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# The re-examination of the Carmahome passage tomb, Isle of Arran, North Ayrshire

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## 1. ABSTRACT

The unusual simple passage tomb of Carmahome was partially excavated over the course of two days in 1924 by the landowner James Craig and archaeologist Ludovic McLellan Mann. This excavation revealed a small round cairn with a central chamber formed by a circular setting of ten upright stones and a short, narrow passage that led into the central chamber from the west. The monument had been cleared out, with just a single artefact (a flint knife) recovered from under one of the floor slabs. Almost 100 years later, in 2022, Carmahome was re-examined, with the primary aim being to search for organic material that could be used to radiocarbon date the construction of the monument and contribute to our understanding of this type of site. A total of seven samples were recovered and processed for radiocarbon dating by accelerator mass spectrometry (AMS). A Bayesian approach was then applied to the interpretation of the chronology of the archaeological activity at Carmahome, and the results appear to suggest that the monument was constructed during the Late Neolithic, around 3055–2890 cal BC, and was perhaps only used over the course of a few generations before being abandoned; the monument, then in a state of disrepair, was re-used in the Chalcolithic period, with a Beaker being deposited within. However, a second hypothesis is also offered, suggesting the cairn was constructed in the Early Neolithic, as a passage tomb with a low kerbed cairn, and then saw reuse in the Late Neolithic and Chalcolithic periods.

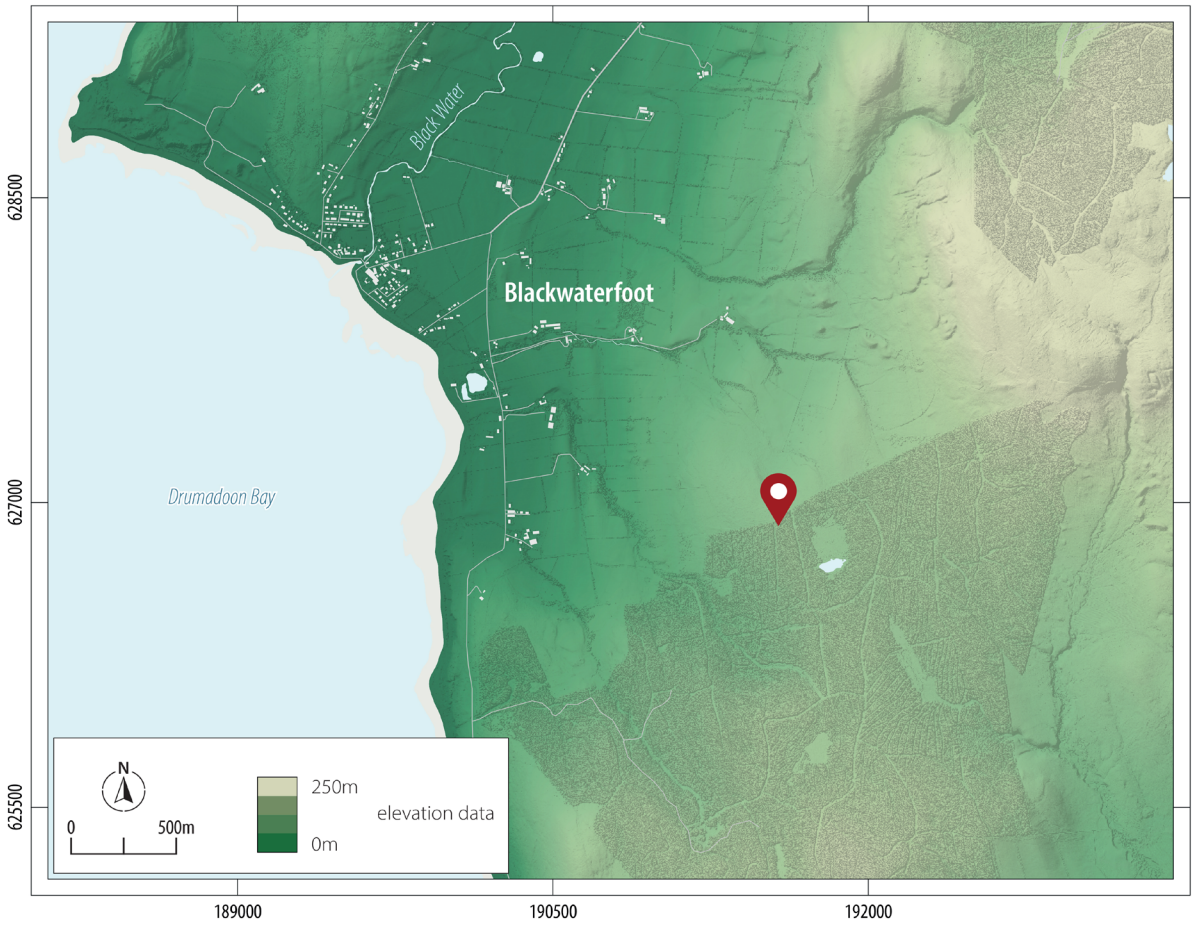
## 2. INTRODUCTION

The simple passage tomb of Carmahome can be found on the southwest side of the Isle of Arran, North Ayrshire, roughly 1km east of Kilpatrick (NR 9149 2685, NRHE ID 39628) (Illus 1). It is now located on the edge of a commercial forestry plantation owned and managed by Forestry and Land Scotland, an executive agency of the Scottish Government. Its location appears to have been carefully chosen, being set on the west-facing slope of Beinn Tarsuim (*c* 140m OD) just at the point where the ground starts to fall away more steeply, ensuring that, when viewed from the shore, it would have been silhouetted against the skyline. The passage tomb lies within a landscape rich in archaeological features, many of which were investigated by John Barber and his team between 1978 and 1981 in order to inform future policies for the conservation of rich upland archaeological areas at risk of afforestation (Barber 1997).

Carmahome lies on the southern side of a broad glen that stretches from Machrie to Kilpatrick and within which is situated a wide range of prehistoric monuments. To the northwest of Kilpatrick lies the recently discovered earthwork cursus of Drumadoon which is set within a landscape filled with prehistoric hut-circles, cairns, and field systems, all sealed beneath a layer of peat (Brophy & MacGregor 2022). Some of these sites may date to the Neolithic. Beyond this lie the burial cairns, timber and stone circles, and settlement of Machrie Moor. To the southeast lie the early Neolithic Clyde cairns of Torrylin, East Bennan, and Carn Ban.

### 2.1 Research context

The *Boyne to Brodgar* initiative (whose research framework was published by Sheridan and Cooney in 2014) aims to improve and promote our understanding of the Neolithic monuments that can be found across Scotland, the Isle of Man, Ireland, and Northern Ireland. *Boyne to Brodgar* (https://




**Illus 1** Location map (image: Forestry and Land Scotland)

scarf.scot/thematic/boyne-to-brodgar-making-monuments-creating-communities/), the *Scottish Archaeological Research Framework* (ScARF, https://scarf.scot/) and *Scotland's Archaeology Strategy* (https://archaeologystrategy.scot/) provided the strategic direction for the '*Awakening Sleeping Giants Archaeological Route Map*' project, created by Gavin MacGregor under the aegis of the *Boyne to Brodgar* initiative (MacGregor 2022). This is an open archaeological proposal rooted in innovative practice: a considered, local action, research programme for the Isle of Arran that was developed in consultation with a wide range of different stakeholders. The *Route Map* proposes potential research actions, suggests possible creative responses and learning activities, and looks to integrate and enhance the visitor experience across a range of different sites. It provides a solid foundation for future archaeological project planning in regard to Arran's fascinating Neolithic heritage. In itself, it represents a new process of project design that is informed by and contributes to *Scotland's Archaeology Strategy*. The *Route Map* identified Carmahome as an important aspect of Arran's Neolithic heritage and prompted its re-examination.

### 2.2 Primary research questions

The primary aim of the re-examination of the Carmahome passage tomb was to provide data that may help to elucidate our understanding of the earliest funerary monuments and the earliest pottery in Britain. This would be achieved by obtaining dating material from sealed deposits within, or associated with, the Carmahome monument.

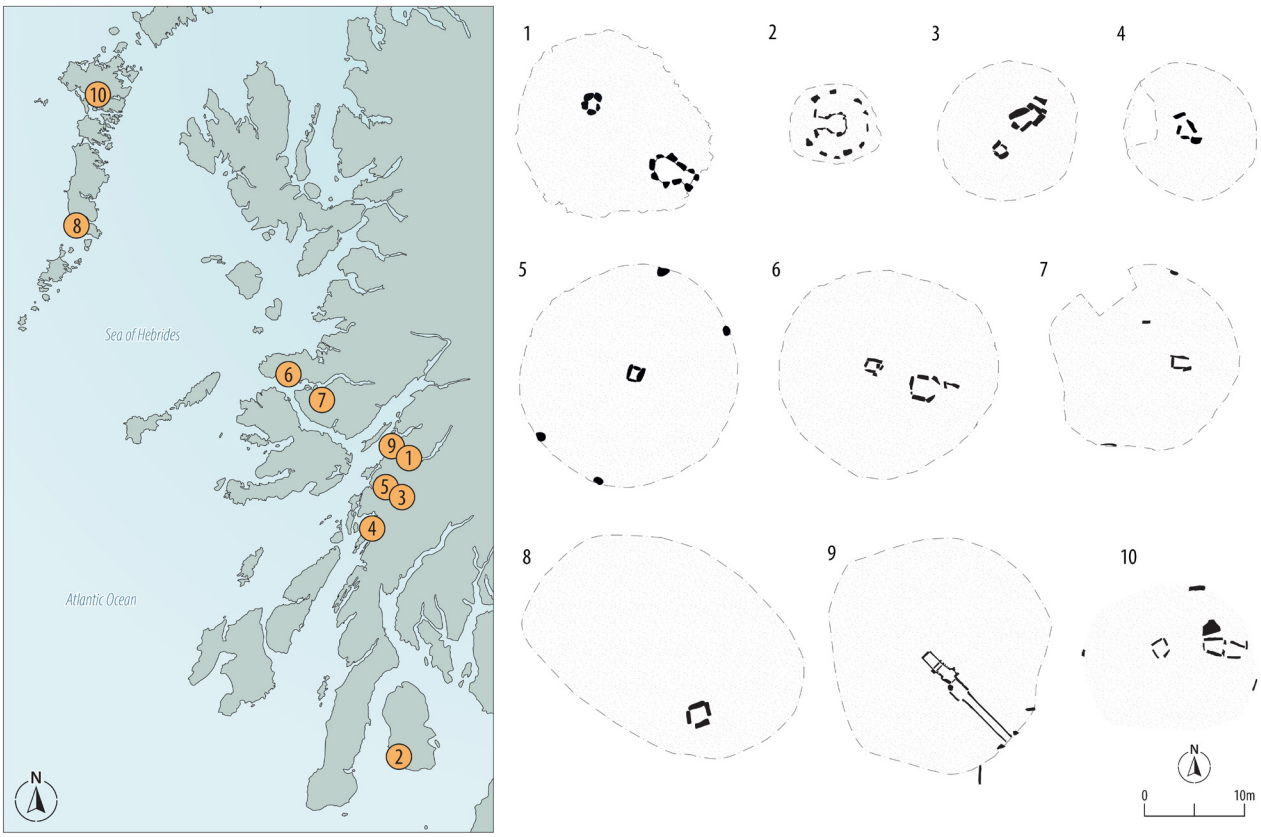
The rationale for considering the Carmahome passage tomb within this context is as follows. This monument has been considered to be one of a small group of Early Neolithic 'Breton-style' megalithic funerary monuments – simple passage tombs and polygonal closed chambers, some with surrounding kerbs and some with low cairns – which hypothetically appeared on and near the west coast of Scotland, and elsewhere along the west coast of Britain and around the coast in the northern half of Ireland, at some time between 4300 cal BC and 3900 cal BC, probably *c* 4000/3900 cal BC (Sheridan 2017: 300; Sheridan & Schulting 2020: 196). We will return to possible similar sites that have been associated with this hypothesis later in the report.

The third important aim of the fieldwork at Carmahome was to assess the current state of survival of the monument and determine the effect that commercial afforestation may be having on its physical and geochemical state. Currently the passage tomb is surrounded by mature Sitka spruce plantation with no distant views. The ground immediately adjacent to the monument was ploughed prior to commercial tree planting with the northern side of the cairn suffering some physical damage. The nearest Sitka spruce is less than 1m beyond the northern limit of cairn material and roots from this and another Sitka spruce on its western side had grown over and into the monument. A large drainage ditch lies a few metres to the east of monument and another non-functioning ditch on its southern side. Immediately prior to the excavation, the monument was covered in moss and the central chamber was waterlogged.

## 3. PREVIOUS ARCHAEOLOGICAL EXPLORATION

'We dug deeper into the cairn, and the supposed rough pavement turned out to be loose stones fallen into the central cavity and embedded in peat growth. These stones were lifted out, and at a depth of about three feet from the original heathery top we came upon a perfectly level flooring consisting of two large slabs and a small one, all neatly laid and fitting one into the other. This pavement was the flooring of a well-constructed circular chamber, with walls formed of vertically set slabs. The floor was swept and the soil carefully sifted by riddle and hand, but no relics were found. It is clear that the contents of the chamber had been subjected to some previous scrutiny, and that the chamber itself had originally been covered by a capstone, removed a considerable time ago for building or other purposes' (Ludovic McLellan Mann, 'Recent Discoveries in Arran', 1925: 252).

