). The shape of the anomaly has changed between Phases 4 & 5 and this can be attributed to the different survey directions. However, the anomaly does appear to link into anomaly 32 which would mean that the ditch (anomaly 29, Phase 4) was either not detected in Phase 5 or that anomaly 36 is a later feature which overlays the ditch.



## **4. Conclusions**

### **4.1 Achievement of Objectives**

The geophysical surveys conducted within this site have allowed the detection of the original site enclosure and an outer double-ditch enclosure, which were partially identified during archaeological excavations. This has enabled a more accurate picture to be gained about the size, orientation and makeup of the enclosure as well as identifying a number of internal features.

Outside the enclosure a number of possible archaeological features have also been identified, as well as evidence of cultivation activity.

### **4.2 Summary of Results**

The magnetic gradiometer survey conducted over the entire survey area revealed the presence of a substantial ditched enclosure with a possible entranceway. The enclosure appears to have a double ditch system on its south and west sides, while no evidence of the second ditch was detected on the eastern side. From the geophysical results it is possible to suggest that the enclosure once occupied the area now defined by the field boundaries associated with the watersystem and a pipeline present on site.

A number of internal features were also detected suggesting a series of sub-divisions once existed inside the enclosure. A central sub-circular ditch is a probable continuation of the excavated original site enclosure. The remains of a possible habitation structure and a right-angled ditch were also detected.

High-resolution surveys were undertaken in the centre of the enclosure over an area thought to contain burials. A number of possible graves were identified as well as possible boundary features.

On the outside of the enclosure further possible archaeological remains were identified in the form of a rectangular pit system, relict field boundaries and cultivation activity as well as a linear pit trend.

### **4.3 Dissemination**

The results of this survey were submitted to *Archaeological Consultancy Services Limited*. *Earthsound* will ensure that copies will be forwarded to the *Department of the Environment, Heritage and Local Government* and the National Museum of Ireland in compliance with the Licence agreement.

## 5. Acknowledgements

<b>Project Management:</b>	James Bonsall BA (Hons) MSc PIFA
<b>Fieldwork:</b>	James Bonsall Igor Murin MSc
<b>Report:</b>	Heather Gimson BA (Hons) MSc MIAI Suzanne Egar James Bonsall
<b>Graphics:</b>	Heather Gimson

## 6. Bibliography

- CLARK, A.J. 1996 *Seeing Beneath the Soil*, London, Batsford
- DAVID, A. 1995 *Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines*, No. 1. English Heritage
- GAFFNEY, C., GATER, J. & OVENDEN, S. 2002 *The use of Geophysical Techniques in Archaeological Evaluations*, IFA Paper No. 6, Institute of Field Archaeologists
- SCHMIDT, A. 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Oxford, Oxbow
- SCOLLAR, I., TABBAGH, A., HESSE, A. AND HERZOG, I. 1990 *Archaeological Prospecting and Remote Sensing*, Cambridge, Cambridge University Press. Topics in Remote Sensing Vol. 2

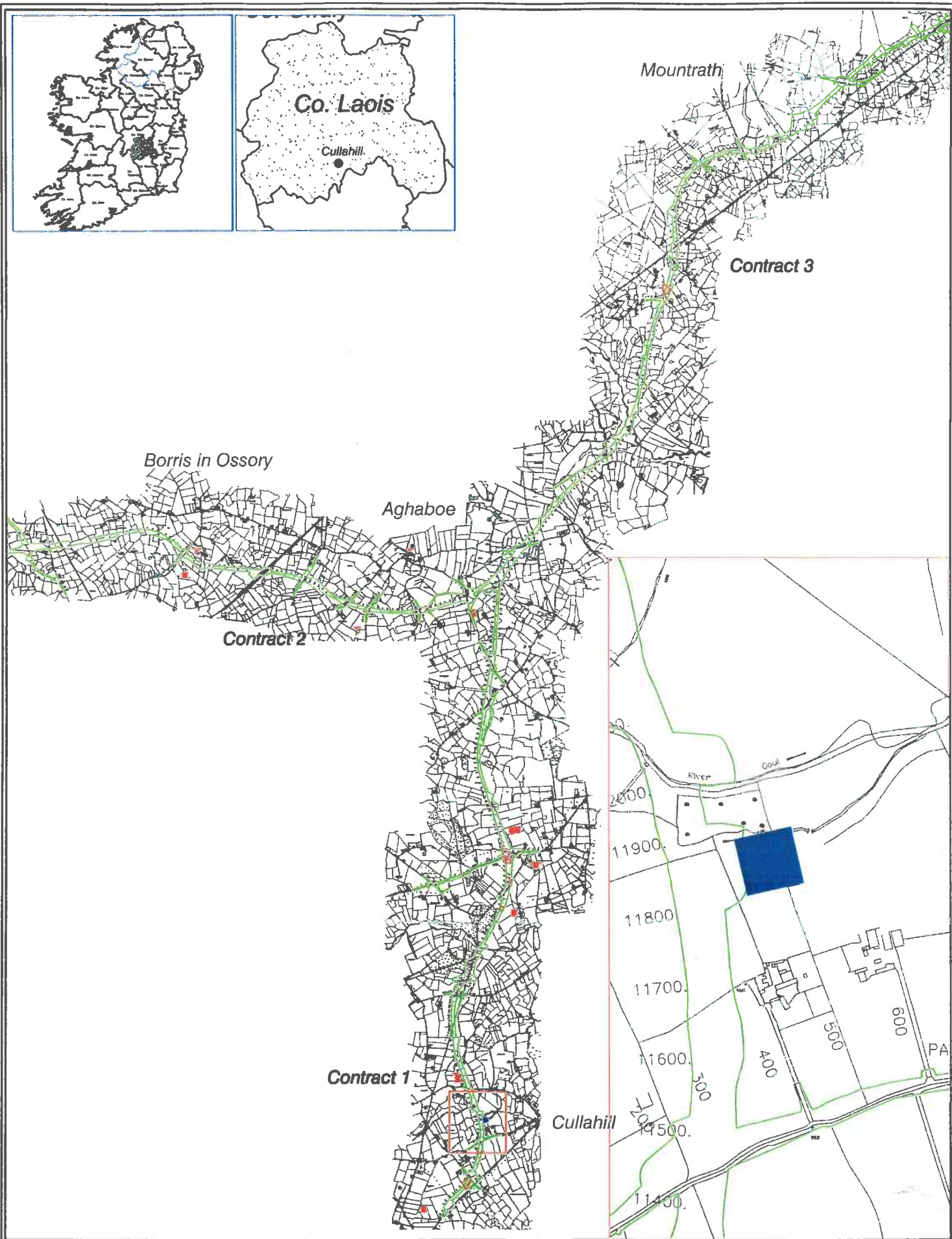
The following texts are referenced in the Technical Appendix:

- WALKER, R. 2000 *Geoplot Version 3.00 for Windows, Instruction Manual, Version 1.2*, Clayton, West Yorkshire

## **7. Figures**

- Figure 1: Site Location
- Figure 2: Pre-processed magnetic gradiometer data
- Figure 3: Phase 1 - Processed magnetic gradiometer data
- Figure 4: Phase 1 - Magnetic gradiometer interpretation
- Figure 5: Pre-processed magnetic gradiometer data, High resolution survey area
- Figure 6: Phases 2 & 3 Processed magnetic gradiometer data
- Figure 7: Phases 2 & 3 Magnetic gradiometer interpretation
- Figure 8: Pre-processed earth resistance data
- Figure 9: Phases 4 & 5 Processed earth resistance data
- Figure 10: Phases 4 & 5 Earth resistance interpretation





**Legend**

- CPO line
- Basemap
- RMP Site
- Geophysical Survey Area



Site Location: Parknahown, Contract 1, M7 / M8, County Laois  
 Client: Archaeological Consultancy Services Ltd.  
 Drawing: Courtesy of LCC Date: 12/09/07 Drawing No.: 08-2861  
 Ordnance Survey Ireland Licence No. AR 0047307  
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Figure No. 1 Location map