Carmahome passage tomb was excavated in 1924 by the landowner, James Craig, and Ludovic McLellan Mann, following initial exploration by the landowner (Mann 1925). When it was excavated the monument was surrounded by open heather moorland, with an open view to the northwest, west, and southwest. The monument measured 5.30m x 5.40m with a circular chamber, passage, and encircling ring of stones. The passage, orientated towards the west, was found to be some 1.10m long and 0.75m wide, narrowing to 0.60m at the opening to the chamber at the east. In terms of size and shape, the chamber and passage compare very closely to those of Achnacreebeag SE (Illus 2 and 3). It is unclear from Mann's excavation whether the passage extended to the edge of the cairn or was limited to the space between the outer ring of stone and the chamber; his published plan (1925: fig. 1) suggests the latter. Mann's excavation appeared to reveal that at some point in the past the capping




**Illus 2** Simple passage tombs, closed chambers and comparative sites: (1) Achnacreebeag (NM 9296 3639); (2) Carmahome (NR 9149 2685); (3) Dalineun (NM 8799 2670); (4) Clach an t'Sagairt (NM 8063 0451); (5) Moleigh (NM 8808 2631); (6) Greadal Fhinn (NM 4765 6397); (7) Rahoy (NM 6446 5592); (8) Leaval (NF 7539 1509); (9) Achnacree (NM 9227 3636); and (10) Craonaval (NF 8330 6272) (image: Forestry and Land Scotland)

stones over the chamber had been removed. Peat had then accumulated within the central chamber up to a depth of about 1m; within this peat were a number of stones which had fallen in from the cairn material. Below the peat was a stone floor comprising two large flagstones and a smaller stone. Mann reported that the 'medium-sized paving stone (C) was lifted and fine soil was found underlying it. This was carefully sifted and a fine flint knife discovered. The largest flooring slab was not disturbed. To have done so would have injured the structure beyond repair' (Mann 1925: 253, and see Illus 14).

The absence of finds from the floor of the chamber led Mann to conclude that the passage tomb had been robbed in antiquity ('It is clear that the contents of the chamber had been subjected to some previous scrutiny' (Mann 1925: 252)). The peat was removed from a large part of the surface of the cairn to reveal the ring of ten stones (the kerb), but it appears that little of the cairn material was excavated; Mann noted that the cairn extended nearly 2m beyond the ring of stones.

More recently, several archaeological landscapes in the surrounding area have been surveyed and investigated by John Barber between 1978 and 1981 in advance of afforestation (Barber 1997). The earliest feature within Barber's study area was the 'Cashel', which Barber argued was likely to have started life as a Neolithic chambered cairn, with later Bronze Age components and later Iron Age occupation (conversion to a dun and enclosure), and with subsequent medieval and post-medieval

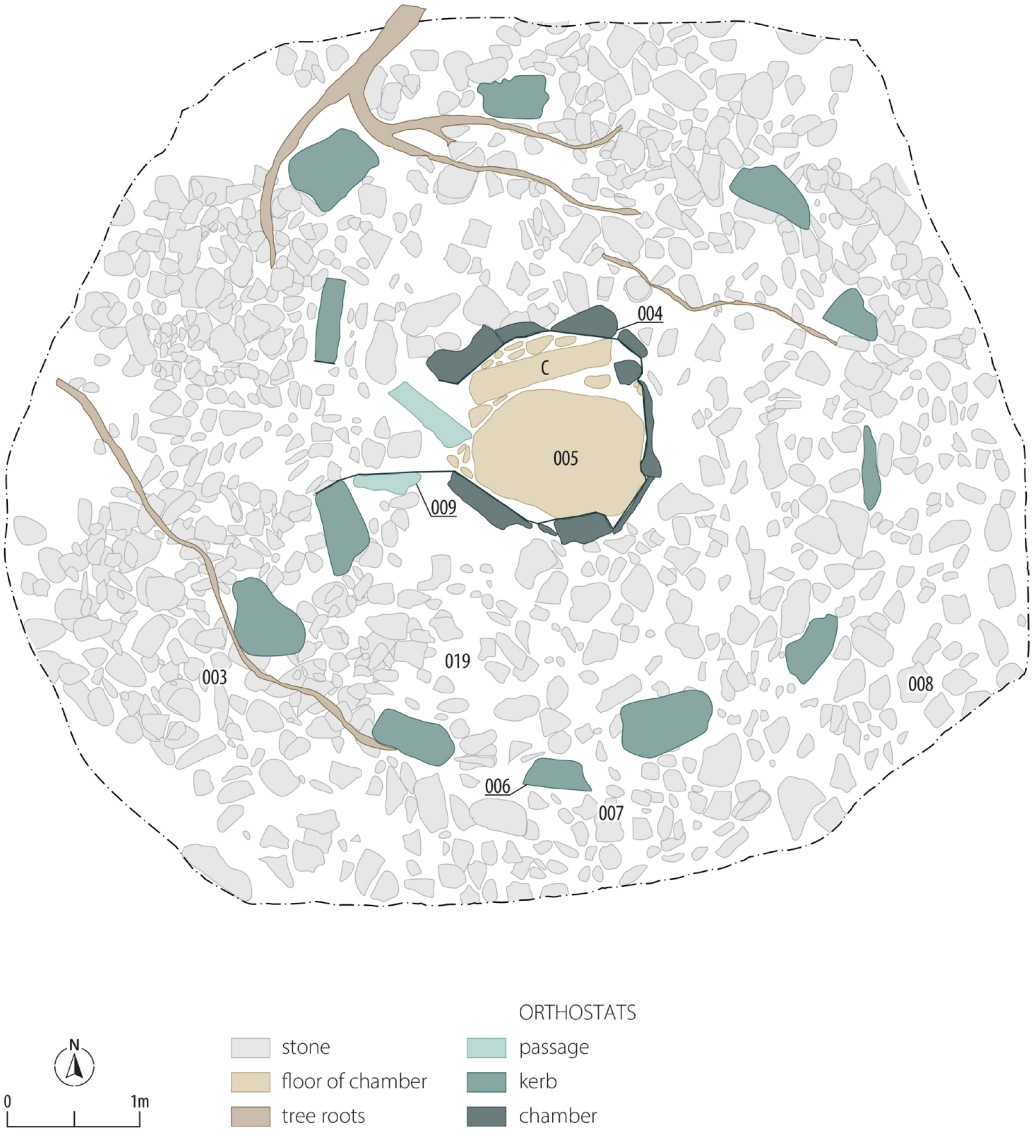
**Illus 3** Achnacreebeag chambered cairn (NM 9296 3639), excavated and reinstated in 1969. The primary chamber is to the rear, and the secondary simple passage tomb is to the fore. (image: Forestry and Land Scotland)

cultivation within the enclosure. Other monuments include hut circles, field banks, and a scatter of stone cairns (Barber 1997: 123). One of Barber's excavated burial cairns within this complex, 16/3, also occupied a prominent location and had a complex history, starting with the creation of a simple pit grave, covered by an earthen barrow (no trace of any body was found in this grave, and there is no justification for Barber's claim that this had been of Neolithic date.) During the Chalcolithic period the barrow was converted to a cairn and enlarged into 'a rather imposing monument which must have been visible from the settlement below' (ibid). Over a hundred sherds of a single food vessel and a single Beaker sherd were recovered from the soil cover of the cairn (MacSween 1997: 46). Another nearby small cairn, 16/2, was also dated to the Chalcolithic.

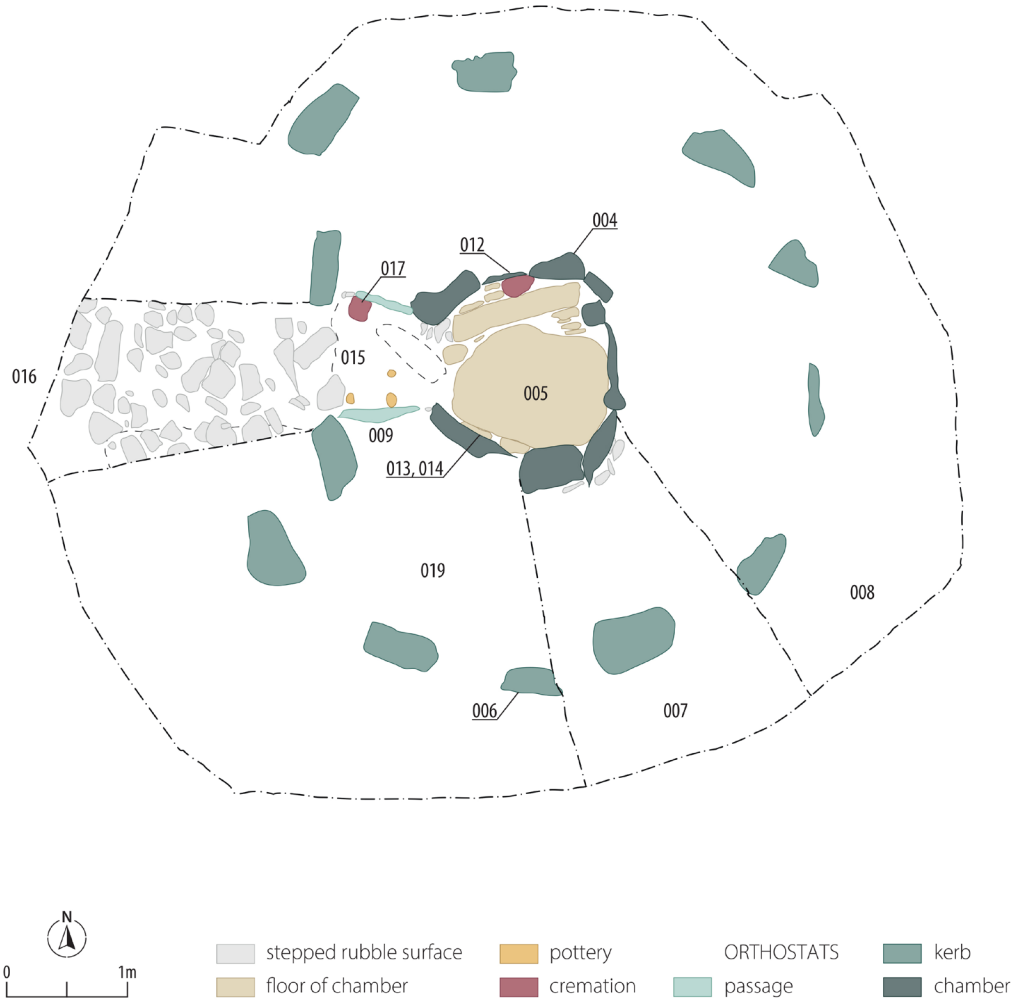
## 4. EXCAVATION METHODOLOGY

The re-examination of Carmahome was carried out according to a Method Statement that was prepared in March 2022 by Argyll Archaeology. The first stage of excavation in October 2022 cleared the moss and explored the chamber (Illus 4). The passage and the central chamber (down to the surface of the flagstones) were investigated and a slot was cut through the southern side of the cairn (Illus 5 and 6). A proposed trench through the northern portion of the cairn was not excavated due to the conditions. The weather was appalling for the duration of the first stage of excavation, making conditions very difficult for recording. When it was suspected that neither of the two large chamber floor flagstones (the largest estimated to weigh around 2 tons) had been lifted, and given the realisation that potentially Early Neolithic material may have survived undisturbed below, it was decided to delay lifting the flagstone floor and cutting a section through the cairn until both could be achieved in a safe and careful manner and under more favourable weather conditions.

The second stage of excavation was undertaken in much better but bitterly cold conditions in January 2023. This stage of excavation focused on the deposits underneath the flagstone floor (Illus 7).

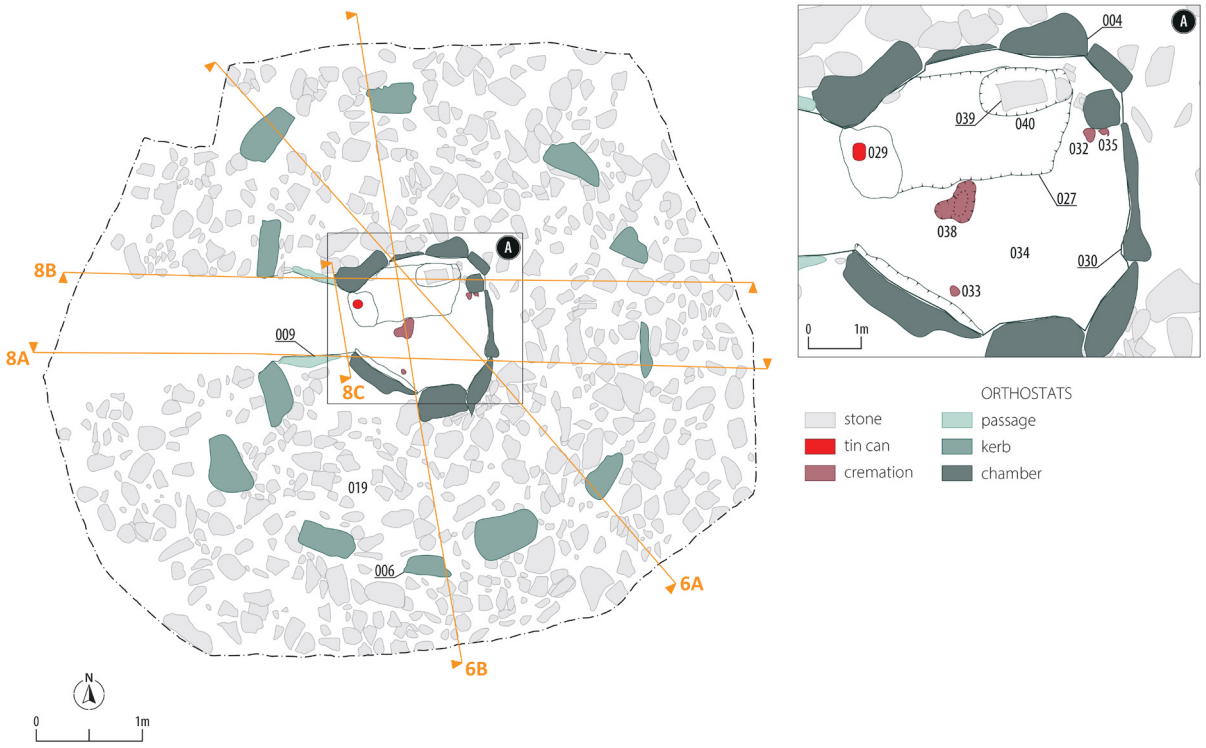



**Illus 4** Plan of the passage tomb after the removal of the surface vegetation and topsoil (image: Forestry and Land Scotland)




**Illus 5** Plan of the passage tomb after stage one of the excavation, showing the location of the Beaker pottery and cremation deposits (image: Forestry and Land Scotland)


**Illus 6** Section drawings of (A) the east side of the slot trench through the cairn material and (B) the west side of the slot trench. (image: Forestry and Land Scotland)




**Illus 7** Plan of the passage tomb after stage two of the excavation, following the removal of the chamber floor and showing location of the sections. (image: Forestry and Land Scotland)

## 5. THE LOCAL ENVIRONMENT AND PRE-TOMB ACTIVITY

A slot trench was excavated from the outside edge of two of the chamber orthostats to the edge of the excavation area and between two kerbstones that were visible from the upper surface of the cairn (Illus 5 and 8). Field observations and micromorphology concluded that a buried soil, comprising a thin, peaty podzol (021), survived largely undisturbed between the chamber orthostats (004) and the kerbstones (006) (Ellis 2023). This soil was capped by a mixed deposit comprising disturbed buried peaty podzol, small clasts of sandstone (020b) and a disturbed blocky turf (020a); the stone within (020b) is thought to be construction waste, small lumps of stones knocked off the orthostats and trampled into the soil during construction. A very small amount of hazel charcoal was obtained from both buried soil horizons (021) and (020), the former dating to 3320–2930 cal BC (SUERC-122897) and the latter to 3500–3140 cal BC (SUERC-122896) (Table 1). The apparent inversion of dates is probably just a reflection of the relative age of the soil, mixing action of soil biota, and possibly the result of the trampling and mixing of soil horizons during the construction of the monument when the footprint of the chamber orthostats and footprint of the kerb were cut through the turf (as discussed below).

Within the chamber the ground surface and the primary burial (see below) were sealed by a dark brown to black soft silt loam (036) which is interpreted as a disturbed buried soil and which is thought to be equivalent to the soil (020a)/(020b) found under the body of the cairn. Interestingly, heather pollen was much more common in (036) than in the largely undisturbed soil over which the cairn was built (021) (Table 4) and one explanation for this is that heather sprigs were laid on the soil within the chamber creating a dry fragrant interior carpet onto which human remains could have been placed.

Pollen and phytolith analyses (Appendix 3 and Jenkins 2023) have shown that, prior to the construction of the passage tomb, the immediate landscape was dominated by open damp herb-rich meadow or grassland, with woodland of mainly alder, hazel, and birch located much further afield (Table 4). The presence of a small amount of hazel charcoal in the buried soil is perhaps the residue of small fires lit around the monument during the course of its construction; such fires would have provided warmth and could have been used to cook food. Fibrous material (024), interpreted as re-deposited turf which had been used as a packing medium for the kerbstone found in the centre of the excavated slot trench (Illus 5), also contained pollen indicative of open, possibly grazed grassland.

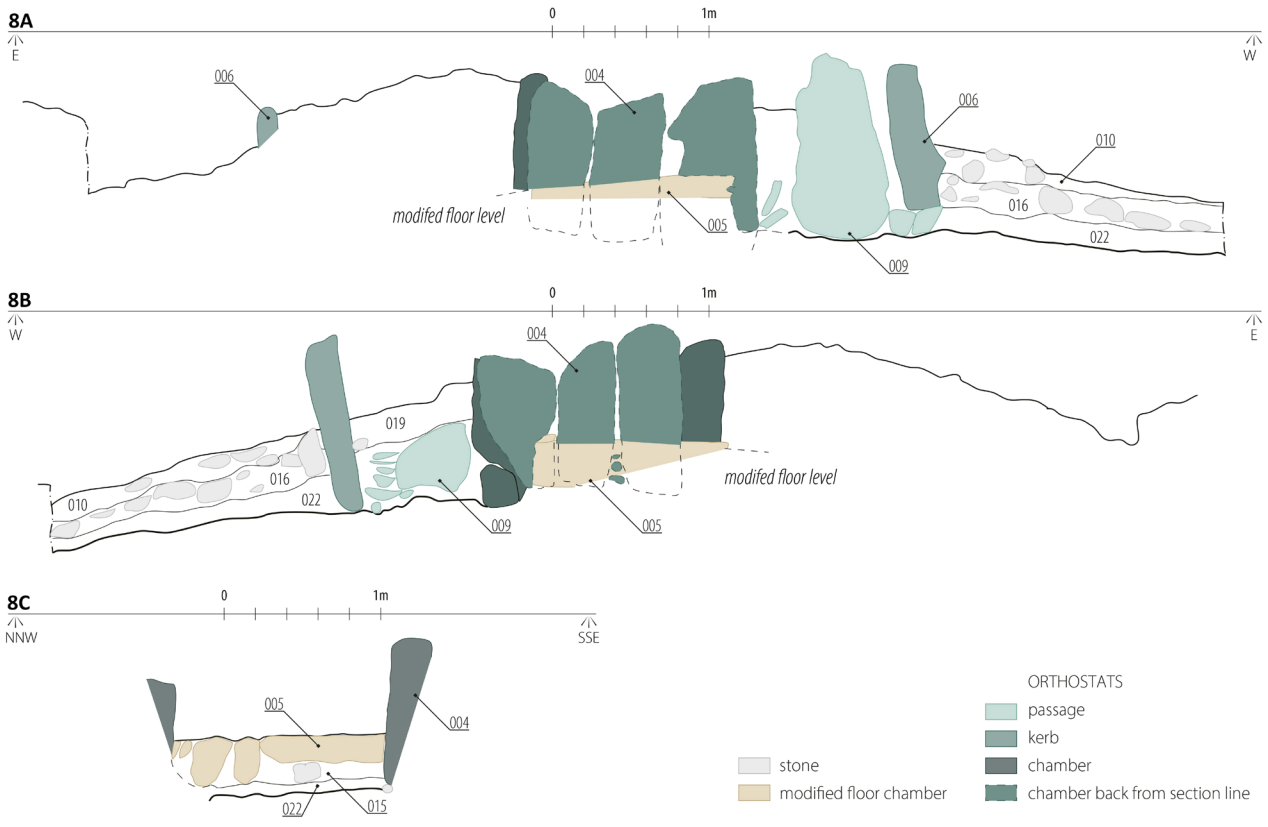
## 6. ARCHITECTURE

Prior to the re-examination, the passage tomb was covered by grass and moss, as well as stands of dead heather. The floor of the central chamber had a covering of waterlogged moss with very little soil content and contained a pool of water. The surface vegetation and a few centimetres of topsoil were removed from the monument to reveal a low stone and earthen mound with an open central chamber and short passage on the western side (Illus 5).

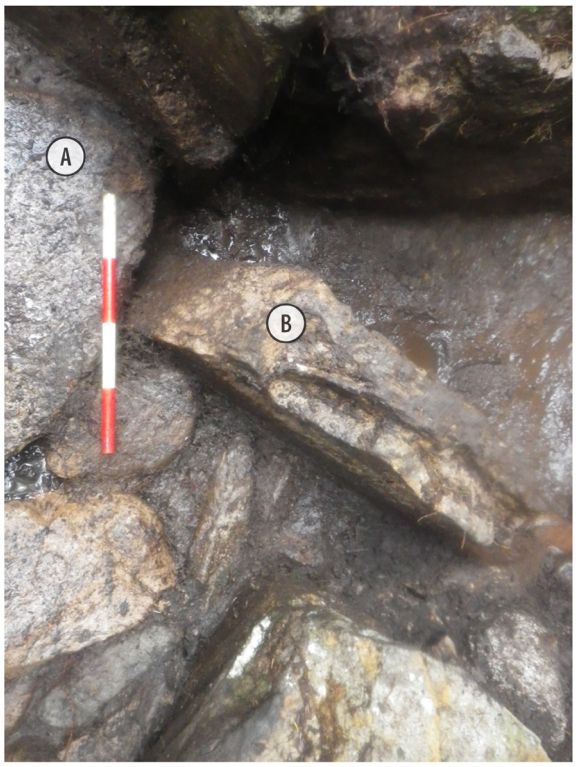
The cairn material of the passage tomb extended at least 7m from east to west and 6m transversely with no clear outer edge. The internal central chamber measured roughly 1.34m in width from north to south and 1.40m transversely and was constructed from eight tightly packed cream sandstone orthostats (004) defining a roughly circular area. These orthostats were of different heights (*c* 0.80m–1.10m) and between 0.32m and 0.19m in width; the tops of the orthostats did not form a particularly level upper surface. The cream sandstone is a local stone (Auchehew Mudstone Formation) and the presence of some rounded edges indicated that it had been quarried from an exposed weathered rock face.

The passage was *c* 1.08m long and narrowed from a 0.84m wide entrance to 0.68m at the entrance into the chamber. A single sandstone orthostat (009) formed the southern side of the passage (Illus 8). The orthostat (009) on the northern side of the passage was broken in two; the lower portion of the stone was discovered in situ while the upper portion was discovered collapsed within the passage (Illus 8, 9, and 10). The eastern end of the collapsed upper passage stone lay under the largest flagstone (005). Smaller stones had been packed in the space between the lower passage stone and the outer entrance kerbstone.

The central chamber was surrounded by a ring of at least ten kerbstones (006) which was around 5.25m in diameter; there is a gap on the north side where a kerbstone probably survives unrecorded under cairn material. These kerbstones seemed to




**Illus 8** Section drawings of (A) the south side of the passage and cairn, (B) the north side of the passage and cairn and (C) at the entrance to the chamber. (image: Forestry and Land Scotland)




A (005) B (009)

**Illus 9** The upper passage-stone (009) which had fallen to the 'floor' of the passage with its east end under the largest flagstone of the chamber (005). (image: Forestry and Land Scotland)


A (006) B (019) C (009) D (004) E (015)

**Illus 10** Detail from section 8B. (image: Forestry and Land Scotland)

be in situ, although the two adjacent to the portal orthostats appear to have collapsed slightly outwards from the cairn. With the exception of the two portal stones the kerbstones sat on the circumference of a circle (Illus 8). The two portal stones were set back from the circle creating an entrance located at the centre of a concave façade. The gap between the kerbstones and the chamber orthostats was infilled with a mixture of large pieces of subangular stone, rounded cobbles, and soil/turves. There was no recognisable formalised stone walling between the kerbstones, although this may have collapsed and been thoroughly disturbed beyond recognition. One in situ kerbstone was buried deep within the cairn, suggesting that either these stones were not designed to be visible but were just a means of containing and maintaining the height of the cairn over the chamber and passage beneath, or else that a large proportion of the cairn material has collapsed away from the centre of the monument.

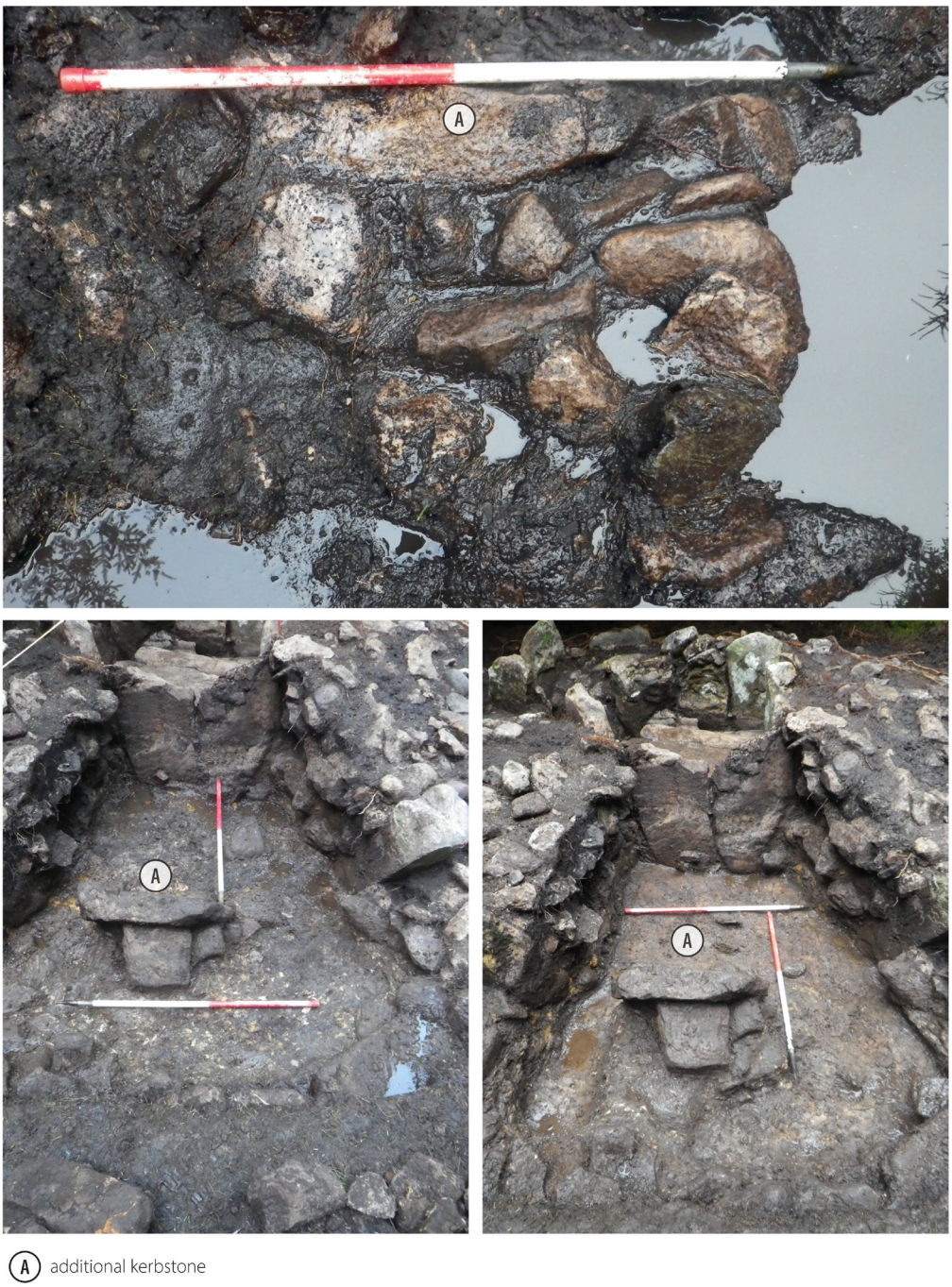
## 7. INITIAL ACTIVITY AND CONSTRUCTION

The stratigraphically earliest burial comprised a small deposit (6.1g) of fragmentary cremated cranial bone and a single fragment of molar tooth (037) (Appendix 2) placed within a small irregular kidney-shaped pit (038) that was located just off the centre of the chamber (Illus 7). Two attempts were made at dating the cremated bone but due to insufficient carbon both samples failed. However, a piece of hazel charcoal recovered from the fill of the pit returned a date of 2900–2690 cal BC (SUERC-122889) (Table 1). The pit was sealed by a dark brown to black soft silt loam (036) and mixed soil and crushed sandstone deposit (034). These deposits are interpreted as the remains of a disturbed soil into which small clasts of sandstone had been added to form the 'floor' of the chamber. The disturbed soil lapped up against the chamber orthostats (004) but it did not extend below them, rather these rested directly upon the surface of the natural red silt, demonstrating that the original topsoil had been removed from the intended footprint of the chamber orthostats before they were placed in position. Furthermore, no socket had been cut for the orthostats, but with the passage of time their weight had created shallow indentations into the surface of the natural red silt. The rear of the orthostats was packed with a few small stones and the previously removed soil with fragments of sandstone used to infill and level the ground immediately adjacent to them. A single piece of cremated bone (033) was trodden into the surface of (034) and a single fragment of burnt soil, presumably brought in with the cremated bone, was recovered from the surface; otherwise, the bulk of this surface was remarkably clean.