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**Parknahown 5, M7 Portlaoise-Castletown / M8 Portlaoise-Cullahill, Contract 1, Gortnaclea To Oldtown**  
**Figure 2: Pre-processed Fluxgate Gradiometer XY Traceplot**



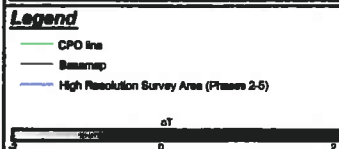
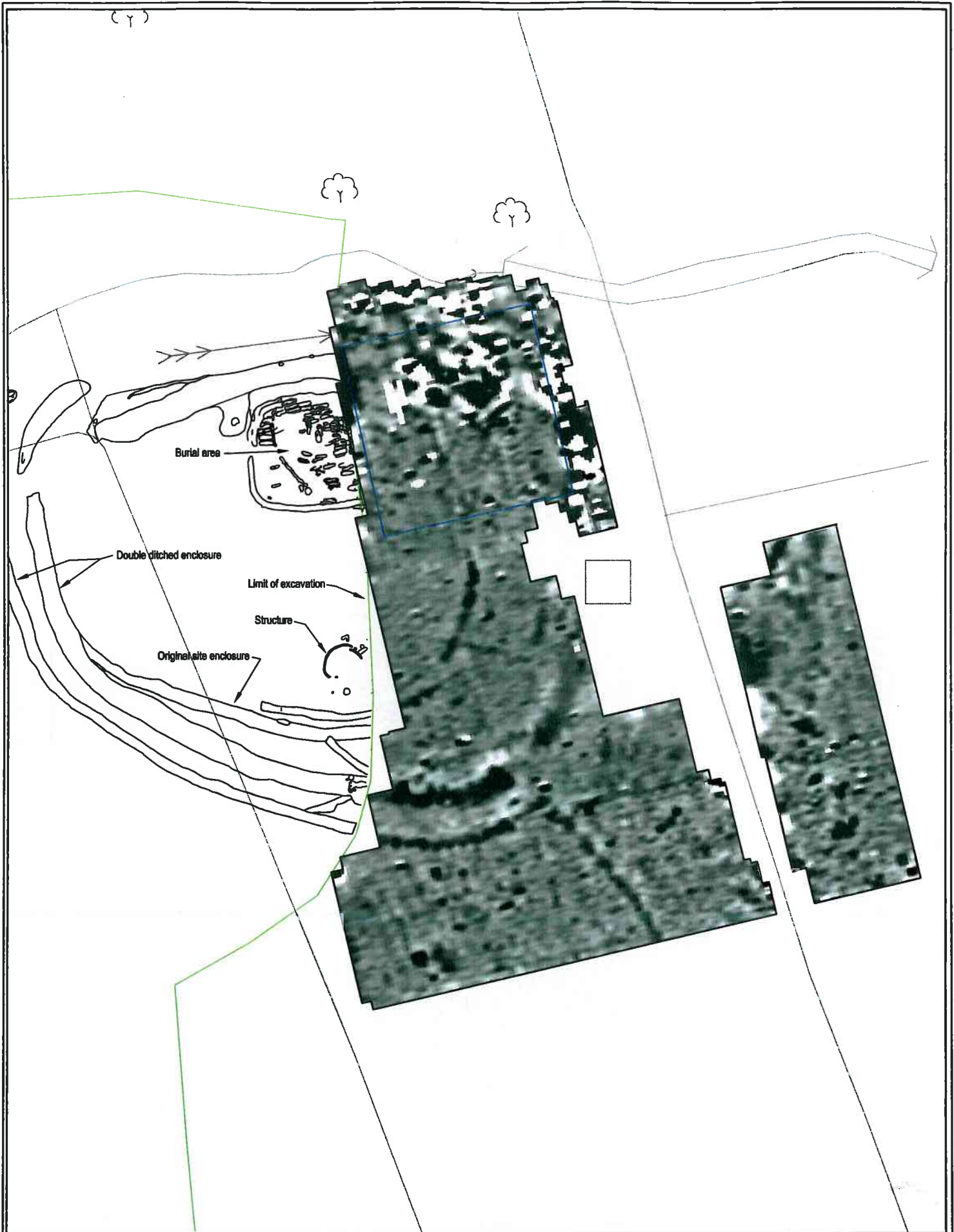
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0 10m

Resolution 0.3nT,

Data Clipped to  $\pm 3$ nT

1m x 0.125m Sample Interval



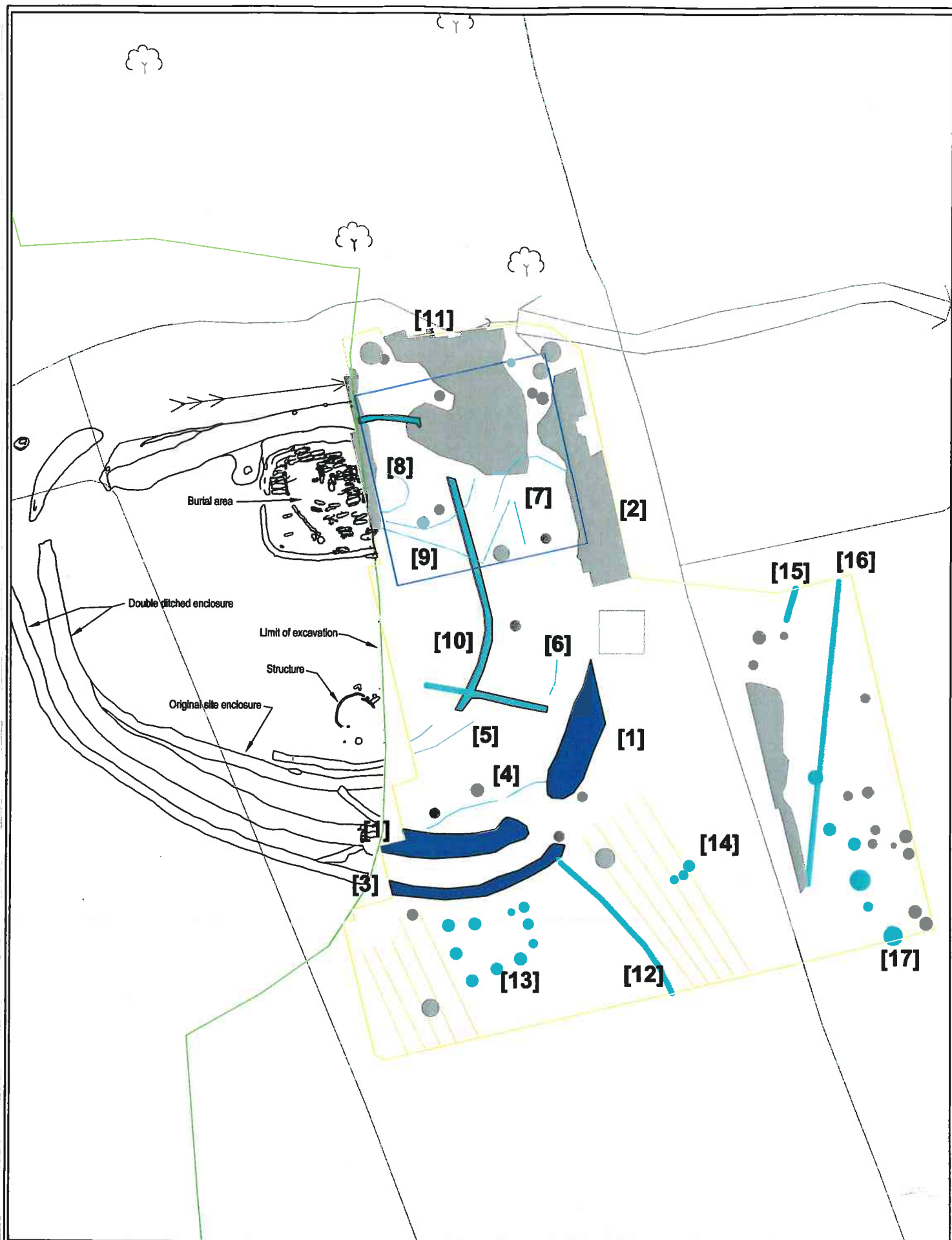
Site Location: Parknahown, Contract 1, M7 / M8, County Laois  
 Client: Archaeological Consultancy Services Ltd.  
 Drawing Courtesy of LCC Date: 12/02/07 Drawing No.: 04-3563  
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0m 10m 20m