Located on the northern side of the chamber was a small deposit of cremated human bone (012) which had been pressed into the side of the chamber and up against the chamber orthostat. This deposit was located under two later floor packing cobbles which lay flush with the elongated flagstone (005). The deposit of cremated remains contained a high proportion of cranial vault fragments, one tooth root of a molar, fragments of a small patella, and of a femoral shaft and pieces of toe phalanges including an unfused proximal epiphysis. The skull fragments included some which appeared adult and at least one fragment which was probably juvenile. The deposit may therefore comprise the remains of at least two individuals. This deposit of cremated remains (012) has been dated to 3030–2890 cal BC (SUERC-122890), earlier than the date obtained for deposit (037) despite the latter stratigraphically pre-dating (012) (Table 1). Comparison of the dates for the deposits of cremated remains, (037) and (012), indicates that these are likely to have occurred within a few generations of each other. Other small fragments of cremated bone, (032) and (035), survived in brown silt found adjacent to the internal orthostat.

Fragments of the original topsoil/ground surface (022) survived outside the entrance but only in patches within the passage. Mostly the passage floor comprised trampled natural red silt into which the occasional small stones had been trampled. A deposit of cremated bone (017) was recovered from this floor. It was found on the north side of the passage hard up against the orthostat where presumably it had escaped disturbance during the use of the tomb. Radiocarbon dating indicates that this deposit may be more or less contemporary with that located within the chamber (012) (Table 1).

The Late Neolithic buried soil had been cut into and removed to make way for the chamber orthostats and the ring of kerbstones. The kerbstone in the west facing section sat within a shallow scoop or indentation in the soft red silt, while the smaller kerbstone in the east facing section sat within the disturbed buried soil (020b). The upper buried soil (020b) and (20a) had been removed from the ground surface outside of the kerbstones and was probably incorporated into the body of the cairn. An additional kerbstone was discovered within the slot trench; it was not visible from the surface of the cairn (Illus 11). This kerbstone had been packed with a turf-like material (024). Turf and stone (018) were roughly stacked between the chamber orthostats and the kerbstones to form the bulk of the cairn material. Smaller stones had been stacked slanting away from the newly revealed kerbstone to prevent it from collapsing outwards and other stones had clearly been stacked against the eastern kerbstones, also to prevent them from collapsing outward. The pressure of the cairn fill against the kerbstones, coupled with the absence of (020a/b) on the outside of these, may account for their outward-leaning nature. It is possible that in the original




**Illus 11** The additional kerbstone identified within the slot trench through the cairn material. (image: Forestry and Land Scotland)

design the outer face of the kerbstones was meant to be visible but imminent collapse necessitated their packing with stone.

A radiocarbon date was obtained on a piece of carbonised hazel recovered from the lower turf of the cairn (018) and this is surprisingly late, 2400–2150 cal BC (SUERC- 122898), given the otherwise Late Neolithic dates associated with the monument (Table 1). The monument definitely saw re-use in the Chalcolithic period (see below for further discussion) and it is probable that the dated charcoal had worked down through the cairn material by means of roots, soil biota, or even water percolation. The charcoal content of the sampled cairn soil (018) is also significantly different from that of the buried soils, with oak being the dominant species, a surprising result as no oak pollen was recorded in the Late Neolithic buried soils, (020) and (021)

(Table 1 and 3). This may indicate that additional turf was carried from afar and incorporated into the monument during the Chalcolithic re-use of the monument. The upper stone and turf cairn material (019) became more stone-rich towards the top of the cairn, perhaps a consequence of the loss of soil down through the profile, or perhaps a result of later Chalcolithic repair and re-stocking of the body of the cairn. An alternative explanation, and one favoured by the first two named authors, is that cremated bone and ash collected from funerary pyres – oak being the fuel of choice for funerary pyres as it produces the hottest temperature – were subsequently deposited within the pre-existing cairn material or scattered over the top of the cairn. Although no cremated bone was observed in the cairn material this is not surprising given the open nature of the cairn and the susceptibility of bone to leaching, as attested by the nature of the soil within the cairn.

## 8. PARTIAL COLLAPSE AND STRUCTURAL MODIFICATION

In the opinion of the first two named authors, the dates relating to the cremated human remains (012) and (017) appear to suggest that the passage tomb was in use for a relatively short time before the flagstone floor was laid. The largest flagstone (005), interpreted by Mann (1925) to be part of the original floor, sealed the crushed sandstone layer (034). The flagstone floor was rather more complex in plan than indicated in Mann's report, with smaller cobbles being located on the northern and southern side of the chamber (Illus 8). Excavation revealed that the cobbles, under which the deposit of cremated bone (012) was located, had not been disturbed or re-laid despite being located adjacent to the elongated flagstone that Mann had reported lifting (Illus 4, flagstone 'C'). On the southern side of the chamber a deposit of blocky peat loam mixed with compact brown sandy silt and cremated bone (013) sealed three small stones (014) that lay parallel to the largest flagstone (005). Stratigraphically this deposit of cremated remains must be later in date than those sealed below the flagstones (005).

Excavation of the rubble and silt (015) within the passage exposed the collapsed top of the north passage stone (Illus 9). The eastern end of this stone was wedged under the western side of the largest flagstone (005) and therefore proved that the passage had partially collapsed prior to the formation of the flagstone floor.

Within the chamber on the eastern side, a narrow upright orthostat was located against the vertical gap between two of the chamber orthostats (Illus 12). This additional orthostat sat upon the crushed sandstone surface (034) and therefore was placed in position after the creation of this 'floor' and hence was not part of the initial design of the passage tomb. Significantly this narrow upright orthostat was roughly the same length and width as the elongated flagstone.

One possible explanation is that the elongated flagstone once stood upright on the southwestern side of the chamber and, together with the in situ upright orthostat on the northeastern side, served to support one or more of the capstones; and the large flagstone could have been one part of the capstone roof that covered the chamber. The implication is


**Illus 12** Detail following the removal of the chamber floor. (image: Forestry and Land Scotland)

that at least one of the capstones brought to the site was found to be too small to span the width of the chamber. Following the collapse of the capstone roof over the chamber and the partial collapse of the passage roof, it appears the decision was made to raise the floor level of the chamber using the larger flagstone (one of the collapsed capstones) and the elongated flagstone (the fallen secondary supporting orthostat). This may have been an easier solution than trying to lift the stones – the larger flagstone is estimated to be *c* 2 tons in weight, and the elongated flagstone estimated to weigh *c* 0.58 tons – out of the chamber, or break it up in situ, or manoeuvre it down the partially collapsed, but still probably largely capped passage. As there were no other large stones found within the chamber or passage, it is presumed the remaining roof stone was removed from the monument during the remodelling phase. Cremated bone (013) may date the laying of the flagstone floor to after 2900–2690 cal BC (SUERC-122490) (Table 1), although there is the possibility that the cremated bone and soil were gathered from earlier deposits within the tomb. Entrance into the tomb appears to have continued via the passage over a stepped rubble surface (016) located just outside the entrance.

## 9. REUSE (OR RENEWED ACTIVITY) DURING THE CHALCOLITHIC PERIOD

Evidence for the later reuse of (or, at least, activity at) the passage tomb is attested by the discovery of parts of a Low-Carinated All Over Comb-decorated Beaker (see Appendix 4) in the passage. These were recovered from within the collapse infill of stone and silt (015) which had built up in the passage and around the collapsed passage orthostat. Three conjoining (and now refitted) sherds from the lower part of the pot, including its rounded carination, were found first, then around 40cm further along the passage a large part of the same Beaker was discovered resting on a lump of rubble. This latter piece, around 110mm across, also includes the carination and lower belly, along with part of the body above the carination. An irregular 'crater' area where the surface is missing, extending roughly from the carination, must relate to where the sherd was hit by something (eg a falling stone) in the past, causing the surface to spall off. The rim and base of the pot are missing, as is an indeterminate amount of the upper body, discussed in Appendix 4.

The vessel is immediately identifiable as belonging to the earliest kinds of Beaker found in Britain and Ireland – ones that are closest in style and in their technique and quality of manufacture to their immediate Continental precursors and congeners. According to the most up-to-date typochronology for British Beakers, this vessel should date to between *c* 2450 cal BC and *c* 2200/2150 cal BC (Parker Pearson et al 2019: 173).

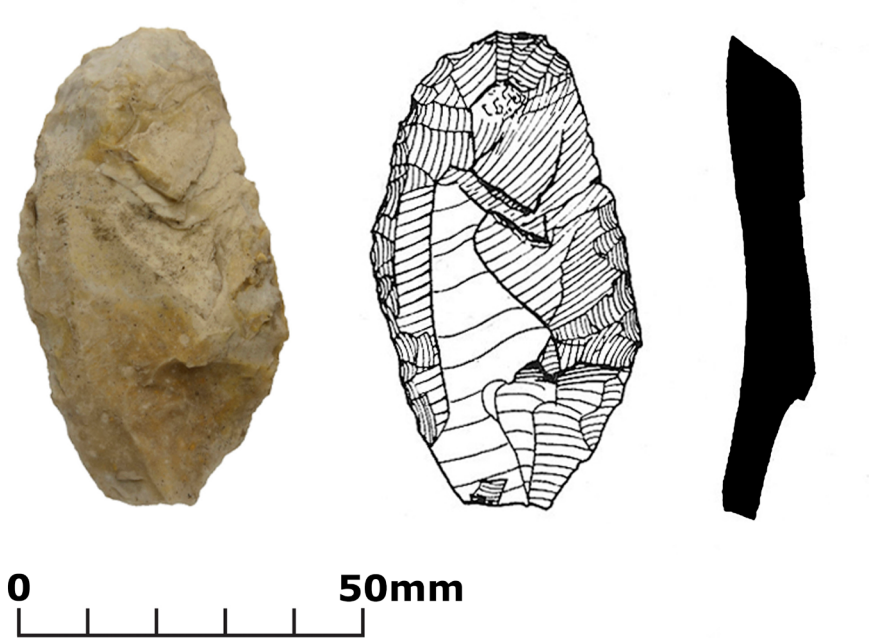
Questions remain about how and why these Beaker sherds came to be deposited in this much older monument. Are we dealing with a pot that had been buried intact (perhaps as a grave good accompanying human remains) in the monument and had then been disturbed and broken, its parts scattered among the silty infill of the passage after the side wall had collapsed? Or had this been deliberately broken, and parts of it placed among the fill, during an act of deliberate decommissioning of the monument during the Chalcolithic? Decommissioning does not appear to be likely, however, since the rubble in the passage is believed to have accumulated during the monument's collapse during the Late Neolithic. The degree of abrasion on the non-recent fracture surfaces is not particularly heavy; the sherds found 40cm from the main piece are slightly more abraded, both on their edges and their exterior, than the main piece.

There are no human remains that are definitely associated with the remains of the Beaker. The deposit of calcined bone (017) found in the passage, in silty fill closely resembling (015) but which was actually trampled natural, has produced a Late Neolithic radiocarbon date of 3020–2890 cal BC (95.4% probability; 4324±28 BP, SUERC-122895), which is far too early for the bones to have been associated with the Beaker. Moreover, this deposit appears to have pre-dated the collapse of the passage side wall. If the Beaker had been deposited with unburnt human remains, then the latter would have decomposed in the acidic peaty environment of the monument's fill. However, as Neil Wilkin's (2016) thoughtful review of the practice of Beaker deposition in Neolithic monuments has pointed out, it should not be assumed that all Beakers in such contexts must have accompanied the deposition of deceased people as a secondary funerary use of the monument – even though in some cases, as in the simple passage tomb at Achnacreebeag and in the multiple Neolithic cist monument at Glecknabae, both Argyll and Bute, it is clear that they had indeed been used in this way (Ritchie 1970; Sheridan 2007; 2012). Wilkin has pointed out the predominance of AOC (All Over Cord-impressed) and other probably Chalcolithic Beakers in Neolithic monuments, especially in the west of Scotland (Wilkin 2016: 271–3) and has emphasised the possibility that non-funerary Beaker deposition in Neolithic monuments could have been a way for local communities to engage with the novel Continental pottery and integrate it into their ideology and traditions. That may be so; but given the post-2016 realisation, thanks to aDNA analysis, that we are indeed dealing with an influx of Beaker-users from the Continent, we do have to bring back into play the possibility that at least some of these pots were deposited by incomers. If that was the case at Carmahome, then the deposition of the Beaker could have been a symbolic gesture of appropriation of the monument, or of respect towards its original builders.

## 10. THE 1924 EXCAVATION: A REASSESSMENT

During our preparations for the removal of the largest flagstone, excavation on its western and southern sides proved that the deposits adjacent to it had not been disturbed in the recent past and there was no doubt that the elongated flagstone had not been lifted during the excavation in 1924 (Illus 4, flagstone 'C'). Once we completed the excavation of the passage, the elongated flagstone (the former capstone-supporting orthostat) was carefully winched down into the passage to allow access to the chamber deposits beneath. The two adjacent chamber orthostats located on the southern side were lowered and laid flat in the slot trench which had been previously excavated through the cairn and then the larger flagstone (the former chamber capstone) was carefully winched out and rested on them (Illus 13). An irregular cut (027) was revealed below the elongated flagstone (Illus 12, B). The loose fill comprised soft and waterlogged blocky peat with two sherds of early 20th century white ceramic. Also sitting within this material at the very western end of the cut (Illus 7), but beyond the end of the elongated flagstone, was what was thought initially to be the top of a degraded pottery vessel (029). The vessel was block lifted and upon examination in the laboratory revealed to be the base of a degraded tin can, presumably left behind in 1924 (Murray, pers

**Illus 13** Once the passage had been fully excavated, the elongated flagstone was carefully winched down into it. The two adjacent chamber orthostats located on the southern side were lowered and stored in the previous excavated slot trench through the cairn and the larger flagstone was carefully winched out onto them (image: Forestry and Land Scotland)




**Illus 14** The flint knife recovered in 1924. (image: Forestry and Land Scotland)

comm). It transpired that, rather than lifting the heavy elongated flagstone 'C', Mann had removed the smallest of the three flagstones (Illus 4) and dug a small exploratory 'hole' and then burrowed under the elongated flagstone leaving a shallow void into which modern material had been inwashed or placed; Mann was therefore very fortunate to find a flint knife (Illus 14), the only sizable lithic artefact recovered from the site. That knife is now in the collections of Glasgow Museums, having been bequeathed by Mann in 1955 (Registration No. A.1955.96.lr).

## 11. DISCUSSION

Carmahome has been considered to be one of a small group of Early Neolithic 'Breton-style' megalithic funerary monuments – simple passage tombs and polygonal closed chambers, some with surrounding kerbs and some with low cairns – which hypothetically appeared on and near the west coast of Scotland, and elsewhere along the west coast of Britain and around the coast in the northern half of Ireland, at some time between 4300 cal BC and 3900 cal BC, probably *c* 4000/3900 cal BC (Sheridan 2017: 300; Sheridan & Schulting 2020: 196).

The group includes four of the five passage tombs from North Lorn, Morvern, and Ardnamurchan, all either Highland or Argyll & Bute, previously listed by Ritchie (1970: 37), who noted that 'superficially these tombs may be divided into two types, namely those for which there is no evidence for a passage to the chamber and are thus closed chambers (Greadal Fhinn, NW chamber; Achnacreebeag, NW chamber; Rahoy and Clach an t'Sagairt), and those for which there is good evidence for a passage leading from the chamber to the outside of the cairn (Greadal Fhinn, SE chamber; Achnacreebeag, SE chamber; Achnacree).' Achnacree is not included in Sheridan and Schulting's (2020) group of Breton-style monuments, as in their opinion it constitutes a later development of that passage tomb tradition in the area. When Ritchie was writing, only three of these monuments, all in Argyll & Bute, had been excavated: Achnacree (in 1871), Achnacreebeag (in 1969), and Clach an t'Sagairt (in 1920) (Henshall 1972: 355–8, 364). At the time of their excavation these could not be dated due to the limitations of radiocarbon dating methodologies, and no datable material relating to the construction of the monument is available in the archive from Achnacreebeag, even though cremated human remains relating to secondary activity there (namely blocking of the passage tomb, during the Early Bronze Age) have been radiocarbon dated (Sheridan 2004a: 174).

In their consideration of Breton-style monuments, Sheridan and Schulting (2020: 197) included three further monuments from western Scotland in addition to those mentioned by Ritchie: Moleigh in Lorn; Leaval on South Uist; and Craonaval in North Uist. The tomb at Moleigh (Canmore ID 22935) was excavated in 1872 (Smith 1874: 84, 85; Anon. 1874: 458; Anderson 1878: 454–5, fig. 13) and again in 1967 (Ritchie 1968), and was originally considered to be Bronze Age in date, since the remains of an Early Bronze Age dagger had been found in the chamber alongside cremated human remains (Ritchie 1968; Henshall 1968: 181, 183, fig. 42.4, pl 1c). The butt-riveted, flat-bladed dagger is of a type known to date to between 2200/2150 cal BC and 1950/1900 cal BC (Needham 2015: 23.). However, a series of radiocarbon dates obtained for National Museums Scotland (NMS) on the cremated bone that Ritchie recovered from a lower deposit of cremated remains in the chamber places its initial use in the 38th or 37th century BC (namely 3770–3660 cal BC (GrA-24858), 3760–3640 cal BC (GrA-26158, from same sample as GrA-24858), and 3730–3520 cal BC (GrA-28741): Sheridan 2004a; 2005). The closed megalithic chamber at Leaval on South Uist was partly excavated in 1999 (Cummings & Sharples 1999; 2005; Cummings et al 2012: 66) but did not produce any information pertinent to its date of construction. As for Craonaval in North Uist (Henshall 1972: 512) – an unexcavated monument – it is the square, closed chamber and not the Clyde-type chamber (which is believed by Sheridan to be a subsequent addition) that is considered to be a candidate for a Breton-style monument.

Sheridan has argued that the appearance of the Breton-style monuments relates to the arrival of immigrant farmers from the Morbihan area of southern Brittany, probably around 4000/3900 BC (Sheridan 2017; Sheridan & Schulting 2020). In addition to the architectural similarities of these funerary monuments with those in Brittany, a decorated bipartite bowl, identified as being similar to the classic Breton Late Castellic-type, was recovered from the later passage tomb of the two-phased cairn of Achnacreebeag, along with other Breton-style pots (Sheridan 2016). Sheridan has traced the subsequent development of the Late Castellic-style decorated bipartite bowl in the Neolithic ceramic repertoire of western Scotland (Sheridan 2016) and Ireland (Sheridan 1995), showing that these ceramic 'descendants' can be found in non-passage tomb contexts.

One such example was discovered at the Blasthill Clyde cairn on the south end of Kintyre, Argyll & Bute (Sheridan 2023: 72). Charcoal from the heavily bioturbated fill of a lateral chamber (which constitutes part of the initial-phase monument at Blasthill, built prior to the 'classic' Clyde cairn) suggests a primary use date for the monument of 3980–3790 cal BC (GU-21796), although the excavators cautioned that the charcoal could be residual, deriving from the earlier buried soil (Cummings & Robinson 2015: 6). In this chamber a crushed, lugged globular Early Neolithic bowl, organic residue from which was dated to 3630–3360 cal BC (GU-21791), was found directly beneath the sherds of the decorated bipartite bowl and perhaps represented later use of the monument (Cummings & Robinson 2015: 8, 19).

In considering the broader archaeological and architectural context of the Carmahome passage tomb, two other monuments have been selected for discussion here. Both are located near the simple passage tomb of Achnacreebeag: the passage tomb of Achnacree, just 700m away, excavated in 1871 (Smith 1872; 1874); and the Clyde cairn of Dalineun in Lorn, also Argyll & Bute, around 10km to the southwest, excavated in 1970–71 (Ritchie 1971) (Illus 2 and 3). On plan, the passage tomb of Achnacree is a similar size to many of the other sites selected for illustration; but the massive mound of stones (standing to over 4m in height, and with an original diameter of around 26m) is a salutary reminder of both the complex architecture that may remain hidden elsewhere, and the volume of the cairn material that may have been lost due to stone robbing elsewhere. The excavation of the Clyde cairn of Dalineun reminds us of the complex sequence of events that may remain masked at unexcavated sites: the rectangular two-compartment Clyde-style chamber with sill stone was blocked, perhaps by deliberately destroying and reusing the large kerb stones of its façade (envisioned by the excavator to have resembled the kerb of the passage tomb of Achnacreebeag) (Ritchie 1971: 53). The unusual insertion of a small cist into a pit in front of the entrance to the chamber prior to the blocking of the chamber – and the secondary insertion of a massive cist into the cairn material – also demonstrate the often complex sequence of construction events present at such sites. Without excavation, the typological categorisation of these sites (simple passage tombs, polygonal closed chambers, a passage tomb and a Clyde cairn) based on their size and shape, and the size and shape of their chambers and passages, can be uncertain – and regional and temporal aspects of Neolithic chambered cairn architecture can be seen to change and blend into each other. Indeed, some authors consider the simple passage tomb to be part of the wider tradition of portal tomb buildings (eg Cummings 2009: 67; 2017: 114), although it has been argued portal tombs do not seem to exist in Scotland (Sheridan 2004b: fig. 2.6). Achnacreebeag boasts unusually large and prominent capstones that are worthy of comment and comparison, although no portal stone arrangement is present, and the number of uprights does not correspond to that of portal tombs.

### 11.1 Hypotheses of construction and use

In preparing this paper, the three principal authors enjoyed some (at times) robust and feisty discussion, and did not reach agreement in regard to the date of the monument's initial construction and use. Two hypotheses are therefore put forward here: the first sees the monument constructed in the Late Neolithic and reused in the Chalcolithic (CE and MR); the second sees the monument constructed during the Early Neolithic and reused in both the Late Neolithic and Chalcolithic periods (AS).

#### 11.1.1 Hypothesis 1

This hypothesis takes the view that the dating evidence obtained during the excavation proves that the monument was constructed during the Late Neolithic period, and there are sound archaeological reasons for accepting the idea that this simple passage tomb was constructed at that time, not least the Bayesian model described in Appendix 1. The radiocarbon dates are derived from samples that were considered secure during the excavation of the tomb. There is no evidence whatsoever that there was an early Neolithic phase of this monument.

The monument was built over a peaty podzol which was covered by damp herb rich grassland or meadow and which may have been grazed.

A chamber was created by the erection of eight abutting sandstone orthostats and was accessed by a short passage formed by two opposing orthostats and two portal stones set perpendicular to the passage stones. The portal stones were set back from an outer circle of kerb stones to form a slight recessed crescentic façade. The outer surface of each of the portal stones was concave and these stones may have been deliberately chosen to accentuate the curve of the façade. The chamber was capped by probably two or more large slabs of sandstone, one of which was subsequently re-used as a floor slab following the collapse of the chamber roof. The area between the chamber and the kerbstones was filled with stone and turf. Stone was also used to shore up the exterior of the kerbstones, although this may only have been done after some time when the weight of the cairn fill started to push the top of the kerbstones outwards.

There was then a partial collapse of the monument, perhaps only decades after its construction. The roof collapsed because one of the capstones – there must originally have been at least two large capstones – had been too small to span the central chamber. Rather than source and transport an alternative larger stone, the tomb builders adapted their design by adding two upright stone props to the interior of the chamber (after the floor surface had been prepared) and on which the widest span of the capstone would have been supported; clearly, this adaptation was inherently unstable. Following the collapse of the roof of the chamber and partial collapse of the passage roof and wall, one of the large capstones and one of its stone supports were laid flat over the crushed sandstone floor and over one end of the broken top of the north passage orthostat. After the repair of the monument at least one deposit of cremated remains was placed within the chamber of the tomb but there is no evidence for the extended use of the tomb beyond the Late Neolithic. In fact, the Bayesian modelling of the radiocarbon dates suggests that the use of this simple passage tomb may have been limited to a few generations.

According to this hypothesis, based on the excavated evidence, the re-examination of Carmahome has established it was built in the Late Neolithic, around 3055–2890 cal BC. Although there is some similarity in plan of Carmahome to other small chambered cairns (closed megalithic chambers and simple passage tombs), and to Achnacreebeag in particular, as Cummings and Robinson (2015: 22) point out 'monuments which look alike are not necessarily contemporary.' This statement is particularly pertinent given the distinct lack of dates for the construction of simple single chambers located within small cairns (ibid).

### 11.1.2 Hypothesis 2

This hypothesis takes the view that the dating evidence obtained during the excavation does not prove that the monument was constructed during the Late Neolithic period, and there are sound archaeological reasons for rejecting the idea that this simple passage tomb was constructed at that time. Rather, it is proposed that the monument was constructed during the Early Neolithic period, then re-used during the Late Neolithic (when it also collapsed and was structurally modified), and was re-used once more during the Chalcolithic, when the Beaker was deposited.

The argument for monument construction occurring during the late third millennium appears to hinge on the date of 3320–2930 cal BC (4427±28 BP, SUERC-122897) obtained from a fragment of hazel charcoal from the buried soil under the cairn (context 021). However, as Susan Ramsey's report on plant remains (Appendix 3) makes clear, it is possible that the natural processes of bioturbation and downward transportation that the excavator cites to account for a late third millennium date of 2400–2150 cal BC (SUERC-122898) for charcoal in the cairn – namely root action, the action of soil biota or water percolation – could well be responsible for the presence of the hazel charcoal fragment in (021). Ramsey notes the presence, in (022) – also part of the original ground surface – of 'a trace of heather type wood that may be much more recent in date [than the Late Neolithic]'. Furthermore, the fact that the dated charcoal fragment in (021) was found at a *lower* level than a piece of hazel charcoal from the disturbed old ground surface (020) that was dated to 3500–3140 cal BC (4593±28 BP, SUERC-122896) sheds further doubt on the status of the old land surface as a 'closed' deposit. It is therefore hard to accept the Late Neolithic date for the

(021) charcoal as a reliable indicator of when the monument was constructed.

As for the other radiocarbon dates, the two very similar dates for calcined human bone from (012), below the large capstone-turned-floor slab (005), and from (017), the floor of the passage – namely 3030–2890 cal BC (4332±28 BP, SUERC-122890) and 3020–2890 cal BC (4324±28 BP, SUERC-122895) respectively – attest to funerary use of the chamber and passage during the Late Neolithic, around the turn of the third millennium. The date for calcined human bone stratified above (005), in (013) – 2900–2690 cal BC (4216±26 BP, SUERC-122490) – not only provides a date bracket for the collapse of the chamber roof (and perhaps for the passage too) but also attests to continuing use for funerary purposes after the consequent structural modification of the monument. In the case of the calcined bone found in (037), the fill of a small pit underlying (005) and stratigraphically the earliest archaeologically-attested deposit in the chamber, the bone itself failed to produce a date. It is suspicious that the date for hazel charcoal from this pit – 2900–2690 cal BC (4216±28 BP, SUERC-122889) – is virtually identical to that for cremated bone *above* (005) and is later than the date for calcined bone from pre-(005) context (012). The excavator has admitted that the small amount of charcoal in (037) could have derived from disturbed soil (036)/(034) placed in the chamber. This means that the calcined bone in (037) is not necessarily Late Neolithic in date; and even if it were, it might not relate to the earliest use of the monument in any case: we cannot rule out the possibility that unburnt human remains had been deposited in the chamber during the Early Neolithic and had decayed away completely in the acidic environment. The Late Neolithic funerary activity attested by the cremated human remains could therefore relate to a secondary re-use of an already-ancient monument. Indeed, it could be that the Late Neolithic re-use accidentally triggered the monument's collapse; it is interesting that people continued to deposit the dead after having repurposed the fallen capstone as a flagstone floor.