Figure No. 3 Phase 1 Magnetic Gradiometer data

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 archaeological geophysics





**Parknahown 5, M7 Portlaoise-Castletown / M8 Portlaoise-Cullahill, Contract 1, Gortnaclea To Oldtown**  
**Figure 5: Pre-processed Fluxgate Gradiometer XY Traceplot, High resolution survey area**



These Traceplots show the same area. Surveys were undertaken in different directions in an attempt to detect burials

Direction of First traverse West

Direction of First Traverse North

I

12.00 nT

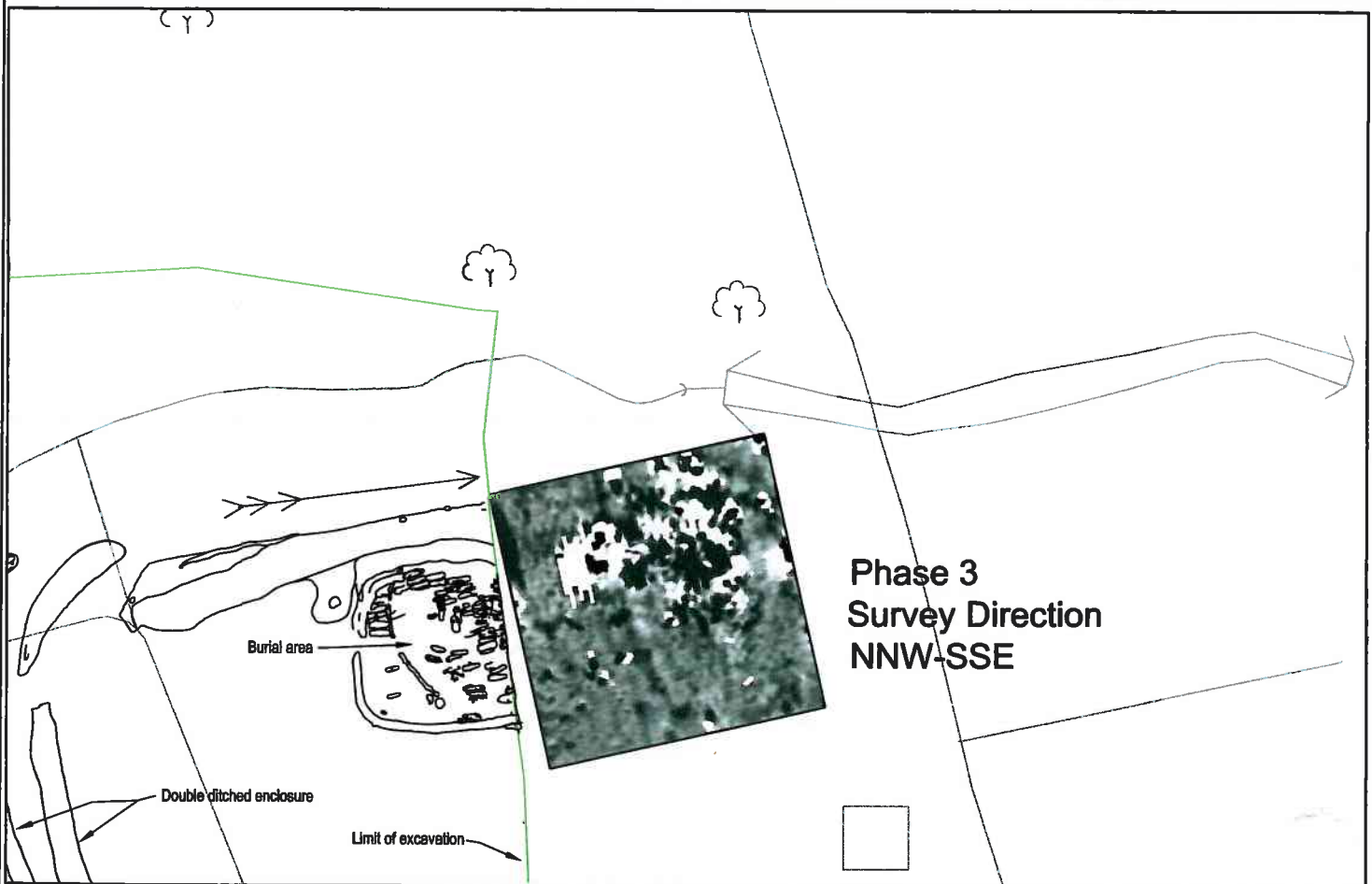
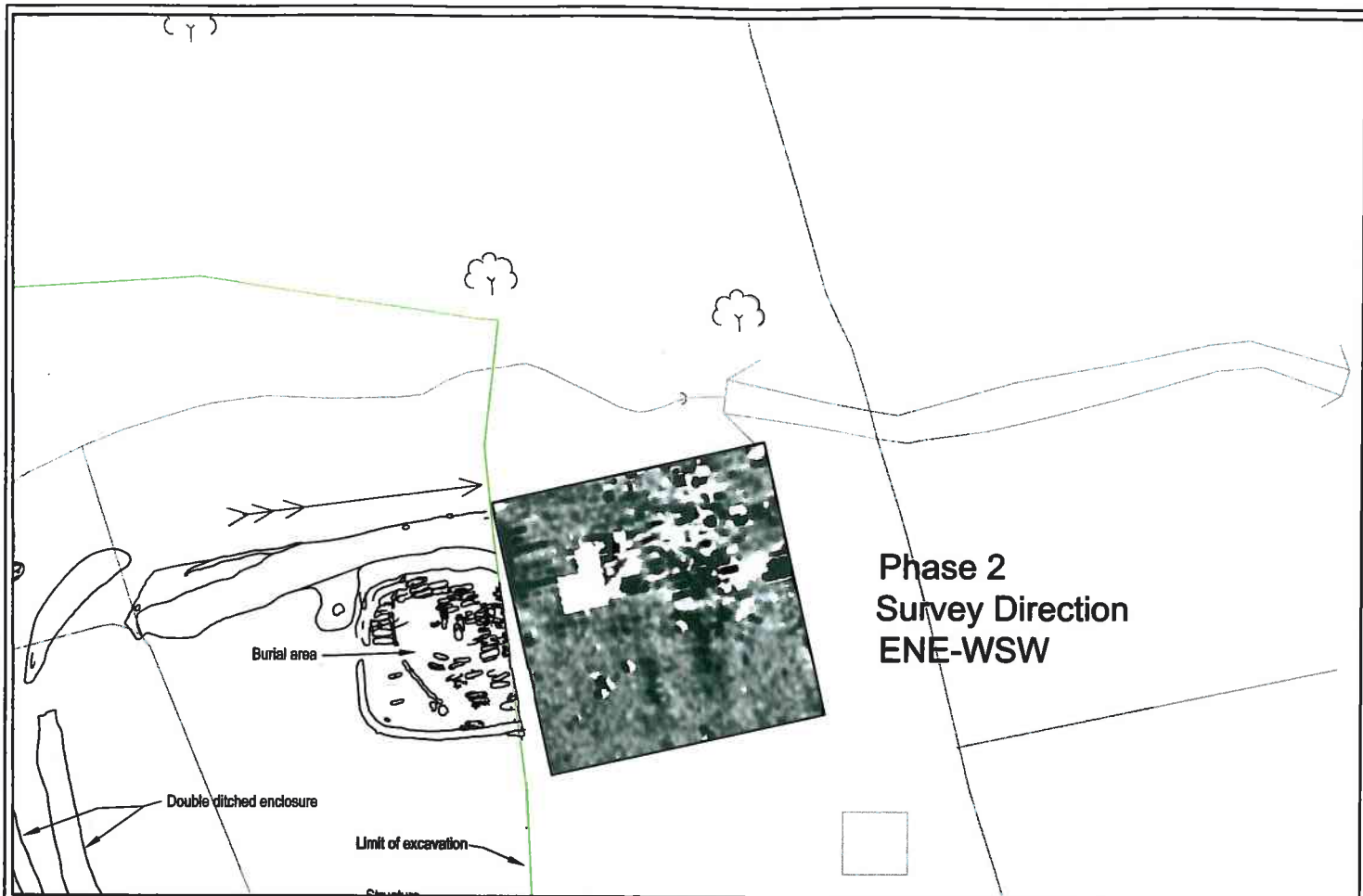
0 10m