As for the date of 2400–2150 cal BC (3814±28 BP, SUERC-122898) for hazel charcoal in the turf of the mound – a date that was excluded from the Bayesian modelling – its possible contemporaneity with the Beaker has already been discussed, along with the possibility that there could have been a renewed use of the monument for funerary depositions at that time. The broader context of Chalcolithic and Early Bronze Age funerary practices on Arran has been mentioned above.

Regarding the archaeological reasons for rejecting the suggestion that the simple passage tomb was built around 3000 BC: firstly, there is no evidence from Scotland (Sheridan & Schulting 2020) or Ireland (Schulting et al 2017a; 2017b), or England and Wales for that matter, that any simple passage tombs of comparable design to Carmahome were being built around this time (see Schulting et al 2017b on what kind of passage tomb was constructed after the mega-passage tombs of the Boyne Valley in Ireland).

Secondly, on Arran, there is no evidence for the construction of megalithic funerary monuments after the second quarter of the fourth millennium, when the Clyde cairns were built. Rather, if one considers what was happening on Arran during the Late Neolithic, one finds that on Machrie Moor, just 5.5km to the north of Carmahome, that people were erecting timber then stone circles (Haggarty 1991), and were using Orcadian-style Grooved Ware pottery. This suggests a society (or a segment of society) that was aware of, and was emulating, developments in Orkney. The radiocarbon dates for these Machrie Moor monuments that were obtained in the early 1990s have recently been complemented by dates for organic residue attached to some of the Grooved Ware sherds, obtained for Mike Copper's *Tracing the Lines* project (Copper et al 2021). Modelling of the dates for Grooved Ware-associated activity at Machrie Moor has produced a date bracket of 3110–2945 cal BC for its start and 3090–2700 cal BC (both 95% probability) for its end (ibid: 96). This corresponds neatly to the time frame for the use of Carmahome for the Late Neolithic deposition of cremated human remains. The simple passage tomb at Carmahome bears no resemblance to the Maes Howe-type passage tombs of late fourth millennium BC Orkney; rather, in the context of Late Neolithic Arran, it can be regarded as a nearby ancient monument that was chosen, possibly even by the builders of the Machrie Moor circles, as an appropriately venerable location

in which to bury the cremated remains of the dead (cremation is attested as a funerary practice associated with Grooved Ware users). Moreover, it is not the only ancient monument on Arran to have been re-used in this way: the presence of Orcadian-style Grooved Ware and an ovoid macehead in the Clyde cairn of Tormore 1 (Henshall 1972: 305, 371–3), just *c* 4km away from Carmahome and 1.65km from Machrie Moor, provides a compelling *comparandum*. In this author's opinion, then, the Carmahome evidence does not disprove the theory that this, and other simple passage tombs and closed megalithic chambers, is a Breton-style monument of Early Neolithic date; absence of corroborative evidence in this instance does not invalidate the theory.

## 12. REINSTATEMENT

The second aim of the re-examination in 2022–23 was to assess the current state of survival of the monument and to determine the impact that commercial afforestation may have had on its physical and geochemical state. Since Mann's excavation in 1924, the area around the passage tomb was ploughed in 1988 and a planation of Sitka spruce established. Although the northern edge of the passage tomb was ploughed through, the remaining cairn appeared unaffected. However, tree roots from a Sitka spruce on the north side and another on the north-western side had grown into the cairn and had caused some physical disruption to the cairn material, and the monument was found to be badly waterlogged. The change in hydrology and increased soil acidity caused by afforestation seems to have had a serious impact on the preservation of archaeological deposits.

The site was reinstated by carefully replacing the flagstone floor and resetting the two chamber orthostats that had been lowered. The slot trench was also backfilled with stones. The site will be marked out and avoided during future forestry operations and will be afforded a much larger open area during subsequent restocking.

## 13. CONCLUSION

The excavation at Carmahome has demonstrated that the use of simple architectural typology to construct a narrative of the succession of Neolithic burial monuments should be treated with caution until many more of these monuments are dated. To reiterate the message of Sheridan and Schulting (2020), what is required is a programme of further re-examination of previously excavated closed chamber and simple passage funerary monuments with the aim of recovering datable material.

## 14. ACKNOWLEDGMENTS

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## 15. APPENDIX 1: RADIOCARBON DATES

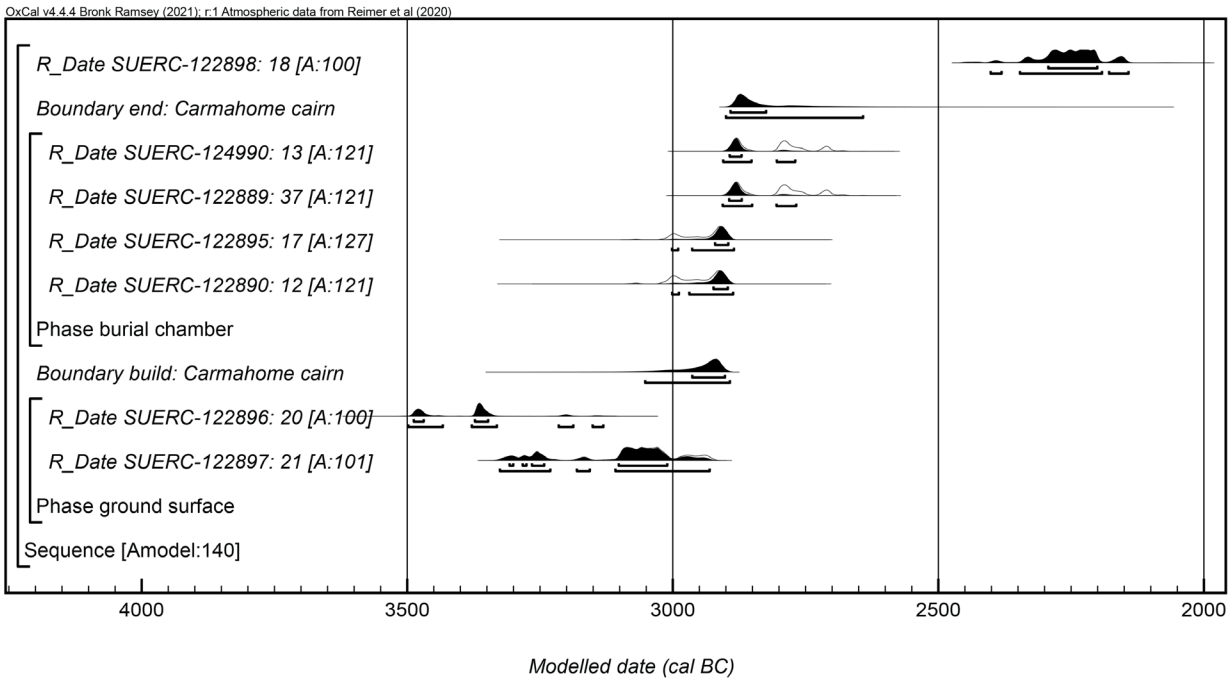
*Derek Hamilton*

A total of seven samples were processed for radiocarbon dating by accelerator mass spectrometry (AMS). The samples consisted of single entities (Ashmore 1999) of charcoal and cremated human bone. The samples were submitted to the Scottish Universities Environmental Research Centre (SUERC), East Kilbride where they were pretreated and measured as described by Dunbar et al (2016). The SUERC lab maintains rigorous internal quality assurance procedures, and participation in international inter-comparisons (Scott 2003; Scott et al 2010) indicate no laboratory offsets; thus, validating the measurement precision quoted for the radiocarbon ages.

The results are presented (Table 1) as conventional radiocarbon ages (Stuiver & Polach 1977). They have been calibrated using the internationally agreed terrestrial calibration curve (IntCal20) of Reimer et al (2020) and the OxCal v4.4 computer program (Bronk Ramsey 2009). Simple calibrated results are presented at 95% confidence intervals (unless otherwise noted) in plain text and rounded outward to 10 years. The *italicised* dates presented in the text below are posterior density estimates derived from mathematical modelling of archaeological problems and have been rounded outward to five years. These dates can change with the addition of new data or when the modelling choices are varied.

### 15.1 Methodological approach

A Bayesian approach (Buck et al 1996) has been applied to the interpretation of the chronology of the archaeological activity at Carmahome. Although simple calibrated dates are accurate estimates of the radiocarbon age of samples, this is not, usually, what archaeologists really wish to know. It is the dates of the archaeological events represented by those




**Illus 15** Chronological model for activity at Carmahome. Each distribution represents the relative probability that an event occurred at some particular time. For each of the radiocarbon measurements two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model use. The other distributions correspond to aspects if the model. For example, 'build: Carmahome cairn' is the estimated date that the cairn was constructed, based on the radiocarbon dating results. The large square 'brackets' along with the OxCal keywords define the overall model exactly. (image: Forestry and Land Scotland)

samples that are of interest. For example, the start and end of the activity associated with the cairn is of interest. The chronology of this activity can be estimated not only by using the absolute dating derived from the radiocarbon measurements, but also by using stratigraphic relationships between samples and the relative dating information provided by the archaeological phasing.

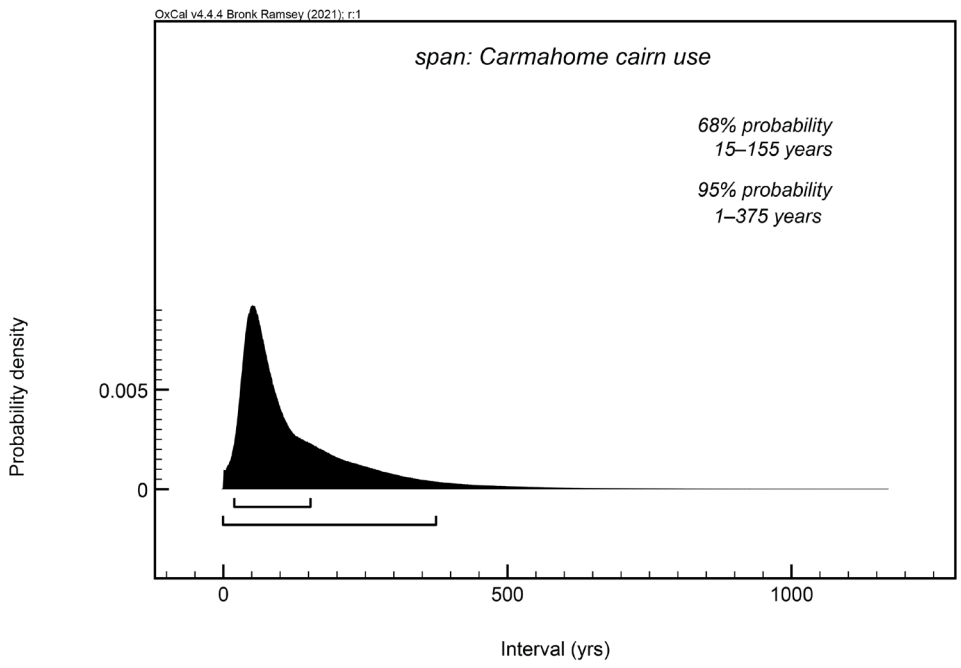
The methodology used allows the combination of these different types of information explicitly to produce realistic estimates of the dates of archaeological interest. The posterior density estimates produced by this modelling are not absolute, rather they are interpretative estimates, which can and will change as further data become available and as other researchers choose to model the existing data from different perspectives. The technique used is a form of Markov Chain Monte Carlo sampling and has been applied using the program OxCal v4.4 (http://c14.arch.ox.ac.uk/). Details of the algorithms employed by this program are available in Bronk Ramsey (1995; 1998; 2001; 2009) or from the online manual. The algorithm used in the models can be derived from the OxCal keywords and bracket structure (Illus 15).

### 15.2 Samples and models

The submitted samples come from contexts associated with layers and specific deposits associated with the period surrounding and including the activity in the cairn. While the results cover nearly 1500 years, the cairn activity was restricted to the first half of the 3rd millennium cal BC. The modelling investigated the chronology of this activity using the simple bounded phase model in OxCal as presented in Hamilton and Kenney (2015) but including dates from pre- and post-cairn elements into a bracketing sequence.

### 15.3 Results

The chronological model has good agreement (Amodel=140) between the radiocarbon dates and the modelled archaeological relationships. The model estimates the Carmahome cairn was constructed by *3055–2890 cal BC* (*95% probability* (Illus 15); *build: Carmahome cairn*) or *2965–2900 cal BC* (*68% probability*). The monument was in use for up to *375 years* (*95% probability* (Illus 16); *span: Carmahome cairn use*) or probably *15–155 years* (*68% probability*). The cairn stopped being used by *2900–2640 cal BC* (*95% probability* (Illus 15); *end: Carmahome cairn*) or *2895–2825 cal BC* (*68% probability*).




**Illus 16** Span of the activity modelled at Carmahome. The span is derived from the modelling shown in Illus 15. (image: Forestry and Land Scotland)

**Table 1** The radiocarbon dates from Carmahome

| Lab ID | Context | Context Description | Material dated | δ13C (‰) | Radiocarbon age (BP) | Radiocarbon date (95% probability) |
|---|---|---|---|---|---|---|
| SUERC-122889 | 037 | small patch of cremated bone with rare charcoal below (036) | charcoal: *Corylus avellana* | –27.2 | 4216 ±28 | 2900–2690 cal BC |
| SUERC-122890 | 012 | small deposit of cremated bone under floor (005) | cremated human bone; skull | –22.9 | 4332 ±28 | 3030–2890 cal BC |
| SUERC-122895 | 017 | concentration of burnt bone with no charcoal | cremated human bone; skull | –24.5 | 4324 ±28 | 3020–2890 cal BC |
| SUERC-122896 | 020 | trampled, mixed and disturbed buried soil beneath cairn | charcoal: *Corylus avellana* | –24.0 | 4593 ±28 | 3500–3140 cal BC |
| SUERC-122897 | 021 | soil beneath cairn | charcoal: *Corylus avellana* | –25.7 | 4427 ±28 | 3320–2930 cal BC |
| SUERC-122898 | 018 | turf within the cairn makeup | charcoal: *Corylus avellana* | –27.6 | 3814 ±28 | 2400–2150 cal BC |
| SUERC-122490 | 013 | sediment overlying (005) and containing cremated bone | cremated human bone | –23.4 | 4216 ±26 | 2900–2690 cal BC |

## 16. APPENDIX 2: CREMATED BONE

*Sue Anderson*

A small quantity of cremated bone was recovered from eleven contexts. The bone from the bulk samples was processed via flotation, and extracted bone from the larger groups was sieved into fractions (<2mm, >2mm, >5mm and >10mm) during analysis. All but the smallest fraction were sorted. All bone was sorted into five categories: skull, axial, upper limb, lower limb, and unidentified. All fragment groups were weighed to the nearest tenth of a gram. Measurements of maximum skull and long bone fragment sizes were also recorded. Observations were made, where possible, concerning bone colour, age, sex, dental remains and pathology. Identifiable fragments were noted. Methods used follow the Workshop of European Anthropologists (Ferembach et al 1980) and McKinley (1994; 2004).

Table 2 shows the bone weights and percentages of identified bone from each context, and the proportions of bone identified from the four areas of the skeleton (skull, axial, upper limb, lower limb). Expected proportions are provided based on McKinley (1994: 6).

The total weight of bone is low. Mays (1998: table 11.2) notes that the combusted weight of an adult skeleton has a mean of around 1500g for females and 2300g for males. The total quantity of bone in this assemblage therefore represents only *c* 16% of the combusted weight of an average adult female skeleton.

The degree of fragmentation was high, and all fragments were heavily abraded, with soil concretions adhering. This is reflected in the low identification rate for every context. The largest fragment of skull was 26mm across and the largest individual piece of long bone was 63mm long. However, these were the exceptions, with the majority of bone occurring in the >2mm and >4mm fractions.

All bone in this group was fully calcined, oxidised, and white in colour. The presence of a high proportion of white bone indicates firing temperatures in excess of *c* 600°C (McKinley 2004: 11), but can also relate to preservation of material in acidic soil, as any interred material which was not fully calcined is likely to have been lost post-burial.

Cranial fragments were considerably over-represented amongst the identifiable material, with almost no axial and no upper limb bones identified. However, the majority of unidentified material in all contexts appeared to be fragments of long bone shafts and it is certain that more arm and leg bones were present in the assemblage than could be recognised. The thinner and lightweight axial material was generally not represented, however, again perhaps due to post-burial decay.

Three groups of cremated bone were thought to be discrete deposits. Context (012), found below the chamber floor, contained a high proportion of cranial vault fragments, one tooth root of a molar, fragments of a small patella, femoral shaft and pieces of toe phalanges including an unfused proximal epiphysis. The skull fragments included some which appeared adult and at least one fragment which was probably juvenile. The group may therefore include at least two individuals. The nearby deposit (013) contained no identifiable material, although it is possible that two large joining fragments could be burnt antler fragments. Context (017) was slightly larger than (012), and also contained a high proportion of cranial vault fragments, together with a single tooth root (canine or premolar), some femur and tibia fragments, and most likely comprised the remains of an adult.

All other deposits comprised small groups of bone weighing less than 10g each. Only (037) and (039) contained any identifiable material, the former a fragment of molar root and the latter a small cranial vault fragment and a fully formed single tooth root. This latter suggests an individual of at least 8–10 years of age, but possibly adult.

The poor condition of the material and the lack of any useful biological information regarding the people buried at this site means that the assemblage is not really comparable with other contemporary groups. However, the presence of at least two individuals, an adult and a child, in one of the deposits is a common occurrence in prehistoric burials of most periods and can indicate the re-use of pyres, the deliberate cremation of more than one individual at a time, or the curation of bone for later burial. It is possible that the several groups of bone recovered from this site were part of the two individuals identified in (012), as no duplication of parts was observed, but this could not be confirmed with the available evidence.

**Table 2** The cremated bone from Carmahome

| Context | Sample | Total wt(g) | % ident | % skull | % axial | % upper limb | % lower limb |
|---|---|---|---|---|---|---|---|
| *Expected** | | | | *18.2* | *20.6* | *23.1* | *38.1* |
| 012 | 2 | 82.2 | 28.6 | 64.3 | 2.1 | 0.0 | 33.6 |
| 013 | 3 | 44.6 | 0.0 | - | - | - | - |
| 017 | 4 | 83.1 | 14.3 | 69.7 | 0.0 | 0.0 | 30.3 |
| 030 | 16 | 0.5 | 0.0 | - | - | - | - |
| 032 | 17 | 7.3 | 0.0 | - | - | - | - |
| 033 | 18 | 1.0 | 0.0 | - | - | - | - |
| 034 | 19 | 0.6 | 0.0 | - | - | - | - |
| 035 | - | 5.9 | 0.0 | - | - | - | - |
| 036 | 14 | 0.1 | 0.0 | - | - | - | - |
| 037 | SP1 | 6.1 | 3.3 | 100.0 | 0.0 | 0.0 | 0.0 |
| 039 | 15 | 8.6 | 5.8 | 100.0 | 0.0 | 0.0 | 0.0 |
| Total | | 240.0 | | | | | |

## 17. APPENDIX 3: PLANT MACRO-REMAINS AND PALYNOLOGY

*Susan Ramsay*

### 17.1 Methodological approach

A total of 12 bulk soil samples, processed using standard flotation methods, were analysed for the presence of carbonised botanical remains. Charcoal fragments were examined using a binocular microscope at variable magnifications of ×4-×45and an estimation of the total volume of carbonised material >4mm was made. All charcoal fragments >4mm were identified and all carbonised seeds or other plant macrofossils present within the samples were removed and identified.

The internal anatomical features of all charcoal fragments were further identified at ×200 magnification using the reflected light of a metallurgical microscope. Reference was made to Schweingruber (1990) to aid identifications and vascular plant nomenclature follows Stace (1997).

Pollen analysis was undertaken on three contexts: (021) a buried soil beneath the cairn, (024) turf packing for kerbstones, and (036) the buried soil within the chamber.

Pollen samples were prepared by the University of Reading, using standard methodologies with sodium polytungstate heavy liquid separation to remove the mineral component and final mounting of the samples in glycerine jelly stained with safranin. Pollen identification and nomenclature follows Moore et al (1991), whilst vascular plant nomenclature follows Stace (1997). A minimum number of 500 identifiable land pollen grains is usually counted for each sample, but in this case pollen concentration was relatively low and so three slides, with coverslip dimensions of 40mm x 22mm, were counted instead. A pollen sum of Total Land Pollen (TLP) was used for the calculation of pollen percentages and a pollen sum of TLP + Pteridophytes was used for all spores.

### 17.2 Results

#### 17.2.1 Carbonised plant remains (Table 3)

Only small amounts of hazel charcoal were recovered from the mixed soil and cremated bone deposit (017) within the passage, suggesting that hazel wood formed at least a component of the cremation pyre fuel. Similarly, the fill (037) of the primary pit (038) contained traces of hazel charcoal as did the soil and cremated bone deposit (035). The charcoal from cremated bone and soil (012) located against the edge of the chamber comprised traces of heather-type and possible oak charcoal. Oak is generally the preferred pyre fuel because it burns with a particularly intense heat and heather may be the remains of kindling or there may have been a layer of heather on top of the pyre on which the body was placed. A third deposit of silt and cremated bone (013) also contained traces of oak charcoal along with clumps of burnt soil, again indicating that along with the selected human bone some funerary pyre material was also collected for re-deposition.

No identifiable charcoal was recovered from the mixed soil and crushed sandstone floor deposit (034), but a small amount of burnt soil was present indicating that cremation material had been incidentally trampled into this surface.

Buried soil (021) produced small amounts of hazel charcoal, but deposit (022) produced only a trace of heather-type wood that may be much more recent in date. Similarly buried soils (020b) and (020a) contained small amounts of hazel charcoal but no other species of carbonised wood; together with the results of the pollen analysis from buried soil (021) there is no evidence for in situ burning of hazel woodland. It is possible that the hazel charcoal originated from hearth waste produced by fires built on the original ground surface around the cairn.

Turf and stone (018) were stacked between the chamber orthostats and the kerbstones. This material produced a more mixed charcoal assemblage of hazel, cherry-type, oak, and willow, suggesting that either some hearth waste had been incorporated into this deposit or perhaps a fire had been built on the original turf surface before it was cut and used within the structure.

A layer of peat and silt (002) which sealed the trampled sandstone surface of tumbled cairn material on the east side of the cairn produced only traces of birch charcoal.

17.2.2 Pollen analysis (Table 4)

Pollen analysis was undertaken on three contexts: (021) a buried soil beneath the cairn, (024) turf packing for kerbstones and (036) the buried soil below the soil and silt crushed sandstone deposit within the chamber. However, it is postulated that all three of these buried soil samples were originally part of the same soil sequence prior to the cairn being built (Ellis, pers comm). The pollen assemblages from contexts (021) and (024) show some similarities but context (036) differs quite significantly.

A pollen diagram from Machrie Moor, around 5km to the north, covers the entire post-glacial period (Robinson & Dickson 1988). Although the radiocarbon dates shown on this pollen diagram are not calibrated, calibration has been undertaken using the CALIB 8.2 calibration program (Stuiver & Reimer 1993), which indicates that Local Pollen Zones (LPZ) 4b, 5a, and 5b cover the period of approximately 3650–1550 cal BC and so are most appropriate for comparison with the current study.

*[1] Trees and tall shrubs*

The tree and tall shrub pollen assemblages for both the soil beneath the cairn (021) and the turf packing for the kerbstones (024) are similar in terms of overall percentage, with trees and tall shrubs making up 16–17% of Total Land Pollen (TLP) in both cases. Both samples show alder, hazel, and birch in the vicinity, with willow also present in (024). Willow trees are insect pollinated and so the pollen does not travel as far as other tree and shrub species, which tend to be wind pollinated. Both samples contained traces of pine pollen, but pine pollen can travel for very long distances and so it is not possible to be confident that pine was actually growing in the wider area.

The soil beneath the crushed sandstone surface (036) showed a slightly higher overall tree and shrub percentage (22.6%) but the types present were the same as in the other two contexts and this variation could just be due to the relatively low pollen counts achieved for (036), meaning anomalies are more likely.

The Machrie Moor pollen diagram shows a similar range of pollen types in the tree and shrub category, but with the addition of significant amounts of oak pollen, which was absent from the Carmahome samples. This suggests that there was no oak woodland in the immediate landscape around Carmahome or when these soils were developing. Therefore, the small amounts of oak charcoal identified in samples from the passage tomb would have had to have been transported from further afield, perhaps within collected cremation material or as fuel for cremation pyres.

*[2] Heaths*

There was a significant difference in the abundance of heather pollen between the three samples. Heather pollen made up only 21.7% of the TLP in (024), 29.8% in (021) but 51.8% in (036). Firstly, this suggests significant areas of heather heathland in the immediate vicinity when the cairn was constructed. This could potentially correspond with a significant increase in heather abundance shown in the Machrie Moor pollen diagram, after the end of LPZ 5a and so dating to sometime within the range 3350–2500 cal BC. Robinson and Dickson (1988) suggest that the increased occurrence of acid heath may be the result of expansion onto areas where abandoned cultivated soil was becoming increasingly acidic. The significantly higher percentage of heather pollen in (036) than in (021) and (024) might suggest an additional input of heather pollen to (036), such as trickle down from heather placed on the chamber floor. There were a few examples of other types of Ericales (heather family) pollen present in all contexts but these were too crumpled to be further identifiable. All that could be said was they were not heather (*Calluna*) pollen.

*[3] Herbaceous plants*

Grasses have a moderate presence in all three buried soil contexts with around 18% in (021) and (036) and 25% in (024). There is no evidence for any cereal type pollen from any of the contexts. However, there is a significant difference in the amount of sedge pollen present between context (036) at around 2%, but significantly higher at 11% in (021) and 13% in (024). This might suggest very local variations in the on-site vegetation, such as in situ flowering sedge plants being incorporated into some of the buried soils during the construction of the cairn.

Buried soil (021) contained a diverse range of

herbaceous 'weedy' pollen types, with knapweed, dandelion-type, and buttercup present at above 1% and devil's-bit scabious present at 14.4% suggesting it was growing very close by since it is an insect pollinated plant. Devil's-bit scabious is a perennial species growing in damp but free draining soils. It can be found in a range of habitats including hay meadows, damp pastures, woodland, marshes, and along riverbanks. It would seem likely that the habitat at the time the passage grave was built was open damp grassland and not recently cleared woodland. The high values of devil's-bit scabious in (021) may, like the high values of sedge discussed above, be evidence for on-site growth of this species and incorporation of one or more flowers into the buried soils given these very high values.

Turf (024) showed a pollen assemblage that also indicated significant areas of grassland. Dandelion-type (5.1%) and members of the pink family (7.4%) were particularly abundant. Devil's-bit scabious was also common (6.3%) but with a significantly lower percentage than in (021), perhaps just as a result of very local differences in the plant species growing directly on site. A small amount of ribwort plantain (1.1%) might suggest grazing nearby as it is a plant often linked with pastoral agriculture. The overall percentage (62.3%) of grasses, sedges, and herbs again indicates the local environment was open, possibly grazed, grassland. It has been suggested that (024) might represent the remains of redeposited turf cut from the immediate area prior to the construction of the cairn and the pollen evidence is consistent with this explanation.

Buried soil (036) had an overall percentage of grass, sedge, and herbs of 25.6%, which is significantly lower than the values from (021) and (024) and there was a reduction in the diversity of herbaceous types present. Only chamomile-type, meadowsweet and devil's-bit scabious were present at over 1% TLP. However, the low pollen counts for (036) and the extremely high values of heather pollen, that may be later additions to this pollen assemblage, could significantly affect the percentage values of the other types since these are relative, rather than absolute values.

None of the contexts contained any evidence for cereal-type pollen that might indicate arable agriculture. However, cereal pollen is large and, although wind-transported, does not travel far from the parent plant and so absence of cereal pollen does not mean absence of cereals in the wider locality.

*[4] Ferns and Moss*

Fern (including polypody) spores were abundant in (021) and very common in (024) and (036). This might suggest shady woodland areas in the vicinity but may also be an indication of differential preservation of pollen/spores in the samples. Fern spores are extremely robust and so will survive when other types have deteriorated. There were also occasional bracken spores in (021) and (024), which can be indicative of open ground that has previously been woodland. Only traces of bogmoss spores were identified from (021), suggesting no significant areas of bog nearby.