Resolution 0.3nT,

Data Clipped to  $\pm 3nT$

0.5m x 0.125m Sample Interval

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#### Legend

— CPO line  
— Basemap



Site Location: Parknahown, Contract 1, M7 / M8, County Laois

Client: Archaeological Consultancy Services Ltd.

Drawing Courtesy of LCC

Date: 12/2/07

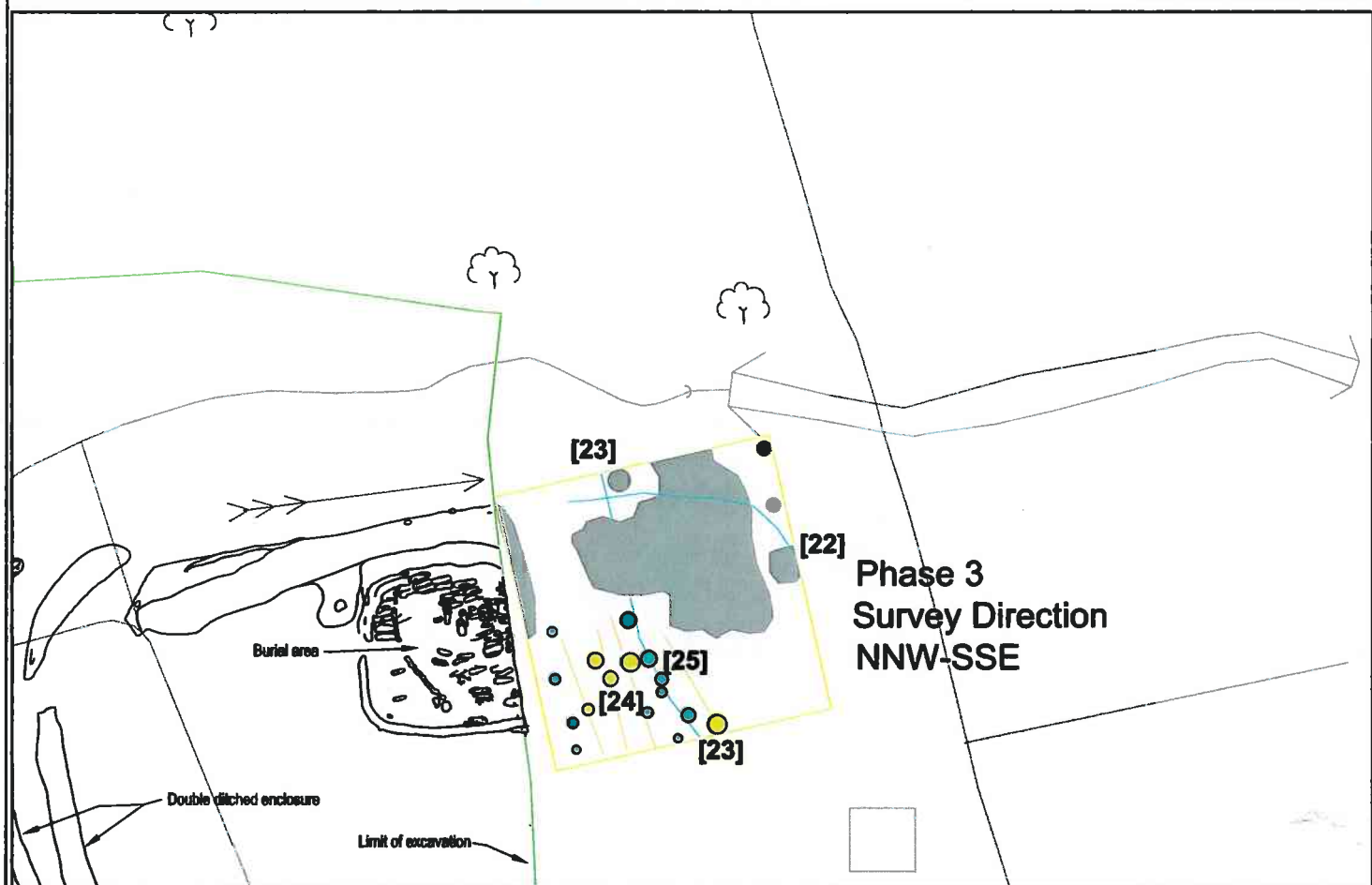
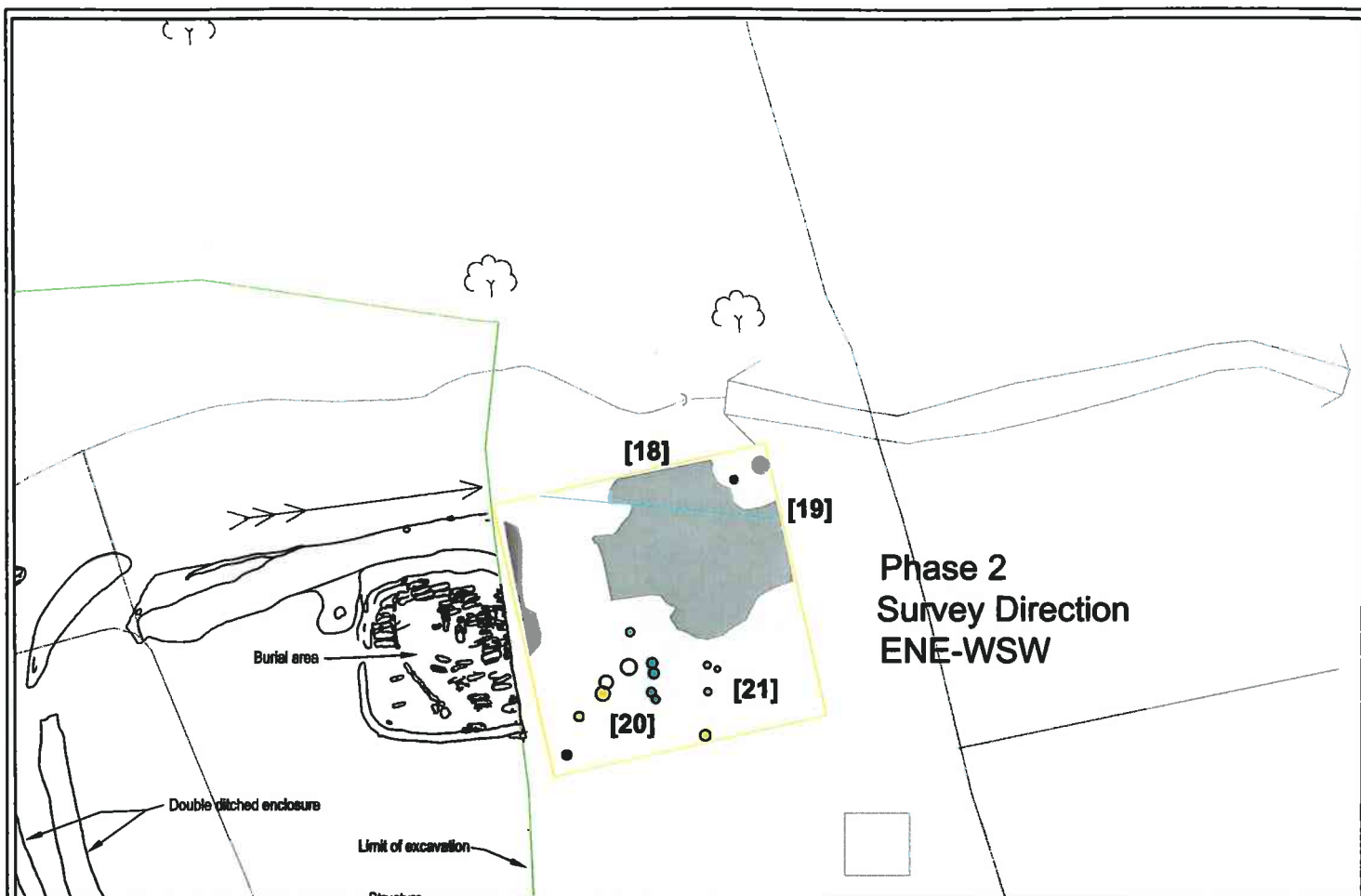
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Figure No. 6 Phases 2 & 3 Magnetic  
Gradiometer Data

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#### Legend

— CPO line  
— Basemap  
— Survey Area

■ Potential Grave Indicator - Grave Good / Coffin Nail  
■ Potential Grave or Pit  
■ Possible Ditch  
■ Magnetic Disturbance  
■ Plough Furrows



Site Location: Parknahown, Contract 1, M7 / M8, County Laois

Client: Archaeological Consultancy Services Ltd.

Drawing Courtesy of LCC

Date: 13/2/07

Drawing No.: 66-36/07

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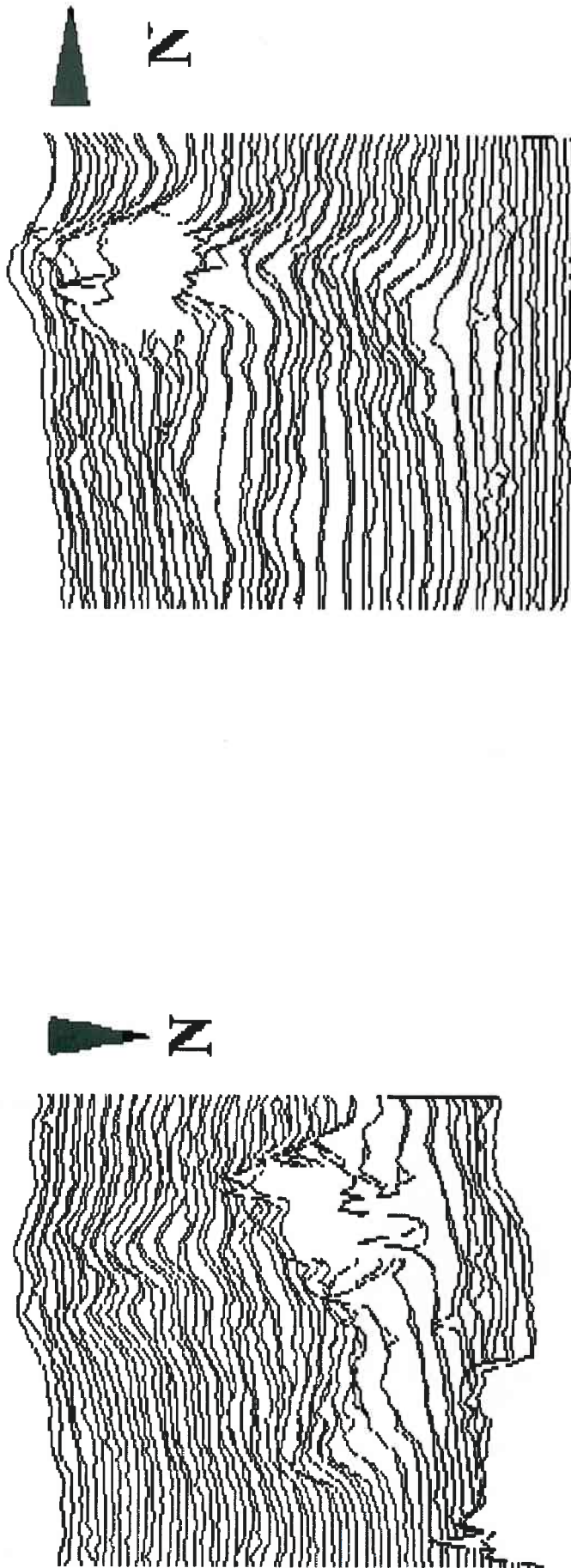
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Figure No. 7 Phases 2 & 3 Magnetic  
Gradiometer Interpretation

**EARTHSOUND**  
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geophysics



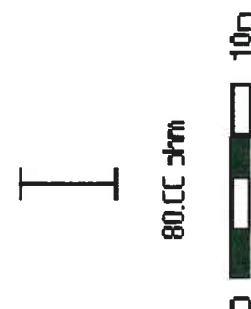
**Parknahown 5, M7 Portlaoise-Castletown / M8 Portlaoise-Cullahill, Contract 1, Gortnaclea To Oldtown**  
**Figure 8: Pre-processed Earth Resistance XY Traceplot, High resolution survey area**



These Traceplots show the same area, Surveys were undertaken in different directions in an attempt to detect burials