### 17.3 Conclusions

It is likely that only some of the wood used as fuel in the cremation pyres came from areas of woodland in the vicinity of the site. Oak charcoal made up a significant percentage of the cremation fuel, but this oak probably came from further afield as it does not appear in the pollen spectra from any of the three pollen contexts examined from the passage grave. However, the pollen spectra from Machrie Moor (Robinson & Dickson, 1988) for the time period in question show significant amounts of oak pollen and so, even if oak was not available in the immediate vicinity, it was probably growing within 5km of Carmahome. There is no evidence for foodplants in the carbonised remains and so no indication that foodplants were included as offerings on the cremation pyres. The passage tomb was probably built within an area of damp grassland that may have been used for animal grazing. Over time, some of this grassland became increasingly acidic and heather heathland expanded into this habitat.

**Table 3** The charcoal from Carmahome

| | Context | 002 | 012 | 013 | 017 | 018 | 020 | 021 | 022 | 034 | 035 | 037 | 039 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample | - | 002 | 003 | 004 | 005 | 006 | 007 | 008 | 013 | - | - | 015 |
| | Description | Layer of peat and silt on the east side | Cremation deposit | Silt with cremated bone | Cremation | Turf and stone making bulk of cairn | Buried soil | Buried soil (same as 022?) | Buried soil (same as 021?) | Floor' layer | Cremation deposit | Cremation deposit | Fill of pit [040] |
| Total volume charcoal >4 mm | | <1ml | 1ml | <1ml | 1ml | 6ml | 2ml | 1ml | - | - | <1ml | 1ml | <1ml |
| Charcoal | | | | | | | | | | | | | |
| Betula spp | birch | 4 (0.02g) | - | - | - | - | - | - | - | - | - | - | - |
| Corylus cf avellana | hazel | - | - | - | 2 (0.04g) | 6 (0.28g) | 8 (0.34g) | 5 (0.24g) | - | - | 1 (0.05g) | 1 (0.15g) | - |
| Ericales | heather type | - | 1 (0.05g) | - | - | - | - | - | - | - | - | - | - |
| Prunoideae | cherry type | - | - | - | - | 1 (0.08g) | - | - | - | - | - | - | - |
| Quercus spp | oak | - | - | 1 (0.03g) | - | 21 (1.31g) | - | - | - | - | - | - | - |
| cf Quercus spp | cf oak | - | 3 (0.15g) | - | - | - | - | - | - | - | - | - | 1 (0.01g) |
| Salix spp | willow | - | - | - | - | 1 (0.02g) | - | - | - | - | - | - | - |
| Indet charcoal | indet charcoal | - | - | - | 1 (0.04g) | - | 6 (0.20g) | - | - | - | - | - | - |
| Uncarbonised wood | | | | | | | | | | | | | |
| Ericales | heather type | - | - | - | - | - | - | - | 1 (0.02g) | - | - | - | - |
| Misc | | | | | | | | | | | | | |
| Burnt soil | burnt soil | - | - | 13 (0.56g) | - | - | - | - | - | 1 (0.47g) | - | - | - |

**Table 4** The pollen from Carmahome

| | Context | 021 | 024 | 036 |
|---|---|---|---|---|
| | Sample | 7 | 10 | 14 |
| | Description | Buried soil beneath cairn | Turf packing for kerbstone | Silt loam below crushed sandstone floor (034) |
| Trees & Tall Shrubs | | | | |
| Alnus | alder | 27 (9.0%) | 5 (2.9%) | 13 (7.9%) |
| Betula | birch | 5 (1.7%) | 1 (0.6%) | 3 (1.8%) |
| Coryloid | hazel type | 15 (5.0%) | 15 (8.6%) | 17 (10.4%) |
| Pinus | pine | 4 (1.3%) | 4 (2.3%) | 4 (2.4%) |
| Salix | willow | - | 3 (1.7%) | - |
| *Total Trees & Tall Shrubs* | | *17.1%* | *16.0%* | *22.6%* |
| Heaths | | | | |
| Calluna | heather | 88 (29.4%) | 35 (20.0%) | 79 (48.2%) |
| Ericales | heather family | 1 (0.3%) | 3 (1.7%) | 6 (3.7%) |
| *Total Heaths* | | *29.8%* | *21.7%* | *51.8%* |
| Herbs | | | | |
| Poaceae | grass | 54 (18.1%) | 44 (25.1%) | 29 (17.7%) |
| Cyperaceae | sedge | 34 (11.4%) | 23 (13.1%) | 3 (1.8%) |
| Anthemis type | chamomile type | - | - | 2 (1.2%) |
| Artemisia | mugwort | 2 (0.7%) | - | - |
| Aster type | daisy type | 2 (0.7%) | - | - |
| Caryophyllaceae | pink family | 1 (0.3%) | 13 (7.4%) | 1 (0.6%) |
| Centaurea | knapweed | 3 (1.0%) | 1 (0.6%) | 1 (0.6%) |
| Filipendula | meadowsweet | - | 1 (0.6%) | 2 (1.2%) |
| Lactuceae | dandelion type | 9 (3.0%) | 9 (5.1%) | - |
| Plantago lanceolata | ribwort plantain | - | 2 (1.1%) | - |
| Plantago major/ media | greater/hoary plantain | 1 (0.3%) | - | - |
| Polygonum | knotweed | - | - | 1 (0.6%) |
| Potentilla type | cinquefoil type | 2 (0.7%) | - | - |
| Ranunculaceae | buttercup family | 4 (1.3%) | 2 (1.1%) | - |
| Rumex acetosa type | sorrel type | 2 (0.7%) | 2 (1.1%) | 1 (0.6%) |
| Succisa pratensis | devil's-bit scabious | 43 (14.4%) | 11 (6.3%) | 2 (1.2%) |

**Table 4** *cont.*

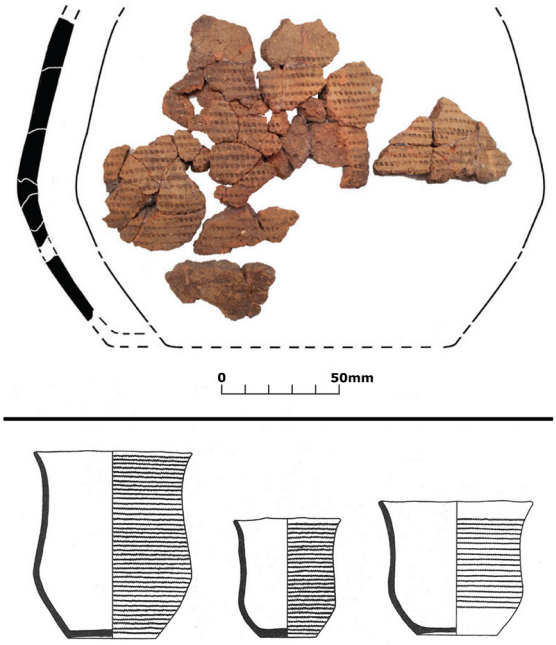
| | Context | 021 | 024 | 036 |
|---|---|---|---|---|
| | Sample | 7 | 10 | 14 |
| | Description | Buried soil beneath cairn | Turf packing for kerbstone | Silt loam below crushed sandstone floor (034) |
| Trifolium type | clover type | 2 (0.7%) | - | - |
| Viola | violet | - | 1 (0.6%) | - |
| *Total Herbs* | | *53.2%* | *62.3%* | *25.6%* |
| Total Land Pollen (TLP) | | 299 | 175 | 164 |
| Pteridophytes | | | | |
| Filicales | ferns | 982 (37.3%) | 443 (61.4%) | 36 (12.7%) |
| Polypodium | polypody fern | 1352 (51.3%) | 102 (14.1% | 83 (29.3%) |
| Pteridium | bracken | 1 (<0.1%) | 2 (0.3%) | - |
| Sphagnum | bogmoss | 2 (0.1%) | - | - |
| Total Land Pollen + Pteridophytes | | 2636 | 722 | 283 |

## 18. APPENDIX 4: THE BEAKER POT

*Alison Sheridan*

Total reconstruction of the large piece of the pot was not possible owing to the friable, laminar nature of the sherds, their structure having been compromised in several cases by rootlet penetration. The pattern of fragmentation did, however, reveal details of the manufacture of this very fine pot, with several sherds having broken along coil joints; clearly it had been built up using flattened coils of varying height. In one case it was clear that the ends of the coil had been joined in a diagonal seam.

The pot had been made with great skill and care. It has remarkably narrow walls, with wall thickness ranging from as little as 5.5mm at the lower belly to 8.1mm just above the carination. In shape, it is low-carinated, with a rounded carination that will have been located around a quarter of the way up the pot. The diameter at the carination will have been *c* 200mm. Below that, the body curved in towards what will have been a flat base, whose estimated diameter is just under 130mm. Further up, at the highest surviving part of the pot, the estimated diameter is *c* 170mm. Above the carination, the wall sloped in gently in a straight line (Illus 17). It is hard to be certain about how much of the upper part of the pot is missing, since the formal *comparanda* (Illus 17) – all Beakers that are likely to be roughly contemporary – show a range of possibilities. The straightness of the wall above the carination is comparable to that on the Drumelzier Beaker, Scottish Borders, although the Carmahome wall slopes inwards slightly, rather than rising vertically. The decorative scheme, with a band of horizontal lines fringed by undecorated zones, is comparable to that on the Antofts Windypits Beaker found in North Yorkshire, although one cannot rule out the possibility that this had been a taller Beaker like another Yorkshire Beaker, the Grassington example, with a further band of decoration on the neck above an undecorated zone (for which a parallel can be cited from Ashberry Windypit, also North Yorkshire: Clarke 1970: 284, no.31). There is no hint of the concavity of the wall above the carination as seen in the Antofts Windypit example. Given the proportions of the surviving part of the Carmahome Beaker, it seems most likely that it had been a tall vessel, like the Grassington example, and is therefore missing around a third of its height (as well as missing its base); its original overall height could therefore have been around 210mm.




**Illus 17** The Beaker from Carmahome (above) and a range of formal comparanda (below, from L to R: Grassington, North Yorkshire; Drumelzier, Scottish Borders; Antofts Windypit, North Yorkshire). Note: even though these have impressions made using twisted cord rather than a comb, they are likely to be broadly contemporary with the Carmahome Beaker (after Clarke 1970). (image: Forestry and Land Scotland)

Much of the exterior is decorated with horizontal lines of impressions made with a rectangular-toothed comb at least 54mm long. These lines stop at the upper part of the surviving wall, and on the lowest part of the belly, to leave the uppermost and lowermost parts of the exterior plain. The surfaces had been very carefully smoothed prior to decoration, probably by wet-smoothing. The exterior is a rich reddish-brown with grey-brown patches; the core varies from light red-brown to medium grey-brown and blackish; and the interior is a light greyish-brown with a slight reddish tinge. There are no visible signs of any organic residues. Inclusions (which were examined both macroscopically and using a binocular microscope at a magnification of x10) are mostly very small (<0.5mm) and sparse, and

consist of sand-sized rounded quartz grains and tiny mica flecks (both probably present naturally in the clay); there are also a few slightly larger inclusions (up to 4.3 x 3.3mm in size) of angular clear quartz and feldspar, plus one sub-angular piece of a light grey stone. Overall, the inclusion density is less than 3% (as estimated using the charts published by Matthew et al 1991).

The vessel is immediately identifiable as belonging to the earliest kinds of Beaker found in Britain and Ireland – ones that are closest in style and in their technique and quality of manufacture to their immediate Continental precursors and congeners. According to David Clarke's 1970 classificatory scheme (Clarke 1970: 290–2, eg nos 81, 84, 86, 88, 92–4, 96, 101–5, 558, Map 2), this would count as a 'European'-style Beaker, with close similarities with his 'All Over Cord-impressed' (AOC) Beaker type. According to Stuart Needham's classificatory scheme (2005), it is a Low-Carinated Beaker with All Over Comb decoration (even though the decoration stops short of covering the whole of the exterior); the type does not feature in Neil Curtis and Neil Wilkin's review of Beakers in north-east Scotland (2019). According to the most up-to-date typochronology for British Beakers, this vessel should date to between *c* 2450 cal BC and *c* 2200/2150 cal BC (Parker Pearson et al 2019: 173). A radiocarbon date within this bracket has indeed been obtained at Carmahome, from hazel charcoal found among the lower turf (018) in the mound (2400–2150 cal BC at 95.4% probability, 3814±28 BP, SUERC-122898). Turf, and possibly pyre debris, may have been added to the mound at this time, and this hazel charcoal could conceivably derive from a funeral pyre. Even though no recoverable Chalcolithic or Early Bronze Age cremated bone was found during the excavation, a scatter of minute cremated bone was observed within the rubble collapse fill within the passage, and this may support the hypothesis of funerary activity at this time; unfortunately, however, this bone was too comminuted to be radiocarbon-dated or identified to any species.

Other Beaker pottery that is likely to be of Chalcolithic date has been found on Arran. At Tormore, in the earliest phase of a 'hut-circle', AOC pottery was found (MacSween 1997: fig. 8D; note that the pottery may well pre-date the erection of that structure); and at Kilpatrick (cairn 16/2) – just 850m from Carmahome – an AOC Beaker (ibid: fig. 22, top left) was found in the earliest phase of a multi-phase funerary monument, possibly a pit-grave or else a cist. Several other Beakers of definite or probable Chalcolithic date have been found in the west of Scotland, many on or near the coast (Clarke 1970: maps 1 and 2). A small AOC Beaker from a simple pit grave at Sorisdale on the island of Coll (Ritchie & Crawford 1978), radiocarbon dated to 2470–2210 cal BC (95.4% probability; 3879±32 BP, OxA-14722; Jay et al 2019: 54), is particularly important because the young woman whose remains produced the radiocarbon date has been found (from her aDNA and isotope values) to be a first-generation immigrant 'Beaker person' from the Continent, probably from central Germany (Olalde et al 2018: fig. 2). Before the DNA analysis was undertaken, the strontium and oxygen isotope analyses of this woman (Montgomery et al 2019: 395; Pellegrini et al 2019: 419) had already revealed that she had been raised far away from western Scotland, thereby leading to the conclusion that she had been a first-generation immigrant. The possibility that the Carmahome Beaker had also been made and/or owned by an immigrant from the Continent should therefore be borne in mind.

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