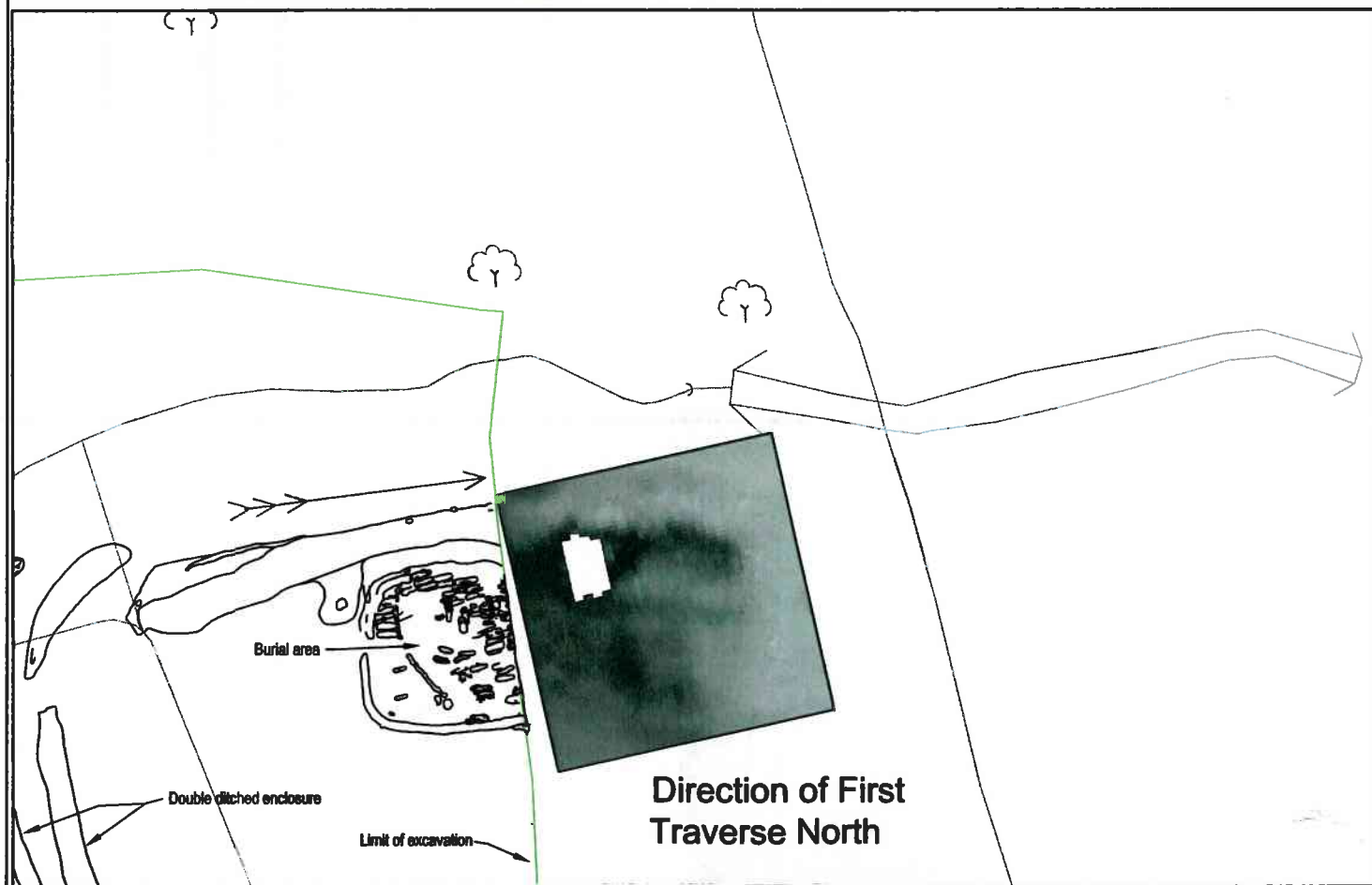
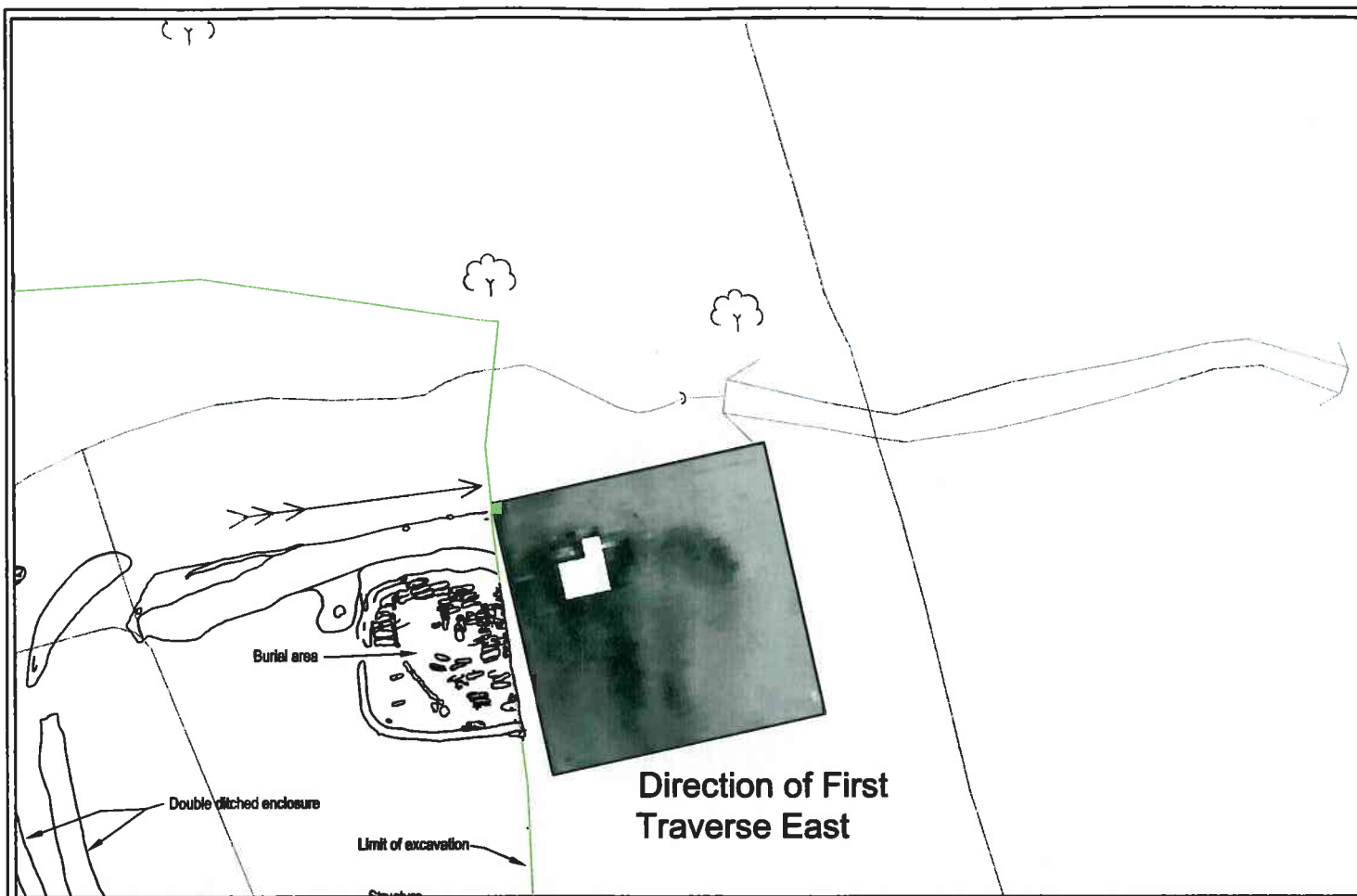
Direction of First traverse West

Direction of First Traverse North



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#### Legend

- CPO line
- Basemap

0m 10m 20m



Site Location: Parknahown, Contract 1, M7 / M8, County Laois

Client: Archaeological Consultancy Services Ltd.

Drawing Courtesy of LCC

Date: 12/07

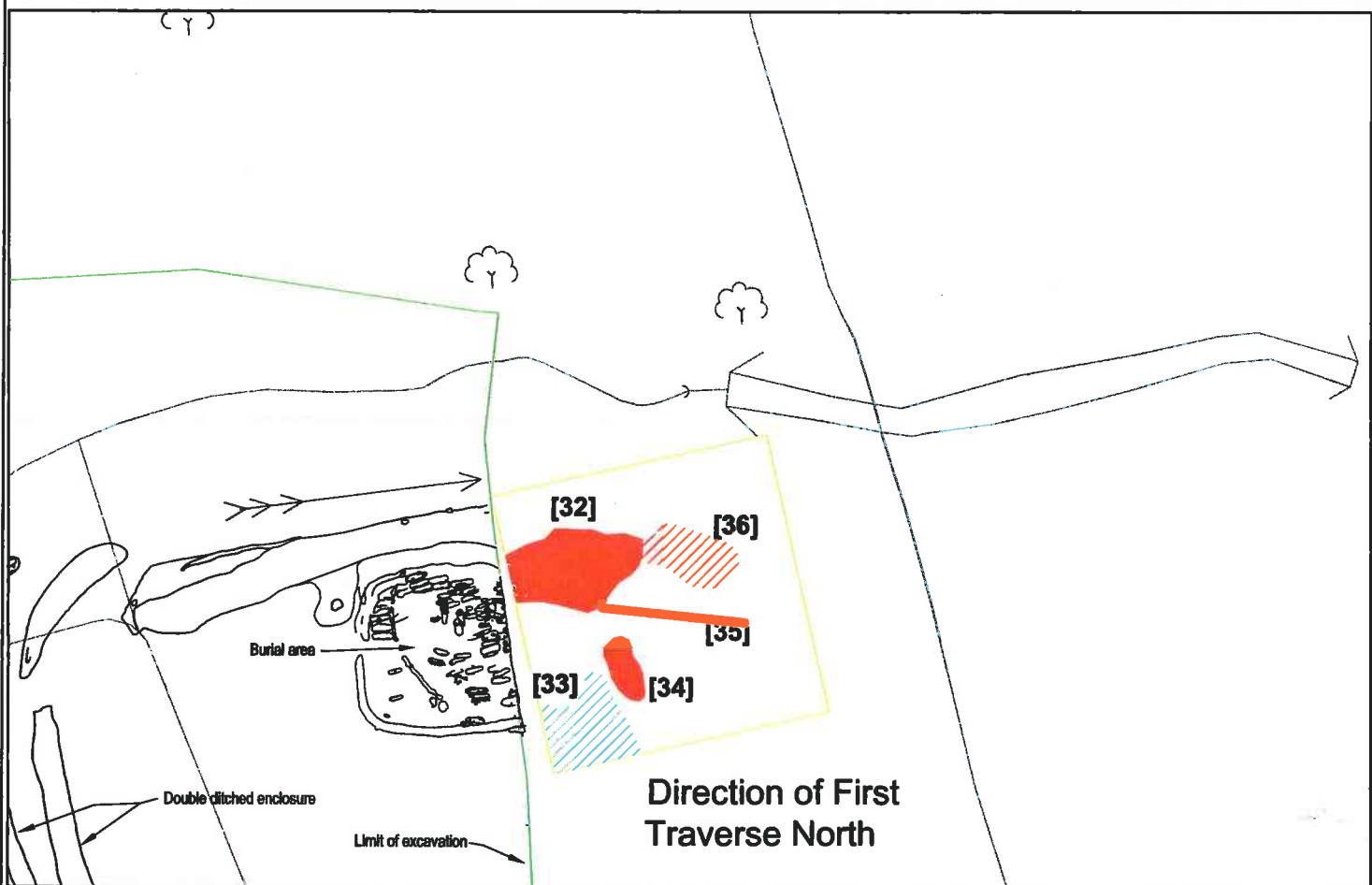
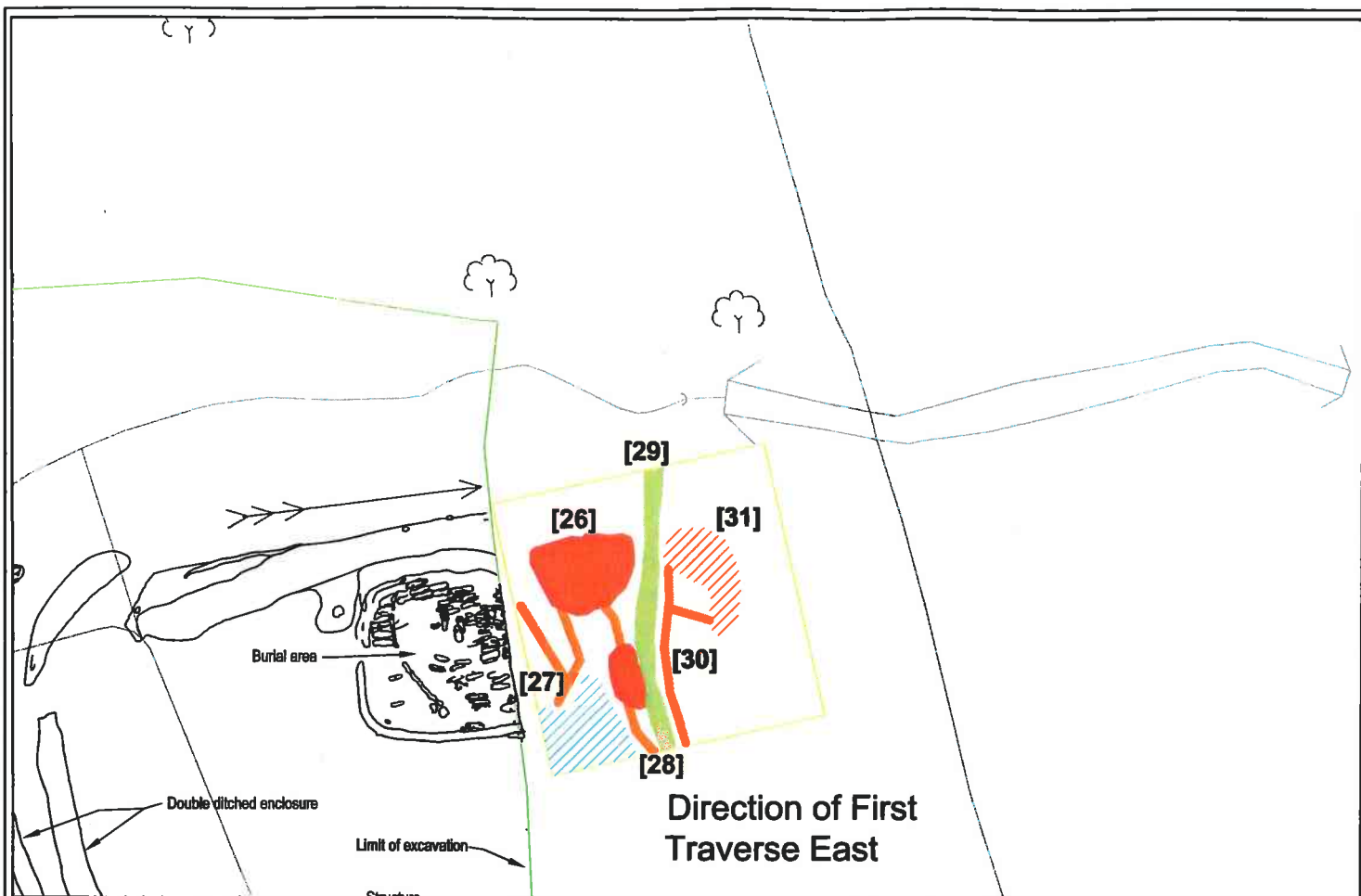
Drawing No.: 06-3508

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0m 10m 20m

Figure No. 9 Phases 4 & 5 Earth Resistance data, High resolution survey area

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## Technical Appendix

### Appendix 1

#### 1. Magnetic Survey: Technical Information

##### 1.1 Magnetic Susceptibility and Soil Magnetism

The Earth is comprised of approximately 6% iron. Via geological and pedological processes iron is present in soils and rocks as three main minerals; haematite, magnetite and maghaemite. Haematite is a very common mineral in archaeological soils and is largely responsible for most of the red colouration in the environment. Magnetite is a common mineral found in all igneous rocks, most sedimentary rocks and nearly all soils. These minerals have a weak, measurable magnetic property.

The magnetism observed in a rock is made up of remanent and induced components. In the weak magnetic field due to the earth, the induced component is proportional to the earth's field. The constant of proportionality is called the magnetic susceptibility. The susceptibility of a rock is controlled by the amount of ferrimagnetic material contained in them, their grain size, and mode of distribution.

An enhancement of ferrimagnetic minerals is responsible for the formation of magnetic anomalies in soils at archaeological sites. Magnetic Susceptibility (MS) measures how susceptible a material is to becoming magnetized. A MS survey can identify and classify different types of iron bearing materials in a safe, fast and non-destructive manner either in a laboratory or as a fieldwork component, complementing other archaeological analyses.

Anthropogenic activities can redistribute these minerals and alter others into more magnetic forms by a process of enhancement, such as burning, industrial activity, fermentation and manuring. MS enhancement of antiferromagnetic haematite in the topsoil is caused by the Le Borgne effect of domestic fires on soils and vegetational matter:

*The burning of organic matter and the heating of non-organic matter above 200°C, allows electrons to be gained through a process of reduction, creating ferrimagnetic magnetite. As the matter cools, or in the case of organic matter, is combusted, electrons are lost through a process of re-oxidation, creating ferrimagnetic maghaemite.*

The decay of organic material associated with areas of human occupation or settlement can be identified by measuring the MS of the topsoil and noting the degree of enhancement. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

There are five different types of magnetic behaviour found in Magnetic Susceptibility surveys, dependent upon the sub-atomic properties of the samples:

- |                             |           |
|-----------------------------|-----------|
| • <i>Ferromagnetism</i>     | Strongest |
| • <i>Ferrimagnetism</i>     |           |
| • <i>Antiferromagnetism</i> |           |
| • <i>Antiferromagnetism</i> |           |
| • <i>Paramagnetism</i>      |           |
| • <i>Diamagnetism</i>       | Weakest   |



Magnetic susceptibility is a value defined by a combination of all of the above types of magnetic behaviour, so that weaker paramagnetism and diamagnetism will be masked if other, *stronger*, magnetic properties are present. For example, a topsoil magnetic susceptibility survey will introduce additional contributions from colluvial/alluvial covering or a disturbed Ap horizon (cultivation/pasturing disturbance *etc.*) that may mask an archaeologically derived response.

## 1.2 Types of Magnetic Anomaly

Magnetic anomalies are either are termed '**negative**' or '**positive**' referring to their magnetic properties relative to the bipolar background (theoretically, 'zero').

The types of response mentioned above can be divided into five main categories which are used in the graphical interpretation of the gradiometer data:

### *Areas of positive/negative enhancement*

These responses can be quite widespread, and often caused by rubble or foundations, burning, agricultural disturbance and general occupational induced enhancement.

### *Linear and curvilinear anomalies*

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by in-filled archaeological ditches or walls.

### *Isolated positive/negative anomalies*

These generally represent small areas of enhancement. They may be caused by exotic geology or by in-filled archaeological pits.

### *Isolated Ferrous anomalies*

Theses are very strong magnetic responses caused by ferrous (iron) debris, often found scattered in fields. These are usually modern in origin, although may represent archaeological material such as coffin nails.

### *Areas of Disturbance*

These are mostly modern in origin, causing widespread magnetic interference, often masking all other magnetic features within the vicinity. These can be caused by nearby structures, metallic fences, road traffic and metallic pipelines.

### 1.3 Methodology

#### 1.3.1. *Magnetic Susceptibility Survey*

The magnetic susceptibility meter displays the MS value of material when they are brought within the influence of the sensor, such as the field search loop. An oscillator circuit within the *Bartington* MS2 meter generates a low alternating magnetic field. Any material brought within the influence of the field (in the case of the search loop, the field of influence is between 0-18cm beneath the loop, i.e. generally the topsoil), will bring about a change in the oscillator frequency. The frequency information is returned in pulse form to the MS2, where it is converted in to a value of magnetic susceptibility,  $\kappa$ , in SI units.

A topsoil MS survey assumes that the sample size is infinite, as the precise mass of each sample point cannot be calculated in the field. Calibration therefore, is best expressed in units of Volume Specific susceptibility. Repeatability of the survey is dependent upon the uniformity of the surface under investigation. Volume susceptibility is expressed as  $\kappa \times 10^{-5}$  SI units.

#### 1.3.2. *Fluxgate Gradiometer Survey*

A detailed survey requires a sample trigger to automatically take readings at predetermined points. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning or magnetic susceptibility.

## 2. **Earth Resistance: Technical Information**

### 2.1 Earth Resistance and Soil Porosity

Earth resistance surveys involve passing an electric current through the ground between two electrodes (the 'current electrodes'). Two other electrodes (the 'potential electrodes') are used to measure the electrical potential between them and hence allow to evaluate the earth resistance ( $R=V/I$ ). This earth resistance mainly depends on the moisture of investigated ground and therefore on the overall soil moisture and the porosity of buried features. Areas of low porosity, such as masonry and buried stonework, have a lower moisture content, and therefore a higher resistance. Areas of high porosity, such as ditch fills and pits, have a higher moisture content, and therefore a lower resistance.

### 2.2 Types of Earth Resistance Anomaly

Geophysical anomalies are either termed '**high resistance**' or '**low resistance**' referring to the electrical conductivity of an anomaly relative to the background.

It should be noted that the local and recent climate can severely affect earth resistance data. Surveys conducted during the winter will generally have a lower mean resistance than those conducted during the summer. A dry masonry feature will appear as a high resistance anomaly given a 'normal' climate. However, during a wet climate, water may lie on the masonry allowing the electrical current to pass with very low resistance. Similarly, ditches, usually low resistance anomalies, may bake hard during hot climates and cause a high resistance anomaly.

The types of response mentioned above can be divided into two main categories, which are used in the graphical interpretation of the earth resistance data:



#### *Areas of high/low resistance*

These responses can be quite widespread, and often caused by rubble or foundations, or in low resistance cases by large excavations or dew ponds.

#### *Linear and curvilinear anomalies*

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by in-filled archaeological ditches or walls.

### 2.3 Methodology

The twin probe array was developed for shallow depth investigations (Clark 1996.44), and involves one current and one potential electrode fixed in the ground (the 'remote probes'), and one current and one potential electrode mounted on a moveable frame (the 'mobile probes'). Provided the remote probes are far enough away (i.e. greater than 30 times the mobile probe spacing), variations in the distance between the two pairs of electrodes has no significant effect on the readings (for a fuller discussion of the technical aspects involved, see Scollar *et al.* 1990, pp 307-372).

A detailed resistance survey employs the use of a sample trigger to automatically take readings as the mobile probes are inserted in to the ground at predetermined points. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

## 3. Data Processing and Presentation

### 3.1 Interpolation

Interpolation can be defined as the estimation of a value between known values. The data magnetometer data displayed in this project have been interpolated using the  $\sin x/x$  function in *Geoplot* 3.0 (Walker 2000).

Gridding methods produce a regularly spaced, rectangular array of Z values from irregularly spaced XYZ data. The term "irregularly spaced" means that the points follow no particular pattern over the extent of the map, so there are many "holes" where data are missing. Gridding fills in these holes by extrapolating or interpolating Z values at those locations where no data exists.

A grid is a rectangular region comprised of evenly spaced rows and columns. The intersection of a row and column is called a grid node. Rows contain grid nodes with the same Y co-ordinate, and columns contain grid nodes with the same X co-ordinate. Gridding generates a Z value at each grid node by interpolating or extrapolating the data values. The *Kriging* gridding method produces visually appealing maps from irregularly spaced data. *Kriging* is a geostatistical gridding method that has proven useful and popular in many fields. *Kriging* attempts to express trends suggested in the data so that, for example, high points might be connected along a ridge rather than isolated by bull's-eye type contours.

## **Appendix 2**

### **Survey Grid Re-location**

1. Each survey grid was laid out using a *Trimble* Pro-XRS Differential Global Positioning System (DGPS), to an accuracy of  $\pm 50\text{cm}$ .
2. There was a good correlation between the geophysical survey data and the digital map base and it is estimated that the average 'best fit' error is lower than  $\pm 0.25\text{m}$ . It is important to note that local grid north (27/08/03) varies slightly from *Ordnance Survey* north, with an annual decrease of  $0.9''$ .

## Appendix 3

### Geophysical Archive

*Earthsound Archaeological Geophysics* takes its archiving responsibilities very seriously. Archiving is a necessary measure to maintain a complete record of past research, prevent unnecessary duplication and allow the re-use and re-interpretation of geophysical data as analytical techniques evolve.

The geophysical archive comprises:-

- an archive CD-ROM containing files of the raw data (Geoplot 3.00a, MS-Excel), report text (Word 2000 9.0), and graphics files (AutoCAD 2000).
- a hard (paper) copy of the report

At present, two copies of the archive are held by *Earthsound Archaeological Geophysics*, at separate locations to ensure preservation against accidental damage or theft. The Client holds one further copy of the archive. Additional paper copies intended for ultimate deposition with the *Department of the Environment, Heritage and Local Government* are in the guardianship, and are the responsibility of, *Earthsound Archaeological Geophysics*.



